



REPORT

on EU best practices in waste management and prevention of unregulated waste disposal



Waste management

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ABBREVIATIONS

DDMP	Detailed Development Master Plan
DG	Directorate General
EC	European Commission
EIA	Environmental Impact Assessment
ELV	End of Life Vehicles
EPA	Environment Protection Act
EU	European Union
HDW	Hard Domestic Waste
LLTF	Law on Local Taxes and Fees
MOEW	Ministry of Environment and Water
MPEP	Municipal Programme for Environmental Protection
NPO	Non Profit Organisation
PCTs	Polychlorinated terphenyls
PHBs	Polychlorinated biphenyls
SDMP	Strategic Development Master Plan
WEEE	Waste electrical and electronic equipment
WFD	Waste Framework Directive
WM	Waste Management
WMA	Waste Management Act
WMP	Waste Management Programme
WWTW	Waste Water Treatment Plant



SUMMARY

The present report has been prepared in implementation of **project “Clean and Green Life”** co-funded by the EU through the Interreg-IPA CBC Bulgaria–Serbia Programme. The report is part of project Activity 3 “*Research on current situation and EU best practices*”, which includes the completion of this research, elaboration of morphological analyses for the territories of Kula Municipality in Bulgaria and the Knjazevac Municipality in Serbia, as well as organisation of a round table event to discuss the conclusions of the prepared documents with all stakeholders.

The project is designed to stimulate the nature protection in the Kula-Knjazevac area through joint initiatives for removal of unregulated dumpsites and building an eco-mindset in the cross-border population. Both mitigative and preventive measures will be employed to:

- increase waste collection capacity and frequency of service,
- decrease municipal waste transported to landfills,
- trigger a behavioral change in the cross-border society with respect to waste disposal.

The project aims at removing the root causes for unregulated landfill sites and improving municipal waste management through:

- provision of modern equipment to increase waste collection capacity,
- exchange of know-how and implementation of EU best practices into a Joint Action Plan for waste management in the Kula-Knjazevac region, round table discussions and public debates;
- awareness raising on all levels on the importance of individual and community contribution for protecting the environment in the Kula-Knjazevac region.

My Green Home cross-border eco initiative will be initiated inviting all residents to participate in cleaning unregulated dumpsites and scattered waste. Special attention will be paid to young people through a joint school campaign to build an eco-mindset in the next generation.

The project will deliver:

- 3 joint interventions, addressing the preservation and restoration of the cross-border ecosystems,
- 5 education and awareness raising joint initiatives in the field of preservation and protection of natural heritage, biodiversity and landscape,
- 3 capacity building initiatives (exchange of experience and know-how) in the field of sustainable use of natural resources.

The Kula Municipality has identified the following priority objectives in relation to waste management:



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- Separate collection of biodegradable waste and its utilisation through composting (either domestic or communal);
- Separate collection of domestic hazardous waste (batteries, fluorescent lamps, accumulators, electric and electronic equipment) and its delivery for recycling or safe disposal;
- Introduction of a regional Waste Management System;
- Law-compliant treatment of construction and demolition waste;
- Closing down of all unregulated landfill sites on the municipal territory and closing down of the municipal landfill site, which does not currently comply with the regulations;
- Clean-up of the contaminated sites and preventing of the formation of new contamination.

The present research includes analysis of the legal framework both locally and in the EU. A list has been prepared of directives, strategies and programmes related to the waste management on European, national and regional scale.

This research also includes analysis of the current condition in the municipalities of Kula, Bulgaria and Knjazevac, Serbia and outlines the primary directions for improvement of the local systems for waste management.

The report provides a list of good practices for waste management within the EU, grouped by priority areas outlined in the EIA of the Kula municipality and the Regional waste management plan for the Knjazevac municipality.

The good practices proposed in this report in combination with the primary directions for both municipalities, and in accordance with the EU legal framework, will form a base for making further decisions for future investment in the region.



1 Introduction

1.1 General information

The Kula municipality is located in the Northeast of Bulgaria, at the western reaches of the Dunav Plane, 32 kilometres from the town of Vidin. It covers an area of 280.07 km². It borders with the municipalities of Vidin, Boynitsa, Gramada and Makresh. To the West it borders with The Republic of Serbia. The “Vrushka Chuka” border checkpoint is located on the territory of Kula municipality. This border checkpoint connects Kula with the Serbian town of Zajecar. The municipality consists of nine settlements (towns and villages). Administrative centre is the town of Kula.

The municipality is located at the western part of the Dunav Plain. The municipality of Kula has a mixed flat to hilly relief sloping slightly to the north and northeast. A number of small ditches cut the terrain and there are two significant rives including River Topolovets and River Chichilska.

There are nine settlements on the municipal territory (a town and eight villages) with the town of Kula being the administrative centre. The municipality comprises of the following settlements: Kula, Staropatitsa, Tsar Petrovo, Topolovets, Chichil, Golemanovo, Izvor mahala, Kosta Pechovo, Poletkovtsi. The population of the municipality according to the National Statistical Institute census of 2011 is 4,615. This figure shows the continuing trend of decline of the population in this region.

The ever-increasing amount of waste generated by human activities, production and trade necessitates measures to reduce the total amount of waste, reuse and increase of recycling and recovery of waste. With the development of new technologies for treatment of waste, the opportunities expand for utilisation of waste as an alternative source of raw materials and energy, and for reduction of waste disposed at landfill.

Based on the administrative, geographic and socio-economic characteristics of the Kula municipality, the main origins of waste are:

- Households;
- Industrial sites;
- Sales and service facilities.

Waste collected on the Kula municipal territory are transported and disposed of at the Regional Landfill Site at the village of Jeglitsa in the Vidin region. The amount of collected waste is weighed by electronic scales at the landfill entrance. The municipality receives a monthly report of the date and time of arrival of the transport vehicle at the depot and the amount of disposed waste.

1.1.1 Conclusions in the Waste Management Programme of Kula municipality

The Waste Management Programme report outlines the following conclusions:



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1. The quantity of disposed waste is relatively stable with a slight decreasing trend.
2. The waste disposal norm per capita is lower than the average for the country.
3. The quantity of the reported separately collected waste has a slight increasing trend.
4. The lack of separation in waste collection is the main obstacle for the achievement of the targets for recycling as defined in the national Waste Management Act. The Municipality needs to provide effective preliminary treatment and separation of waste.

1.1.2 Directions for improvement in the Waste Management Programme of Kula municipality

The main directions for improvement in the waste management in the Kula municipality are:

- Separate collection of biodegradable waste and its utilisation through composting (either domestic or communal);
- Separate collection of domestic hazardous waste (batteries, fluorescent lamps, accumulators, electric and electronic equipment) and its delivery for recycling or safe disposal;
- Introduction of a regional Waste Management System;
- Law-compliant treatment of construction and demolition waste;
- Closing down of all unregulated landfill sites on the municipal territory and closing down of the municipal landfill site, which does not currently comply with the regulations;
- Clean-up of the contaminated sites and preventing of the formation of new contamination.

The specific strategic targets, highlighted in the Environmental protection programme in Kula municipality 2017-2020, part 6 “Improvement of the waste management system” are:

- Closing down of the municipal landfill depot in the “Deri magare” area within the town of Kula;
- Optimisation of the centralised waste collection and transportation aimed at reduction of cost, harmful emissions in the atmosphere and noise;
- Optimisation of the location, number and capacity of the waste collection vessels and purchase of additional vessels;
- Application of pilot domestic composting;
- Introduction of separate collection of domestic waste, including packaging waste;
- Organisation and implementation of a system for separate collection of fluorescent and other mercury-containing lamps;



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- Development of an inventory of the quantities of the existing waste types posing a risk to the environment;
- Provision of a controlled temporary storage of the environmentally hazardous waste;
- Control of the dumping, unregulated disposal and uncontrolled treatment of waste;
- Provision of cleaning of the streets, alleys, parks, squares and all other public spaces;
- Development and maintenance of a data base of all generated waste on the municipal territory.

With an aim to address the above objectives, this report proposes a number of good practices that have been successfully implemented in various locations within the EU and have been targeted at similar waste management objectives.

1.2 Sources of information

- “Waste management programme for the Kula municipality 2016-2020”, Bulgaria;
- “Environmental protection programme for the Kula municipality 2017-2020”, Bulgaria;
- “Kula municipality development master plan 2014-2020”, Bulgaria;
- “Regional waste management plan for the city of Zajecar and the municipalities of Boljevac, Bor, Kladovo, Majdanpek, Negotin, and Knjazevac”, Serbia;
- Correspondence with professionals from the Kula Municipality;
- Correspondence with professionals from the Knjazevac Municipality;
- “Strategies for reduction of waste formation and good practices in the EU” – European Commission web site.
- “Analyses of the current condition and applicable indicators for the National Waste Prevention Programme” – MOEW report.
- Suggested good practices from the Association of Cities and Regions for sustainable resource management in Europe – report and web site.

1.3 Methodology

This research includes an analysis of the legal framework, an analysis of the existing condition of the waste management in the Kula and Knjazevac municipalities and an analysis of the good practices within countries of the EU, which are applicable under specific conditions and address specific necessities of the municipalities of Kula and Knjazevac. Apart from a documental analysis, the research also involved email and telephone communication with professionals from both municipalities.



2 National legal framework for waste management in Bulgaria

2.1 Introduction

The Environmental Protection Act (EPA), the Waste Management Act (WMA) and the Act of Ratification of the Basel convention for cross-border control of the transportation of hazardous waste and its treatment, together with the relevant secondary legislation are the main laws in the waste management in Bulgaria. Other legislation acts affect the development of the waste management sector, with the more important ones being mentioned in this section of the report.

