



SMARTEnvi PROJECT

SMART DECISION TOOLS FOR REDUCING HAZARDS TO OUR
ENVIRONMENT AND WATER RESOURCES BY
REHABILITATING OPEN DUMPS

NATIONAL REPORT BULGARIA



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1. Preface

The European Union's (EU) environmental policy will continue to prioritize reducing the environmental implications of solid waste generation. Consecutive directives on solid waste management have tightened standards and policy directions for EU members to implement, and the EU helps member states and candidate countries improve their sectors to meet the required standards by providing grant financing. Despite the substantial financial resources devoted to the industry, many countries face the issue of falling short of the high goals.

Bulgaria has made progress toward meeting EU standards. To completely comply, however, additional expenditures are required to update the waste management system. The entire cost of meeting EU standards is expected to be EUR 370 million, or 20% of total funding in Standard Operation Procedures - Environment (SOP-Environment). Even with the significant EU structural support covering 85 percent of total waste sector investment, national public co-financing of EUR 55 million, as well as professional assistance to design and manage investment projects, is still necessary. A new system for waste management infrastructure development under the SOP-Environment went into effect in November 2009. The government used this procedure to divert funds from the national budget to close non-compliant regional open dumps and fund preliminary treatment facilities. It also intends to introduce instruments to improve the project preparation process. The resources of SOP-Environment are devoted to the development of regional waste management systems.

Currently, economic activities create over 80% of total waste in the country, with more than 40% of it being disposed of in landfills that meet EU standards. Following the adoption of Article 50 of the Waste Management Act in July 2012, Bulgaria published a National Waste Prevention Program in 2014. The National Waste Prevention Program is part of a larger National Waste Management Plan, with a budget of around EUR 50.23 million. Furthermore, some main priority targets for waste policy are specified in Bulgaria's Environmental Action Programme, which was enacted in 2002 and is updated almost every year:

- i. reducing waste generation;
- ii. maximizing recycling and reuse;
- iii. limiting the production of non-recyclable materials;
- iv. eliminating non-recyclable and non-recoverable waste disposal;
- v. ensuring full implementation of EU policy objectives in the field of waste management.

Aside from recent advances, some concerns still require attention, including:

- i. the closure of open dumpsites that are in violation of current regulations;
- ii. meeting EU recycling and landfill waste disposal targets; and

- iii. ensuring the sector's long-term financial viability.

2. Main trends in the generation of solid waste

The amount of waste generated can be seen as an indicator of how efficient society is, especially in terms of the utilization of natural resources, and the choice of the most appropriate methods of waste treatment. Some of the major types of solid waste generated in the Republic of Bulgaria are industrial, household, construction, hazardous, and specific waste (Fig.1).

