

Clean Up Georgia – Raising of Public Awareness and Involvement in
Solid Waste Management Improvement

Clean Up
წმენდასა და გარემოს
დაცვას



Georgia
საქართველო

Popular Manual
On Municipal Solid Waste Management

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1. FOREWORD

The Manual is created by the Project “Clean Up Georgia – Raising of Public Awareness and Involvement in Solid Waste Management Improvement” and funded by the Swedish International Development Agency (SIDA). It includes waste management planning issues at central, regional-administrative, and local levels; also it reviews different modern methods of planning for the development of sustainable waste management system.

With the purpose of approximation to the EU legislation, it is also necessary to improve the field of municipal solid waste management, which envisages building of new infrastructure including the development of waste recycling industry, waste segregation and presence of modern waste landfills.

The precondition of these actions is the existence of waste management system, the adequate economic and legislative environment.

The Manual is prepared for the employees of self-government and local government, who are directly connected with the planning and implementation of waste management system.

There are other parties also participating in waste management system, such as public organizations and population, who are generally called stakeholders.

The Manual can be used for the development of National Strategy and State Waste Management Plan, as well as regional-administrative and local plans.

In general, the document covers the overview of existing principles and legislative environment of waste management, also advanced international practices and experience in the field of waste management, review of EU waste-related legislation and international conventions. Its main purpose is to allow the interested parties to work out and implement an integrated sustainable waste management system in their region by means of the development of a Waste Management Plan.

This Manual reviews non-hazardous municipal solid waste management; and does not review hazardous wastes, which implies easily inflammable, explosive, chemical, biological, and radioactive wastes.

2. INTRODUCTION

The amount of wastes generated by the mankind represents serious hazard to the environment. There is such a big amount of litter accumulated in the ocean that a huge litter island appeared at 1600 km distance from the eastern coast of the United States, the area of which twice exceeds the area of such a country as the Ukraine. This island does not disappear, does not disintegrate, since substantial amount of the wastes accumulated there is plastic, which is not subject to biochemical dissolution. By estimate of scientists, minimum of 500 years is necessary for disintegration of polyethylene in natural conditions.

The wastes of plastic consumed by human population each year becomes the reason for death of 1 million marine fowl and 100 000 tortoises, seals, whales, and other marine mammals.

Litter includes hazardous chemical substances – lead and phosphorus, which pollute air, soil, surface and ground waters, sea, oceans. In the end, such pollution damages the planet’s biodiversity and endangers the human health.

Today, governments of many countries try to reduce the amount of wastes generated as a result of human economic and domestic activities. One of the ways of such directions is the reuse of wastes as raw materials for manufacturing products.

The amount of generation of domestic wastes is closely related to the quantity of population, urban development and increase of the standard of living. Archaeological excavations clearly show that even B.C. in the cultural strata of discovered urban areas the higher was the standard of living of a settlement the more wastes were identified. Correspondingly, the quality of generation of modern wastes is directly connected to the figures of the standard of living in the country, such as, for example, gross domestic product, energy consumption rate, minimal salary, level of industrialization and unemployment, development of economy, and others.

Developed countries try to reduce generation of wastes.

Approximately 2 billion tons of wastes are generated each year in EU member countries. This amount increases yearly including hazardous wastes.

Disposal of wastes and their direct elimination (for example, through incineration) is dangerous both for human health and the environment.

The best solution of this problem is the reduction of wastes during the process of their generation and their recycling with the purpose of obtaining new products.

3. WHY THE INTEGRATED SYSTEM OF SUSTAINABLE WASTE MANAGEMENT?

Under the conditions of increased population, urbanization, and standard of living, the increase of municipal solid wastes and their management (collection, transportation, recycling, and disposal) remains the main challenge to date for the majority of developed and developing countries.

One of the most important conditions of sustainable development in the developing countries is the establishment of the practice of effective and sustainable waste management. Such a practice is useful from the standpoint of public health, safety, and environmental protection. It reduces greenhouse gas emissions, and considerably favors improvement of life quality and health, care for natural resources, reduces water and soil pollution risks, and represents the source of renewable energy.

Recent studies of the World Bank have shown that the municipalities in developing countries usually spend 20-50% of their yearly budget on municipal solid waste management (open landfills and open incineration are found as an usual practice). In spite of that, 30-60% of the total amount of wastes is still uncontrolled, and it is not possible at all to provide service to more than 50% of population. In low income countries, 80-90% of the whole budget allocated for wastes goes for collection; in medium income countries, 50-80% of waste management budget is used for collection; as for high income developed countries, only 10% are spent on collection, what enables to mobilize more resources for waste management. This is caused by the fact that it has already been long time since in developed countries sustainable, integrated systems were adopted. This ensured transformation of most part of wastes into material and resource, which is by itself reflected in reduction of amount of wastes. The renewable resources and materials allow the obtaining of certain profit, which, in its turn, will be used for waste management.

Management of solid wastes is quite a complex process, since it includes different types of technologies and methods. These can be the technologies related to waste generation (including “at source reduction”), treatment and storage on site, transportation, recycling, and final disposal. All this should be fulfilled on the basis of requirements of local and international legislation, with observation of social and environmental rules and norms.

Incorrect handling, storage, collection, and disposal of wastes, when collected “garbage” is simply dumped on the land in an uncontrolled way, can create quite a big risk for human health and environment. This is especially significant for densely populated areas, where, proceeding from the fast growth of urbanization and living standards, wastes are generated in dramatically large quantities. Incorrect management of solid wastes results in human and animal illnesses as well as considerable economic, environmental, and biological losses.

In developing countries, waste management needs to overcome many difficulties and obstacles, such as, for example, poor technical experience and insufficient financial resources mainly covering only collection and transportation, and even then inadequately.

Integrated approach towards solid waste management aims at connecting with each other different aspects of waste management and different technologies of waste treatment.

The adjusted system of waste management conditions a relevant function of each component of waste management. In its turn, this concept ensures reduction of wastes disposed of at the landfill, reuse of wastes, and their recycling.

There are 3 levels of integration in world practice:

1. Connect waste collection to local recycling market
2. Connect waste collection to biological treatment facilities
3. Fulfillment of all components of waste management with full involvement of interested parties

4. PART I. GENERAL INFORMATION

4.1. Definition of Terms

“Waste” is any substance or product, which is generated as raw material, matter, semi-finished product, residue of other item and product as a result of manufacturing and/or consumption process, also as the product, which lost consumer qualities, although can be recycled and has some cost;

“Litter” is the substance or product, the owner of which carries out or plans throwing, eliminating, or disposing of it in any other form, which cannot be recycled and does not have any cost;

“Waste generator” – any person, as a result of whose activities wastes are generated;

“Source” – the place, where waste is generated;

“Waste streams” – wastes according to types;

“Waste management” – activity which is connected with the prevention of waste generation, their reduction, generation, collection, transportation, application, neutralization, and disposal;

“Sustainable” – is the system, which: corresponds to those conditions in which it functions in technical, social, economic, financial, institutional, and environmental perspective, and which can support itself in time without reduction of necessary resources;

“Integrated” – is the system, which: uses interconnected collection and treatment versions in different-scale settlements; ensures involvement of all types of stakeholders, whether governmental or non-governmental, formal or non-formal, profit-oriented or non-profit-oriented, envisages interaction between waste management and other urban systems;

“Waste disposal” – the point of final placement of wastes. Different wastes have different places of disposal according to streams and classes through their further burial, neutralization, or use;

“Reuse of wastes” – reuse of certain product or product waste with different purpose without its technological recycling;

“Waste neutralization and/or disposal facility” – specially designated place, building or compartment, which is for neutralization and/or disposal of wastes;

“Stakeholders” – are physical persons and organizations, e.g. consumers, sponsors, implementing authorities, and public figures which are directly or indirectly involved in a certain project (system), and whose interests a particular project (system) can influence positively or negatively during or after its implementation. They can also have an influence over functioning and development of the system at different degree;

“Waste recycling” – use of wastes as raw materials for generation of new products, fulfillment of work, provision of service or obtaining of energy;

“Incineration” – thermal destruction of wastes, burning;

“Waste neutralization” – different kinds of technological processing of wastes (including incineration of wastes in special devices) with the purpose of avoiding harmful influence of wastes on human health and environment;

“Waste Segregation” – sorting out of wastes according to the “streams”, when wastes of different types are collected separately and have different sites of disposal;

“Sustainable” is a system, which:

- is adequate to those conditions, in which it functions, with technical, social, economic, financial, institutional, and environmental perspective; and
- can sustain itself in time without reduction of necessary resources

“Integrated” is the system, which:

- uses interconnected collection and treatment versions in different-scale settlements
- ensures the involvement of all types of stakeholders, whether governmental or non-governmental, formal or informal, profit-oriented or non-profit-oriented
- envisages interaction between waste management, and other urbane systems

4.2. Principles of Integrated Sustainable Waste Management

Integrated sustainable waste management system is based on the basic principles of environmental protection

The basic principles of environmental protection are:

- a) “Risk mitigation principle” – while planning and implementing his activity, the subject of the activity is obliged to take adequate measures for avoiding or mitigating the risk of harmful influence over environment and human health;
- b) “Principle of sustainability” – use of environmental and natural resources, during which no danger is created to the development of society and the protection of environment and natural resources towards their irreversible quantitative and qualitative changes is ensured;
- c) “Principle of priority” – action, which can cause negative influence over environment and human health, can be changed for other, less risky, although more costly action. Priority is attributed to the latter if its cost does not exceed the expenses of compensation of the losses resulting from the environmental damage imposed by less costly activity;
- d) “Principle of paid nature use” – use of natural resources of land, water, forest, flora and fauna is paid by the person fulfilling the activity;
- e) “Polluter pays” principle – obligation of the subject of the activity, also other physical and juridical person to compensate the damage imposed on the environment;
- f) “Principle of preservation of biological diversity” – an activity should not cause reversible degradation of biological diversity;
- g) “Waste minimization principle” – during the implementation of an activity, priority is attributed to such a technology, which ensures minimization of wastes;
- h) “Principle of recycling” – during the implementation of an activity, priority is attributed to re-usable or recyclable, biologically degradable or environmentally harmlessly disintegrable substances, materials, and chemical compounds;
- i) “Principle of restitution” – as a result of an activity, degrading environment should be restored to the form, maximally approaching its primary condition (restitution in integrum);
- j) “Principle of environmental impact assessment” – while designing or planning his activity, the subject of an activity is obliged to envisage and assess potential impact of this activity on environment in accordance with procedure established by law;
- k) “Principle of public participation in decision-making” – public participation in the process of decision-making related to implementation of activities is ensured;
- l) “Principle of access to information” – information regarding environmental situation is open and accessible for society

and includes the following necessary conditions regarding waste management:

1. Public involvement in the whole cycle of waste management system, from planning to implementation;
2. Reduction of the amount of wastes to be disposed of at the landfill;
3. Reuse and recycling of wastes;
4. Waste collection and treatment by available technologies;
5. Implementation and monitoring of waste management system.

Below there are enumerated other additional important principles of integrated sustainable waste management which should be by all means considered in the process of formation of the system:

Technical/operational principles (technologies, location, topography, local resources, equipment and facilities)

Financial principles (payment rates both for the enterpriser and consumer, correctly planned financial benefit, municipality incomes, reduction of prices, high productivity of workforce and capital)

Socio-economic principles (should include the whole population in spite of ethnic, cultural, religious, or social situation, mitigation of health risks adapted to consumer demand and priorities as well as population solvency)

Institutional/administrative principles (raising the level of operators and managers (especially local personnel); ensuring public involvement in the phases of planning and implementation; development of organizational culture)

which furthers the increase of professionalism; transparency and accounting based on decentralized management; giving local self-government bodies enough financial and legislative autonomy; increase of motivation)

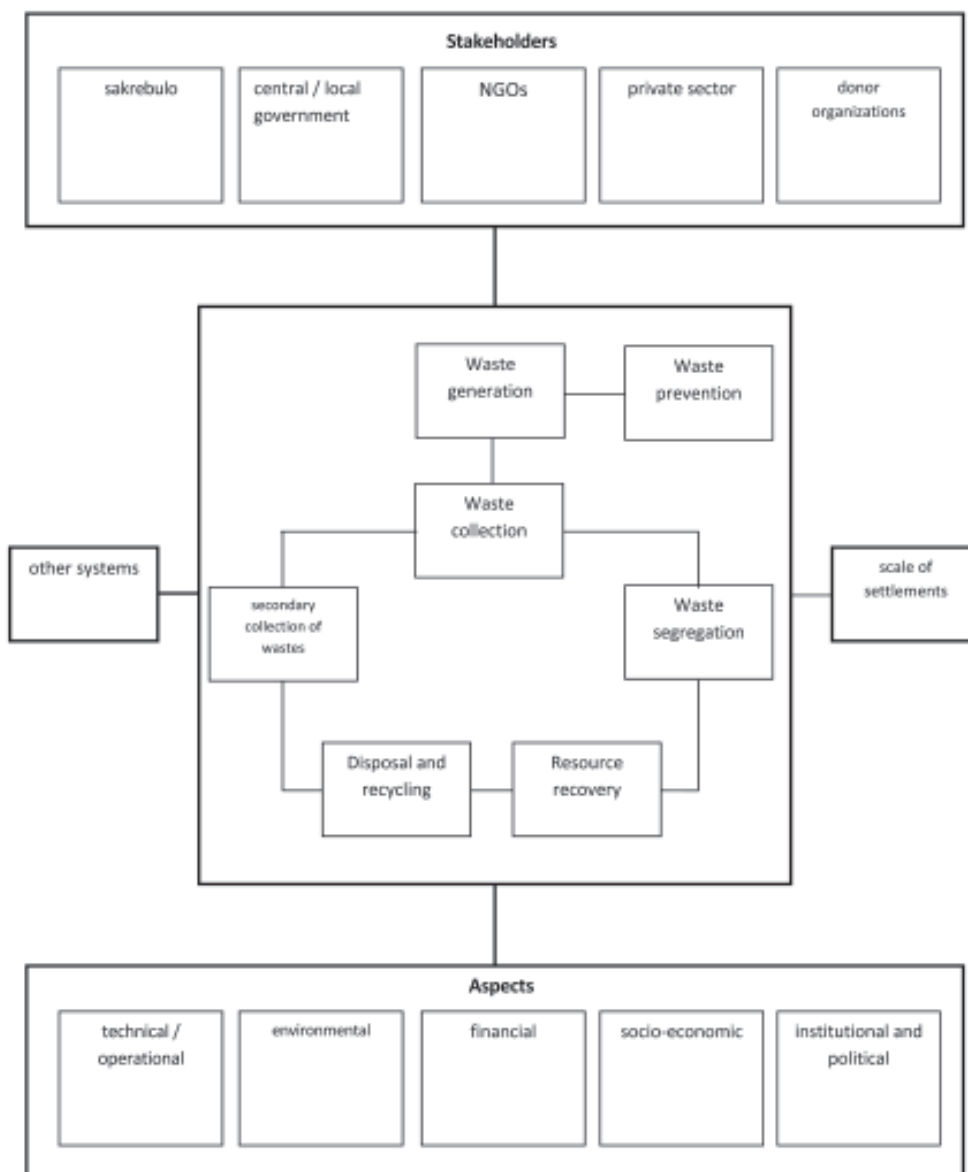
Political and legislative principles (legislative base, which furthers the involvement of non-governmental and private sectors; decentralization of different fields, rights and finances; development of transparent regulations and laws; possibility of decision-making at a lower level; making and approving the budget on the place)

4.3. The Concept of Integrated Sustainable Waste Management

Integrated sustainable waste management includes waste prevention, resource restoration, and participation of stakeholders as well as interaction with other systems and integration of settlements of different size (city, settlement, populated area). However, it should be mentioned that while selecting a technology or forming a system the most important still is the factor of a united state strategy and adjusted legislation.