2.2 Environmental Protection Act (EPA)

EPA outlines the general requirements for protection of all components of the environment (air, water, soils, underground, biodiversity) and management of the factors posing risk to these (waste, noise, chemical substances and human activity). EPA outlines the principles for protection of the components of the environment – such as “sustainable development”, “prevention before treatment”, “the polluter pays” and the integration of the environmental protection policy in the sectoral and regional policies. Apart from framework directives regarding the principles for environmental protection (and waste management in particular) the main duties of individuals and the authorities, the Act also regulates the procedures for environmental impact assessment (EIA) and the licensing and issue of complex permissions.

2.3 Waste Management Act

Until the publication of the Law on Limiting the Harmful Impact of Waste on the Environment in September 1997, in Bulgaria there had been no specific legal framework on that matter. The Act regulates for the first time public relations in the “Waste management” and introduces a number of fundamental requirements of the Waste Framework Directive 75/442/EEC including obligations of the persons performing waste activities, information on activities with waste, programming through national, municipal and company programs for waste management, permitting and control of the waste related activities; import, export and transit, fines and penalties for non-compliance. For the first time, the terms “waste”, “causer” and “holder” of waste are defined. This law also introduces the principle of “extended producer responsibility” by requiring producers and importers of products who, in the course of their production or after their final use, form hazardous or widespread waste, pay product eco-taxes. For details, the provisions of the Act have subsequently been approved by a number of secondary legislation.

The Waste Management Act, adopted in September 2003, further develops the philosophy of the 1997 Act and fully transposes WFD 75/442/EEC and, together with the ordinances to the Act, introduces the requirements of all European directives in the Waste Management Sector. At the time of Bulgaria's accession to the EU in 2007, the legislation in the sector is harmonised with European law. In addition to the law, economic incentives were introduced in 2010 for the local authorities to take real action to reduce landfilled waste as well as to move to the regional principle of municipal waste management.



The WMA, in force since July 2012, introduces WFD requirements 2008/98 / EC, including the polluter pays principle, extended producer responsibility and the waste management hierarchy. For the first time it introduces specifically addressed operational targets for the recycling of household and construction waste, requirements for waste facilities and installations, introduces economic and regulatory mechanisms and instruments for implementing the legislation; rules for the management of widespread waste; regulates the "end of waste" and "by-products" approach, defines in detail the controlling functions of the authorities and the specific fines and penalties for non-compliance .

2.3.1 Key provisions, subsequent to the WMA

- Quantified targets for preparation for reuse and recycling of waste materials, including at least paper and cardboard, metal, plastic, and glass from households and similar waste from other sources which the municipalities need to achieve within the following deadlines and quantities:
 1. Until 1 January 2016 - at least 25 per cent of their total weight;
 2. Until 1 January 2018 – at least 40 per cent of their total weight;
 3. Until 1 January 2020 - at least 50 per cent of their total weight.
- Introduces requirements by the end of 2020 that municipalities should limit the amount of landfilled biodegradable municipal waste to 35 per cent of the total waste generated in Bulgaria in 1995.
- Introduces step-by-step targets for re-use, recycling and other type of recovery of construction and demolition waste for which the contracting companies have responsibility, both public authorities and businesses:
 1. Until 1 January 2016 – at least 35 per cent of the total weight of waste;
 2. Until 1 January 2018 – at least 55 per cent of the total weight of waste;
 3. Until 1 January 2020 – at least 70 per cent of the total weight of waste.
- Mayors of municipalities organise systems for separate collection of household waste from paper and cardboard, metals, plastics and glass and provide conditions for separate collection of packaging waste for all settlements with a population of more than 5,000 inhabitants and for all resorts settlements.
- Mayors of municipalities to provide sites for free-of-charge disposal of separately collected waste from households, including bulky waste, hazardous waste and others in all settlements with a population of more than 10,000 inhabitants and, where necessary, in other settlements until the middle of 2014.



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- Users of commercial establishments, production, business and administrative buildings in settlements with over 5,000 inhabitants and in resort towns are obliged from the beginning of 2013 to collect separately the waste from paper and cardboard, glass, plastics and metals in accordance with the regulations of the municipalities under Article 22 of the WMA. The regulations should be adopted by municipal councils by mid-2014.
- Introduces detailed rules and requirements for the association of municipalities in regional associations to plan the management of household waste at regional level through regional facilities and organisation.
- Introduces economic instruments to cover future costs of closure and post-operational care at the landfill site and to promote waste prevention and recovery before landfilling.
- Identifies the competent state authorities under Regulation (EC) No 1013/2006, the requirements for financial guarantees in cross-border transport, and the possible cases of restrictions. The shipment of waste for the Republic of Bulgaria for incineration or co-incineration with energy recovery for each installation shall be prohibited for quantities in excess of half of the annual capacity of the installation per calendar year. Where specific waste management measures or waste streams are detailed in the National Waste Management Plan, the Council of Ministers may restrict the import of this waste.

The Law for the ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal was adopted in January 1996 (promulgated, SG, No. 8/1996). In addition, amendments to the Convention have been ratified with the Law (promulgated in State Gazette, issue 113 of 1999). On a pan-European level, the Convention is implemented through Regulation (EC) No 1013/2006 on transboundary shipments of waste.

The existing secondary legislation, which details the requirements of the WMA, can be divided into four groups:

Secondary acts defining requirements for facilities and installations:

- to the sites for installation of waste treatment facilities;
- for construction and operation of landfill sites and other facilities for waste treatment;
- for building and operation of facilities for incineration and co-incineration of waste;
- for treatment and transportation of production and hazardous waste;
- to installations producing titanium dioxide.

Secondary legislation regulating the management of specific waste streams:

- for sludge from sewage treatment by use in agriculture;
- for construction waste and for the use of construction recycled materials;



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- two separate regulations for treatment and separate collection of bio-waste;
- for polychlorinated biphenyls;
- for packaging and packaging waste;
- Disused electrical and electronic equipment;
- end-of-life vehicles;
- for waste from expired batteries and accumulators;
- for waste oils and waste petroleum products;
- for car tires.

Secondary legislation containing regulations on waste management through economic instruments:

- for the deduction and spending of the funds collected for the closure and after-care activities at the landfills and the deductions for the disposal of household and construction waste;
- to pay a product fee for products after the use of which a widespread waste (ELV, WEEE, tires, packaging, oils, batteries and accumulators, polymer bags) is generated;
- a financial guarantee or equivalent insurance for cross-border shipments of waste.

Secondary legislation with horizontal provisions for all types of waste, installations and waste facilities within the scope of WMA:

- for the classification of waste
- for the provision of information and procedures for keeping public waste registers

2.3.2 Secondary legislation on the application of WMA:

- Ordinance No 7 of 19.12.2013 on the procedure and method of calculation and determination of the amount of collateral and deductions required for the disposal of waste (promulgated SG No. 111 of 27.12.2013)
- Ordinance on separate collection of bio-waste, adopted by Decree of the Council of Ministers No 275 of 06.12.2013 (State Gazette, No. 107 of 13.12.2013)
- Ordinance on the Treatment of Biowaste adopted by Decree of the Council of Ministers No 235 of 15 October 2013 (SG No. 92 of 22.10.2013)



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- Ordinance on the management of construction waste and for the use of recycled building materials, adopted by Decree of the Council of Ministers No 277 of 5 November 2012 (Obn., SG, No. 89 of 13.11.2012, in force as of 13.11.2012)
- Ordinance on the requirements for treatment and transportation of industrial and hazardous waste (adopted by Council of Ministers Decree No. 53 of 1999, SG 29/1999)
- Ordinance on Packaging and Packaging Waste (promulgated, SG No. 85 / 06.11.2012, amended and supplemented, No. 76 / 30.08.2013)
- Ordinance No. 3 on Waste Classification (issued by the Minister of Environment and Water and the Minister of Health, promulgated, State Gazette, issue 44 of 25.05.2004)
- Ordinance No. 4 on the conditions and requirements for the construction and operation of incineration plants and co-incineration plants (promulgated SG, issue 36 of 2013)
- Ordinance No. 7 on the requirements to be met by the sites for the disposal 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 Forests and the Minister of Health, , SG 81 of 17.09.2004)
- Ordinance No. 6 on the conditions and requirements for construction and operation of landfills and other facilities and installations for waste recovery and disposal (Issued by the Minister of Environment and Waters, promulgated, State Gazette, issue 80 of 13.09.2013. , in force from 13.09.2013)
- Ordinance No. 2 of January 22, 2013, on the procedure and models for providing information on waste activities, as well as the procedure for keeping of public registers (promulgated, SG, No. 10 of 05.02.2013)
- Ordinance on end-of-life vehicles (adopted by Decree of the Council of Ministers No 11 of 15.01.2013, promulgated, SG No. 7 / 25.01.2013, in force as of 25.01.2013, amended and supplemented , issue 95 of 1.11.2013, in force since 1.11.2013)
- Ordinance on the Procedure and Method for Utilization of Sludges from Waste Water Treatment by Their Use in Agriculture (adopted by Decree of the Council of Ministers No 339 of 14.12.2004, promulgated, State Gazette No. 112 of 23.12.2004).
- Ordinance on batteries and accumulators and for unusable batteries and accumulators (adopted by Decree of the Council of Ministers No 351 of 27.12.2012, promulgated SG No. 2 of 08.01.2013)
- Ordinance on waste oils and waste petroleum products (adopted by Decree of the Council of Ministers No 352 of 27.12.2012, promulgated SG No. 2 of 08.01.2013)
- Ordinance on the requirements for the order and the way of inventory of equipment containing polychlorinated biphenyls, its marking and cleaning, as well as for the treatment and transportation of waste containing polychlorinated biphenyls (adopted by Decree of the Council of Ministers No 50 of 9 March 2006, SG, No. 24 of 21.03.2006)