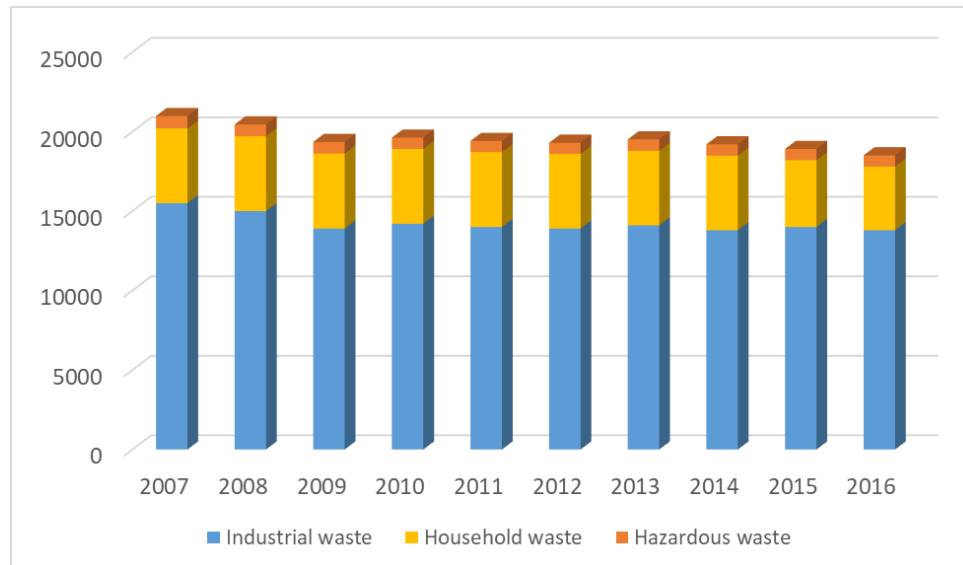


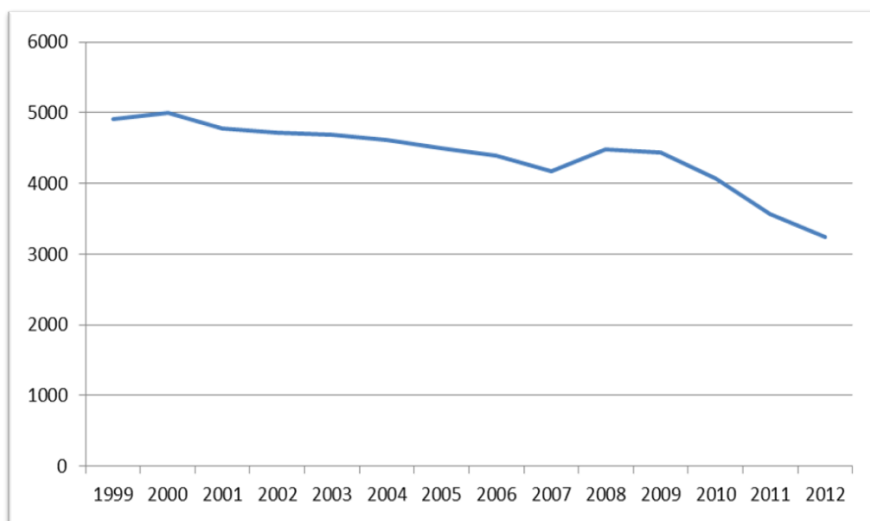
Fig. 1. Main types of solid wastes in Bulgaria

Industrial waste

In the Republic of Bulgaria, the major type of solid waste generated is industrial waste. The total amount of generated industrial waste for the period 2004–2011 is 149,469 thousand tons or 16,607 thousand tons/year derived mainly from the electricity, heat and gaseous fuels generation and distribution.

Household wastes

In second place is the household waste, 80 to 90% of which is generated from households and between 10% to 20% is formed by commercial, administrative, social, company, and other similar sites. The generation of household waste per capita (7% of all waste) is currently stabilized at around 513 kg/capita/year. In total, the average amount of generated waste in the country is about 18,110 kt (including 706 kt of hazardous, 3,561 kt of household, and 13,843 kt of industrial) per year. However, in the last decade, a decrease of about 4% per year in the total amount of generated household waste and about 3% per year in the volume of landfilled waste is observed. Furthermore, over the previous five years, the proportion of household waste in total waste generated in the country has decreased by 16–20 percent. (Fig. 2).



— Total generated household waste

Fig. 2. Total generated household waste in Bulgaria

Hazardous waste

Hazardous waste accounts for around 10.4% of total waste. Since 2006, the amount of hazardous waste produced in Bulgaria has remained relatively consistent, calculated at 13.4 million tonnes. The majority of this waste comes from the country's mining activities, which account for 99 percent of the total. Most of it has been processed in a landfill. Current hazardous waste management initiatives include increasing non-hazardous waste flows, diverting biodegradable waste from landfills in accordance with EU legislation, and building capacity to manage Extended Producer Responsibility (EPR) waste flows.

Construction waste

The main strategic goal of the National Strategic Plan for Waste Management of Construction and Demolition on the Territory of the Republic of Bulgaria for the period 2011-2020 is to develop a developed construction and demolition waste (CDW) management system in Bulgaria, which will ensure that at least 70% of waste generated as a result of construction activities is economically feasible to recycle. Other major strategic goals include preventing and lowering CDW generation, which will lessen the need for new landfills and other construction waste facilities.

3. Organized collection of solid waste

Another key concern in the country's waste management is organized waste collection. In this regard, the percentage of the population covered by systems for organized waste collection and transportation of household waste has increased from 77.6% to 99.2% over the last 13 years. This

increase is due to the new systems for organized garbage collection and garbage removal that have been created and started functioning in the smaller, entirely rural municipalities, as well as to the coverage by the system of new settlements in a large part of the municipalities.

Another major priority for the country is the development of a strong system for separate waste collection and the performance of campaigns to raise public awareness. According to Object-Oriented Programming (OOP) data, in 2018 in 183 municipalities and 16 districts of Sofia Municipality, with a covered population of 6 627 295 inhabitants, systems for the separate waste collection of packages are built, serviced by 45,500 pcs. separate collection containers. Forty municipalities are covered by 100% of separate collection systems, and 82 municipalities do not have such collection at all (Fig. 3).