Selection of waste management technologies may be limited only by technical requirements, such as waste amount and composition, characterization of location, the distance of transportation to the place of final disposal, and price of operation. However, it is possible to understand this notion even wider, which includes economic condition, cost of workforce and capital, opportunities for storage and renovation, and level of proficiency of available workforce.

It is notable that often waste management is considered as purely technical issue. This is not right. For example, let us consider a number of cases, when different technologies proved unsustainable for given society, economy, and environment exactly because waste management was considered as a purely technical aspect.



1. City municipality takes a long-term loan (up to 30 years) from different international donor organizations to purchase the equipment necessary for collection of wastes. Considering that the equipment necessary for collection after 5-7 years will in general become obsolete and would require replacement, in addition under the conditions of high expenditure and low profit for the municipality, the municipality will for a long time be repaying the loan after the equipment is obsolete and out of work.
2. In some countries, with the purpose of storage and reduction of renovation expenses, so-called standardization of waste-collecting motor-cars takes place, i.e. motor-cars of the same type are used for waste collection in the whole country. This can result in coming to a standstill of collection of wastes in particular regions or city areas because the motor-car cannot reach particular narrow and uneven streets because of its large size.
3. In some countries they use a motor-car with automatic open load system of garbage can. Plastic garbage cans are distributed to the population for collection of wastes, but there are cases, when (in some developing countries) population uses plastic garbage can for completely different, more important purposes for them (laundry, washing kids, brewing beer and etc.). Because of this the work of the whole system is disrupted, since expensive motor-car stays inactive and collection of wastes from population cannot be managed.

The above examples show us that while selecting technology it is not enough to focus only on technical issues while forming the system of waste management. Therefore, while making decisions in the process of formation of integrated, sustainable system, other issues (social, political, financial, and etc.) should be considered by all means.

If waste management system is integrated with other systems this increases its sustainability even more. For example, the compost, produced from urban organic wastes can be used in city parks and other urbane areas which in its turn creates a single closed-cycled system within the city.

The given diagram schematically reflects the system of integrated sustainable waste management.

4.4. Waste Management in Georgia

There are 10 regional-administrative units in Georgia. There are 4 self-governing cities within these administrative units, Tbilisi and 64 municipalities (local self-government), which, in its turn, includes executive body – administration (gamgeoba) and legislative body – assembly (sakrebulo).

The field of waste management is generally coordinated by the Commission of Infrastructure of Sakrebulo, which is authorized to take decisions at local level, approve budget and supervise earmarked spending of the budget.

In Georgia at present, the service of waste management is carried out by clean-up services existing at local self-government, which are generally governmental structures or government-owned companies. These structures manage to collect only 25-35% of total amount of generated wastes, which they dispose of at unmanaged landfills, where with the purpose of elimination of collected wastes their spontaneous burning takes place. In most cases there is no landfill design, EIA and permit, waste disposal procedure, the quantity of wastes is not reported. However, in some regions there already exist modern, European standard landfills, but this is very insignificant, and it should be mentioned that disposal at segregation landfills is the last instance in the waste management hierarchy.

The problem is also that the sorting of wastes does not occur at either level. That is why together with municipal wastes landfills receive medicines, substances of different chemical composition, electric products and etc., which are mixed with all other types of domestic wastes and their burning is extremely dangerous both for environment and health.

Much worse is the situation in the settlements at a remote distance from administrative centers, where practically no waste collection and disposal occurs. According to preliminary, unconfirmed information, 80% of total amount of generated wastes comes on population, 15% comes on enterprises, nutrition facilities and trading facilities, 3% - on wastes dumped in the streets in a disorderly way, and other 2% - on all other sources.

Technically, there are a number of ways of collection and transportation of wastes, although there is one particular technology acting in all regions of Georgia; this is disposal of average-size garbage container at particular sites, from where waste trucks carry out collection and transportation of garbage to existing “landfills”.

4.5. Methods of Waste Management Worldwide

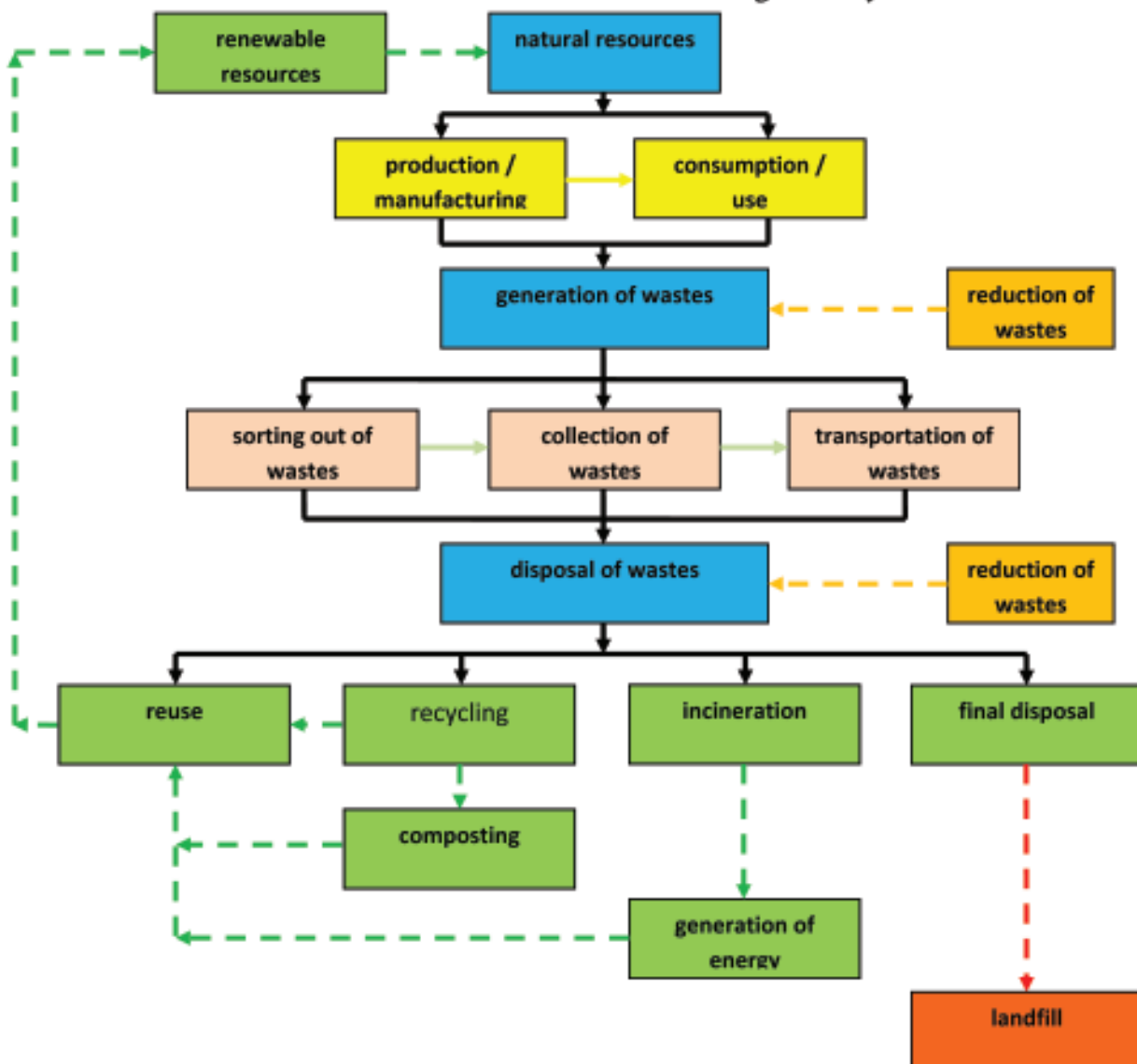
The concept “Waste Management” includes waste collection, transportation, recycling, and/or disposal, its management and monitoring from the “source” of origin to the final site of disposal. Waste management concerns materials, generated through human activities, and is directed at mitigation of their negative impact on human health, environment, or esthetic condition. Waste management is the practice of renovation and reuse of resources, and is directed at reduction of consumption of natural resources.

The practice of waste management differs for developed and developing countries, urbane and agricultural regions, as well as for residential and industrial areas. In large populated areas, management of non-hazardous wastes is generally the prerogative of local administration bodies, although management of commercial and industrial wastes is the “producer’s responsibility”.

The system of integrated waste management, which is extensively introduced in the whole developed world, is the aggregate of methods of waste control and disposal, such as reduction of wastes “at the source”, recycling, treatment, and secondary use, incineration (burning), and disposal at a landfill. The diagram given below reflects the structure of the system of waste management.

The most acceptable and effective management instrument in the world is the reduction of amount of wastes “at the source”. The second is reuse of solid wastes, during which residual product or material can be reused with the same or other purpose. Recycling is the first, when restoration (renovation) of resources from wastes is possible. Incineration (burning) and restoration of energy at the expense of released gas and heat is the fourth method. Finally, in those cases when these methods are unattainable for different circumstances, the final stage of waste management is their disposal at a landfill.

The structure of the waste management system

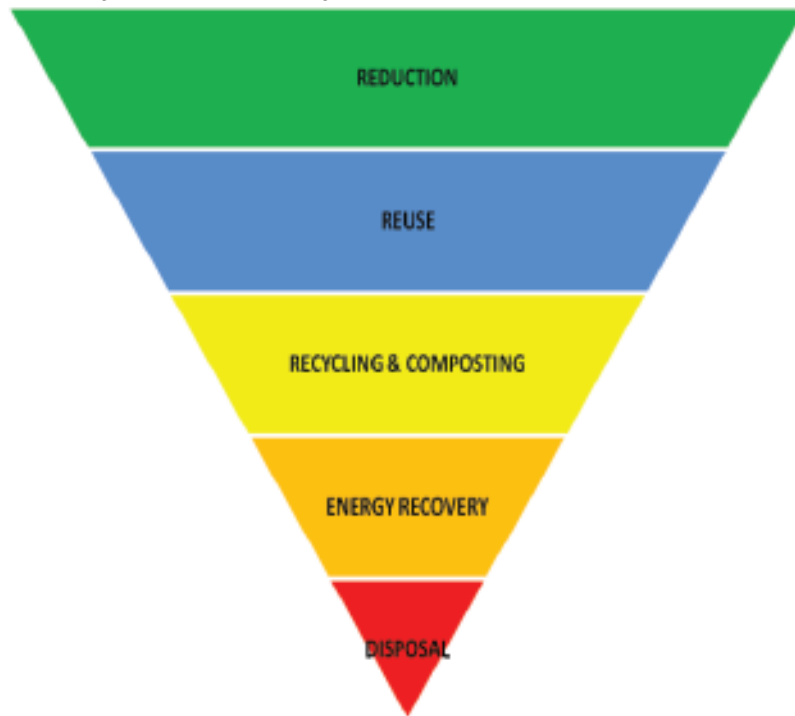


4.6. Waste Hierarchy

Although after the use of the four above-mentioned methods the site of final disposal of wastes left is still a landfill, their amount is considerably less, which increases sustainability of the landfill, its terms of service, and considerably reduces adverse environmental impact. Therefore, for the creation of the waste management system it is necessary to consider the following main factors:

- reduction of the amount of generated wastes
- increase of the quality of recycling
- increase of the quality of restoration and use
- reduction of the amount of wastes disposed at the landfill

The hierarchic pyramid of wastes looks as follows:



4.7. Classification of wastes and terms of disposal

To create a sustainable system it is necessary to clearly and exactly define the types of wastes, so-called “streams” in the first place. For example, the concept “municipal wastes” can be perceived differently in different countries and even within a country, in different ethnographic groups. With this purpose, kinds and types of wastes should be clearly defined. For example, let us bring the most known classification of the types of municipal wastes:

1. General wastes
 - domestic wastes, which were in contact with food or other organic components and it is impossible to recycle or restore and reuse it
2. Recyclable wastes
 - solid plastic
 - polyethylene
 - plastic (PETE) bottles
 - glass
 - metal
 - aluminium
 - wood
 - paper / cardboard

3. Construction (inert) wastes
 - concrete fragments
 - brick fragments
 - asphalt fragments
 - lime and other insulator fragments
 - gypsum and cardboard fragments
 - construction plastic fragments

The types of wastes such as used accumulators, batteries, fluorescent or economic lamps and others belong to the class of hazardous wastes and therefore are not considered in present Manual.

After that the directions of final disposal for each type (“stream”) should be determined.

For example: place of final disposal for general wastes is a landfill; recyclable wastes should be recycled in corresponding facilities; construction wastes should be recycled and used in the construction again.

One more very important factor of creation of the system is the establishment and implementation of relevant, sustainable system of data registration and reporting. These statistical data are important for better management and right planning of wastes.

4.8. “3R” Initiative

The policy of waste minimization, reuse, and recycle is widely spread in developed countries. Existing landfills cannot keep up with increased amount of wastes because of developed economy and increased standard of living, and it becomes necessary to construct new landfills, which is connected with additional costs and adverse impact on environment.

It is just because the governments of developed countries set as their aim to maximally reduce the amount of wastes disposed at landfills. The “3R” Initiative of waste management (Reduce, Reuse, and Recycle) is adopted in many developed countries of the world. This initiative has been initiated and correspondingly motivated by almost all governments of developed countries.