- Ordinance on the Disposal of Electrical and Electronic Equipment (adopted by Decree of the Council of Ministers No 256 of 13.11.2013, promulgated in State Gazette No. 100 of 19.11.2013, in force as of 01.01.2014)
- Ordinance for determining the order and amount for payment of a product fee for products, after the use of which mass widespread waste is formed (adopted by Decree of the Council of Ministers No 120 of 30.05.2008, promulgated SG 53 from 10.06.2008 Amended and supplemented, SG No. 5 / 20.01.2009, in force as of 20.01.2009, amended, No. 45 of 16.06.2009, No. 69 of 03.09.2010. , amend., SG 85 of 29.10.2010, in force as of 01.01.2011, amended and supplemented, issue 29 of 8.04.2011, issue 47 of 22.06.2012, in effective from 22.06.2012, amended, issue 75 of 2.10.2012, effective as of 1.10.2012, amended by Decision No 9028 of 22.06.2012 of SAC of the Republic of Bulgaria - No. 87 from 9.11.2012, amended, issue 76 of 30.08.2013, in force from 30.08.2013, issue 100 from 19.11.2013, effective from 1.01.2014 years)
- Ordinance on the requirements for treatment of obsolete tires (Adopted by Decree of the Council of Ministers No 221 of 14.09.2012, promulgated SG No. 73 of 25.09.2012)
- Ordinance on the procedure and method of calculation of the amount of the financial guarantee or equivalent insurance and for the provision of annual returns - declarations for transboundary shipments of waste (Adopted by Decree of the Council of Ministers No 76 of 31.03.2011, promulgated SG No 29 of 08.04.2011)

2.4 Local Taxes and Fees Act

The financing mechanism for implementation of the municipal waste management obligations under the Waste Management Act is regulated by the Local Taxes and Fees Act. A "municipal waste tax" has been introduced, which is paid for collection, transportation and disposal services at landfills or other domestic waste facilities, as well as for the maintenance of the cleanliness of the public areas in the settlements.

The fee is set at an annual rate for each settlement by decision of the Municipal Council on the basis of an approved plan account for each activity (Article 66 of the TDCA):

- Provision of containers for the storage of household waste: containers, bins and others;
- Collection and transportation of household waste to landfills or other facilities and equipment for their disposal;
- Cleaning of streets, squares, alleys, parks and other areas of the settlements, intended for public use;
- Design, construction, maintenance, operation, closure and monitoring of landfills for municipal and construction waste or other installations or facilities for disposal.

2.5 Territorial Development Act (TDA)



The Territorial Development Act regulates public relations concerned with development planning, the requirements for investment design and construction in the country and defines the restrictions on properties for development purposes. Waste treatment facilities and installations are identified as elements of the technical infrastructure. This creates additional administrative barriers and delays in their planning and construction, as it is required to draw up a specific Detailed Development Plan (DDP), even if the site is designated by a Master Plan or Detailed Development Plan for industrial purposes. It is unclear why, for example, on designated industrial land it is allowed to plan energy, chemical, metallurgical and similar sites, however waste projects such as a composting or separation plant can only be started after submitting a specific DDP. In terms of characteristics, significance, complexity and operational risks, these installations are defined as a second category of construction from a total of eight categories, the first category being the most complex and risky, and the eighth category - of negligible risk and complexity.

The law contains provisions arising from the WMA related to the construction and demolition waste:

- The assessment of the compliance of the investment projects with the essential requirements for the construction works includes the control of these projects for compliance with a number of requirements, including the requirements for the selective separation of waste generated during the construction, demolition activities to ensure their subsequent recovery, including recycling and achievement of the relevant quantitative targets for recovery and recycling;
- The removal of construction works is carried out after approval of the construction waste management plan required by the TDA;
- the building permission includes measures for the selective separation of the waste generated during the construction, assembly and demolition activities and their subsequent recovery, including recycling;
- at the stage of approval of construction for commissioning is not allowed commissioning when:
 - 1) There is no fixed amount of deductions per unit of landfilled waste for subsequent closure and exploitation under Art. 60 of TDA;
 - 2) An authorisation or a registration document for waste operations has not been issued when required by the WMA.



2.6 National framework documents related to waste management

2.6.1 National Programme for management of waste activities and Waste Management Plans

Waste management planning started in 1998 with the development and adoption of the first National Waste Management Programme for the period 1998-2002. In 2002-2003, national programs were developed for specific waste streams regulated by several European directives, including for end-of-life vehicles, discarded electrical and electronic equipment, depleted batteries and accumulators, packaging waste. This has set a solid base for the management of specific waste streams.

The subsequent national waste management programs are:

National Waste Management Program 2003-2007, updated and extended for 2008 and the third National Waste Management Program 2009-2013, which sets ten strategic objectives, including the prevention and reduction of waste generation, the increase of the quantities of recycled and recovered waste, the environmentally friendly disposal of waste and others. Most of the measures to achieve the strategic objectives have been met, including the measures to improve administrative capacity, the introduction of economic instruments to stimulate recycling and prevent waste generation. Significant progress has been made in the preparation and application of integrated regional waste management systems. A delay is particularly noted with regard to the timescales for commissioning regional landfills and municipal waste facilities, but it is worth noting the unrealistic start-up times for these facilities mentioned in the program - July 2009, given that at the beginning of 2009 a large part of the projects were in the conceptual phase, no sites were provided and it was evidently unrealistic to build them for several months.

Within the scope of the national system of programmes and documents in the analysed area, there are two more national plans setting targets and defining measures for solving two specific areas of waste management:

2.6.1 National Strategic Plan for Phasing-out of Biodegradable Waste for Disposal 2010-2020

This is the country's first plan, which systematically conducts a thorough analysis of the environmental problems resulting from the landfilling of biodegradable waste, defines the problems and identifies the necessary measures (administrative, normative, financial, etc.) to overcome problems and to implement the objectives of phased reduction of landfilling of these wastes and increasing their recycling and recovery. It is expected that the implementation of the plan by 2020 will prevent the disposal of over 5 million tons of biodegradable waste. An additional effect will be achieved by replacing phosphate fertilizers with compost in agriculture. The planned measures are also considered key to achieving the goals of the Third National Action Plan on Climate Change 2013-2020 to reduce greenhouse gas emissions from the waste sector.



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Some of the installations for the utilisation of biodegradable waste are already in operation and the largest installation of this kind was put into operation in Sofia in 2014. However, awareness campaigns for the population and other stakeholders are still very limited.

2.6.2 National Strategic Plan for the management of construction and demolition waste on the territory of the Republic of Bulgaria for the period 2011-2020

This is also the first country plan in the country in the area under consideration. As a result of detailed analyses of the current situation, for the first time, this plan sets out measures (administrative, normative, financial, etc.) to increase recycling and recovery of the waste stream, which is mostly landfilled in the country at the moment. The overall strategic goal of the plan is to reduce the environmental impact of construction waste by 2020 by at least 70% recycling of construction waste. In implementation of the measures of the plan, provisions have been adopted in the 2012 Waste Management Act and a Regulation has been developed and adopted for the management of construction waste and the use of recycled building materials. Installations for recycling of construction and demolition waste are in the process of preparation and completion as part of a municipal system for waste management.

2.6.3 National Plan for Waste Management 2014-2020

This is the fourth programming document at national level for the management of waste activities in the Republic of Bulgaria. The main purpose of this plan is to break the link between economic growth and increased waste disposal by improving the waste management hierarchy by first developing a sub-program and measures to prevent waste generation, setting specific quantitative targets for preparation for re-use, recycling and other recovery of specific waste streams.



3 National legislative base for waste management in the Republic of Serbia

3.1 Introduction

There are over 50 acts and regulations in the Republic of Serbia dealing with waste management. Some of them have remained from the former Republic of Yugoslavia and others have been adopted by the Republic of Serbia (RS).

The acts and regulations adopted in recent years have been harmonised with the active European legislation.

"National Waste Management Strategy" was adopted in 2010 by the Government of the Republic of Serbia.

3.2 Waste Management Act

The main Law on Waste Management of the Republic of Serbia is the Waste Management Act, promulgated in the State Gazette of RS No 36/2009, 88/2010 and 14/2016.

3.3 Environmental Protection Act

The Environmental Protection Act (SG 66/91, 66/91, 83/92, 53/93, 67/93, 48/94, 53/95, 36/09 and 135/04) regulates an integrated system of protection of nature and the environment that ensures the realisation of human rights, the life and development of a healthy environment and a balance between economic development and the environment in the Republic; guides the preventive measures and procedures related to the emission of pollutants in the ambient air, water and land for the purpose of improving, preserving and protection of the environment.

The law also defines hazardous wastes and harmful substances (in gaseous, liquid or solid state) generated during the production, use, traffic, transport, storage, which may pose a threat to human life and health or the environment. It also defines the methods of their treatment and disposal, as well as the obligations and responsibilities of all subjects, the manner and procedures for taking certain actions.

3.4 Local Self-Government Act

The Local Self-Government Act ("Official Gazette of the Republic of Serbia" No. 129/07) regulates the rights and obligations of the local self-government established by the Constitution and other legislative acts such as planning and adopting programs, urban development plans, budgets, (cleaning of towns and villages, maintenance depots, etc.), security organisation and many others.



The Act defines how the local administration finances the public revenues of the municipality and transfers public funds to the Republic (local municipal taxes, environmental taxes, concession fee revenues, etc.); identifies the possibility of cooperation and unification of the local administration in order to achieve common goals, plans and programmes development as well as other needs of common interest.