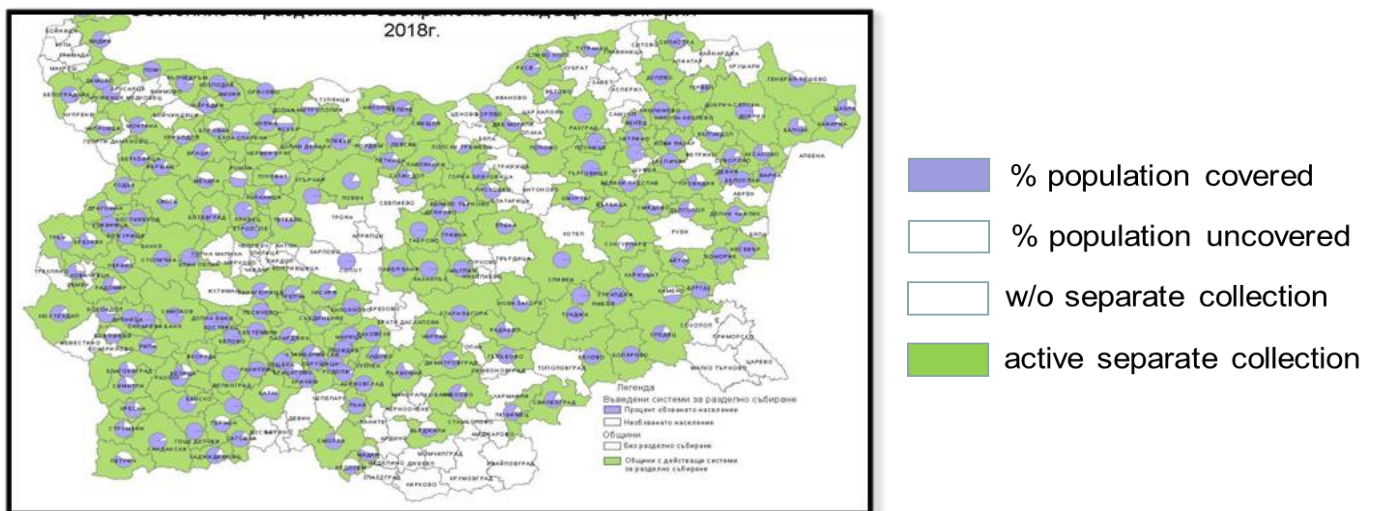


Fig. 3. Municipalities that are covered by separate waste collection systems in Bulgaria. Source: Bulgarian Executive Environment Agency

Despite the rising recycling sector, homeowners' incentive to separate waste still has to be boosted. Although the introduction of recycling containers at collection sites has generated positive results, the total amount of separated waste collected remains insufficient, demanding greater public education and outreach activities. Municipalities have the legal authority to raise fees. They are, however, cautious about taking advantage of this opportunity because the higher costs will have a negative impact on society. As a result, attaining the EU's ambitious recycling and waste reduction targets appears to be a difficult undertaking.

4. Solid wastes treatment

EU policy has several main objectives, including waste avoidance through the introduction of technologies and processes that are environmentally friendly and generate less waste, and through the production of environmentally friendly and recyclable products. It is this trend that is expected to affect the reduction of waste generated in Bulgaria. Reducing packaging weight and using recycled materials preserve raw materials and reduce costs. To exploit the energy and resource potential of solid waste, various methods for solid wastes treatment are applied in Bulgaria. These methods are being developed and improved, which increases the opportunities for efficient waste recovery.

Thermal methods of waste treatment

Thermal methods are most commonly used to treat solid waste. Solid waste is usually decomposed at a very high temperature - around and above 1000°C - where the materials break down into their constituent parts.

Incineration of solid waste

Waste incineration is one of the oldest and most commonly used methods for disposing of accumulated waste. When done professionally, waste incineration is usually divided into 2 types:

- ✓ Incineration of unsorted waste - mixed waste is incinerated completely in an oven at over 800°C. The incineration of waste releases energy that can be used for other purposes
- ✓ Incineration of sorted waste - first the garbage is distributed by separating its non-combustible part of the municipal solid waste.

Incineration of waste is not recommended due to the intense release of harmful substances into the atmosphere.

Biotechnological methods for solid waste treatment

They are based on the accelerated decomposition of solid waste, with the active participation of various microorganisms. Artificial acceleration of biochemical processes is carried out, in which the waste is corroded.

Biotechnological methods for waste treatment are divided into two main types:

- ✓ Aerobic - methods involving oxygen, such as the so-called composting;
- ✓ Anaerobic - methods in the absence of oxygen.

In both cases, the mass of accumulated solid waste is reduced.

Solid waste disposal

It is recommended as a last alternative for solid waste treatment. Also, pre-specialized treatment of solid waste is recommended before disposal. This approach in Bulgaria is in transition to new controlled landfills, which include waterproofing and leachate and landfill gas collection systems. However, there are still many landfills, as well as many new landfills that do not have landfill gas

capture systems, with methane being released freely into the atmosphere. Other pollutants are present in the composition of the landfill gas, which has the potential to reduce the quality of the atmospheric air, provided that the gas is not captured and burned.

Recycling of solid waste and reuse of useful substances in their composition

A major part of the solid waste contains useful elements that can be reused. This reduces the total amount of waste in landfills and the irretrievable loss of valuable resources.

In general, the most common approach to solid waste treatment in Bulgaria is its disposal. About 45% of the solid waste generated in Bulgaria is disposed of in landfills, often subjected to pre-specialized treatment. As regards the incineration of waste, there are two installations in the country with officially issued state permits. About 18% of the solid waste generated in Bulgaria is subjected to biotechnological methods for decomposition, of which 2% are home-built composting installations. Recycling of municipal waste remains relatively low with 25% compared to the European average of 44 % (Fig. 4).