To support this initiative, different programs have been developed, such as, for example:

- Extended Producer Responsibility, ERP
- Imposition of the Costs of the Unity, the so-called “Pay As You Throw”, PAYT
- Landfill taxes and programs of recycling and reuse of other wastes

4.8.1. “Extended Producer’s Responsibility”

Within the framework of the integrated system of sustainable waste management EU adopted so-called “Directive of Producer’s Responsibility”, which includes regulation of packaging, consumption and management of electronics and electric appliances, motor-cars, and their elements. The framework directive of wastes calls upon the member countries to carry out necessary measures for introduction of “Extended Producer Responsibility” Program.

This Program includes increased responsibility of the producer in the period of further use of the product, i.e. creation of strong motivation for the producer for the modification of the product, which requires fewer amounts of materials, and includes increased potential for recycling. If this purpose is unattainable, strict financial sanctions are envisaged, while in case of achievement, different types of encouragement are envisaged. Initially, such programs were rather costly, however EPR is quite an extensive concept and its price in contemporary world does not represent the problem anymore. According to their complexity and cost, EPR programs are quite different, however their final result, waste reduction, is obvious in a whole number of developed and developing countries.

Dramatic growth of bottle and jar wastes caused the concern of environmentalists, who noted accumulation of resistant wastes along landfills, rivers, and motorways during biochemical disintegration. They were also concerned by polluting substances, which originated in the environment as a result of production of aluminium jars and plastic bottles. Governments also got concerned by the situation created in the field of beverage production. As a result, when in the 1980s one of the producers of aluminium jars in Sweden decided to build a new factory, Swedish government put forward a condition to him which implied that unless 75% of the products of this sector were recycled, the use of the jars in the country would be banned altogether. The sector proved able, and, even more, exceeded governmental requirement owing to the system of preliminary mortgage and returning of dishware costs. The same practice is extensively introduced in different advanced developed countries of the world.

The example of Sweden shows us how a government is able to make a producer pay attention to the wastes generated as a result of his activities not only in the process of production, but also after the sell of the product. The aim of such a policy is to encourage producers to think about environmental protection during the development of a product concerning the selection of raw materials. The main idea lies in the fact that producers generate fewer wastes and, correspondingly, the product produced by them pollute the environment in a low degree.

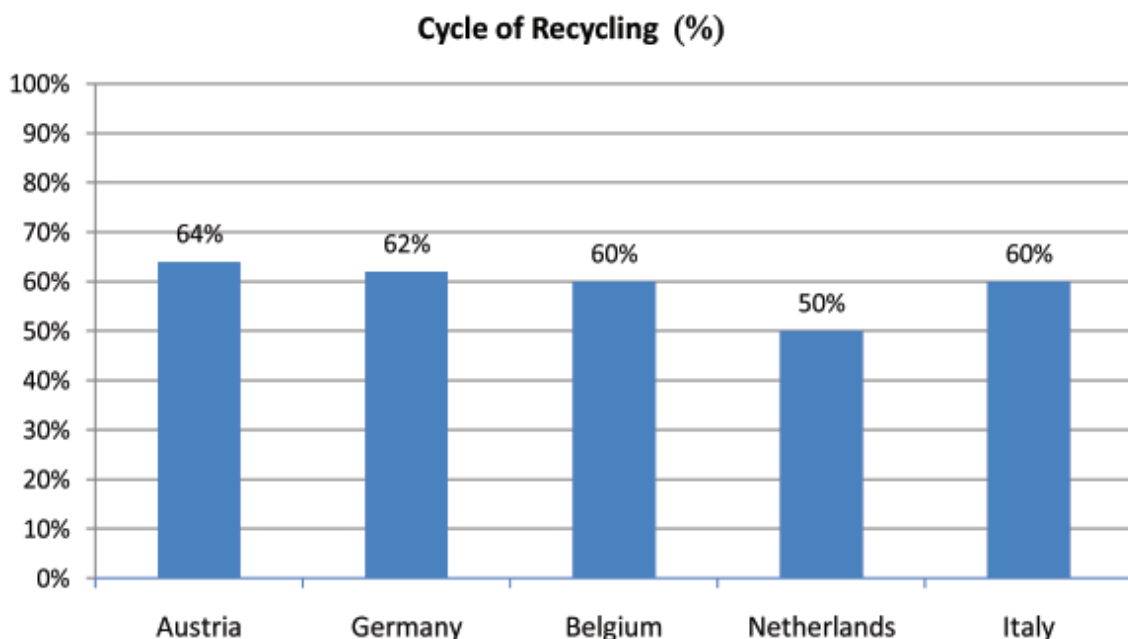
4.8.2. Unit Costs and Landfill Taxes

This Program implies setting the increased cost of the unit on the service of collection and waste disposal at a landfill and imposition of additional “landfill” tax for population and municipalities.

The increased price for collection implies increased price for unsorted wastes compared to the sorted ones. This program also includes introduction of penalties for municipalities, enterprises, and individual residents for disposal of unsorted wastes, which will further the reduction of the amount of wastes disposed at landfills, segregation “at the source”, and increase of demand on recycling of wastes and development of this activity.

4.8.3. Waste Recycling

Waste recycling programmes imply the increase of motivation towards the recycling of wastes. First of all, for this there are to be established and adjusted waste collection system, development of “at source waste segregation”, and the most important, legal basis. The percentage of waste recycling is in direct connection with efficiency of collection of wastes. The more efficient is the process of collection of recyclable wastes, the higher is the percentage share of recycled wastes related to the whole amount of wastes. By 2011, the share of recycling of domestic wastes in leading countries of EU was quite high.



4.9. Waste Incineration (burning – thermal elimination)

Some countries give preference to the incineration of domestic wastes (thermal elimination), rather than to their disposal at a landfill. However, governments of many countries suggest that incineration is not safe for a human and environment. Because of this, they give priority to waste minimization and reduction “at the source” as well as implementation of recycling programs.

There is also other policy and measures, which include different types of subsidies from government, as well as education programs for members of different strata and age of society, regarding the importance of wastes and prioritization of the material to be recycled. For example, in the USA, 21 states introduced requirement regarding separate collection of garden (green) wastes, which finally undergoes composting and final product is used as fertilizer, by which often the layer of waste disposed at a landfill is covered.

4.10. Biological Treatment of Waste

Biological treatment includes composting of biological wastes, anaerobic boiling and mechanical biologic treatment.

Many developed or developing countries address composting and anaerobic digestion of compound wastes and/or fractions of biodegradable wastes (kitchen and restaurant wastes, vegetation (green) wastes, sewage wastes, and others). Both of these processes are possible in case of wastes sorted out at the source: anaerobic digestion is particularly designated for “wet” wastes, while composting is more designated for dry, food wastes.

Composting aerobically dismembers wastes into carbon dioxide (CO_2), water and humid fraction. Composting may be quite sustainable owing to beneficial price in developing countries.

Proceeding from the quality of the compost, there are different ways of its use, such as agriculture, soil stabilization, soil restoration, and etc. However, the fact is notable that in case of incorrect process of composting, the increased emissions of the gases of CH_4 and N_2O are possible.

The advantage of mechanical biological treatment of wastes lies in reduced volume and faster stabilization of wastes. At this time there occurs sorting, breaking, and dismembering of waste mass. Then, each “stream” of wastes undergoes adequate treatment (composting, recycling, incineration, anaerobic digestion).

As for anaerobic digestion, this method is used by placing organic mass into anaerobic environment, where so-called boiling of biomass occurs, and gases are emitted, which are further used for production of electricity.

4.11. Construction wastes

Today, when the country strives for building up, when in conditions of economic growth the price of real estate increases, also new enterprises are built at the places of old enterprises, roads and new infrastructure, commercial and residential quarters are built, the large share of construction wastes belongs to general amount of wastes.

Construction wastes mainly consist of concrete, pebble, asphalt, brick, and other inert wastes, which are of great resource restoration capacity. Recycling and secondary use of this type of wastes is mutually beneficial both for the country/society and local environment. Through recycling of the wastes of this type the inert material is received, which is extensively used in some construction projects. Hundreds of tons of such material are mined in river ravines, sea beaches (where it cannot be extracted, it causes abrasions of sea coast) and mountain mines. Secondary use will considerably lessen its extraction, which will have positive impact on the environment. Second positive side of recycling of construction materials is in the increase of exploitation time of landfills. Today the place of final disposal of hundreds of tons of inert wastes is landfills.

Reuse of the large part of the wastes of this type will considerably decrease the amount of wastes disposed at the landfills, which will correspondingly increase the length of exploitation of the landfill.

Against the different principles and programs spread in the world, with consideration of specificities, geographic location and customs of region, city, and/or populated area, it is necessary to select particular policy and/or measure of waste management, which would be adapted and introduced in a particular administrative unit.

However, effective combining of different programs and uniting them in a single package is a fundamental issue of the approach to the development of waste policy. Different programs have different results in different countries. This result is individual and is based on ethnographic peculiarities, economic development and sustainability.

In general, the policy of Extended Producer Responsibility has probably the strongest effect because of its financial mechanism.

5. PART II. BASIC PROVISIONS

5.1. Georgian Legislation Related to Waste Management

According to Georgian legislation, while planning and implementation of any activity, the enterpriser / activity performer is obliged to take adequate measures to avoid or mitigate the risk of adverse impact on environment and human health; protect biological diversity from irreversible degradation and restore the environment degraded as a result of performed activity with maximum approximation to its primary state.

Environmental legislation of Georgia includes the Constitution, environmental laws, international agreements, regulations, presidential orders, and decrees of the Cabinet of Ministers, ministerial orders, instructions, regulations, and other.

Constitution of Georgia

(Adopted in 1995; amendments made in 1999, 200-2006, 2008)

According to the Article 37 of the Constitution of Georgia, all citizens of the country have the right to live in healthy (harmless) environment, benefit from natural and cultural resources and, at the same time, are imposed an obligation of protecting it.

According to the Constitution, the Government of Georgia is obliged to ensure rational use of natural resources and protect natural environment.

The Law on Environmental Protection of Georgia (in force since 1996, amended in 2000, 2003, 2007) – the law regulates legal relationships between governmental institutions and physical or juridical persons in the field related to environmental protection and use of natural resources on the territory of Georgia, including territorial waters, atmospheric air, continental shelf, and special economic zones.

The Law considers the issues of environmental education, environmental management.

The Law refers to some aspects of waste management.

Management of wastes, their import, export, re-export, and transit is regulated under the rule established by the legislation of Georgia. In particular, the Law determines environmental requirements regarding wastes (Article 34).

According to the Provision given here, the enterpriser is obliged to reduce generation of industrial, domestic, and other types of wastes, ensure adequate neutralization, utilization, disposal, or burial with consideration of environmental, sanitation-hygienic, and epidemiological norms and rules. The disposal of (industrial and domestic) wastes is permitted only on specially allocated territory with the observation of environmental and sanitation requirements.

The Law on Environmental Permit (2007). The Law defines a full list of activities subject to obligatory environmental expertise on the territory of Georgia. The Law defines the aspects concerning an environmental permit, carrying out environmental expertise, informing public, and legal aspects of participation in this process. According to the Law, environmental permit represents authorization for implementation of planned activities. According to the Law, environmental permit is issued by the Ministry of Environment Protection of Georgia on the basis of review / examination of the application submitted by the one wishing to obtain the permit.

The Law on Public Health (2007). The objectives of the Law are: assisting in assertion of public health and healthy lifestyle; providing safe environment for human health; assisting in the protection of reproductive health of the family; avoiding of spread of infectious and non-infectious diseases. The Law defines the rights and obligations of population and juridical persons in the field of public health. In order to ensure safe environment for public health, the Ministry sets qualitative norms of safe environment for human health (atmospheric air, water, soil, noise, vibration, electromagnetic radiation), which includes the norms for maximum allowable concentrations and adverse impact.

The Law on Licenses and Permits (2005). The Law regulates such organized activities or actions, which deal with indefinite circle of public, is featured by increased danger for human life or health, includes particularly important national or public interests or is connected with the use of national resources. This Law regulates the field regulated by the license and the permit, determines complete list of license and permit, and establishes the rules of issuing a license and permit, making amendments in them, and annulling them. According to the Law, national regulation of an activity or action through the license or permit is carried out only in case when this activity or action is directly connected with increased danger for human life or health or the field of national or public

interests. State regulation is carried out only if through issuing a license or permit it is really possible to reduce the noted danger or take into account national and public interests.

According to the Law, it is possible for a license or permit issued by a foreign country to be recognized under an international agreement or law, and be given the same legal status, which the license or permit issued on the basis of Georgian legislation has.

Law on Environmental Examination (adopted in 2007). According to this Law, environmental examination represents an obligatory stage for issuing an environmental permit or construction permit. The objective of environmental examination is protecting ecological balance with the consideration of environmental requirements, rational use of natural resources, and principles of sustainable development. Positive conclusion of environmental examination is compulsory for obtaining an environmental and / or construction permit. The process of environmental assessment is regulated by the Ministry of Environment protection.

Law on Water Protection (1997, amended in 2003, 2004, 2005, 2006). The Law regulates basic legal relations:

- between national agencies and physical and legal persons in the field of water protection, study, and use;
- on land, underground, on continental shelf, territorial waters and special economic zone in the field of water protection, restoration, and use;
- in the field of manufacturing of water commodity and international water trade;
- determines the scope of autonomous republics, local self-government and administrative bodies in the field connected with water;
- relationships in the field of groundwater protection, exploration, and use, with the consideration of requirements of the Law on the Fossils of Georgia;
- relationships in the field of water living resources protection, exploration, reproduction, and use, with consideration of requirements of the Law on Animals of Georgia;
- Regulates legal relationships connected with the use of animals, vegetation cover, forest, land, and other natural resources during water use.

According to the Law, the water existing on the territory of Georgia is national property and is given out only for use. Any action, which in a direct or hidden form encroaches upon the right of national water ownership, is prohibited.

The Law on Soil Protection (1994, amended in 1997, 2002). The objective of the Law is to ensure the protection of integrity of soil, and improvement of fertility, determines obligations and responsibilities of users and government to provide for the conditions of soil protection and environmentally healthy products. The Law defines maximum allowable limits (MAL) of concentrations of hazardous substances in soil.

The Law excludes the use of fertile lands with agricultural purposes, prohibits leading of any activity without removing the upper fertile layer, prohibits the mining of minerals following open pit principle without further re-cultivation, prohibits arranging of terraces without preliminary study and approved project; prohibits uncontrolled grazing, forest cut, and damaging the means of soil protection; prohibits any activities, which are capable of deteriorating the quality of soil (e.g. use of prohibited chemicals / fertilizers, and etc.)