3.5 Common Activities Act

The Common Activities Act (State Gazette, issue 16/97 and 42/98) defines the communal services and regulates the general conditions and the method of their application. Allows local administrations of two or more municipalities and populated areas to engage in joint activities.

3.6 Planning and Construction Act

The Planning and Construction Act (promulgated in the State Gazette, issue 72/09 on 31.08.2009) regulates the conditions and the methods of development, the conditions and method of installation and land use for building, construction and use of facilities.

3.7 Wrapping and Packaging Waste Act

The Wrapping and Packaging Waste Act (promulgated in State Gazette, issue 36/2009 of 5.12.2009). This law regulates the environmental protection activities by defining pre-packaging requirements, management of packaging as waste, reporting on packaging and much more. The provisions of this Act shall apply to imported packaging, packaging produced or placed on the market and all packaging waste.

3.8 Concessions Act

The Law on Concessions (State Gazette, issue 22/97, 25/97 and 55/03) regulates the conditions, the manner and the procedure for granting concessions for use of natural resources, goods for general use, for which the law provides that they are ownership of the Republic of Serbia and for the performance of activities of common interest, such as the construction, maintenance and use of communal facilities for the performance of municipal activities. The duration of the concession, the concession contract, the concession public tender, compensation, the exercise of rights and concession obligations, the establishment and operation of the concession, etc. are governed by the law.

3.9 Environmental Impact Assessment Act

The Environmental Impact Assessment Act (State Gazette, nos. 135/04 and 36/09) defines the procedure for environmental impact assessment; the method of preparation and content of the environmental impact assessment study; the involvement of bodies and organisations and the public; cross-border notification of projects that may have a significant impact on the environment of another country; specifies the types of projects whose construction or redevelopment and execution requires an environmental impact assessment; defines control by an institution conducting an assessment.



3.10 Strategic Environmental Impact Assessment Act

Strategic Environmental Impact Assessment Act (State Gazette, No 135/04). This act sets out the conditions and procedure for assessing the environmental impact of certain plans and programs in order to ensure the protection of the environment and the promotion of sustainable development by integrating the main principles of environmental protection into the preparation and adoption of plans and programs.

3.11 The Law on Integrated Prevention and Control of Environmental Pollution

The Law on Integrated Prevention and Control of Environmental Pollution (State Gazette, Issue 135/04) regulates the conditions and procedure for the issue of complex permits for installations and activities that may have negative impacts on human health, the environment or material goods. The law is guided by principles of integration and coordination, regulating public participation in decision-making and information exchange in cross-border contexts, identifying types of activities and installations, regulating control and other issues for the prevention and control of environmental pollution.

3.12 Conclusion

The above laws are only part of the laws in force in the country. The municipal waste management plan of Knjajevac Municipality listed and described 46 laws and 56 regulations dealing with waste management.

The laws, regulations and national strategic programs adopted in recent years are in line with EU legislation.

According to the National Waste Management Strategy of the Republic of Serbia adopted in 2010 and the Waste Management Act, the most optimal waste disposal solution is the proposition to build regional landfill sites.



4 European legislation

4.1 Introduction

EU waste management legislation.

4.1.1 Scope and structure

Since the adoption of the First Framework Directive on waste 75/442 / EEC in 1975, European legislation in the sector has grown tremendously. Currently, the Community legislation includes three categories of legislation:

- **Framework legislation:**

Directive 2008/98 / EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives and Regulation (EC) No 1013/2006 on transboundary shipment of waste.

- **Legislation referring to operations and facilities for treatment of waste:**

Industrial waste directive 2010/75 / EU / on waste incineration and requirements for integrated permits for certain waste treatment installations / and Council Directive 1999/31 / EC of 26 April 1999 on the landfill of waste.

- **Legislation on specific waste streams includes the following basic Directives**

Directive 2006/66 / EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157 / EEC;

Directive 2012/19 / EC on waste electrical and electronic equipment;

Directive 94/62 / EC of the European Parliament and of the Council of 20 December 1994 on wrapping and packaging waste;

Directive 2000/53 / EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles;

Council Directive 96/59 / EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls;

Council Directive 86/278 / EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture and Council Directive 78/176 / EEC of 20 February 1978 on waste from the titanium dioxide industry.

In addition to these directives on specific waste streams, there are a number of accompanying EU Directives and Decisions introducing specific technical requirements and rules.



4.2 Current WFD (Waste Framework Directive) legislation since 2008.

The framework and structure of European legislation governing public relations in the waste sector can be illustrated as follows:

4.2.1 New key provisions within the WFD

In addition to the above waste hierarchy, the WFD also introduced other key provisions for Member States and their respective national, regional and local authorities responsible for the relevant policies:

- Recovery and recycling of at least 50% of household and domestic waste equivalents by 2020;
- by 2020, recycling and recovery of at least 70% of construction and demolition waste;
- by 2014, Member States to develop national waste prevention programs;
- By 2015 at the latest, collection should be introduced for household waste and similar sources of paper, metal, plastic and glass as a minimum;
- introduces a procedure for setting end-of-waste criteria and specifies in which cases substances or articles resulting from a manufacturing process are by-products and not waste;
- distinguishes when waste incineration is energy efficient and is considered a recovery operation;
- clearly defines the difference between "recovery" and "disposal" of waste
- introduces "extended producer responsibility" as one of the means to support the development and production of fully-fledged goods and facilitate the efficient use of resources throughout their lifecycle, including their repair, re-use, dismantling and recycling , without hindering the free movement of goods on the internal market.
- Requirements for cross-border transport: Regulation (EC) No 1013/2006 introduces requirements for border-crossing persons to notify or provide information to the competent authorities of Member States on the cross-border shipment of waste and to provide financial guarantees covering the risk of transport. The Regulation allows Member States to limit the import of waste in certain cases and requires competent authorities to control and impose appropriate sanctions when establishing illegal shipments.

The regulation prohibits the export of waste for disposal outside the EU except for exports to the EFTA countries - Iceland, Norway, Liechtenstein, Switzerland when they are also parties to the Basel Convention.

- Requirements for treatment operations and facilities:



Two directives introduce technical and other requirements for waste facilities and their operation:

- 1) Industrial Emissions Directive 2010/75 / EU on incineration and co-incineration plants
and
- 2) Directive 1999/31 / EC on the disposal of waste.

The Landfill Directive also introduces restrictions on the disposal of biodegradable waste: the amount of biodegradable waste that is deposited to be reduced in 2016 to 35% of the quantity in 1995. For several new Member States, including Bulgaria, this deadline is until 2020. The directive prohibits the disposal of tires, liquids and explosives.

- Requirements for specific waste streams

Quantified targets for preparation for re-use, recycling and recovery have been introduced in 4 European directives on packaging waste, end-of-life vehicles, discarded electrical and electronic equipment, spent batteries and accumulators. Specific requirements for other waste streams: LOD/FTT, sludge from WWTP and titanium dioxide waste are regulated in two separate directives. With a view to simplifying legislation, the requirements for separate collection, where possible, the recovery and disposal of waste oils have been included in the WFD, which repealed an old European directive.

4.2.2 Legislative review process

The Commission's Roadmap for Waste Sector Policy Review for 2014, which presents the possible legislative initiatives, includes three main elements:

Firstly, a review of key objectives in the 2008/98/EU Waste Framework Directive; Directive 94/62/EC on Packaging and Packaging Waste; Directive 99/31/EU on landfills. The objectives set out in these Directives act as the tools to realise the resource efficiency objectives and objectives of the EU Raw Materials Initiative. It is envisaged that the review of objectives will address in a comprehensive way the adequacy of the current targets in the three target directives, for example by setting stricter targets than the current ones or by setting new targets, including waste prevention and reduced waste disposal. At the same time, the review foresees an overlap audit (including between the WFD recycling targets and the Wrapping and Packaging Directive) and, if necessary, identify options for simplification of legislation and improve clarity and consistency between directives. The legislative initiative is part of the published Work Program of the European Commission for 2014.

Secondly, “ex-post fitness check” of five longer-time directives on specific waste streams: sludge from WWTPs; PCB/PCT; packaging waste, ELV, batteries. An assessment will be made of the consistency between the requirements of these Directives and the new approach to waste policy, the waste hierarchy, the lifecycle approach, and the objectives of current policy, including efficiency of resources and raw materials. The assessment provides for consultation with stakeholders.



Thirdly, an assessment of the problem of plastic waste in the context of the current waste management policy framework based on the Green Paper on a European Strategy for Plastic Waste and the Environment, approved in January 2014.

4.2.3 Proposal to amend Directive 94/62/EC on Wrapping and Packaging Waste

In 2011, the EC commissioned a study and possible regulations on disposable polymer bags. Proposals for such regulation are already a fact by amending Directive 94/62/EC. On the 4th November 2013, the European Commission adopted a proposal to reduce the use of polymer bags below 50 microns. Under the draft amendments to the Directive from the date of its entry into force, Member States have to transpose the requirements within 12 months, and within two years after it enters into force, implement it in practice. This means that Member States must introduce measures that may be economic instruments, national tonnage reduction targets or market constraints, while respecting the rules on the free movement of goods and services.

The objective of the proposal is to reduce the harmful impact of the disposal of polymer bags on the environment and, in particular, on aquatic marine organisms, and to promote waste prevention and resource efficiency.

4.2.4 Other research

The EC also commissioned a study on a possible change in deadlines for targets for WEEE.

4.2.5 European Community Strategy for the Future of Municipal Waste Management

As part of the implementation of the sixth Environment Action Program (2001-2010), "Environment 2010: Our Future, Our Choice", at the end of 2005, the EC adopted a Thematic Strategy on Prevention and Recycling of waste.