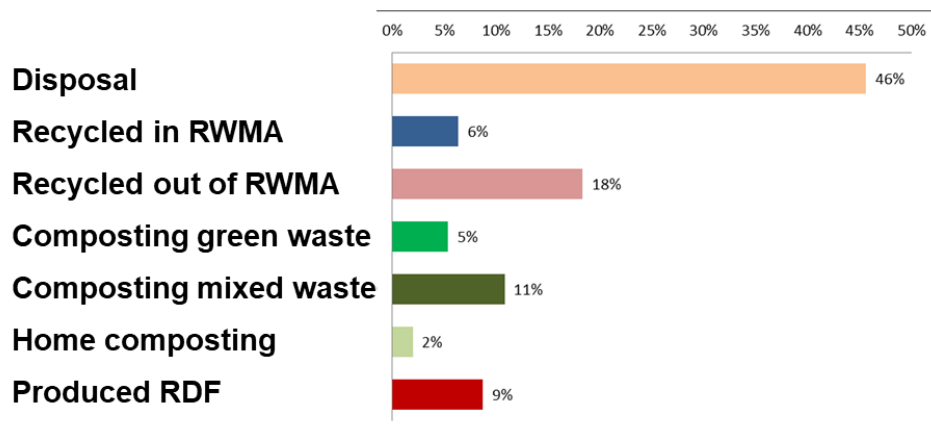


Fig. 4. Applied solid waste treatment methods in Bulgaria

Between 2001 and 2010, there was an upward trend in material quantities recycled; however, between 2010 and 2014, recycling rates, as well as total amounts, decreased. However, there is a general upward trend in recycling rates, with rates increasing from 16% in 2001 to 23% in 2014. During this time, the total trash volume decreased while the amount of recycled waste decreased. Bulgaria began recycling organic waste in 2011 (Fig. 5).

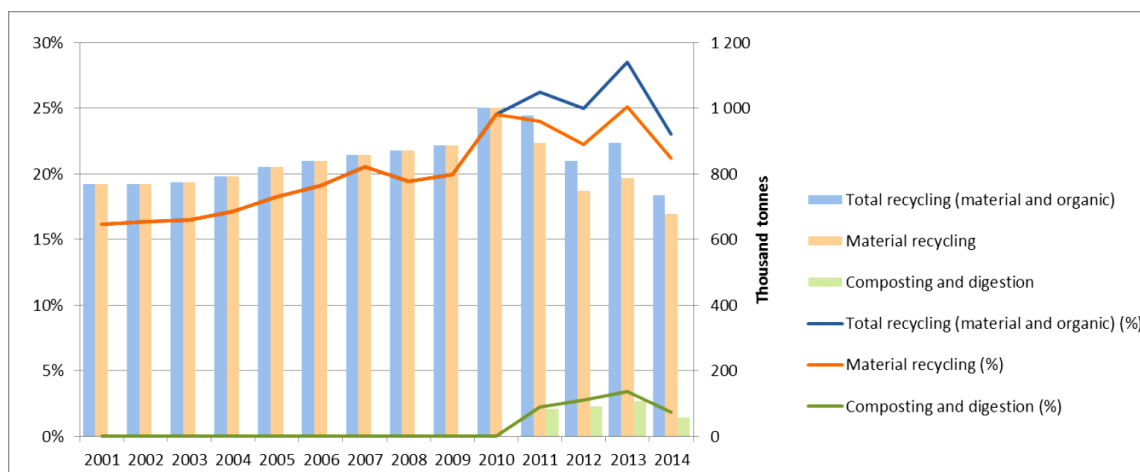


Fig. 5. Bulgaria, recycling of municipal waste, percentage, and tonnes. Source: Eurostat, 2016

The EU's 2008 Waste Framework Directive (WFD) includes a target for certain fractions of solid waste (SW): *'by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic, and glass from households and possibly from other origins as far as these waste streams are similar to waste from households shall be increased to a minimum of overall 50 % by weight.'* Bulgaria reported a recycling rate of 31% using one of four different approaches to calculate conformity with the target. The European Commission proposed new municipal waste targets in 2015, with the potential of temporal derogations for some countries, of 60 percent recycling and preparing for reuse by 2025 and 65 percent by 2030 (Table 1).

4.1 Waste and Circular Economy

The key characteristic of the circular economy is the recycling of materials from waste with the goal of 'closing the loop.' The recovery of energy from waste is also crucial. Waste disposal should be avoided whenever possible, and when it is unavoidable, it should be effectively controlled to ensure that human health and the environment are not jeopardized.

The EU is supporting research on waste-related aspects of the circular economy because it is a high policy priority for the EU. End-of-waste standards for defined waste streams, as well as quality and safety requirements for recovered materials, are being developed by the EU in collaboration with stakeholder experts. Meanwhile, its experts provide reference information on the best available procedures and practices for performing technical-economic and environmental analyses of waste recycling processes, waste-to-energy solutions, and waste disposal activities.

Bulgaria has to cope with its lagging from European pioneers of circular economy. Thanks to its valuable human capital with qualified professionals (engineers, researchers and R&D institutions) it is constantly increasing its potential for a well-monitored transition to a circular economy. The

perspective of transforming waste into resources for the country is outlined in Table 1. Bulgaria plans to progress towards the mentioned in Table 1 EU circular economy targets by:

- Multiplication of the separate waste collection points and making them more convenient for access;
- Implementation of specific standards and assurance of technical support for the waste collection services at municipalities' level;
- Encouraging citizens to separate waste applying the pay-as-you-throw principle;
- Stimulating producer responsibility for separate waste collection and imposing packaging recycling targets;
- Exploitation of EU financial schemes for investment in separate waste collection, sorting and recycling;
- Raising public awareness.