Law on Atmospheric Air Protection of Georgia (1999, amended in 2000, 2007). The scope of this Law is protection of atmospheric air from hazardous anthropogenic impact (Part I, Chapter I, Article 1.1). Hazardous anthropogenic impact is any impact on atmospheric air caused by human activities, which has or can have negative influence on human health and natural environment (P. II, Ch. IV, Ar. 11.1).

Law on Protected Territories of Georgia (1997, amended in 2003, 2004, 2005, 2006). The Law provides the definition of protected territories (which includes national parks, national strict nature reserves and managed nature reserves) and defines the limits of allowed activities in these territories. Allowed activities are defined in accordance with the function of a territory, legislation of a territory, particular provisions, and management plans of protected territories, also requirements of international agreements and conventions, signed by Georgia. It determines the limits for the use of natural resources within the frames of national parks and other protected territories.

Law on Transit and Import of Wastes on the Territory of Georgia was adopted in 1997 and regulates transit and import of wastes on the whole territory of Georgia. The Law prohibits import and disposal of wastes on the territory of Georgia.

5.2. International Legislation Connected With Waste Management

5.2.1. Framework Waste Legislation

a. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste.

The main objective of this Directive is to direct any action related to waste management towards protection of human health and environment. It considers the categories of wastes except of those given below:

- gas emissions
- radioactive elements
- explosive wastes
- fecal masses
- sewage water
- animal products
- animal skeletons
- elements obtained from mineral resources

and sets general terminology and definitions, as well as definite rules of waste disposal. It defines the main concept of waste recovery and disposal and regulates the requirements for waste management. The Directive also regulates main principles of waste treatment (transportation, sorting out, and etc.). It calls member countries for reduction of wastes by means of clean technologies and use of recyclable material. The Directive obliges all member countries to elaborate waste management plans, introduce permits, waste monitoring and registration. The Directive defines the “Polluter Pays” Principle, which obliges the producer of non-recyclable wastes to pay for the disposal of wastes.

b. European Council Directive 91/689/EEC of 12 December 1991 on hazardous waste

This Directive refers to hazardous wastes making the rules and procedures of its management and disposal stricter.

c. European Council Decision #2000/532/EC of March 3, 2000,

Establishes the list and categories of hazardous wastes and approves the catalogue of European wastes.

d. Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste

The main objective of this regulation is also protection of environment and health. The regulation regulates the rules and procedures for wastes transportation both within the country and trans-boundary transportation. It comprises the issues of Basel and Stockholm Conventions, which are compulsory for member countries.

5.2.2. EU Legislation on Waste Management Operation

a. Council Directive 1999/31/EC of 26 April 1999 on the landfill of wastes

This Directive defines different categories of wastes (municipal, hazardous, non-hazardous, and inert) and options of their disposal. Landfills are divided into three classes:

- hazardous wastes landfills
- non-hazardous wastes landfills
- inert wastes landfills

This Directive clearly defines peculiarities, standards, rules, and procedures of construction and further operation of the landfills of all three classes. It calls upon all member countries once again to reduce the amount of wastes to be disposed at landfills through reduction, recycling, and reuse.

b. Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of wastes

The Directive sets strict conditions and technical requirements of operation for incinerators, permit structure, standards, procedures of receiving and returning of wastes and other. It also determines the limits of emission for hazardous substances into air and discharge of water, their control measures and mechanisms.

c. Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues.

5.2.3. EU Legislation on Streams of Specific Wastes

- a. Council Directive 75/439/EEC of 16 June 1975 on the disposal of residue oils;
- b. Council Directive 92/112/EEC of 15 December 1992 on procedures for harmonizing the programs for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry;
- c. Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of soil, when sewage sludge is used in agriculture;
- d. Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances;
- e. European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste;
- f. Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles.

Besides that, EU has issued a number of directives and decisions on waste registration, accounting, and statistics.

Seeing all above-mentioned Directives and studying them in detail in English is possible at the following web-page address:
<http://ec.europa.eu/environment/waste/legislation/index.htm>

5.3. International Conventions Related to Waste Management

Basel Convention – on Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989). Date of ratification/joining by Georgia: May 4, 1999.

Rotterdam Convention – on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998). Date of ratification/joining by Georgia: December 1, 2006.

UN Framework Convention on Climate Change (1992), ratified in 1994 by Georgia, and Kyoto Protocol on Climate Change (Kyoto, 1997). It is ratified by Georgia on May 28, 1999.

Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol on Substances That Deplete the Ozone Layer (1985). Date of ratification/joining by Georgia: November 8, 1995.

Stockholm Convention – UN Convention on Persistent Organic Pollutants (POPs) (2001). Date of ratification/joining by Georgia: April 11, 2006.

Aarhus Convention - on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (June 25, 1998). Date of ratification/joining by Georgia: February 11, 2000.

Geneva Convention on Long-range Transboundary Air Pollution (1979). For Georgia, it entered into force on January 13, 1999.

5.4. Waste Management Plan

Waste management plan is one of the most important components of integrated sustainable waste management system. EU legislation explicitly demands from all member countries developing one or several waste management plans considering the principles of EU Directives.

Waste management plan is the main component of integrated sustainable management system. It is one of the basic instruments to ensure correct and sustainable management of wastes. It fully includes the “life cycle” of waste, from their origin to final disposal.

The main objective of the Waste Management Plan is:

- to correspond to national waste policy, goals and objectives
- to determine the amount of wastes, their streams, and ensure relevancy of collection, disposal, and recycling systems to their amount
- to control technological measures, reveal those components, where it is necessary to use different corresponding technologies
- to determine specific final disposal conditions for each of revealed streams
- to formulate economic and investment requirements, e.g. concerning the collection schemes, recycling, and etc.
- to determine necessary resources, both human and financial and technical

Traditionally, municipal solid waste management was under local government responsibility. Now, against the conditions of technical progress, which caused the origin of new waste sources (e.g. industrial wastes, package material, electric supplies, laboratories, and etc.), more and more organizations get involved into the chain of waste management. Because of the necessity of shifting from public to private institutions, the government should establish a strong regulating body, which would control effective and quality activity of providers of private services.

While designing the waste management plan, involvement of different stakeholders is given high significance, whether it is public, governmental structures, non-governmental sector, private sector or experts in certain fields.

5.4.1. Hierarchy of the Waste Management Plans

To create and implement integrated, sustainable waste management systems it is necessary to elaborate 4 level plans. These are:

- Centralized, National Waste Management Plan, where basic strategic issues will be considered;
- Regional Waste Management Plan. Based on the strategy of the National Plan, each regional unit elaborates a Regional Plan considering local peculiarities;
- Local Waste Management Plan. Municipalities and local self-governing bodies will elaborate now the detailed waste management plans for particular regions or populated areas;
- Industrial Waste Management Plan. Large and Average enterprises, different projects or other commercial organizations will elaborate the waste management plan corresponding particularly to their immediate activities.

5.4.2. The United National Strategy

The most important component of the National Waste Plan is a United National Strategy. This is the long-term vision of waste management planning, which determines general principles of waste management, identifies priorities, and elaborates the directions of land allocation and spatial planning. The National Strategy is elaborated by the Government and it represents an important part of the spatial plan of the country.

The United National Strategy should be envisaged for about 15-30 year period and should include clearly formulated components of waste management. At the same time, it should formulate models of waste management.

The National Strategy should ensure the formation of such a sustainable system of waste management in the country, which would envisage the main principles of waste management: Reduce, Reuse, Recycle, and disposal of only little portion left at a landfill.

In fact, the objective of the National Strategy of Waste Management should be the reduction of the tendency of growth of wastes caused as a result of country's economic development, which will cause fundamental changes in the existing methods of waste management and will attract significant investments in this sector.

5.4.3. The National Waste Management Plan

The National Waste Management Plan for the period of 5-10 years is elaborated by the Government and approved in the form of legislative act by a Prime Minister.

This is a plan, in which the issues, considered in the Common National Strategy, are formulated in detail:

- specific management models;
- particular strategic requirements (prohibitions, pre-conditions, payments, etc.)

At the same time, the National Waste Management Plan does not determine and describe specific technologies and waste management methods.

While elaborating the National Plan, all categories of wastes existing in the country should be considered, and both international as well as local standards the application of which will be obligatory at any level of waste management system should be explained in details. In addition, the National Waste Management Plan should assist in formation of flexible waste accounting system.

The National Waste Management Plan should also indicate:

- priority methods and technologies of waste separation (sorting) and collection (e.g. interim recycling stations, landfills, incineration, "collection at houses", centralized collection, and other)
- conditions of final disposal for each category of wastes
- schemes of territories specified for polygons of waste disposal
- Conditions necessary for the fulfillment of requirements and obligations specified by Aarhus Convention
- Enumeration of acceptable methods and programs according to the regions

For example, let us consider a number of cases. The central government establishes: 1) to reduce wastes to be disposed at the landfill by X% in urban areas (according to the amount of population) and by Y% in rural areas by the second half of 2012; or 2) to prohibit the disposal of polyethylene materials in any form at the landfill from December 2012.

The National Waste Management Plan also sets the list of methods and programs according to regions:

For example: waste recycling measures to be carried out in X regions, by means of available local (or, if such are not available, modern) technologies and obtained resources to be sold at the local market.

Here ends the role of central power in the implementation of waste management system. Further, its main responsibility is periodical reviewing and updating of the National Plan, coordinating different types of waste management plans of individual regions, approving them, and, what is most important, conducting the monitoring of their implementation.

The central power should also ensure allocation of necessary funds for the implementation and encouragement of different types of programs of waste management, which can be carried out with the help of governmental subsidies, funds allocated by international donor organizations, by assistance of foundations and other financial instruments and institutions.

5.4.4. The Regional Waste Management Plan

The Regional Waste Management Plan is created directly for specific regions – it corresponds to the Common National Strategy and is in accord with the goals and tasks set by the National Management Plan. While elaborating the noted Plan, regional peculiarities should also be considered.

In some regions a landfill can be placed and, at the same time, incinerator arranged, while in its other neighboring region, proceeding from natural factors, no such measure can be carried out.

In some regions the "door-to-door" collection practice is acceptable, while, for example, in large cities such a practice is ineffective.

Regional waste management plans precede from municipal management plans and are agreed with the Ministry of Regional Development and Infrastructure.

5.4.5. The Local Waste Management Plan

The Local (Municipal) Waste Management Plan implies specific schemes of management of a specific city, region, populated area or village, and ensures waste collection, transportation and disposal.

The Local Waste Management Plan is more detailed and should be more concentrated on technical issues. In local plans the direct performers of different activities should be exactly determined, also proceeding from the amount of population and seasons – the expected amount of wastes, waste collection means and scheme, conditions and technologies of their final disposal, budget planning, payments, and other financial instruments and etc.

The responsibility over the implementation of the Plan is imposed on local administration bodies and the sums needed for its implementation should be reflected in a local budget.

5.4.6. The Industrial Waste Management Plan

Any enterprise, which manufactures products, and as a result of its activities generates wastes, is obliged by legislation to elaborate the waste management plans.

Large enterprises, the activities of which is an object of environmental impact permit, are required to submit the EIA report to be reviewed at the Ministry of Environment Protection. Such a report itself includes waste management, although it is still obligatory to elaborate an individual waste management plan, which will be based on the principles stated in the EIA. For such enterprises, waste management plan is approved by the local self-governing body, Sakrebulo.

The Industrial Plan should include a whole cycle of industrial process and related waste management from its origin to final disposal. The Industrial Waste Management Plan should reflect the goals and tasks outlined in the National Plan, and should be integrated with other industrial plans and systems.

5.5. Stakeholder's Identification

As we have already mentioned “stakeholders” are physical persons and organizations (for example users, sponsors, executive units, public representatives and so on), who are directly or indirectly involved in this or that process (system) and whose interests may be positively or negatively influenced by a specific project (system) during its implementation or after its completion.

In their turn, stakeholders may influence the functioning of the system and its development in a varying degree.

Typical examples of stakeholders are:

- Central government
- Local self-governing bodies (Boards and Assemblies)
- Municipalities and their services
- Users (population of a specific street, city, district, region, and country)
- Non-governmental organizations
- Other persons and organizations having particular interest (opponents, supporters, etc)
- Representatives of private sector, companies

In order to identify stakeholders, it is necessary to answer the following questions:

- Who receives feedback from the system?
- Who contributes to the system?
- Who monitors (manages, controls) the system?
- Who possesses other relevant responsibility?
- Who benefits from the system in case of success?
- Who is damaged in case of failure?

After the main stakeholders are identified, it is necessary to analyze their influence in waste management.

During the development of Integrated Wastes Management System involvement of public - the main stakeholder in the functioning of the system is very important; the reason for it is that the public can have the biggest influence over the sustainability of any system.

Public involvement is a social process during which the population striving to improve their living standard has everyday contact and manages such issues as water supply, education, health, etc. This process implies individual or collective involvement in a varying degree, financial or personal contribution and others.

Public involvement in the whole process, from its planning to the implementation, ensures possibility that the public itself defines the necessary priorities and after the completion of the project could be responsible for the results.

5.5.1. The System Benefit

In many developing countries the most important issue for local self-governing bodies is the mobilization of financial resources. Public involvement does not imply the use of people as cheap work force. There are different forms of public involvement in the field of solid domestic waste, for example:

- Population segregates wastes at their homes
- Population bring the garbage cans out from their houses facilitating to making easier the collection process
- Representatives of society participate in the planning of waste collection and the process of working force hiring
- Citizens demand from municipalities better service
- Members of the society participate in clean up actions
- They pay fees for the waste management service
- Supervisors, so called “Watchdogs” carry out the monitoring of service implementation

Public involvement could benefit the system in the following way:

- The system efficiency may improve
- System may become sustainable
- Public participation facilitates to the prevention of conflicts.

5.5.2. Society Benefits

- Increases the level of responsibility and knowledge. Society obtains the experience of negotiations with the authorities;
- Participation in the decision making process means that different problematic and important for the society issues will by all means envisaged in the waste management process;
- Public participation also means that its members are given possibility to show their abilities and bring about themselves through it.

At an individual level, population is responsible for disposing their own waste in garbage cans or also for the clean up of their own yards. In addition to the individual responsibility there is also collective responsibility. For example, joint clean up actions or public responsibility and public education facilitating actions. Public involvement may also include material, financial or physical assistance in solid waste management different measures.

High index of public involvement is their participation of the process implying their participation in the relevant meetings and expressing their own point of view.

5.6. Defining of Budget and Analysis

5.6.1. Waste Management Marketing

Waste management has one very specific characteristic feature; local self-governing bodies and private sector may compete with each other in the field of waste collection service.