The strategy identified the approach to better European waste legislation, emphasized new approaches and outlined measures for better implementation of existing legislation.

The strategy played a significant role in the waste management development policy. Because of its implementation, considerable progress has been achieved in a number of areas: simplification of legislation, identification of key concepts in waste hierarchy and life cycle, focus on waste prevention requirements, adoption of a set of new European targets for separate collection and recycling of waste.

The European Commission adopted the Roadmap for Resource Efficiency in Europe in September 2011 to implement one of the flagship initiatives of the Europe 2020 Strategy. The Roadmap is at the heart of EU and EU Member States' sustainable development policy. The focus is on an economy that produces more with fewer raw materials, thus achieving higher value with fewer materials and minimising environmental impact. Using the Roadmap, the goals on this path are outlined and the activities needed to achieve sustainable growth based on resource efficiency.



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The main objective for waste, according to the section "Waste conversion into resources", is - "By 2020, waste should be managed as a resource. The amount of waste generated per capita is in a state of absolute decline and more materials and raw materials are to be recycled. Energy recovery will be limited to non-recyclable materials, landfills will practically be eliminated."

The document supplied the Commission with a number of actions, including:

- Promote the secondary materials market and the demand for recycled materials through economic instruments.
- Review the objectives of the already adopted European legislation on prevention, reuse, recycling and diversion in order to move to an economy based on reuse and recycling with near zero residual waste.
- Ensure that public funding from the EU budget gives priority to activities related to higher levels of the waste hierarchy under the Waste Framework Directive, eg. priority is given to recycling projects over landfills.
- Facilitate the exchange of best practices on waste collection and treatment among Member States and develop measures to tackle infringements of EU waste laws more effectively.
- Put a focus on Union research funding (EU Horizon 2020) in the area of the most important resource efficiency objectives, including recycling, re-use, substitution of materials with environmental impact, or on rare materials, on smarter design.

Member States should take the following measures:

- Ensure full implementation of EU waste law, including minimum targets.
- direct public funding for research activities to the most important resource efficiency objectives (continuous).
- Take measures on food waste in their national waste prevention programs (2013), taking into account the target set in the Roadmap by 2020 the disposal of edible food in the EU should be halved.

The EU's Global Environment Action Program 2020 "Prosperity within our planet" was approved in November 2013.



One of the main thematic priorities in this Seventh Community Environment Action Programme is "Making the Union a resource-efficient, green and competitive low-carbon economy". It is emphasized that there is also considerable potential for improving the prevention and management of waste in the Union in order to make better use of resources, to open up new markets, create new jobs and reduce dependence on imports of raw materials, while reducing environmental impacts. It is noted that in 2011 the average level of waste per capita in the Union reached 503 kg, ranging from 298 to 718 kg in individual Member States. On average, only 40% of solid waste is prepared for re-use or recycled, while some Member States achieve 70%, showing how waste can be used as one of the EU's main resources. At the same time, many Member States dispose of more than 75% of their municipal waste.

In order to make the Union a resource-efficient, green and competitive low-carbon economy, the Seventh Environment Action Program ensures that waste is managed safely as a resource no later than 2020 and to prevent damage to health and the environment, absolute generation of waste and waste generated per capita will decrease, and landfilling will be limited to residual waste. This will include the implementation of the waste hierarchy in line with the WFD and the effective use of market instruments and measures to ensure that:

- 1) landfilling is limited to residual waste (ie those that are not subject to recycling and recovery);
- 2) energy is recovered only from non-recyclable materials, taking into account the provisions of Article 4 (2) of the WFD;
- 3) recycled waste is used as the main and reliable source of raw materials for the Union by developing non-toxic cycles of materials
- 4) hazardous waste is managed safely and its production is reduced;
- 5) illegal shipments of waste have been abolished and strictly monitored;
- 6) reduction of food waste.

Examinations of existing product and waste legislation are foreseen, including a review of the key objectives of the key waste directives based on the Resource Efficiency Roadmap to progress towards a circular economy and removing bottlenecks on the internal market for green recycling activities in the Union.

The aim of the Green Paper on the European strategy on plastic waste in the environment is to launch a wide-ranging discussion on possible responses to public policy challenges related to plastic waste. The follow-up actions to the Green Paper are an integral part of the wider review of waste legislation, and in particular the existing waste recovery and disposal targets, as well as the assessment of the five directives covering the different waste streams. The Green Paper presents both the results of a number of studies on the plastics industry and plastic waste as well as the environmental damage caused by plastic waste to the environment, especially the marine environment and aquatic organisms, and the potential threats to human health from chemical additives in these waste that can migrate into the environment, albeit in small quantities.



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Policy options on plastic waste are being considered, such as the prevention of formation through requirements for the creation of plastic products, the revision of plastic packaging targets, the banning of plastic waste disposal, the introduction of PET bottle deposit systems, the introduction of economic instruments, incentives for recycling to energy recovery by burning and reducing the use of disposable or useless cheap or free products, such as toys, nylon bags and more.



5 Good practices for waste management and prevention of unregulated landfill sites within the EU

The main purpose of the present report is the analysis of good practices within the EU for their applicability in the municipalities of Kula and Knjazevac.

5.1 Method of selection of proposed good practices

The strategic objectives for the municipality of Kula, as highlighted in the Waste Management Programme (2017), have been listed as follows:

OBJECTIVE 1: Reduce the harmful impact of waste by preventing its formation and encourage its reuse.

OBJECTIVE 2: Increase the quantities of recycled and recovered waste by construction of a network of facilities to treat the entire amount of generated waste, so to reduce the risk to the population and the environment.

OBJECTIVE 3: Waste management that ensures a clean and safe environment.

OBJECTIVE 4: Making the public a key player in implementing the waste management hierarchy.

The municipal program sets nine specific waste management objectives for the period 2016-2020:

- 1) Reduction of generated waste.
- 2) Achieving all predetermined regulatory targets for the preparation of household waste for recycling by 2020.
- 3) Achieving predetermined regulatory targets to reduce biodegradable and construction waste streams to landfill.
- 4) Management of specific waste streams in accordance with the requirements of national legislation.
- 5) Sustainable financial budget of the system at affordable prices for the population;
- 6) Environment-friendly disposal of waste.
- 7) Preventing and reducing the risk of existing waste pollution.
- 8) Establish an effective legal framework for waste management at the local level.
- 9) Participation of the public.



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The Regional Plan for Waste Management (RWMP) in the municipalities of Zajecar, Boljevac, Bor, Kladovo, Majdanpek, Negotin and Knjazevac outlined the priority tasks (section 11. Conclusion):

- 1) Provision of conditions for separate collection by a system of two containers (container for recycling of waste and containers for other mixed waste);
- 2) Construction of a regional landfill depot at the Regional Center in Zajecar.
- 3) Selection of one of the options offered by this regional plan and its timely assessment to meet all the requirements proposed by a optional solution;
- 4) Remediation and reclamation of illegal landfill sites in the region in accordance with the relevant acts and regulations.
- 5) Provision of continuous education of the public, experts and decision makers from local authorities in order to raise awareness in waste management as soon as possible.
- 6) As described in chapter "7.2.3 Methods of planning and financial management" the Regional plan suggests a particular step in the preparation and active work of all municipalities along with the procedure to create a new system that is durable, before building of a new regional landfill and recycling center has started. Interaction of municipalities will be more beneficial to all parts, compared to the current situation where each municipality works for themselves each using a different approach, more or less successfully, sometimes confronted with its own problems.

Referring to the strategic and specific objectives detailed above, examples of good practices have been selected from EU member countries that have similar strategic objectives, including reduction of the amount of landfilled waste, increase of recycling and reuse, introduction of education activities for the population and legislative initiatives for better waste management.

Following a documental research, the following good practices of waste management in the EU have been selected:

Selective collection of waste for recycling (aimed at objectives 1&2 of the Kula WMP and objective 1 of the Knjazevac RWMP)

- **Odense in Denmark**, where collection from door to door is organised for paper (no cardboard), batteries and residual waste.
- **Limerick in Ireland**, where paper and cardboard is collected co-mingled with other recyclables in the MDR (mixed dry recyclables) bin: aluminium cans, steel cans and plastics (PET, HDPE, LDPE, PP).
- **Maia Municipality (greater Porto region) in Portugal** has four different coloured bins (paper, packaging, glass and residual waste), with adapted capacity depending on the type of user.

Collection of biodegradable waste (aimed at objective 3 the Kula WMP and objective 1 of the Knjazevac RWMP)



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- **Catalonia in Spain**, the Waste Agency of Catalonia (ARC) applies a set of economic instruments to incentivise municipalities to do so. Firstly, lower landfill and incineration taxes are charged to municipalities that have introduced selective collection for bio-waste. Furthermore, such municipalities benefit from financial support for the construction of biological treatment plants (i.e. anaerobic digestion or composting facilities). The collection scheme includes light garden waste and kitchen waste from households and small-scale commercial producers of food waste. The bio-waste is collected separately in compostable bags.
- **Styria in Austria** was the first Austrian province to legally implement separate collection of bio-waste as early as 1990. Today, bio-waste from households is collected separately in dedicated waste containers, integrated in the municipal waste collection system. Additionally bio-waste originating in gardens and green spaces is collected. The bio-waste is treated in anaerobic digestion or composting facilities.
- **Milan in Italy** – selective collection of bio-waste has mainly been implemented along the year 2013 and it is currently on its way to being extended to the whole territory of the city. Bio-waste is collected using brown bins and compostable bags from households and commercial premises. The favoured treatment method is anaerobic digestion which replaces the hitherto practice of sending bio-waste to incineration.

