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Report on the Waste Composting Capacity and Recommendations on the Introduction of Composting in several Localities in Georgia (Kutaisi and Poti) and Moldova (Ungheni rayon) Deliverable: D.T.1.2.1



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OVERVIEW

Environmental pollution is a major issue of the modern world and this is the main factor generating the global warming of the atmosphere with serious current and future repercussions on the health and life on planet Earth. Therefore, the pollution sources, their influence on the main environmental factors (air, water, soil) and life should be looked into with great responsibility while appropriate measures should be identified and implemented in order to reduce or even eliminate environmental pollution. In agriculture also, a basic industry in all economies of the world, countless factors are known to pollute the environment, one of the most important being represented by waste or by-products resulting from non-agricultural activity in general and the livestock breeding in particular. This is in fact about the scrap resulting from the agricultural crop production, animal manure in livestock farms or individual farms, as well as other plant and livestock residues resulting from the activities of those production units.

E.U. LEGISLATION

The Directive establishing a legal framework for the waste treatment in the EU is the Directive 2008/98 / EC on waste.

Its aim is to protect the environment and human health by emphasizing the importance of a proper waste management and the use of recovery and recycling techniques to reduce the pressure on resources and improve their use.

- The Legislative Act establishes a waste hierarchy: prevention, reuse, recycling, recovery for other purposes - such as energy - and disposal.
- It confirms the "the polluter pays" principle, based on which, the original waste producer has to bear the costs of waste management.
- Waste management should be carried out without creating risks to water, air, soil, fauna or flora, without creating noise or smells, and without damaging the landscape or areas of special interest.



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- Waste producers or holders are bound to treat them or arrange for them to be handled by an officially recognized operator. They need authorization and are subject to periodic checks.
- The competent national authorities should establish waste management plans and waste prevention programs.
- Special conditions apply to hazardous waste, waste oils and biowaste.
- The directive introduces waste recycling and recycling targets to be achieved by 2020 for the re-use and recycling of waste such as, at least, paper, metal, plastic and glass from households to reach a minimum of 50% their total mass whereas, in the case of non-hazardous waste, arising from construction and demolition activities, this will have to reach a minimum level of 70% of their total mass.

The EU waste management approach is based on three major principles:

- Prevention of waste generation - a factor considered to be of great importance in any waste management strategy, directly related to both improving production methods and determining consumers to modify their demand for products (orientation towards green products) and to adopt a lifestyle that generates small amounts of waste.
- Recycling and reuse - where waste is generated, encouraging a high level of recovery of component materials, preferably through material recycling. For this purpose, several waste streams are identified, for which material recycling is a priority: packaging waste, end-of-life vehicles, battery waste, electrical and electronic equipment waste.
 - Improvement of final waste disposal and monitoring - if waste can not be recovered, it must be disposed of in a safe area for the environment and the human health, based on a strict monitoring program.



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THE WASTE POLICY OF GEORGIA

The Waste Management Code was adopted on December 26th 2014 and entered into force in January 2015. Prior to this, waste issues were governed by a series of legal acts and, to a certain extent, by international conventions. Although the new Code adopted is based on the principles and approaches envisaged by the EU-Georgia Association Agreement and on the international best practices, it is necessary to develop and adopt a series of secondary laws with view to fully implement the Code.

The new Code seeks to create a legal and regulatory framework to support waste prevention and re-use as well as waste management processes, including collection, transport, recovery (recycling, composting, etc.) and disposal. Among the objectives of the new code, the following could be mentioned:

- 1) protection of human health and environment by preventing or reducing the generation of waste and its negative effects;
- 2) the introduction of efficient waste management mechanisms;
- 3) encouraging a more efficient use of the resources that could be achieved through better municipal waste management.

By way of the "Waste Management Code", the Government of Georgia is trying to improve waste management practices across the country by imposing superior design and operating standards that are compatible with those existing in the European Union. This objective is supported by Georgia's obligation, under the EU-Georgia Association Agreement, to align its waste management practices with those of the European Union.

International conventions are not fully transposed into the national law. Practice shows that, without a complete adjustment of national legislation, the implementation of conventions is not effective.

The new "Waste Management Code" will lead to new waste management initiatives designed to:

- 1) optimize and extend the coverage of official collection services;
 - 2) implement new landfills designed and built to meet the international standards;
- and



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3) significantly increase the recovery rates through official municipal recycling and composting programs.