There are four main models of providing service:

- Collection directly by local self-government
- Engagement of private sector in the collection market when the local self-government does not any more provides collection
- Collaboration of private and public sectors at the same market
- Agreement when on the basis of a tender different elements of waste management is assigned to a third party, private company

The latter is the most common among the collection models all over the world. In Georgia too this model has been tested and is operational till today.

5.6.2. Sources of Financing

As we have noted, financial resources are necessary to ensure the sustainability of integrated waste management system. There are different ways of financial provision and attraction.

Integrated sustainable waste management system shall be financed from the local budget. It should be financed at the expense of taxes, fees and industrial wastes producers. In addition, subsidies from the central budget are also necessary. It should also be noted that in many developed countries waste management systems are financed from different state funds and through international cooperation.

Waste management system budget largely depends on the common strategy and tasks of a state. Decentralization and granting freedom to the local self-governments during the budget design is one of the significant issues for the sustainable system formation. By taking into account the peculiarities of a specific region the local self-government should work out, plan and implement the budget the substantial part of which should be used further for the development of waste management system of municipalities and its maintenance.

Functioning of a well arranged system of waste management facilitates to the development of various new activities in the country, which in its turn is connected with the creation of new jobs and growth of the population well-being.

In many countries, particularly in developing ones, the waste system tariff levels based on the fees in many cases is not affordable for low-income population groups. The fact that all groups of population benefiting from the waste management system should ensure its functioning and preservation is also arguable. In general, citizens of a country are direct users and beneficiaries of waste management service. The private sector which is engaged in the recovery and recycling of resources also is a beneficiary because valuable residuary materials ensuring financial advantage are available for it. And finally, local self-governing bodies and central authorities also benefit thanks to the decreased expenses for health care and environmental protection, as well as from the income from growing tourist business and obtained international grants.

In the solid waste management chain for the purpose of the improvement of various aspects and integrated waste properly sustainable system formation, development and functioning require rather big investments which respectively will cause the fast growth of waste management tariffs. In order to monitor (control) all this the budget should be correctly planned which is possible through the implementation of different financial models.

5.6.3. Financial Models Spread in the World

In the world the most common and accepted models of financing are:

1. Consumer fees (fees based on the number of family members, households, waste garbage cans, etc) or volume fees (fees based on the volume of waste). These fees could be relatively small for the municipality sector

(population); however, taking into account the principle of the increased producer's responsibility, for commercial and industrial sectors it may be higher. In addition, high fees would cause the waste producers to reduce the amount of waste.

2. Fines, taxes. Such type of payments is a direct form of income which is a significant financial tool for government. The amount of a fine and taxes and their specificity may differ from region to region based on the peculiarities of a region. The form of a fine can also be different; in some cases it may comprise specific percentage of a service, or may be linked to the damage amount or it might be just a fixed amount of sum.

It should be noted that in Georgia there is relevant legislation defining the formation criteria of fines and taxes. Due to this, this legislation should be taken into account by all means when using this model. (See Annex: Law on Taxes, Law on Fines).

3. Ecological Bonds. In many countries this type of instrument is widely used by local governments for the purpose of formation of funds for waste management system, ecological infrastructure and services. This type of model can be used only in the case when there is relevant legislation on bonds in the country.
4. Environmental Fund. Some countries have established recoverable funds for assisting local self-governments financially to develop and maintain environmental protection infrastructure and services. Such funds are filled through different taxes and fees and making possible for municipalities to enjoy long-term low-interest loans for the development of waste management field. During the use of this model, similar to the previous case, a country should have relevant legislation which would regulate the issues of establishing funds and their functioning.
5. Direct Loans. Local self-governments can borrow the necessary amount of money from local or international financial institutions.
6. Central Budget and Governmental Subsidies. Local self-governments allocate significant amount of money for financing the waste management system from their annual budget. This usually occurs at the expense of beneficial projects co-financed by local governments.

For many countries subsidies obtained by local governments from central budget still are the main financial source for environmental infrastructure and services.

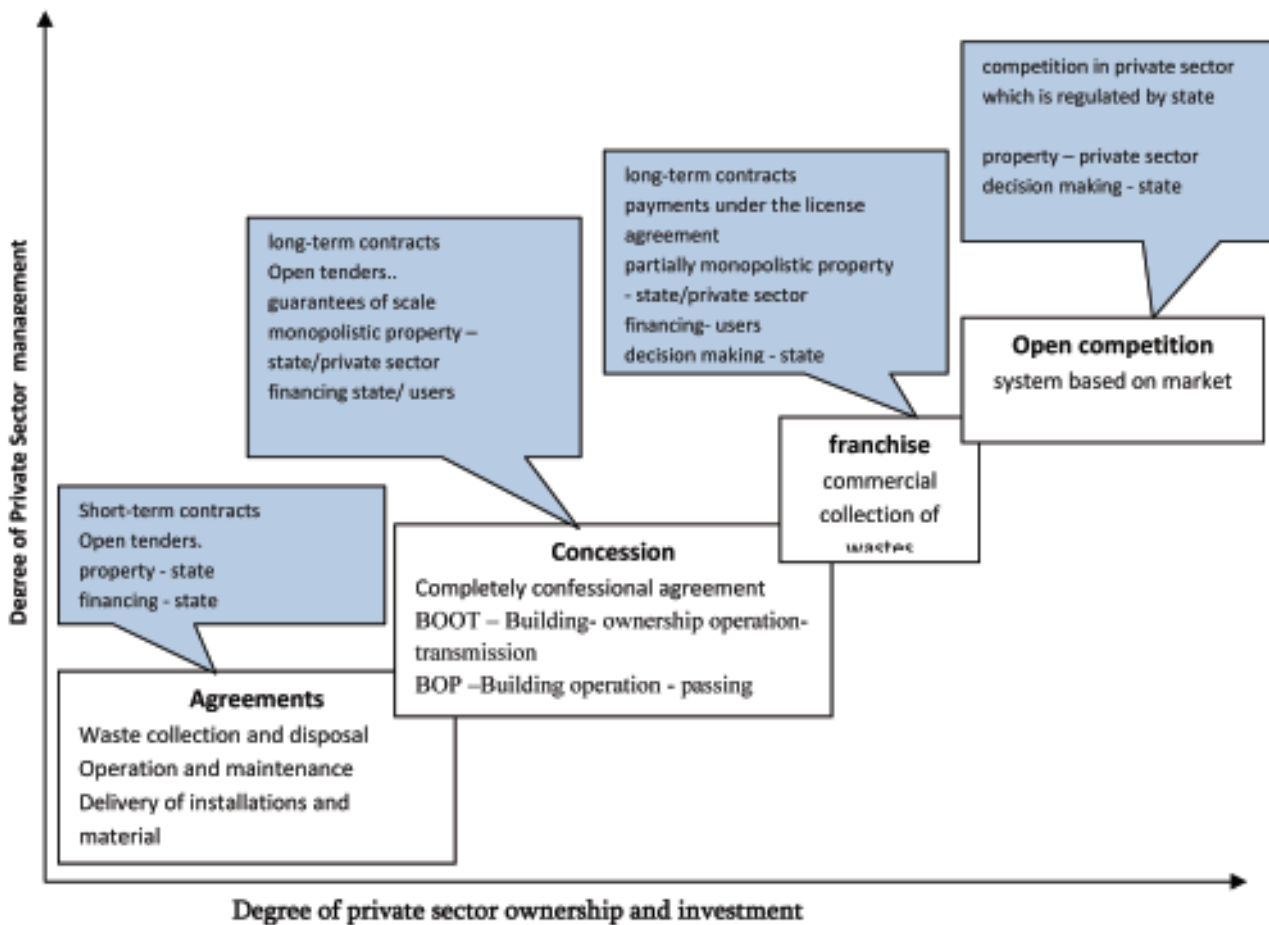
It should be noted that waste management, as a type of business, in its initial phase requires significant assistance from central and local governments. Taking into consideration that waste management technologies are rather expensive, particularly those of disposal and recycling, development of this business is almost impossible without certain subsidies and incentives. Even in developed countries such as the USA are, the field of waste management is granted a subsidy through different forms. This may be direct financial subsidy, low-interest loan, priorities during the sell of recycled product and others. For example, in the State of California about 25-30% of companies and municipalities are given the State subsidy in the form of direct financing.

At present in Georgia, at the initial stage of waste management both the sector of collection as well as disposal require subsidies allocated by the state. Otherwise, attraction of new investments in this field will be impossible.

7. Involvement of Private Sector. The growing trend of the private sector involvement in the chain of waste management system is being notable in the world. One or several aspects of waste management activity (collection, transportation, treatment, disposal, recycling) chain can be easily distributed among different organizations. There are several forms of such cooperation, for example in many countries the primary collection system which is called "door to door collection" is functioning through private companies. Under this form, population pays monthly fees to the service providing companies. As for the infrastructure, for example landfills, incinerators and others, they are handed over to private companies on a concession/lease bases. This means that they belong to the state while the private sector has the right to build this or that type of facility, ensure the facility functioning and return it to the state after certain period of time. Another very common way of private sector involvement is so called "franchising" type agreement when a private company is given right to collect wastes and then sell recyclable waste or recycle itself.

This is the most common and practiced model all over the world.

The typical diagram of private sector involvement looks like:



5.6.4. Rules of Local Budget Formation in Georgia

Law on the Local Budget defines relevant rules and forms and for local self-government bodies represents the instructions for budget formation.

These rules and instructions should also be taken into account when working out the wastes management system budget.

5.6.5. Tariff Formation

Generally, tariff policy is carried out by the central government. Let us consider the simplest scheme of how tariff is fixed: one of the necessary conditions for fixing the tariff is register system which makes it possible to accurately define the amount of generated waste. At the same time, for fixing the tariff it is necessary to know what collection and treatment technologies are which shall be taken into account in the waste management plan. Further, on the bases of these two parameters becomes possible to define what financial resources are necessary for waste collection and treatment and what amount of money is possible to obtain through tariffs.

For example, Tbilisi City Hall has linked the waste collection and disposal tariff to the electricity fee because there did not exist an accurate inventory of waste.

See Tbilisi City Hall regulations connected with the waste tariff.

For different services it is possible to fix different types of tariff. For instance a collection tariff (monthly fixed or depending on the volume), segregation tariff (that is to collect correctly segregated wastes from the population

and commercial units, this type of tariff is less than the tariff for not-segregated wastes for which the producer will be assigned to pay much more or quite a big fine if the waste is not separated) and a disposal tariff (which will mainly included in the collection tariff, although the tariff for the disposal of wastes at a landfill brought there by individuals specific landfill use tariff will be used).

Central government defines the upper limit of tariff, while the local self-government (Sakrebulo) defines the final amount of tariff on the bases of the peculiarities of a specific region and ability of the population to pay; this is a necessary condition for all private companies and municipalities.

5.6.6. The Concept of Fees and Fines Formation

Central government within the limits of common strategy may introduce specific (special) requirements which will be a necessary condition for all local self-governing bodies. In case these requirements are not fulfilled each local self-government or municipality will be fined by relevantly defined fine (the amount of which is defined by the legislation). Such an approach ensures the formation of a new, regulated (adjusted), integrated and waste management sustainable systems and the implementation of the primary aim of the state – reduction of the wastes at source.

For example:

The government in its State Strategy plans and declares that generated domestic waste amount per person should be:

- less than 250 kg by the end of 2012
- less than 200 kg by the end of 2013
- less than 150 kg by the end of 2015 and
- less than 100 kg by the end of 2020

or for example:

waste disposed at the landfills shall be reduced by:

- 30% by the end of 2012
- 40% by the end of 2013
- 50% by the end of 2015
- 70% by the end of 2020

In parallel with this there can also be set an objective of waste recycling (recycling and secondary use) degree index.

For example:

the recycle degree of commercial wastes shall reach

- 55% by the end of 2012
- 60% by the end of 2013
- 70% by the end of 2015 and
- 80% by the end of 2020

Local bodies will be fined for not implementing these objectives by 10 fold amount of money (per kg, per ton, per percent or other).

This does not mean that in this case the state should not do anything and transmit all burden of waste management system formation only to local governments and municipalities. The state shall through different economic, social, financial and other instruments assist the local governments and private sector in every possible way to achieve these objectives whether through privileges, low-interest credits, subsidies or others.

5.7. Refundable Long-term Loans for Construction and Development Projects

One of the effective tools of construction waste management could be long-term refundable loans. This measure implies that before the construction work is started the construction contractor is required to pay to the local budget specific amount of money together with the small administrative tax (to cover the administrative

expenses). This amount of money will be kept in the local budget as a loan to ensure that at the end of the project the issues of wastes management, waste reduction and recycling requirements are really met (it should be noted that Georgian fiscal policy does not envisage such a financial procedure although it is a generally accepted practice in the whole world). The amount of the loan will depend on the scope of a project and will be refunded to the contractor after the completion of the work in case if all conditions are met. In case of partial implementation of the responsibility the amount of loan will be reduced by the relevant percentage and only remaining money will be returned. Administrative tax (fee) is not refundable. As a result each “developer” will try to reduce the amount of wastes as much as possible at the source and recycle as much waste material as possible. This in its turn will facilitate to the involvement in the treatment and recycling third party companies, creation of jobs and improvement of living conditions of the population.

In this regard, both during the construction as well as the project operation the development of waste plans, their approval and implementation shall be a necessary condition assigned to all development projects which includes:

- construction of at least 10 living apartments buildings
- institutional, educational, recreational and other public buildings and infrastructure construction
- any construction-refurbishment, restoration or demolishing projects which presumably generated over 100 m³ construction wastes
- civil engineering projects which presumably generate over 500 m³ construction waste.

6. PART III. FORMATION AND IMPLEMENTATION OF THE WASTE MANAGEMENT PLAN

6.1. Development of the Waste Management Plan

Just like any other type of management or action plan, solid domestic waste management plan consists of three main phases.