Collection of waste electric and electronic equipment (WEEE), batteries and accumulators (objectives 1, 4 and 6 of the Kula WMP and objective 1 of the Knjazevac RWMP)

- **Throughout the country of Greece**, the association 'AFIS' operates as a non-profit organisation with the aim to collect and recycle portable batteries and accumulators in order to fulfil the national obligation to do so, as foreseen in EU and National legislation. There are collection bins for batteries and accumulators in easily accessible points for consumers (supermarkets, municipal buildings, schools, public buildings, shops, private businesses etc.) The special bins, that are relatively small, are made from polycarbonate, are cheap and lightweight. This makes their transport easy.
- **Sofia in Bulgaria** – Sofia Municipality decided to streamline the collection on its territory with the assistance of the accredited bodies "Eltechresource" and "Ecobultech". WEEE is collected from households on request according to an officially approved schedule that includes two dates per month. Alternatively, citizens also have the option to return their WEEE to shops selling devices of the same kind..

Systems for collection of hazardous waste (aimed at objective 4 of the Kula WMP and objective 1 of the Knjazevac RWMP)

- **Tallinn in Estonia** – the system of household hazardous waste collection was launched in 2000 and currently includes 14 working hazardous waste collection points in Tallinn. 4 of them are on civic amenity sites, 6 at gas stations and 4 in residential areas. The largest fraction of hazardous waste is paint residues.



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- **Sofia, Bulgaria** – Hazardous waste is collected from households following the request in advance on a universal telephone number (the price of a local number) and in mobile collection points once a month with no cost to citizens.

Other waste collection systems in different practices shown below (aimed at objectives 1&9 of the Kula WMP and objective 2 of the Knjazevac RWMP):

- **Odense, Denmark**, where a site for separate waste collection has been built. It is called Civic Amenity Site.
- **Lisbon, Portugal**, where a system for collection on demand of bulky waste has been set up.

Legal and economic measures (aimed at objectives 5&8 of the Kula WMP and objective 4 of the Knjazevac RWMP):

- In **Flanders in Belgium**, a system has been set up for restrictions on incineration and landfilling of waste.
- In **Limerick in Ireland**, a pay-per-weight fee has been introduced for waste disposal at landfill.
- In two **Porto** regions (Valongo and Gondomar) a loyalty free card enables citizens to accumulate points on the card, which can later be exchanged for goods or services, listed in a catalogue.
- In **Brussels**, financial support is provided to social economy actors according to the quantities of waste collected and recycled and products reused. Four categories of items are subsidised: textile, bulky waste, electric and electronic equipment and printer related consumable goods
- In **Austria**, the Act on the Remediation of Contaminated Sites (ALSAG) was passed on the 1st of July 1989.

Communication and advising initiatives (aimed at objectives 1, 8 and 9 of the Kula WMP and objective 5 of the Knjazevac RWMP):

- **Lisbon** started to promote specific environmental education programmes.
- **Tallinn, Estonia** – waste awareness campaigns for children and adults.
- the municipality **Elefsina in Greece** – a door-to-door information campaign to provide all the available information regarding recycling facilities of the municipality.
- **Austria** has introduced the concept of “municipal environment & waste consultant”.



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- **Brussels** – the Brussels Waste Network was created in 2010 to develop a network of waste advisers for Brussels-based enterprises. A waste adviser is hired, whose mission is to monitor the evolution of the sector and to link the private sector and public authorities.

5.2 Detailed analysis of the good practices

SEPARATE COLLECTION OF WASTE FOR RECYCLING

5.2.1 Door-to-door paper collection in Odense, Denmark

Region	Odense
Country	Denmark
Target group	All citizens in the municipality
Waste stream	Paper (not cardboard)
Population	193 500
Number of households	93 500
Area (km ²)	305,6
Population density (inhabitants/km ²)	633
Total waste (kg/inhabitant/year)	515,79

All citizens in the municipality participate in this practice. It lasts for 10 years. The category of collected waste is paper, without cardboard. The legal framework includes the National Waste Act and municipal bye law (regulation). The programme was initiated by the Odense Waste Management Company (OWMC) in 2003-2004.

Around 2000 the Danish government declared a more ambitious collection efficiency for paper. After some initial pilot projects it was decided to roll out a door-to-door collection system over all Odense.

All paper bins (and paper containers) are collected at the households every four weeks. The collection is coordinated with the collection of residual household waste, so that the collection is always on the same day.



Image 1: Paper collection from door to door in Odense, Denmark

The objective of the door-to-door paper collection is to offer an easy way for the citizens to get rid of their paper waste, and thereby increase the recycling percentage.

The first system in Odense consisted of approximately 250 bring banks around the city and paper containers at the civic amenity sites. Around 2000 the Danish government declared a more ambitious collection efficiency for paper. After some initial pilot projects it was decided to roll out a door-to-door collection system over all Odense.

Wheely bins and minicontainers (130 l, 190 l, and 600 l volume) were purchased, together with a number of paper waste collection trucks. It is important not to choose too big containers. Otherwise there will be handling problems, as the containers tend to be very heavy and/or unstable. Therefore Odense decided to opt out the 240 l bin and the 400 l and 800 l minicontainers.

The bins and minicontainers are situated at the households (houses and apartments), and they are collected every four weeks. The collection frequency can be extended even more (to e.g. every six weeks), as paper does not rot like biowaste.

Key success factors

Success = Infrastructure (the bins and trucks) + information about the system + motivation (awareness raising).

Infrastructure: The necessary collection equipment must be there, so it is easy for the citizens to use the system. It is also important to have a paper treatment plant not too far away.

Information: Communication must be two-sided: Both inform objectively about the system as it is and works, and communicate environmental attitudes to convince people about the advantages (better environment and (perhaps) lower costs) of correct sorting and treatment.



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The paper collection is financed by a part of the general household waste fee paid by all households in the municipality and is appr. 7.5 Euro (gross value) per inhabitant per year. The value of the paper covers a percentage of this total operation cost (from appr. 30% when prices were lowest, up to 80% when prices are high). So what the citizen actually pays is more like 5.25 – 1.50 Euro per year.

Monitoring of the progress of the good practice:

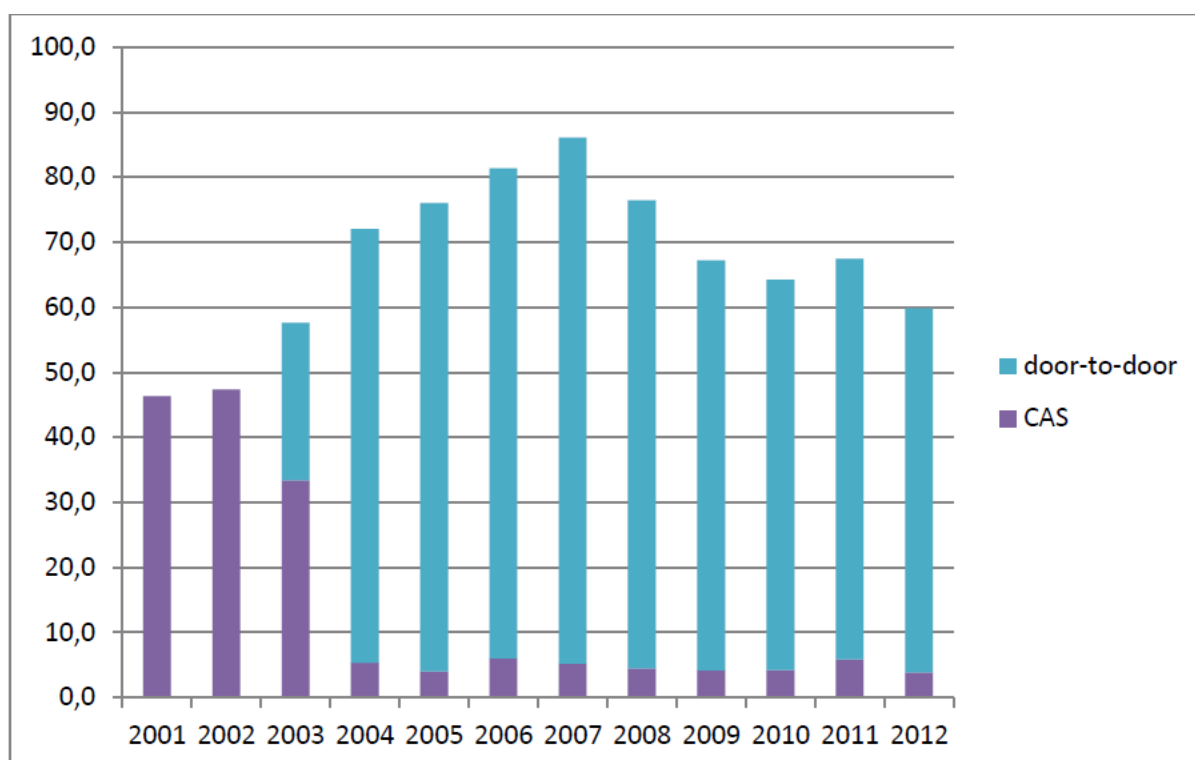


Figure 1: Paper collection from door to door in Odense, Denmark

Legend:

„CAS” – Civic Amenity Sites

„Door-to-door” – system of collection door-to-door

All numbers are kg/year/inhabitant.

The graph shows how the introduction of the door-to-door collection scheme has two clear consequences: **The amounts of collected paper goes up, and the door-to-door collection exterminates the Civic Amenity Sites almost totally.**

Every year the OWMC makes a general customer satisfaction survey on all the waste services, including the door-to-door collection of paper waste. In general, the citizens are very satisfied with the system and have few complaints. The main wish from the citizens is to be able also to put cardboard and carton in the paper bin.