Table. 1. EU targets for top waste management and ranking of Bulgaria. Source: Eurostat.

Indices	Municipal waste recycling	Municipal Waste Landfilling	Packaging Waste Recycling	Plastic Packaging Waste Recycling	Waste Electrical and Electronic Equipment
	% Recycled	% Landfilled	% Recycled	% Recycled	Kg/capita
Bulgaria 2016	32	64	64	53	7.9
EU 2016 (av.)	45	24	67	42	
EU 2014 (av.)					6.2
EU target 2006					4
EU target 2008			55	22.5	
EU target 2020	50				
EU target 2030			70	55	
EU target 2035	65	10			

4.2. Open dumps data

Prior to 2009, the country had 1426 illegal dumping and 440 local polluted sites (Fig. 6). Municipalities were required to close all open dumpsites by July 2009 under current regulation. Regions without a functioning sanitary landfill must dispose of waste at existing sites that meet EU environmental criteria to avoid penalty. This approach, however, proved difficult to implement because it raises transportation costs and implies that municipalities will receive waste from other areas.

The Republic of Bulgaria's commitments, made as part of its accession to the European Union, are related to the construction of a system of regional facilities to ensure environmentally sound waste disposal, as well as the closure of all existing open dumps that do not meet the requirements of the regulations and modern technical standards. Initially, the deadline for the closure of the open dump sites that do not meet the requirements of the regulations was July 16, 2009. In 2012, more than 120 illegal open dumps were still detected in the country. By Decision № 310 / 26.10.2012 of the Minister of Environment and Water a project was approved - "Improvement and development of waste treatment infrastructure" in the frame of the operational program "Environment 2007-2013". The final effect in the implementation of this project led to reclamation and closure of at least 37 municipal landfills and reclamation and landscaping of at least 1620 acres of municipal land that the landfills occupied. The government has adopted a National Waste Management Plan until 2028 that envisages allocating approximately 1.5 billion levs to address waste problems.



A



B



C

Fig. 6. Open dumps in Bulgaria (A) Vetovo, (B) Silistra, (C) Haskovo

4.3. Rehabilitation of open dumps

It is a country policy priority that open dump sites must be closed because of their adverse effects on society and the environment. In addition, the open dumps rehabilitation management practices and approaches are reconsidered in the light of the current COVID 19 pandemic. In this respect funds are provided for:

- Closure of dangerous open dumps & transportation of solid waste to regional landfills built according to the European standards;
- Rehabilitation of old municipal landfills;
- Improvement and expansion of the national laboratory system for waste management;
- Reduction of the risk of old pollution with hazardous waste on the territory of the enterprises;
- Storing of expired plant protection products and construction of facilities for the integrated treatment of hazardous household waste. (Fig. 7).



Fig. 7. Open dump rehabilitation in Karlovo, Bulgaria

5. Legislations and directives about solid waste management and open dumps

5.1. The legal framework of Solid Waste Management

In compliance with the waste policy of the EC and the strategic priority for the development of circular economy, Bulgaria is restricting the application of the well-known linear economic model "*get, produce and dispose of*" that contradicts both the contemporary society requirements and the

progressive reduction of natural resources. Following the accepted waste hierarchy, the attention is focussed on the preventive measures for waste generation rather than on its run-up for reuse, recycling, recovery and finally – disposal. The waste disposal is considered as the worst approach among all.

Consequently, the waste management policy of Bulgaria provides for innovative, environmentally, and economically sustainable, ways for maximization of the waste use that include thorough recycling and minimal disposal, all performed in the modern landfills operating at regional level.

Historically, a year after the ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, adopted in January 1996, in September 1997, the first legal regulation in this area has been approved in Bulgaria – the Act on limitation of Harmful Impact of Waste on Environment in Bulgaria. This legal document regulated the public relations in the waste management sector and for the first time introduced some of the fundamental requirements of the Waste Framework Directive AI 75/442/EEC.

The Waste Management Act enforced in September 2003 defines the duties and responsibilities of the state and local authorities in terms of organization, endorsement, monitoring and funding of the activities related to waste management. The legal document supports and additionally develops the philosophy of the law of 1997 and corresponds to the RD 75/442/EEC. In the meantime, it introduces all the mandatory elements of the directives of the EC in sector “waste management”.

Bulgaria entered the EU in 2007 and since then it has been harmonizing its legislation for the waste management sector with European legislation. The local authorities have been encouraged to implement activities for reduction of the landfilled waste and to enforce the principle of regional municipal waste management. For this reason, the relevant amendments to the law have been introduced to clothe these activities in legal form. The purpose was to launch robust monitoring mechanisms that guarantee better recovery of the waste and more efficient environmental protection.