These are:

1. Preparation phase
2. Planning phase
3. Implementation phase

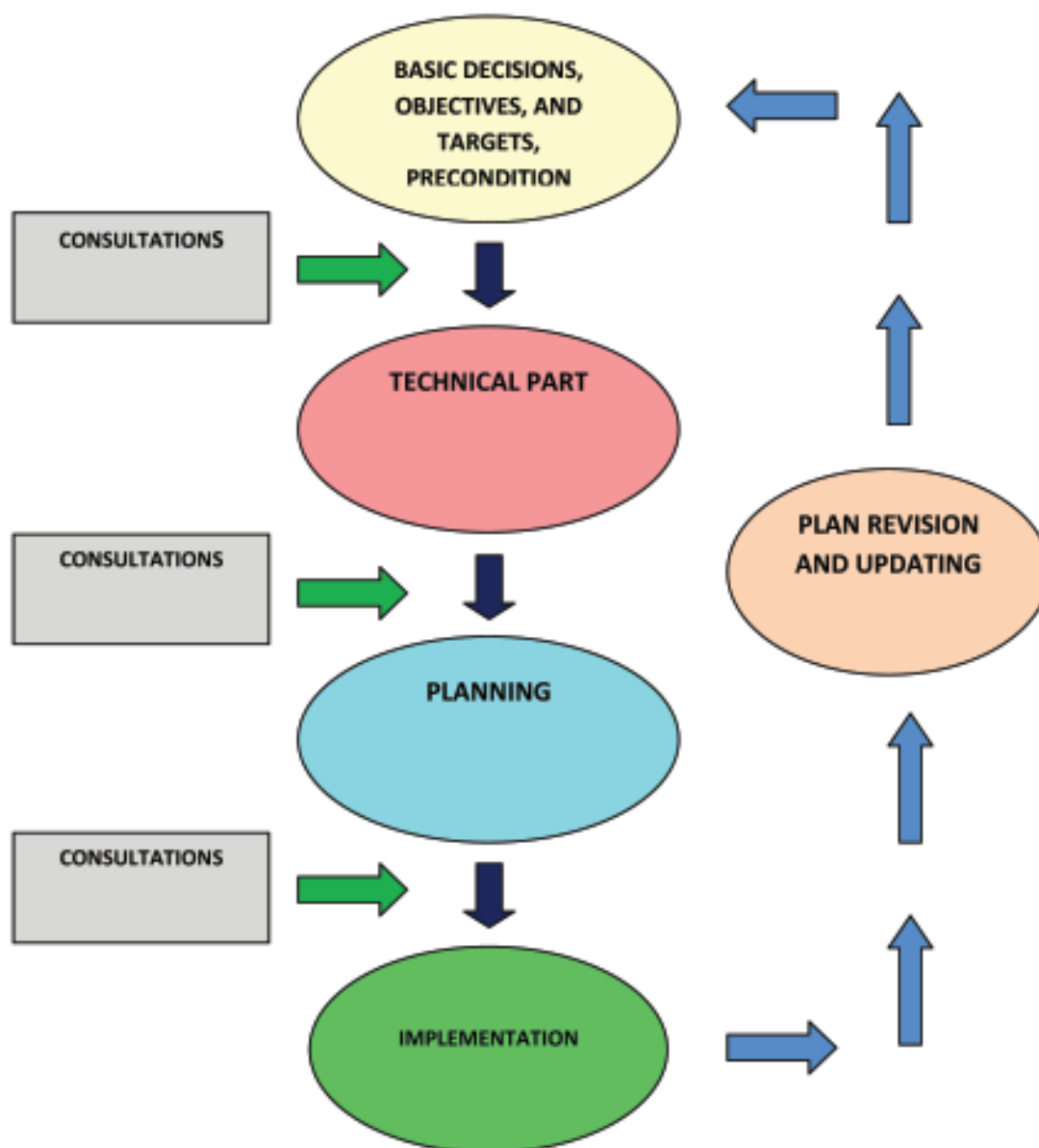
Let us consider in details each phase of municipal solid waste management plan.

6.1.1. Typical structure of the Waste Management Plan

In reality, there is no exact instruction or indication about how the waste management plan should be structured. However, it is advisable to make up the plan of planning part and technical part. Besides, there are a number of indispensable issues, which each plan should encompass.

The process of planning of the waste management is a continuous process, which needs revision and updating at certain intervals. The process can be divided into six basic parts: general decisions, technical part, planning part, consultation process, implementation phase, and plan revision/updating.

The process diagram is given below:



6.2. Preparation Phase

In the Preparation Phase all the components necessary for the implementation of the plan are sought, information is collected, discussions held, analysis conducted. In short, in the Preparatory Phase, the modeling of the plan takes place.

The Preparatory Phase in its turn consists of the following main components:

1. Choosing of the strategy and setting the objectives and targets
2. Analysis of existing situation
3. Identification of main stakeholders and determination of their role

6.2.1. Setting of the Strategy, Objectives, and Targets

While starting composing the municipal solid waste management plan, in the first place it is necessary to set the main strategy, particular objectives and tasks of the plan.

Setting of strategic task is one of the most important factors during the formulation of any management plan, since the Strategy is the main driving force of the plan and the main factor determining its direction.

Strategic Objective is the final “product” of the plan, i.e. the thing, the implementation of which has been set while composing the plan. Strategic objective can be a part of current activity, completely new activity, or even a single action.

For example:

A typical strategic objective of the municipal solid waste management plan can be: “Municipal solid waste of the X municipality to be disposed at landfills corresponding to EU standards by 2012” or “Integrated sustainable municipal solid waste management system of to be introduced in X municipalities by 2012”

Strategic Objective should basically be in accord with to the objectives and targets of National Management Plan and correspond to its requirements. In case if there is no National Strategic Plan, then the task can be in line with the requirements of different international organizations and conventions, e.g. EU legislation, Kyoto Protocol, Rotterdam Convention, and etc.

Target – is more detailed requirement for fulfillment. Usually, it proceeds from the strategic objective, and is quantitative, which allows of the opportunity of its digital display. In some cases, the setting of quantitative task is quite difficult, and at this moment it is necessary to set a qualitative task.

For example:

“Only mixed wastes to be disposed at the landfill in X municipality by the end of 2012, which will constitute 65% of the total waste volume, while other 25% to have been recycled.”

Generally, each task should be accompanied the associated objective and vice-versa.

6.2.2. The Ways of Setting Objectives and Targets

While setting the objectives and targets, one should in the first place consider the following conditions.

The objectives and targets should be:

- specific for particular cases
- measured
- accomplishable
- realistic
- time-scheduled

The objectives and tasks are recommended to include such fields as:

- finance
- consumers and stakeholders
- internal and external resources
- education and renovation

While setting the objectives and targets we should consider our vision of the system and imagine what we are trying to achieve through putting this system into place. To make this task easy there are a number of questions, which we should put before ourselves:

- Will this target or objective help us in the implementation of our vision and mission?
- Will the accomplishment of this target increase the cost of our mission?
- Is this target measured or not?
- Will the person responsible for the implementation of this task be able to understand and comprehend it?

The process of setting of the objectives and targets proceeds from the general towards the particular, i.e. from supreme management towards practical implementation of a certain plan. At the same time, each participant is obliged to contribute to this process.

While setting the objectives and targets it is necessary:

- to improve existing target with consideration of existing local or international practices, experience, and standards or set a new target
- to set preliminary, interim targets, and their review with relevant agencies and people
- agree set targets with all participants
- set the objectives to achieve the targets and elaborate necessary measures to evaluate the progress
- discuss the objectives and targets with the public
- review the progress regularly and inform all participants

6.2.3. Significance of data Collection and Analysis of Current Situation

At any municipality, there can be several municipal solid waste management systems, which including management of different types of wastes generated by different enterprisers. In this case each system should be analyzed separately.

The municipal solid waste management system may differ in different countries, regions, cities, and municipalities.

For example:

At some municipalities, municipal solid waste management is carried out by local self-administration, while in other two systems the responsibility over industrial and hazardous wastes is taken by the central government.

In some places, municipal solid and industrial waste management is carried out by private sector, while hazardous waste management is carried out by local or central government and etc.

Local government may carry out management of all three systems. Such a system is called the “general management system”, while if different bodies are responsible for management of different types of wastes, then such a system will be called “particular management system”.

To compose the plan, it is necessary to collect information for the particular management system one-by-one, even in case if these systems overlap each other in the fields of legislation, financial mechanisms, technologies, infrastructure, and stakeholder participation. This information is necessary for the evaluation of the current waste management system.

Further it is necessary:

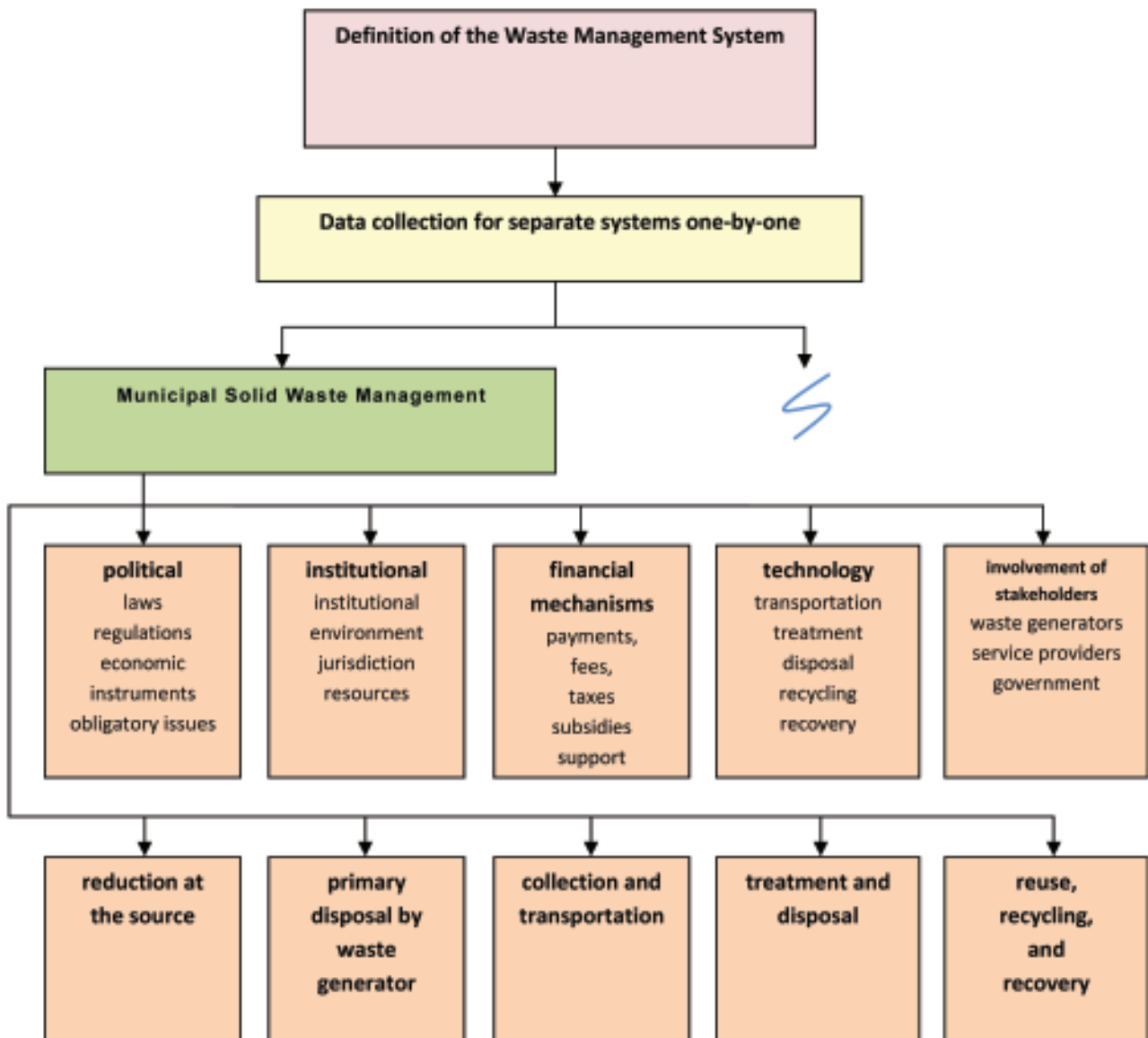
- for the analysis of strengthening and influence of legislation and economic instruments
- organizational order
- evaluation of jurisdiction of resources and existing bodies
- waste collection, recycling and disposal schemes and technology efficiency analysis
- definition and identification of the role of different stakeholders at different levels of the municipal solid waste management chain

Important questions for the analysis of obtained data:

- What is global strategy of the state in the field of waste management?
- What is regional strategy of local government?
- Which particular strategy is chosen by a particular municipality?
- How will the collection of wastes be carried out?
- Which amount of wastes is expected?
- Where will basic activities be carried out? (sorting, receiving, collection for further treatment)
- Which direction will be used for recycling?
- Are there local recycling facilities and where is the nearest one in municipalities or regions?
- Which technology will be used? (waste treatment facility to be described as detailed as possible)
- For which period (short-term, mid-term, or long-term) is waste collection calculated and which technologies may be used?
- Which permits are necessary and where/how should the permits be obtained?
- Is there a relevant project?

- Which international or national standards are to be considered?
- What is the solvency of local population?
- What is the readiness of local population for introduction of payments for waste disposal?

Data collection and analysis can be displayed through the following diagram:



6.2.4. Collection of Baseline Data

Obtaining of reliable information regarding the current situation in the field of municipal solid waste is the first step in the process of composition of the municipal solid waste management plan. The objective of the collection of basic information is to prepare real and quantitative foundation for the design of the plan.

The list of baseline data necessary for the design of the municipal solid waste management plan:

- political and legislative environment
- organizational structure
- demographic situation
- amount and properties of wastes
- description of current waste management systems and practice
- financial data and available economic instruments
- technical requirements and alternatives
- characteristics and analysis of main stakeholders and dependent parties

6.2.5. Demographic Situation

It is necessary to collect information about demographic situation and the degree of population growth of relevant target area (country, region, city, municipality, and etc.). This information are necessary for determination of potential amount and types of wastes as well as services and needed infrastructure and financial calculations.

It is necessary to consider all previously unaccounted newly created settlements, even informal ones. The degree of population growth for the period of the Plan can be sought in statistical reports. The exact forecast of future demographic situation is quite unreal. Numerous different factors can influence the changes of distribution. This can be the strength of economy, existence of working places, construction of permanent residential houses, emigration, and etc.

To identify the current degree of waste generation, also the quantity of expected wastes it is necessary to identify social-economic distribution of population. Typical examples of social-economic distribution are:

- high income, low density
- average income, average density
- low income, high density
- informal settlements

It is to be noted that a significant change of living standard is quite a long process, therefore it is real that current social-economic environment will not change significantly at least for the period of one generation.

6.2.6. Identification of the Amount of Waste and Classification

To forecast the expected quantities of municipal solid wastes it is necessary to identify current quantity of waste generation, collection, recycling, reuse, and disposal.

Historical data of waste quantities can be obtained from statistical reports (if any). Besides, information can be obtained from waste generator, collector, and transporters, also if possible from the site of disposal. The quantity should be measured either in tons or cubic meters.