In order to support this target improvement process, the Georgian "Waste management code" stipulates that the local administrations need to develop comprehensive plans to improve the urban waste management activities.

Article 13 of the *Waste Management Code* defines both the intention and the minimum content of the municipal waste management plans. The most urgent measures are expected to focus on improving waste collection and disposal processes, while in the long run, the waste minimization, reduction and recovery processes will be addressed.

On April 1st, 2016, the Georgian government approved the National Waste Management Strategy 2016-2030 and Georgia's Waste Management Action Plan for 2016-2020. The strategy and action plan are an integral part of Georgia's waste management policies. The National Waste Management Strategy aims at creating solid foundations for the establishment in stages and development of a system that responds to modern waste management requirements in Georgia, taking into account international practices and the socio-economic status of the country.

The waste management strategy is in line with the Waste Management Code setting out the waste management hierarchy:

- a) Prevention
- b) Preparation for reuse
- c) Recycling
- d) Other recoveries, including energy recovery
- e) Disposal.

THE WASTE POLICY OF THE REPUBLIC OF MOLDOVA

The Republic of Moldova Government's policy on waste management consists of developing the necessary infrastructure and services to adequately protect the environment at global, national and local levels from the outcomes associated with the management of the waste generated by the citizens, businesses and institutions.



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The Government of the Republic of Moldova is to establish the legal and institutional framework needed to support the gradual alignment of waste management practices with those of the European Union. Through partnerships at international, national and local level, the necessary level of investment will be encouraged and attracted to enable the sustainable development of the sector, in accordance with the priority needs and at an accessible rate for the society.

The inappropriate waste management over the past few years affects the local communities, threatens the environment and contributes to the global greenhouse gas emissions increase. In the context of economic growth in both volume and diversity of the generated waste, the management and recycling of waste are local, national and international priorities.

Waste management in the Republic of Moldova remains a difficult and unresolved issue, both organizationally and legally. Although the field of environmental protection is regulated by approximately 35 legislative acts and over 50 Government decisions, the legal aspect of waste management requires essential improvements, as both the revision and modification of the legal and institutional framework are necessary, as well as creating an upright technical and environmental regulation system in terms of selective collection for the recycling, recovery and disposal of waste.

The waste management strategy in the Republic of Moldova for the years 2013-2027 aims at establishing the guiding trend for the activities to develop the necessary infrastructure and services for the waste compliance with view to safeguard the environment and public health.

The strategy establishes the basis for the necessary framework with view to developing and implementing an integrated and effective system from the social, economic and environmental protection perspectives. Sustainable development in the waste field is founded on the controlled management in order to limit on short-term the impact on the environment caused by its elimination, whereas on the medium and long-term, it should be socially acceptable and economically feasible.



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The hierarchy of the most efficient waste management options is a simplified conceptual framework which envisages:

1) waste generating prevention, which is positioned at the top of the hierarchy and consists in slowing down and finally reversing the rate of waste growth and of the hazardous properties of the generated waste;

2) the re-use and recycling, which refers to the use of waste as secondary raw materials, without further processing (re-use) or with subsequent processing (recycling);

3) the recovery, which concerns the further extraction of the value (including the energy) in the generated waste. Recovery includes the use of combustible waste fractions as alternative fuel in the production of electricity and heat;

4) the elimination, which consists in the burial of the waste components which cannot be reused, recycled and recovered, in order to restricting the emissions into the environmental air.

The current status of biodegradable waste

In the Republic of Moldova, the biodegradable matter from municipal waste is the major component and, it is mainly solid.

The main producers are:

- livestock farms;
- individual households (both blocks of flats and especially those in private homes), which remove such waste from gardens, kitchens;
- local authorities generating plant waste from parks and public spaces,
- restaurants and other types of companies.

As regards the street waste, the amount and composition of the waste depend on:

- the geographical area;
- the climate;
- the nature of the pavement;
- the degree of vegetation coverage of urban and rural areas

Organic biodegradable waste is produced throughout the year, regardless of the season.



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In general, biodegradable waste of this origin is relatively dry, but it can also be in suspension, resulting from street washing, wastewater treatment plants and other activities. Biodegradable waste resulting from the agro-food industry is in large quantities, which under the current conditions, is not subject to basic records and, in most cases, is not stored properly. The largest flow of agri-food waste is attributable to the food and beverage industry, the plant breeding industry and livestock farming, etc.

In the recent years, the percentage of biodegradability in municipal waste as well as in the waste generated by technologies has decreased.