The National Waste Management Plan for 2009-2013 period sets up several strategic objectives, namely:

- Avoidance and minimisation of the waste generation;
- Growth of the portion of recovered and recycled waste;
- Improvement of the management of the separation process, the transitory storage, collection, and transportation of the waste;
- Arrangement of eco-friendly and sound waste disposal;

- Establishment of lawful framework for the waste management regulation;
- Enhancement of the systems for data provision regarding the waste generation;
- Reinforcement of the administrative capacity and society implementation in the waste management process.

Bulgaria has adopted and enforced the new Waste Management Act in July, 2012. The document introduces the requests of RD 2008/98/EC, among which the principles of *'polluter pays'*, the *'extended producer responsibility'*, and the *'waste management hierarchy'*.

Current Bulgarian national policy on waste management is focused on several strategic priorities. Among them are the promotion of waste prevention and reuse through recycling, extraction of secondary raw materials through different processes (e.g., regeneration), arrangement of harmless waste disposal and storage, increase of producers' obligations, encourage the investment intentions in the sector.

Bulgarian waste management policy is enforced by the Ministry of Environment and water with the support of the Directorate Waste Management and Soil protection. It complies with both EU and national legislation and is subordinated to the listed below regulatory acts and national planning and strategic documents.

- **Environmental Protection Act:** in force from 25.09.2002; last amended 12.03.2021. This Act provides for the public relations related to the environmental and human health protection; the biological diversity maintenance and conservation; the protection and use of nature components; the management and monitoring of the factors responsible for the environmental damage and pollution; the pollution avoidance and limitation; the launching of environmental protection policies, platforms and action plans; the environmental protection economic aspects, governmental and local authorities rights and obligations.
- **Waste Management Act:** in force from 13.07.2012; last amended 03.01.2019. This legal document implements the Waste Framework Directive (2008/98/EC) and regulates the measures for better waste management while diminishing the risks for both the environment and the human health. This includes preventing / decreasing the harmful impact by waste formation and management, via diminishing the total impact from using resources, increasing the part of the recycled and recovered waste, and raising the effectiveness of the resources' use. The act applies to various types of solid waste: household, industry, construction, and dangerous waste. The Waste Management Act presents new rules that strengthen the importance of the local authorities and administration and sets up certain achievable objectives for the municipalities. Furthermore, the document determines the obligations of the waste recovery organizations and individuals for bank guarantees and for elaboration of plans for recycling and recovering of construction waste. Special

attention is paid to the requirements for the users of commercial sites, production facilities and business premises to comply with the requirements for separate waste collection and delivery to specialized waste disposal / recovery organisations, bound with the corresponding penalties in case of no compliance with the Act provisions.

- **National Waste Management Plan (NWMP) for 2021-2028 period.** This plan has three main objectives: to create conditions for reducing generated waste; to implement management practices that ensure the effective use of waste as a resource, thus encouraging the transition to a circular economy; and to reach 55% recycled amount of the entire municipal waste by 2025. The financial dimensions of the NWMP cover total planned funds of 1.428 billion BGN. The measures for the promotion of investment initiatives encompass the construction of infrastructure for waste pre-treatment for landfilling and treatment of biodegradable waste. Funds are also provided for the expansion of the systems for separate waste collection. At a regional level, for the waste management systems 260 million BGN are foreseen, for construction of waste recycling plants through financial instruments - 40 million BGN, for construction of new and expansion of existing systems for separate collection of municipal waste - 145 million BGN, for elaboration and realisation of projects for closure and rehabilitation of municipal landfills for household waste - 100 million BGN, for construction of landfills or additional cells for municipal waste - 174 million BGN.
- **National Strategic Plan for Wastewater Treatment Plants Sludge Management**, in force since 2014. This is a national plan for the management of the sewage sludge from the municipal wastewater treatment plants (WWTP). It also provides guidelines for the professionals – operators of WWTP on the elaboration of plans for sewage sludge utilisation that fit the requirements of both Bulgarian and EU legislation. This documents offer a solid background for casting workable options and taking reasonable decisions in respect to wastewater treatment and sewage sludge utilisation.
- **National Strategic Plan for Construction and demolition Waste Management.** This plan encompasses the targets for construction waste recycling, reuse and recovery. Bulgaria reports a positive tendency for the generation of construction waste during the last years. However, the annual values of the construction waste/inhabitant ratio are quite lower than those for the EU-27 average. There is also a positive tendency for dominance of the share of the recycled against the disposed construction waste. The priorities in this plan are focused on the capacity promotion of the construction industry branch through encouraging the use of training and information acquisition options, the access to methodological and training materials available in the global net portals in respect to national and EU legislation and policies. The document outlines as well the

procedures for development of waste management plans including their investment components with the aim improvement of the waste management efficacy.

- **National Strategic Plan for Reduction of Biodegradable Waste Going to Landfills 2010 -2020.** This document analysis bio-waste management. It is important guideline, since the biodegradable waste represents about 50% of the municipal solid waste. This plan is established with the aim to reduce the landfilling and the generation of bio-waste of municipal origin, thus limiting the GH emissions and contributing to the quality of the soil, i.e. contributing to the environmental protection. The plan encloses as well anticipated quantitative targets for municipal bio-waste separate collection, recycling and recovery, as well as for off-putting of bio-degradable municipal waste from the landfills.