In case, when there are no statistical data and records regarding waste quantities, there is a number of different instruments approbated in a number of developed countries, e.g. topographic survey of the past disposal site and taking of samples to describe the wastes disposed. In a number of cases, when the place of disposal of wastes is unknown, it is necessary to apply the method of “grandfathers”, i.e. invite old colleagues and find out as to where the disposal of wastes occurred earlier, how frequently, for how long, and other.

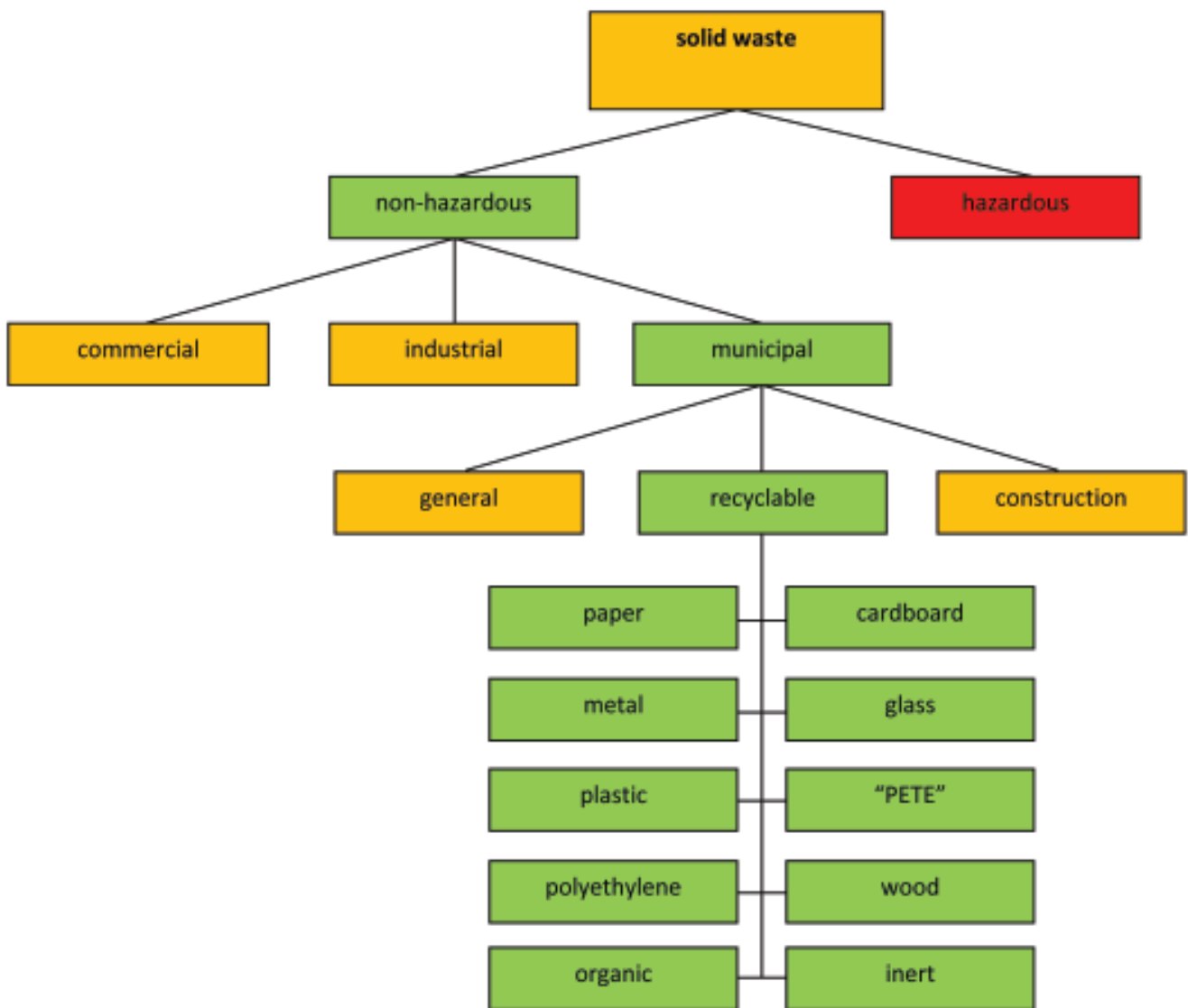
Along with the identification of historical and current quantities of wastes, it is necessary to forecast the future quantities of waste generation. This is possible through interpolation of obtained social-economic data.

6.2.7. Classification and Description of Categories of Wastes

Solid wastes are basically divided into two categories: non-hazardous waste and hazardous waste. Within these two categories, non-hazardous waste, in their turn, are divided into streams according to their source of origin, namely: municipal solid wastes, solid industrial and solid commercial wastes. Since the given Manual describes only municipal solid waste management plan, therefore other types and categories of wastes are not discussed.

Municipal solid wastes, in their turn, are divided into the classes of general, recyclable, and construction wastes. The recyclable waste includes the following waste streams: paper, cardboard, metal, glass, plastic, organic, and inert wastes. It should be noted that above-mentioned types, classes, and streams of waste can be part of other classes and waste streams.

In case of adequate management, proceeding from their composition and properties, non-hazardous wastes do not impose danger for health and environment. As for hazardous wastes, they even at little concentrations have the capacity to impose harm to public health and environment.



Properties of wastes may vary according to year season or location, which may have influence on identification of the quantity of individual components. This information is significant for determination of waste recovery and reuse capacity.

6.2.8. Geographic Diagram of Waste Management

It is better to make up the waste management diagram, which would reflect the places of waste generation, their collection and transportation routes, location of recycling and treatment facilities, also location of places of disposal. This information is necessary in order to identify the necessity of existence of interim stations, also the optimization of treatment, recycling and disposal areas. This diagram may be a mere drawing or a map done in GIS.

6.3. The Planning Phase

6.3.1. General Strategy of the Waste Management Plan

Generally, while formulating the context of the Strategy of the Plan, the following factors are discussed, such as: existing regulations, legislation and readiness of the public to participate in sustainable development of waste management.

While developing the Strategy of Local Plan, it is also necessary to consider the international hierarchy of

wastes. While formulating the Strategy, it is much easier to determine by the use of this hierarchy as to with what kind of waste relevant services will have to deal. This hierarchy contributes to reduction of waste generation as the primary task in waste management and makes waste recycling sector much more sufficient. After the existence of such hierarchy, it will be possible in municipalities to divide internal action territories into waste management areas according to the plan.

The typical examples of waste generation sources are:

- population
- municipal services
- industrial units
- agriculture / forestry
- organizations, trading and commercial facilities, offices
- construction sites
- power stations
- open pit mines
- sewage water treatment facilities and other

After this, selection of method of treatment for each of waste streams occurs (in accordance with the National Plan, Policy, or Objectives, i.e. which waste should be recycled, which incinerated, which reused, which disposed of at a landfill, and which prohibited from disposal at a landfill, and etc.).

The detailed description of waste management system should occur here as well, for example, selection of technological instruments (which kind, type or volume of buildings and edifices or other measures are needed, which equipment or devices are to be purchased, how much additional land is necessary, and etc.).

The treatment of collection scheme should also occur (how much and what kind of collection equipment, collection methods, waste containers type, volume and quantity is necessary).

6.3.2. Measures Necessary for Waste Management Planning

There are a number of measures, by means of which the waste management system may become more sustainable and integrated. These are:

- technical and operational
- environmental
- financial
- social-economic
- institutional and administrative
- political and legislative

Let us briefly discuss each of them.

6.3.2.1. Technical and operational measures

1. Waste reduction and prevention

- collection of data regarding waste amount, types, and sources
- public awareness and involvement

2. Waste collection

- Data regarding waste origin and composition
- Identification and description of peculiarities characteristic for location

- Determination of the distance of transportation of wastes
- Existence of spare parts and relevant auto-service
- Integration of collection and transportation systems
- Selection of collection frequency according to generation
- Establishment of registration and monitoring system

3. Secondary resources

- Motivation of waste segregation through public awareness and economic encouragement
- Collection of data regarding types and quantities of recyclable wastes at waste generation sources
- Collection of information regarding recycling enterprises existing in the region
- Encouragement of recycling activities through different financial or economic ways (payment and/or customs benefits, cheap credit, cheap plots, training and etc.)

4. Disposal

- Collection of data regarding the types and quantities of waste at landfills
- Determination of the period of operation and volume of the landfill
- Study of the practice of operation of the landfill (what the frequency of disposal is, how it is covered, whether there are fires, whether leachate and landfill gas is noted)

6.3.2.2. Environmental Measures

1. Norms and regulations

- Elaboration of environmental legislation, which will regulate the ways of collection, sorting, final disposal, and recycling of all types of wastes
- Designing of EIA project to be made a compulsory precondition for development of any type of new industrial, residential, or resort zones.

2. Environmentally healthy practice

- Monitoring of the amount of remaining, burnt wastes in the streets, ravines, and rivers
- Covering and Frequency Monitoring of the territory of collection service
- Waste transportation only by covered motor-cars
- Monitoring of the amount of recyclable wastes and calculation of the energy saved by recycling
- Environmental impact monitoring of landfills and waste recycling enterprises
- Monitoring and control of the leachate and gas at landfills

3. Raising of public awareness

- Initiation of the programs of public awareness raising in the field of waste reduction, prevention, recovery, and recycling
- Elaboration and distribution of manuals (guidelines)

6.3.2.3. Financial Measures

1. Budget

- Evaluation of real cost of waste management system, which includes the cost of “doing nothing” (i.e. water and soil cleaning as well as increased public health cost as a result of pollution, and etc.)
- Increase of transparency, accountability, and fiscal discipline in local self-administration bodies through training, stimulation measures, and definition of behavior rules

2. Introduction of beneficial economic mechanisms

- Elaboration of the flexible tax system for users, which will be founded on solvency and actual cost of service (e.g. the tax may be different for commercial enterprises and private sector, may differ according to the type, volume, segregation of wastes and kind of service)
- Landfill entry tax to be introduced
- The fines for environmental pollution and incorrect waste management to be introduced. The fines may be introduced both for private individuals and for juridical persons, local self-administration and even individual cities
- Payment mechanisms to be made easier and improved
- Local self-administration to be given the right for commanding budget, also the right for obtaining and issuing cheap credits

3. Price reduction and control

- Introduction and encouragement of waste minimization at the source of waste generation through differentiated price
- Encouragement private sector and public involvement, which will cause growth of efficiency and reduction of price
- Introduction of performance-depended flexible tax scheme in local self-administration

6.3.2.4. Social-Economic Measures

1. Preparation of local social report (population amount, average number of households, average number of people at a household, employment, average income, attitude towards waste management, attitude towards separation, desire and capacity to pay, and etc.)

2. Evaluation of public demands and needs

3. Ensuring public involvement

- Involvement of community members in the process of waste management monitoring and implementation (in local self-administration bodies, committees, and etc.)
- Establishment of close contacts with local government and community (meetings, information boards, posters, brochures, local radio, TV, and etc.)

4. Social situation

- Raising of status of waste collecting workers and working conditions (by different benefits, equipping with uniforms and special clothes, identification cards (badges), providing new tools, raising of awareness and training in the issues of public health and waste management, improvement of hygienic conditions of working place, and etc.)

6.3.2.5. Institutional and Administrative Measures

1. Institutional arrangement

- Role and responsibility of each participant in the field of waste management to be clearly defined
- Exact procedures in the field of waste management clear for everybody to be elaborated individually for each component
- Inspection and monitoring body, belonging to the central management to be established

2. Organizational arrangement

- Employment and encouragement procedures to be elaborated, which will be based on personal merit and volume of performed work
- Transparent encouragement and fining system to be elaborated

3. The Staff

- Experience and education level of the workforce engaged in the field of waste management at local self-administration to be evaluated and necessary qualification raising system to be determined

6.3.2.6. Political and Legislative Measures

1. Planning

- Responsibility for decision-making in the field of waste management to be transferred from the central power to local level, which includes the decision on distribution of finances, making and commanding of the budget
- The single strategic concept of waste management to be elaborated, approved by the central power
- The management plans to be elaborated for long-term period, which easily undergo certain changes
- While discussing and approving the local self-administration budget, waste management to be considered one of the priorities

2. Legislative environment

- Elaborate exactly formulated and effective laws and regulations regarding waste management
- Clearly formulate standards on the use and recycling of different materials (ASTM, EN adapted to Georgian reality)
- Change legislation if it contradicts the principles of integrated waste management
- Elaborate exactly formulated and effective laws on participation of private sector in the field of waste management, which can include payment or other benefits, obtaining cheap credits, subsidies, and compensations (establishment of foundations and etc.)
- Strengthen legislative requirements and inspection and monitoring structure
- Allow the public and mass media of monitoring the field of waste management (watchdog) and ensuring its transparency

The above-mentioned measures include only some of the considerations regarding the possibility of ensuring the sustainability of the waste management plan. Of course, their compliance depends on local peculiarities and rules, even on traditions.

In order to determine what the main problem is and what kind of resources are available to solve this problem, it is necessary to carry out fundamental analysis of the problem. Only after that it is possible to determine as to what can be done to improve the situation by means of one of the above-mentioned measures.

The main and important issue is as to how it is possible to select the right combination of these measures and involve them into the waste management plan in such way that maximum result of the sustainability and integration of waste management is achieved.

6.3.3. Identification and Evaluation of the Options

While selecting the sites designated for waste management, be it a permanent landfill, waste transfer station, waste sorting or dissemination site, waste management professionals should take into account different criteria and factors. It is necessary to consider the type and scale of needed structure, best available technology, also contradictions, which may arise during the construction and functioning of structures of type and scale specific for waste management.

There are a few main factors and criteria, which should be considered while elaborating the waste management plan:

1. Water resources (proximity to surface and underground water reservoirs. In case of landfills it is necessary to study geological conditions and remoteness of water-containing horizons both within the site and at its

- surroundings);
2. Instability of the ground (location and surroundings, which happens to be in the area of influence. In case of unstable ground, the construction of buildings and structures designed for waste management is not recommended);
 3. Visual influence (landscape peculiarities to be considered and maximal mitigation of impact over the landscape to occur);
 4. Nature conservation (to be considered are any negative impact over the sites of local or international importance, national parks, protected areas, Ramsar areas, and places of special scientific importance);
 5. Sites of historical and cultural heritage (to be considered are any negative impact, sites of cultural heritage of local or international importance, such as, e.g. monuments, historical houses, sites of historical battles, and etc.);
 6. Movement of motor-cars and access roads (road network stability to be considered, and available access roads reliability and safety degree to be estimated);
 7. Air emissions and dust (to be considered are the proximity of sensitive receptors and the degree, to which it is possible to control emissions by different means with consideration of wind diagrams at a particular given place);
 8. Odour (to be considered are the proximity of sensitive receptors and the degree, to which it is possible to control unpleasant smell by different means);
 9. Rodents and birds (some waste management structures, especially landfills containing decaying wastes attract rodents and birds. Such a structure can impose an adverse impact over the quantity and movement of some bird species, or, on the contrary, gathering and movement of birds in large quantities may damage airplanes if a landfill or other waste management structure is located close to the aerodrome);
 10. Noise and vibration (proximity of sensitive receptors to be considered);
 11. Scattered litter (some types of waste management structures are featured by scattering of garbage because of the wind. Relevant measures are to be taken);
 12. Potential land-use conflict (type of land use of neighborly land plots and implementation of expected projects in the neighborhood to be considered);
 13. Cumulative effect of previously existing waste disposal sites or facilities over public well-being, which comprises any negative impact over environment, social unity and economic capacity;
 14. Reinstatement of land plots engaged in the waste management sector and their use for other purposes.