Opportunities for application of the good practice within the Kula municipality

This good practice could be implemented as a separate stream in the regional waste collection system in Vidin region. The introduction of such a practice in the municipality of Kula would require the procurement of paper collection containers for each household and a separate truck for transporting it to a common recycling center to be built at a regional recycling center in Vidin district or a local recycling center in the Kula municipality. This good practice can be used under objectives 1, 2, 4 and 6 of the WMP of Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice could be implemented as a separate stream in the regional waste collection system in the Zajecar region. The introduction of such a practice in the municipality of Kula would require the procurement of paper collection containers for each household and a separate truck for transporting it to a common recycling center to be built at a regional recycling center in Zajecar district or a local recycling center in the Knjazevac municipality. This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.

In response to a query regarding the separate collection of waste, the following statement has been received from Knjazevac municipality: “The Municipality of Knjazevac plans to build a reloading station and to determine its location, however the detailed project has not been completed as yet; it is not decided whether there will be separation of waste and the method for that. The project in conjunction with the Knjazevac municipality should agree the technology and the method of operation of the reloading station.”



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5.2.2 Waste collection in a mixed dry recyclables (MDR) bin in the Limerick/Clare/Kerry region in Ireland

Region	Limerick/Clare/Kerry region
Country	Ireland
Target group	Waste collectors & producers of recyclable waste (household & commercial)
Waste stream	Mixed municipal waste
Population	454 507
Number of households	171 476 (occupied)
Area (km ²)	10 700
Population density (inhabitants/km ²)	42,5
Total waste (kg/inhabitant/year)	599,93

In the Limerick/Clare/Kerry region paper and cardboard is collected co-mingled with other recyclables in the MDR (mixed dry recyclables) bin: aluminium cans, steel cans and plastics (PET, HDPE, LDPE, PP). Fully segregating waste materials into different streams for collection at the kerbside is not always possible or feasible, particularly in less densely populated areas of Ireland. As presented in Table 2 below, the population density in the Limerick/Clare/Kerry region is much lower than in the other territories. The collection of a number of recyclable waste sources in one recycling bin i.e. cardboard, paper, plastics and cans has been undertaken in Ireland since 2001.



Image 2: Collection of waste in a mixed dry recyclables bin in Limerick/Clare/Kerry region in Ireland



An interesting challenge for the MDR (mixed dry recyclables) bin in the Limerick/Clare/Kerry region is the recycling of plastics:

The ability to recycle all plastic waste collected within the MDR bin is currently an issue particularly as there has been a phenomenal growth in the range of plastic packaging materials placed on the market, over the last decade. The primary problematic material is low-grade plastic i.e. plastic bags including bin liners, plastic film, bread wrappers and crisp bags.

When segregated collections began over a decade ago only plastic bottles were accepted, then more & more plastics crept into the MDR stream and now waste contractors reluctantly continue to accept them but only out of fear of having a negative impact on the recycling message and creating negative publicity for the waste collection company. Sorting the various plastic types at the MRF is not economically viable for the waste operator and as a result plastic waste collected in the MDR bin is often ending up as either RDF/SRF or worse yet landfilled (RX3 Plastic Waste Arisings Report 2012 stated that 334,000 tonnes of plastic was landfilled in Ireland in 2009). This issue now needs to be addressed at a national level in order to ensure level playing field for all operators.



Opportunities for application of the good practice within the Kula municipality

This good practice could be implemented as a separate stream in the regional waste collection system in Vidin region. The introduction of such a practice in the municipality of Kula would require the procurement of paper, plastic and metal collection containers for each household and a separate truck for transporting it to a common recycling center to be built at a regional recycling center in Vidin district or a local recycling center in the Kula municipality. This good practice can be used under objectives 1, 2, 4 and 6 of the WMP of Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice could be implemented as a separate stream in the regional waste collection system in the Zajecar region. The introduction of such a practice in the municipality of Kula would require the procurement of paper, plastic and metal collection containers for each household and a separate truck for transporting it to a common recycling center to be built at a regional recycling center in Zajecar district or a local recycling center in the Knjazevac municipality. This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.

In response to a query regarding the separate collection of waste, the following statement has been received from Knjazevac municipality: “The Municipality of Knjazevac plans to build a reloading station and to determine its location, however the detailed project has not been completed as yet; it is not decided whether there will be separation of waste and the method for that. The project in conjunction with the Knjazevac municipality should agree the technology and the method of operation of the reloading station.”

5.2.3 „Eco-container at home” Maia municipality, Porto region, Portugal

Region	Great Porto Region (Maia Municipality)
Country	Portugal
Target group	Citizens living in Maia Municipality
Waste stream	Paper and Cardboard Glass Plastic and metal packaging Mixed Waste
Population	136 000
Number of households	55 000
Area (km ²)	83



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Population density (inhabitants/km ²)	1 638
Total waste (kg/inhabitant/year)	413,3

The “Eco-container at home” Project is based on the distribution of individual containers/ bins for waste selective deposition and for the mixed waste deposition (4 different bins with four different colours), which allows separate the waste without living home. Besides the containers distribution, this Project includes a door-to-door collection with pre-defined timetable, optimizing the collection circuits and the collection frequency.



Image 3: „Eco-container at home” in Maia municipality, Greater Port region, Portugal

„Maiaambiente” is a local public company that implements this unique project in Portugal, based on the widespread distribution of single-use containers for disposal of four fractions of solid waste: paper, packaging, glass and rest. The project covers the entire population of over 135,000 inhabitants in the Maia municipality, in either single and multifamily residences, as well as companies and institutional partners, schools and restaurants.



Image 4: „Eco-container at home” in Maia municipality, Greater Port region, Portugal



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Containers with a capacity adapted to each customer are equipped with an electronic identifier, for automatic data collection, recording the amount of waste collected from each customer.

Through this process, it'll be possible to implement the PAYT principle, rewarding who separates (enhancing the amount of waste sent for recycling) and penalizing who less separates (reducing waste sent for landfill).

Complementary, RFID based technology it's used to communication, monitoring and reporting the all process of waste collection, facilitating human resources and equipment optimization and regular information from customers.

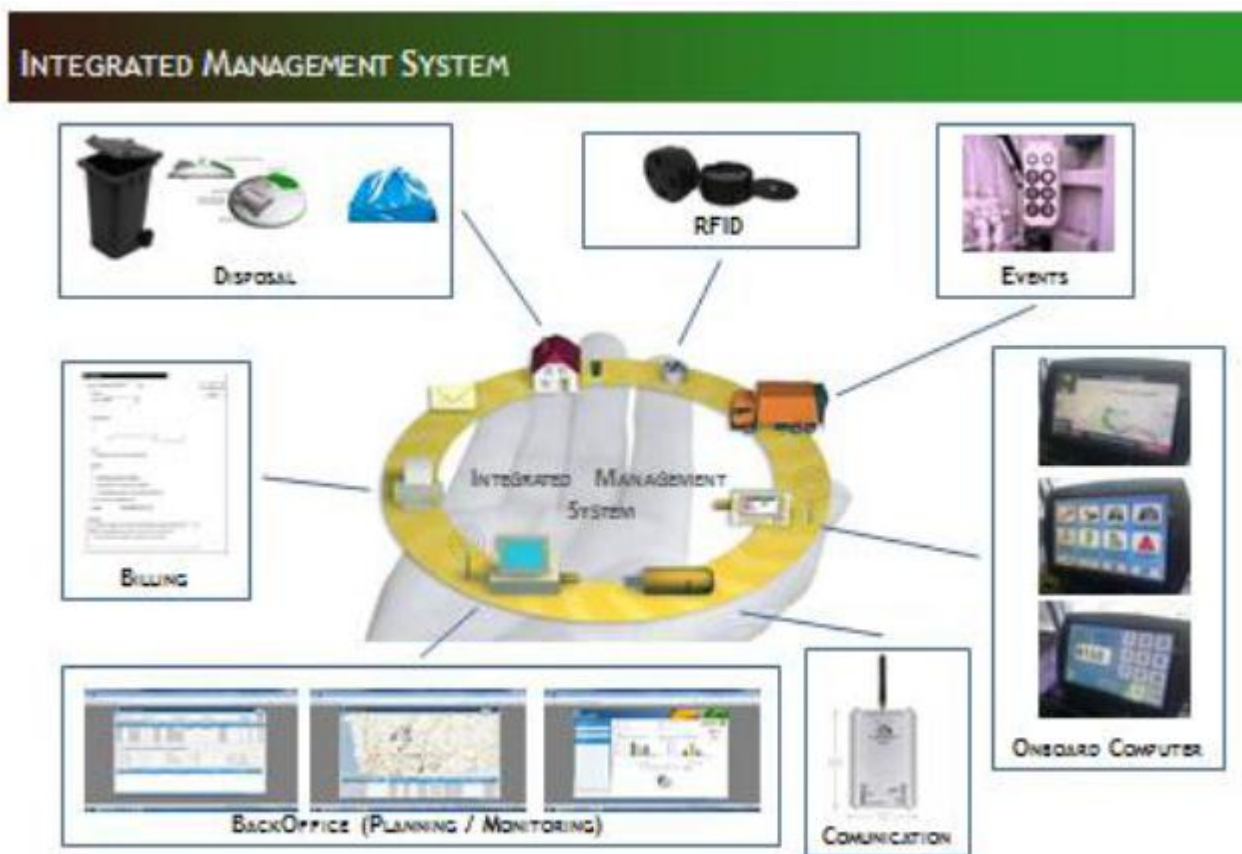


Image 5: „Eco-container at home” in Maia municipality, Greater Port region, Portugal

This project contributes to reinforce the recycling industry, upgrading jobs qualifications, improve urban health and safety, reduce natural resources consumption as well as reduce pollutant emissions. Improving the well-being and life-quality in general, generating a more convenient and hygienic operation model, as well as more economically, transparent and fair system.