5.2. Open dumps and waste landfilling restriction

Bulgarian Ministry of Environment and Water puts in force both legislative measures and non-legislative initiatives consistent with EU policies and national awareness to achieve by 2030 recycling of household waste of 65%; recycling of packages of 75%, and a limit of 10% maximum landfill disposal.

The EU Directive on Waste Landfills has stipulated targets for reduction of the disposed waste volume together with very harsh demands regarding the landfilling process and sites. In Bulgaria, landfilling is still the prevailing technology of waste management. The relative share of this technology for waste management is about 64%.

The current national legislation regarding waste landfilling encompasses ordinances, resolutions, rules, and guidelines, as follows:

- **Ordinance No 7** on the requirements to be met by the sites for placement of waste treatment facilities (issued by the Minister of Environment and Water, the Minister of Regional Development and Public Works, the Minister of Agriculture and Forestry, and the Minister of Health, promulgated in the State Gazette, issue 81 from 17.09.2004).
- **Ordinance No 6** on the conditions and requirements for construction and operation of landfills and other facilities and installations for recovery and disposal of waste (issued by the Minister of Environment and Water, promulgated in the State Gazette, issue 80 from 13.09.2013).
- **Ordinance No 14** on the procedure and way for calculating the deductions and spending of the funds for closure and rehabilitation activities at the landfill sites (promulgated in the State Gazette, issue 93 from 26.11.2010).
- **Ordinance on Packaging and Packaging waste** (promulgated in the State Gazette, issue 19 from 09.03.2004) on the requirements for the products, which use generates mass widespread wastes, the rules for their separate collection, recycling, reuse, and disposal.

- **Regulation No 20 / 20.01.2017** on the adoption of the Ordinance on the separate collection of bio-waste and biodegradable waste treatment.
- **Regulation No 209 of the Council of Ministers from 20.08.2009** on financing the construction of MWT systems at regional level, including facilities for MSW pre-treatment, and for closure of waste landfills at municipality level (promulgated in the State Gazette, issue 68 / 25.08.2009).
- **Resolution No 207 of the Council of Ministers of 16.09.2010** for determining the amount and procedure for deductions under Art. 71f of the Waste Management Act (promulgated, SG, issue 75 of 24.09.2010).
- **Rules** for submission of projects for municipal waste landfills closure and rehabilitation, with the financial support assured by the Resolution of the Council of Ministers No 209 / 20.08.2009.
- **Guide for pre-treatment** before waste disposal in Bulgaria (approved by Order No RD - 664 from 29.08.2014 of the Minister of Environment and Water).
- **Guide for performing basic characterization of waste** and application of the criteria for acceptance of waste at different classes of landfills (approved by Order No RD - 156 from 04.03.2015 of the Minister of Environment and Water).

6. Target Groups - Identification of them, how this project will contribute them better, what should be done to include more of them, etc., your proposal of the best strategy

6.1. Solid Waste Management sector development: a vision for contribution of education

The solid Waste Management (SWM) sector requires professional staff that fits a set of minimum requirements for SWM professionals, in terms of adequate operational and managerial knowledge, skills, and competencies. Thus, measures that encourage the professional development of the SWM staff are required that will boost permanence, reward attainments, and reduce incompetence. The education of professionals in different sectors of economic activity and their further development is considered of primary importance for the creation of European knowledge-based society. Needs have emerged for staff possessing high subject-specific competence and skills relating knowledge to practice. In this respect, the SMARTEnvi project objectives are to boost the

quality of education and professional competence of several types of target groups through VET via a learner-centered approach.

6.2. Target groups benefiting from SMARTEnvi

The target groups will be offered an e-learning programme structured on the basis of competences attainable through Learning Outcomes, assessed via ECVET principles. The management of solid waste is a multidisciplinary area covering environmental, economic, political, and social aspects. Hence, the target groups – potential beneficiaries of SMARTEnvi e-learning system are chosen to encompass all these aspects taking into account the following considerations:

- **Technical personnel of local governmental and provincial directorates of environment.** This target group is directly involved in the SWM practices. For this reason, the requirements for skills and competencies of these professionals are also developing, and the pace of change is increasing. To support them in exploiting the opportunities offered by SMARTEnvi project, the e-learning process offered by the project must be oriented as well towards workplaces, where the technical personnel will take the experiences and challenges of combining work and study.
- **Engineers working in different careers of the environment.** They have to integrate the updated knowledge into their professional work on an ongoing basis. Thus, the subject-specific knowledge and skills will help them stay up-to-date with the developments of the SWM sector. Besides their direct engagements with organization and control of the SWM processes, the engineers play an additional, equally important role: the building of well-developed relations with relevant research centers, enterprises, and their networks to guarantee SWM activities efficiency and complexity. In this context, SMARTEnvi e-learning tools and educational content will help them not only to increase their skills and competencies but also to bridge the gap science industry.
- **Decision-makers about waste disposal and management.** The application of modern principles of SWM by well-educated and qualified staff is strongly needed and it imposes the necessity for the corresponding enterprises to keep a sufficient influx of well-trained workers. It is a real challenge for the decision-makers in the SWM sector to promote and encourage the partnership between the SWM branch and the VET providers. From this standpoint, SMARTEnvi project will offer the target group of decision-makers opportunities to establish and maintain exchanges of experience and, if possible, engage in common training development activities. The decision-makers would be able to focus on their relational competencies and other personal competencies to increase the attractiveness of SWM. They

will as well be encouraged to strengthen their competencies in SWM through the flexible and innovative tools, offered by the project