6.4. Elaboration of the Short-term Action Plan

The Action Plan should be considered for the short-term period, maximum for 3-4 years, and it should be reviewed and updated once in approximately six months. Each reviewed version should be accordingly considered for next six months.

The Action Plan should include consistent, organized order of steps and actions designated for the successful implementation of a certain project, system or action of other function, to be fulfilled in near future. The Action Plan should also include actions to be fulfilled in the longer term. Review of the Action Plan occurs in accordance with completed operations and accomplished results.

This is the process, which is planned in the parallel regime and implemented as well. In order to make any action plan real and accomplishable, it is necessary that the objectives and targets be real and accomplishable.

Below a typical example of an Action Plan is given, in which each action for the fulfillment of some particular operation is specified. This may be used as a sample (model) of a document of this type.

Objective 1: Waste reuse and recycling

Action Plan. Work No.1.1 to be fulfilled	
Objective	Maximal reduction of the wastes brought to the landfill
Result	Formation of the reserve deposit and money return system, which will help the used bottles get to the landfill.
Action	Municipalities address the manufacturers of soft and alcoholic drinks and shop-owners in order to convince them in necessity of creation of depositories and money return system for the used bottles. As there is no legislative base for the implementation of noted initiative, the mentioned actions will take the form of negotiations and be established on the principle of their contribution to the cause of protection and improvement of environment.
Needed resource	Two or three workers per month, quarters for the meetings, stationery accessories.
Controlled indicator	The shop pays the cost of returned bottles, and afterwards the shop is reimbursed the sum by, for example, Coca-Cola or somebody else with the motto "Cleaner streets for Georgia".
Evaluation	At present there is no system of depository and money return altogether, therefore during the formation of this system it is necessary to share the experience of those countries, which had long time ago gone through these processes. It is necessary to use already approbated methods, and invention of anything new is not recommended in order to minimize the risks associated with the working of the system.
Executive body	For example, N municipality
Implementation date	End of 2011
Cost	Minimal
Funding	From the budget of N municipality

Action Plan. Work No.1.2 to be fulfilled	
Objective	Minimization of the amount of wastes brought to the landfill
Result	Creation of waste paper and cardboard collection system to reduce their getting to the landfill.
Action	The Municipality will find local paper recycling or producing companies, which will purchase paper to be recycled and use it for manufacturing of different products. Within this direction it is possible also to work on export, since there is great demand for waste paper in the whole world.
Needed resource	Two workers at the yearly implementation stage, quarters for meetings, stationery accessories and transportation.
Controlled indicator	Visits on-the-site will confirm that independent collection of paper and cardboard will reduce their amount at the landfill.
Evaluation	Quite large amounts of recyclable paper and card board are generated from business sources, from where their getting is simple and cheap. At the same time, paper manufacturers in Georgia depend on import, which means that they will agree to use local resources, while this means cheap resource for them, being additional income for waste collectors.
Executive body	For example, N municipality together with paper producer.
Date of implementation	The end of 2012
Cost	Minimal
Funding	From the budget of N municipality, from the Ministry of Environment.

Objective 2: Waste Collection and Transportation

Action Plan. The work to be implemented N 2.1	
Objective	Create waste collection and transportation system which would ensure their withdrawal from settled areas
Outcome	Thanks to well organized work of the waste collection system pollution will be reduced.
Activity	Municipalities will be divided into conventional territories and if possible each territory will be served by a contractor company which will ensure taking away the waste. These companies will be either owned by the state or private and their service fees will be paid by the population and businesses which will fully cover the expenses of the companies.
necessary resource	10 staff members every month
controlled (monitored index	There already exists an experience of practice with the agreements signed with private companies working according to this scheme.
Assessment	Waste collection and transportation well organized system creates clean and safe environment on the settled territories and significantly reduces the possibility of illnesses and their spread, also it facilitates to the development of garbage system where it is possible to treat the wastes and their use for the generation of renewable energy.
Executive body	For example, N municipality
Implementation deadline	The end of 2012
Cost	minimal
Financing	From N municipality budget, private investments

Action Plan. The work to be implemented N2.2	
Objective	Create waste collection and transportation system which will ensure its taking away from the settled areas.
Outcome	To install small size garbage cans in the settled areas in every 200 meters and will be cleaned by a contractor according to the worked out timetable.
Activity	Municipality will make it obligatory for all types of business to install their own garbage cans on their territories. A specific information campaign will be arranged and all business will be able to obtain garbage cans of different sizes on which they will have right in case of wish to put their own logos or advertisements.

Necessary resource	3 staff members who will select local company for producing garbage cans, owners of stores who will install the garbage cans.
Monitored index	All selected sites shall be monitored (controlled). The process of emptying the garbage cans shall be monitored.
Assessment	This direction facilitates that streets and roads are clean; at the same time this will ease the work of the cleaning services to clean the streets and roads.
Executive body	For example, N municipality together with the owners of stores, etc.
Implementation deadline	The end of 2012
Cost	minimal
Financing	The costs for producing and installing the garbage cans are covered by the business.

Action Plan. The work to be implemented N 2.3	
Objective	Create waste collection and transportation system which will ensure its taking away from the settled areas.
Outcome	Monitoring and control (management) of clean-up services (companies). Observance of relevant legislation locally.
Activity	Municipality as a contract signing body carries out all types of monitoring and control within the frames of the legislation in order the conditions of the tender are fully observed.
Necessary resource	4 staff members annually, transport, stationery.
Controlled index	The staff members shall carry out checking of sites (field visits) which is the best way of the situation assessment.
Assessment	The practice shows that when there is a complete system of supervision, the process functions without shortcomings.
Executive body	For example, N municipality
Implementation deadline	the end of 2012
Cost	minimal
Financing	Municipality budget

Objective 3: Waste Disposal

Action Plan. The work to be implemented N 3.1.	
Objective	Municipal solid wastes shall be disposed in safe for the health and environment conditions
Outcome	Creation of environmentally safe landfills and management
Activity	Municipality shall establish a modern landfill with relevant infrastructure which will receive wastes generated in municipalities, except for hazardous wastes. A tender shall be announced, a detailed design shall be developed and relevant site shall be selected for the construction of a landfill.
Necessary resource	A contractor for construction works; several staff members for the supervision over construction and later on, over landfill operation.
Monitored (controlled) index	Completed and well organized landfill
Assessment	These activities together with the waste taking away and collection are the most important in the whole Action Plan. Implementation of these stages is vital for the turning point in the settling this problem.
Executive body	For example, N Municipality
Implementation deadline	The end of 2012
Cost	Very high, expensive
Financing	international donors

Action Plan. The work to be implemented N 3.2	
Objective	municipal solid wastes shall be disposed in the safe conditions not creating danger to human health and environment
Outcome	Well organized management of hazardous wastes
Activity	At the landfills hazardous wastes shall be separated and relevantly neutralized according to all those procedures that are defined for this or that category of a hazardous waste.
Necessary resource	A legal expert knowing the environmental legislation very well
Controlled index	Hazardous wastes shall be controlled at the site (locally) very strictly.
Assessment	At present hazardous wastes disposed at the landfills are creating serious problem to people, hence, 3.2 Action Plan implementation should settle this issue.
Executive body	For example, N municipality
Implementation deadline	The end of 2012
Cost	Average
Financing	Income received from landfill management.

Thus, as it becomes from the examples the Action Plan has its objective, outcome, sequence of activities, and necessary resources for the implementation of activities, results the control of which is possible, assessments, implementation deadlines, costs and responsible bodies for the implementation of the Action Plan.

All these points are united around one main idea and in case of their complete implementation the achievement of the objective is realistic and easy. Despite the fact that the points given in the Action Plan are connected with solid waste management, still they are standard and they can be modified and adjusted to other specific cases.

There is one more tool (instrument) during the development of an Action Plan, so called logical model. An example of a logical model is given below.

6.4.1. Logical Model

The request is to once more formulate the objective of the project. Present the project logical link between the project tasks, activities, results and impact. Please take into account that each task may have direct (short-term), medium (medium-term) impact. As needed you can either add or erase cells in the table.

Project Objective:

Tasks	Main Activities	Outcomes (results)	Impact	
			Direct impact	Medium impact
In N municipalities establishment of eco-centers at the Departments of Tourism	In N municipalities selection of eco-centers staff, preparation of office space, purchase of equipment and opening of the Center	In N municipalities eco-centers will be established which will be oriented at awareness raising of local communities in the field of environmental protection. Community representatives will have possibility obtain any information in this field, also carry out different (various) eco projects through attracting finances from different donor organizations	For the first time such a type of center will become operational, at least 4 people will be given jobs.	New centers will be opened with more people to get jobs
Arrangement of information campaigns, holding seminars with the help of eco-centers	Active information campaigns in local communities through thematic booklets and posters dissemination, meetings with the communities, conversations and internet. Arrangement of seminars about the effectiveness of the sustainable use of secondary raw materials and possible creation of income sources with the interested representatives of the communities	Local community will obtain information about secondary raw material, specifically about sawdust which is in abundance in the countryside, about the effectiveness of its sustainable use and possible creation of income sources. In addition, they can receive alternative source of heating (fuel) which is more effective than just firewood, which in its turn will reduce forest cut. If big amount of "pellet" is accumulated a community will be given a possibility to earn additional income through its realization (sell).	Community people will raise their educational level and get new information. They will learn ways of gaining economic benefit via sawdust.	They will hand over their own acquired knowledge and experience to neighbor communities which will facilitate to the increase of environmental protection level and more people will get involved in the use of alternative energy source for gaining personal benefit.

<p>Purchase of wood pellet producing plants and for eco-centers and their installation.</p>	<p>Purchase of wood pellet producing plants, transportation and installation on the territories of eco-centers</p>	<p>Because of rather high price communities cannot afford purchasing the plants by themselves, hence the project will provide such plants to the communities. In case they are interested further the community will try to raise necessary funds itself for the purchase of plants. This practice will also spread in the neighboring communities and the interest will grow even more.</p>	<p>Actually it will be for the first time that selected communities are provided "pellet" producing plants.</p>	<p>Any community can use such type of a plant. If one community knows how to use a plant they will share their knowledge and experience with other communities</p>
<p>Eco-center staff and local communities representatives training</p>	<p>Training for Eco-center staff and local communities' representatives in the operation of pellet producing plants. Planning of secondary raw material realization and logistic scheme, finding secondary treatment (recycling) enterprises and signing agreements with them.</p>	<p>Community representatives will learn how to operate the installations correctly and effectively which later will be handed over to neighbor interested communities. The project will also ensure the formation of correct business model for pellet realization (sell).</p>	<p>For the first time sawdust will be used to produce raw materials</p>	<p>As soon as the production of pellet is started the damaged environment will be reduced immediately, which means preservation of the unique wood fund.</p>

7. IMPLEMENTATION

7.1. Formation of Working Group

After the waste management plan is developed and approved in the relevant body the phase of the waste management Plan implementation starts.

In the first place a Working Group shall be established which will be directly responsible for the implementation of the Plan. The composition of the Group can be defined on the basis of the taking into account local conditions and the difficulties of the wastes management plan. The Group may comprise of local self-governance staff and representatives of business, sub-contractors, and representatives of public and invited specialists.

Responsibilities, obligations and rights of the members of the Working Group shall be clearly distributed among its members. The group members are accountable only to the Group Leader and the public.

The Group Leader is appointed by a manager of a local self-governance body, head of the Sakrebulo.

The Working Group holds tenders for different service provider companies, manages construction works (if such is needed), permanently arranges meetings and actions for the purpose of awareness raising of the local population, carries out the control of wastes register and ensures the implementation of all issues represented (described) in the Waste Management Plan.

Under specific conditions it is possible that the Group function is carried out by the Commissions of Sakrebulos.

7.2. Reporting

Every set interval (monthly, weekly, every quarter, annually – which is defined by the Plan) the Working Group will submit a report at the Sakrebulo meeting where the progress of the waste management Plan implementation and existing problems will be discussed in details, and relevant decisions will be made concerning the integration with other systems or concerning other issues.

In addition, during the implementation of the Plan regular meetings with the public shall be organized; at these meetings will be discussed the requirements of the public representatives in the field of waste management and the public opinion will be shared. Also, at these meetings those problematic issues which the local population has with regard to the waste management will be discussed and taken into account.

7.3. Plan Review and Update

Annually (or in accordance to the legislation (if there is such) after a bigger interval) the Waste Management Plan shall be reviewed and renewed.

The renewal of the Plan is necessary for the purpose that the Waste Management system always meets the modern requirements. It is possible that during certain period of time some new technology has been introduced in the world which is cheaper and more efficient.

The review of the Plan and renewal is also necessary also in case if big group of people (population) migrated from one region to another, a new, big enterprise was put into operation or a big development project is being carried out with a big number of constructions and renewals which might have changed the demographic data of a municipality. In all above mentioned cases the Plan shall be reviewed and relevantly renewed on the basis of new data.

8. References

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Useful Internet Links:

<http://ec.europa.eu/environment/waste/legislation/index.htm>

<http://www.cleanup.ge>

<http://www.sida.se>

<http://www.cepis.ops-oms.org/indexeng.html>

<http://www.melissa.org/cwg/>

<http://www.epa.gov/osw/>

<http://www.iswa.dk/welcome.htm>

<http://www.solidwaste.com/>

<http://www.cfe.cornell.edu/wmi/Edresources.html>

<http://www.munisource.org/>

<http://www.sustainable.org/>

<http://www.iisd.org/about/default.htm>

<http://www.un.org/esa/sustdev/>

http://ec.europa.eu/environment/waste/hazardous_index.htm

http://www.wastegovernance.org/main3_2_eng.html

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