In the last period, attention is paid to the quantities of biodegradable waste that can be easily collected and treated. These generally include: straw, other agricultural residues, which can be used to obtain fuels.

Biodegradable household waste from urban areas is calculated on average in a volume of 0.9 kg / place / day, which generates an average amount of 1,337,130 kg / day from 1485.7 thousand people.

This amount, actually all of it, is stored on the very poorly managed and uncontrolled garbage ramps. Uncontrolled deposits are lacking the minimum necessary facilities, they are unhealthy areas that endanger people's lives by the risk of polluting the surface and underground water due to leakage of organic (leachate) liquid. At the same time, they create discomfort to the population as a result of unpleasant odors, aesthetically affect the landscape, enables preserving and propagation of disease outbreaks for humans and animals.

The amount of solid household waste in the rural sector is about 0.5 kg / spot / day. An average annual quantity of about 1,036,900 kg / day of rural household waste can be estimated, for the rural population of 2,073.8 thousand inhabitants.

In the vast majority of cases, rural biodegradable waste is discarded in the forest strips, at the edge of ravines and watercourses, a cause for which the degree of environmental pollution may be more intense than in the case of the storage of urban waste.

The differences recorded in the quantities of biodegradable waste from one area to another in terms of their quantity and characteristics depend on:



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- the degree of socio-economic development of the country (locality);
- the degree of technological development;
- the living standard of the population;
- the level of culture and ecological awareness of the problem;
- the demographic density of the locality

In most districts (rayons) there is no strict record of the amount of waste generated by various industrial or other kind of activities.

In general, different categories of biodegradable waste can be qualitatively characterized by the following quality indicators:

- volumetric weight;
- composition as per granulation;
- composition as per assortments;
- the moisture content;
- the content of organic substances;
- the caloric power.

The biodegradable rural waste differs from the urban waste in terms of composition and quantity. The non-existence in the rural area of the public sanitation services and the primary record of waste generation makes it impossible to produce a correct and timely statistics of the rural biodegradable waste, in some cases due to the non-submission of the information requested by the statistical bodies, which is why they can be assessed only approximately.

In most of the cases, the common storage of biodegradable waste is made with the other types of waste. From the quantitative point of view, the biodegradable waste constitutes most of the waste, both urban and rural, the average per country, according to the investigations carried out during 2005-2011, built up 73.8%.

It is worth mentioning that due to the composition of the waste, the calorific power of the waste in the Republic of Moldova is 500-600 kcal / kg compared to 1500-2000 kcal / kg in the developing countries.

The main objectives of solid biodegradable waste management are:

- Protecting the health of the population;



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- Environmental protection;
- Maintaining public cleanliness so that these places can be aesthetically acceptable;
- Conservation of natural resources following waste reduction policies and by way of recycling, recovery or composting.

All these objectives can be achieved by safe collection and treatment, an appropriate disposal and storage, which is not characteristic for the Republic of Moldova for the moment.

Thus, integrated waste management is vital to the community for the following reasons:

- the storage capacity decreases continuously. The installation and construction of new warehouses is a difficult and expensive process;
- many waste materials are natural sources, which require its recovery, reducing the impact on the environment and increasing the quality of life;
- the component elements found in the volume of biodegradable waste can be an opportunity to start an activity in electricity and thermal energy production;
- a system that is not based on a single solution is more flexible in economic, technological and legislative changes;
- local public authorities are in a vantage point in choosing proposals for a new facility, when they have the chance to carefully examine the entire system.

All biodegradable waste can be technologically transformed through a series of processes into different combustible products, such as:

- solidification of biodegradable waste (production of pellets, briquettes);
- gasification - production of synthetic gas from solid bio-products;
- liquefaction - conversion of the biofuel gas into liquid fuel (bio-diesel, bio-ethanol, etc.)

To the above mentioned, the component elements of the integrated biodegradable waste management system are added, such as: waste minimization - recycling - composting - incineration and controlled storage.



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Taking into account the general characteristics of the biodegradable waste will increase the attractiveness of the economic agents, the specialists in the field regarding the solution of the waste management problems at the level of the EU requirements.

Prerequisites of composting implementation

Integrated waste management in the economic and social processes, according to the concept of sustainable development, is the effective support of the material and energy recovery of the waste that can become a branch of the national economy along with traditional sectors.

The management, is initially oriented primarily towards the environmental protection, while in time, the emphasis being placed on the most efficient use of natural resources, recovery, recycling and recovery of waste, including the biodegradable waste, promotion of latest technologies in the field, etc.