- **Private sector representatives working in related subjects.** The interaction with private sector representatives working in SWM-related sectors, which is planned by SMAETEnvi to be realized through the establishment of an associated partnership, will facilitate the integration of the theory with the practice during work-based learning. The participation of the private sector in the development of educational initiatives is very important at both the overall system level and when the actual provision of VET is taking place. The private sector representatives will strengthen their capacities for contributing actively to SWM benefiting from the specific knowledge offered by SMARTEnvi project through e-educational tools.

6.3. Best strategy proposal for target groups involvement

The potential training needs of SMARTEnvi target groups (technicians, engineers, decision-makers, and private sector representatives related to SWM sector) in respect to solid waste management issues have to be identified to attract better and more of them to benefit from the educational opportunities offered by SMARTEnvi project.

A proposal for a suitable strategy includes the following options:

- Consultations with SWM branch representatives at local/national level to refine the scope of the educational material offered and its delivery manner;
- Performance of queries among the potential targets on key topics, current levels of skills and knowledge, and preferred training formats of
- Data collection and finding analysis to form a focus group of extended potential targets.

7. Dissemination - Type of dissemination activities, possible associated partners, involvement of associated partners, how to get associated partners to involve more, etc., your dissemination plan

The dissemination activities for SMARTEnvi project will be performed as a continuous process of diffusion of information/materials to popularize and mainstream project achievements. The following timeline, dissemination channels, tools, and targets are foreseen:

- Activities during different project phases:

- Feasibility stage - identification of target groups for dissemination (short- and long-term beneficiaries); selection of the most suitable communication channels; definition of the most suitable messages for each target group;
- At project commencement - detailed planning of the dissemination actions and recording of dissemination activities (how, when, to whom);
- Along with project advancement – contacting relevant targets and spread out of information/materials (printed, digital, oral) at local/regional/national level
- At the project final stage - uploading the final project results on the Erasmus+ Project Results Platform
- Beyond the project - continuing dissemination activities;

➤ Dissemination materials:

- Digital: short signal messages; dedicated e-mails; PPT presentations
- Printed - dissemination leaflets, flyers, brochures, placards

➤ Dissemination channels/approaches:

- Digital: websites; social media; mass media
- Dedicated events: face-to-face meetings, seminars, happenings, conferences, discussion forums, information sessions, training demonstrations
- Cluster activities and networking with other related projects/initiatives
- Multiplier event planned for the project

➤ Dissemination targets:

- Project immediate target groups; associated targets, not directly involved in the project; expert and non-expert wide audience
- End-users: HEIs, VET providers, state and private settings within SWM and VET sectors
- Sectors of economic activity: waste management, environment protection, education, ICT

SMARTEnvi project consortium is supported by the informal participation of associated partners - organisations with highly qualified employees from diverse areas of economic activity. These partners can contribute to project development if deeply involved in its activities. An approach for such inclusion may comprise the following:

- Participation in Project steering committee, a managerial structure with observing / supervising functions regarding the project development;
- Involvement in exchange of opinions on the content, structuring, and implementation of project intellectual outputs; advising on their production;
- Taking part in the project Multiplier Events as invited speakers and discussion moderators;

- Contribution to project follow up activities through participation in the external assessment of the impact of the accomplished project actions;
- Contribution to dissemination actions: popularizing of project objectives, deliverables, and outcomes at their institutions using their information channels.

8. Conclusions and recommendations

The Republic of Bulgaria has implemented its National Waste Prevention Programme along with a National Waste Management Plan, following Art. 50 of the Waste Management Act enforced in July, 2012. The country introduced new systems for organized waste collection, transportation, and removal as well as a strong system for separate waste collection and performance of campaigns to raise public awareness on the matter. In this way, the country not only meets the requirements of the EU regulations (Waste Framework Directive RD 75/442/EEC) and modern technical standards but also ensures environmentally sound waste disposal and termination of operation and closure of all existing open landfills. Thus, it is on the way to fulfil its commitments undertaken in connection with the put in force of Directive 1999/31/EC on the landfill of waste and to advance towards circular economy.

At a national level, needs for improvement of the subject competence and links between theory and practice of professionals occupied in the solid waste management area (technicians, engineers, decision-makers, and private sector representatives related to SWM sector) were identified. Best strategy proposal for SMARTEnvi target groups' involvement in project development as well as a dissemination plan for the diffusion of information/materials to popularize and mainstream project achievements are proposed.

9. References:

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