The practical aspects and solutions of one of the main problems faced by our society are: the generation of waste, particularly the biodegradable waste, in large volumes, but which are traditionally disposed of at the landfills.

In the recent years, the Ministry of Environment of the Republic of Moldova has directed its efforts to develop a package of legislative-normative acts in line with European standards, such as: *Waste Law, National Strategy and National Action Plan for the implementation of integrated waste management, etc.*

In the field of biodegradable waste management, there hasn't been yet a well-established legislative framework that would allow the implementation of modern technologies and machines.

In the last two decades, the Republic of Moldova has become increasingly confronted with the problems of purchasing energy resources, being almost entirely dependent on the import of energy. About 97% of the energy needs are imported from Russia, while the natural gas, which is the main source of urban heating, is 100% imported. Import prices are constantly rising, thus becoming a burden for the country's population and economy.



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This process was further developed during 2004-2005, by way of the World Bank and ended with the project proposal for GEF (Global Ecological Fund) - "Renewable Energy from Agricultural Waste", completed in February 2005. The Renewable Energy Project from Agricultural waste has opened the way for the implementation of biomass as an energy source in Moldova, focusing in particular on the use of straw.

The GEF project established eleven demo pilot-installations in eight localities with a capacity of 2.72 MWth, using straws as an energy source and it was based on the thermal power plants produced first in Ukraine and then in Moldova, using Danish models and providing heating in public buildings in rural communities.

The social and economic benefits have proved favorable, with obvious and considerable reductions in the cost of energy (up to 50% less compared to coal and 70% compared to natural gas) and in the volume of greenhouse gas emissions. The heating systems worked with maintaining the optimum temperature throughout the entire heating season, which led to the increase of the comfort level in schools and other rooms.

The GEF project was completed in 2008 and it was followed by a demonstration plant (300 kWth), funded by JICA and implemented by the 2 KR implementation unit in Moldova, representing a first lesson in biomass energy use.

RECOMMENDATIONS – REPUBLIC OF MOLDOVA

In order to ensure a better adaptation of the waste management to the new economic conditions, especially, when the branch is just emerging, **it is necessary to have a Concept of the policy in the field of waste recycling and recovery**, a viable infrastructure in the integrated management and of professional training of specialists in the field.

Given the still low investment possibilities of the country, a special priority is to **establish partnerships between public and private entities**.



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The local public authorities, the private entities will effectively benefit from these partnerships, both from the transfer of clean technologies, as well as from the development of facilities, such as selective collection systems, recovery, recycling, composting or incineration facilities, construction of storage facilities. waste, etc.

An important role, at national level, is also **intended to be given to bilateral cooperation programs** with different international bodies for the development of institutional capacities at community level, observing the specific objectives at regional or local level.

Moreover, the territorial-administrative units will have to take **measures to close the hundreds of non-compliant storage areas**, thus ecologically remedying the land to be restored into the economic circuit.

At the same time, it is necessary **to arrange / build up compliant landfills of waste**, and the waste generators, first of all, biodegradable waste generators will be stimulated and controlled in the process of recovery with the presentation of the concrete evidence that they have been integrated into the process.

From the legislative point of view, **the Ministry will have to speed up the transposition process of the community acquis**, so that as soon as possible, the Republic of Moldova can have a functional legal framework throughout the waste management field, which will include clear objectives and targets to be achieved in the coming years regarding the collection, reuse, recycling and recovery of waste. The main objective of the waste policy must be to **minimize the negative effects thereof on human health and the environment with obvious economic efficiency**.

It requires a number of elements, such as:

- **a precautionary approach to the process of using renewable and biodegradable resources for the purpose of producing electricity and heat;**
- **the correct management of municipal waste;**
- **the extension of high-level public utilities and services in rural areas, as a means of creating a living environment that offers minimum comfort, stimulating young people to stay in the rural areas;**



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- **householding attitude towards the development of agriculture and the correct use of land,**
- **creating the premises for the development of a green agriculture, green food industries and a clean energy industry.**

ACHIEVEMENTS MADE IN GEORGIA

Significant steps have been taken by the Georgian authorities regarding the use of composting in large composting stations.

Less popular is the individual composting of waste.

A study on a representative population has revealed that only 4% of the respondents are ready to use individual methods of composting organic waste.

In Kutaisi, there is already a project worth 40,000 euros, which will be implemented under the name of **Green Waste Recycling and Composting Center**, positioned on the site of a former concrete plant, managed by a specialized company.

The site is about 240 m away from the inhabited areas, as long as there is no legal provision for establishing a safety zone. Currently all waste is deposited in a non-compliant garbage dump, located about 500 m from the inhabited areas.

The green waste (leaves, wood and plant waste, green agricultural waste, etc.) collected in and around the city estimated at about 4,000 t / year, out of 50 parks and markets with a spike collection in autumn will be delivered to the Recycling Center for the green waste composting project, promoted by the governor of Kutaisi.

In the first phase, Tkaltubo also a village 10 km away from Kutaisi, can also benefit from this project. The locality has a population of 11,280 and 78 ha of parks, which means generating a large amount of green waste.

The technological composting process will be carried out in accordance with the main stages of composting.



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Initially, the big size green waste for composting will be crushed and mixed with other fine fractions of green waste. The obtained biomass will be stored on the site of the Composting Center in the form of longitudinal stacks. In order to accelerate and aerate the compost, the compost mass will be mixed periodically, using special equipment.

After 3-4 months from the beginning of the process, the compost mass becomes a homogeneous mass as fertilizer. The composting process will be carried out continuously throughout the year, during which time 1,020 tons of finished product, that is compost, will be obtained.

The final product obtained will be stored in a storage area allocated on the composting station site and will be used for green areas, parks and parking lots located in the city. If necessary, it will be packed in special packages.

Elements of the technological infrastructure

The plant will be located in a semi-open building, where all the main and auxiliary equipment will be installed an area allowing for the special equipment in the composting process to move.

The total area of the main building is 3,024 sqm. (length - 84 m, width - 36 m).

The following processing areas will be located:

- Storage room for raw materials (green waste);
- The area for locating the large waste shredding equipment;
- The area for mixing green and small waste; 300 sqm
- Composting (for biomass) the lines of the whole composting cycle; 1152 sqm
- Storage space for the finished product (compost). 420mp
- The storage and shredding area for the green raw materials and the mixing of waste for composting is 300 m2.
- The surface of the storage area for the finished product is 420 m2.



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The composting process will be implemented in the form of so-called longitudinal piles. The length of each longitudinal stack is 64 m, and the width is 3 m. A total of 6 longitudinal stacks is proposed to be arranged. The total surface area for longitudinal stacks is 1,152 m².

Spaces are envisaged for tractor driving between the piles with a width of 3 m between the neighboring piles.

The administration and accommodation block - will be situated in the existing buildings in the area.

Working capacity and working schedule

The company intends to recycle and compost 10,200 m³ (2,040 tons of green leaves waste, wood and plant waste, green agricultural waste, etc.), as well as to obtain 1,020 tons of compost as a result of the continuous composting cycle. Composting is carried out in the form of a continuous technological process, which takes place naturally and does not require any special working program.

The working schedule shall consist of eight working hours and five working days in accordance with the legislation in force.

RECOMMENDATIONS FOR GEORGIA

- initiating campaigns to promote the benefits of green waste composting and its consequences on the quality of life improvement;
- expediting the necessary approvals and building the composting station in Kutaisi;
- extension of the green waste collection areas to the localities in the vicinity of Kutaisi;
- adopting the Kutaisi experience for arranging other composting stations, especially in the areas covering large parks and green spaces (ex Tkaltubo);
- introducing into the legislation a green fee for green areas to support local initiatives and expand composting;
- encouraging individual composting initiatives;
- seasonal collection of green waste from the population.



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A modern solution of organic waste treatment – Gore® Cover, is provided by the German company, Gore.

Gore® Cover is an aerobic treatment technology for the organic waste that uses Gore semipermeable laminates and offers operators the same performance as the closed systems using technological structures (halls, tunnels, containers). It complies with the regulations in force, it is flexible and easy to use, having substantially reduced investment and operating costs.

A leader in terms of in-vessel systems technology, Gore® Cover treats over 2 million tons of waste annually in over 150 composting and mechanical-biological installations with capacities ranging from several thousand to hundreds of thousands of tons annually.

The advantages of using the GORE® Cover composting system are as follows:

- reduction of odour emissions by over 97%;
- removal of pathogens in safe conditions;
- higher treatment capacity in confined space;
- stabilization and reduction of the volume of waste before storage according to the legislation in force;
- composting throughout the year;
- obtaining high quality compost in the shortest time;
- investment and operating costs considerably reduced as compared to other composting systems.