Opportunities for application of the good practice within the Kula municipality



This good practice could be implemented as a separate stream in the regional waste collection system in Vidin region. The introduction of such a practice in the municipality of Kula would require the procurement of three new collection containers for paper, glass, plastic and metal for each household and a separate truck for transporting it to a common recycling centre to be built at a regional recycling centre in Vidin district or a local recycling centre in the Kula municipality. This good practice can be used under objectives 1, 2, 4 and 6 of the WMP of Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice could be implemented as a separate stream in the regional waste collection system in the Zajecar region. The introduction of such a practice in the municipality of Knjazevac would require the procurement three new collection containers for paper, glass, plastic and metal for each household and a separate truck for transporting it to a common recycling centre to be built at a regional recycling centre in Zajecar district or a local recycling centre in the Knjazevac municipality. This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.

In response to a query regarding the separate collection of waste, the following statement has been received from Knjazevac municipality: “The Municipality of Knjazevac plans to build a reloading station and to determine its location, however the detailed project has not been completed as yet; it is not decided whether there will be separation of waste and the method for that. The project in conjunction with the Knjazevac municipality should agree the technology and the method of operation of the reloading station.”



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COLLECTION OF BIODEGRADABLE WASTE

5.2.4 Catalonia in Spain – Biological treatment and separate collection of biowaste

Region	Catalonia
Country	Spain
Target group	Municipalities, Citizens
Waste stream	Organic Fraction of Municipal Solid Waste: Kitchen waste and green waste
Population	7 570 000
Number of households	2 782 300 (data from 2007)
Area (km ²)	32 106
Population density (inhabitants/km ²)	236 (average, max. 5 093 in Metropolitan Area)
Total waste (kg/inhabitant/year)	423

In Catalonia municipalities had to develop before August 2009 a Deployment Plan for the separate collection of the biowaste, subject to approval by the Waste Agency of Catalonia (ARC). The progress of the deployment has to be reported annually to the ARC. Municipalities without an approved Deployment plan have to pay an increased disposal tax for the landfilling and incineration of residual waste. The ARC finances the construction of biological treatment (composting and anaerobic digestion) plants for separately collected biowaste by means of a disposal tax charged for each ton of MSW going to landfill or incineration. There is a disposal tax refund scheme for the delivery of biowaste to biological treatment plants. The refund depends on the quantity and quality of the biowaste delivered.



Image 6: Catalonia in Spain – separate collection and treatment of biowaste

Biological treatment in Catalonia is performed in 19 composting plants and 5 anaerobic digestion plants, which combine composting and anaerobic treatment. These plants treat food waste, garden waste to a certain extent used as structure material, and organic waste from the fruit and vegetable processing industry.





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In response to a query regarding the separate collection and treatment of biowaste, the following statement has been received from Knjazevac municipality: “The municipality of Knjazevac plans to build a biomass power plant in the future, but for the time being, we have no more data on the extent to which such a project is being implemented. If the biomass power plant is included in the design of the substations at the plant, then it would be possible to use biomass power for heating of the entire waste treatment station.”

This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.

5.2.5 Styria in Austria – separate collection and treatment of biowaste

Region	Styria
Country	Austria
Target group	Private households
Waste stream	Biowaste
Population	1 200 000
Number of households	512 000
Area (km ²)	16 000
Population density (inhabitants/km ²)	75
Total waste (kg/inhabitant/year)	398,2

Currently, around 51% of household biogenic waste is collected in organic waste containers, which are integrated in the separate collection system in the Styria province in Austria. The rest, mainly biogenic waste originating in gardens and green spaces, is collected via municipal structures or socio-economic organisations. In rural areas and households with gardens, biogenic waste is recovered by home or community composting, which has been encouraged by the Provincial Government of Styria according to the slogan “as centralized as required and as decentralized as possible”.



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Image 8: Community composting plant in Styria, Austria



Image 9: Home composting plant in Styria, Austria

In Styria, biogenic waste is mainly collected in 120 l containers. In most municipalities collection intervals vary according to the seasons: organic waste containers are emptied every week in the summer months and every two weeks in winter.

Two treatment forms are possible for biogenic waste: aerobic treatment (composting) and anaerobic treatment (fermentation).



Composting

In Styria, the main form of biological treatment of biogenic municipal waste is composting, aiming to generate a product rich in humins (compost) from biogenic waste. If the requirements of the Compost Ordinance are met, the used wastes eventually lose the characteristic properties of waste: they run through specific processes before defined output qualities are determined and can then be considered a competitive product which is returned to the natural cycle.

Impurities in biogenic municipal waste (“mishthrows”, contaminated input) can significantly increase the pollutant content of biogenic waste, making it inadequate for composting. Since only highquality biogenic waste is suitable for composting impurities must be separated, which necessitates technical efforts or increased personnel input. Modern systems automatically detect impurities in organic waste containers and allow reducing their number by informing the waste producer or by not emptying the containers in question. In the future, measures to reduce contamination should be taken in particular in areas where a lot of impurities are detected in organic waste containers.

24 communal or commercial composting facilities with a processing capacity of approx. 65,000 t/year are available in Styria. Moreover, 46 agricultural composting plants with a processing capacity of approx. 55,000 t/year hold approvals. Therefore, the total Styrian processing capacity amounts to 117,000 t/year.



Image 10: In Styria, composting of separately collected biogenic waste is mainly performed in uncovered piles



Image 11: Modern composting plant in Liezen with composting tunnel

Material collected in organic waste containers and sewage sludge must be mixed with bulking materials such as tree and bush cuttings before composting.

Biogas plants

In biogas plants biogenic raw materials (waste and/or agricultural residues) and, to some extent, sewage sludge are biologically converted into biogas and a remaining fermentation residue. This process does not require oxygen (anaerobic treatment) and is done by microorganisms, producing combustible biogas from the carbon contained in the biogenic raw materials.

As at January 2010, 44 biogas plants with a total processing capacity summing up to approx. 500.000 t/year were operated in Styria (Image 10). In about half of all biogas plants energy crops (so-called renewable resources) and farm-produced fertiliser (in particular pig manure) are treated, whereas agricultural residues and other commercial biogenic waste (from food, beverage and feeds industries, gastronomy, etc.) are treated in the remaining plants.

Currently, the treatment of biogenic municipal waste in biogas plants plays a minor role; the same is true for the joint treatment of biogenic waste and municipal sewage sludge in digestion towers of sewage treatment plants (so-called co-fermentation). In principle, kitchen waste and grass cuttings would be well suited for fermentation, whereas wooden parts (tree and bush cuttings) are not biodegradable during anaerobic processes.



Image 12: *Biogas plant/fermentation tank with foil gas storage*

During treatment, impurities still contained in the waste are separated because they can have negative impacts on the substrate and process flow. The main impurities are floating matters such as wood, straw, plastic etc. as well as setting sediments such as metals, sand, stones, glass, etc.

The produced biogas can either be transformed into electric energy and heat in block heating stations or heat can be generated directly. Alternatively, correctly purified biogas can be introduced into the natural gas system or used to operate vehicles.

Opportunities for application of the good practice within the Kula municipality

This good practice is not directly applicable for the municipality of Kula as it would require great investment and would treat large quantities of biowaste. It could possibly be implemented at regional level in a common biowaste treatment system in the Vidin region. This good practice can be used under objectives 1, 3 and 6 of the WMP of Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

In response to a query regarding the separate collection and treatment of biowaste, the following statement has been received from Knjazevac municipality: “The municipality of Knjazevac plans to build a biomass power plant in the future, but for the time being, we have no more data on the extent to which such a project is being implemented. If the biomass power plant is included in the design of the substations at the plant, then it would be possible to use biomass power for heating of the entire waste treatment station.”

This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.



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5.2.6 Milan in Italy – door to door food waste collection for households

Region	Milan city
Country	Italy
Target group	All citizens
Waste stream	Food waste and small plants
Population	1 281 000
Number of households	Approx. 700 000
Area (km ²)	182
Population density (inhabitants/km ²)	7038
Total waste (kg/inhabitant/year)	649,8

The door to door households organic waste collection plan was first introduced in November 2012 in ¼ of the city of Milan and then was extended to the whole city in June 2014. Brown bins and compostable bags are used for collection, while small kitchen bins with a special airy structure to minimize the inconvenience related to the formation of odors and liquids are used in apartments. Collection frequency is twice a week.

The aim of the separate collection of food waste is to divert this material from incineration and to send it to AD for production of biogas and good quality compost. Food waste collection sent to recycling will help also to boost recycling rate enabling us to achieve the EU target of 50% recycling. Also benefit from the trailing phenomenon with better quality for all other separately collected fractions (paper, plastic, etc.). maintain or increase the existing levels of customer satisfaction and system efficiency.

The plan is a two year plan for the introduction in the whole city slit in 4 phases (1/4 each). Many activities were coordinated with the City of Milan (number of inhabitants, households and mayor rule at each step). Census of the area in preparation for the the servicen set-up, and to detect any possible management problems.

Sizing of the new collection system with the construction of a theoretical model, based on key elements (weights, loads, distances, productivity, etc.). Operational tests in the field are implemented to refine the model.

Delivery of the containers to households including a 120 liter brown wheely bin, a 35 liter brown bin (only for single homes and on request), a 10 litre aerated kitchen basket. Delivery occurs 1-2 months before start-up. The delivery is preceded by a sign of "delivery notice" and is performed by specially dressed Amsa personnel and trucks.

Opportunities for application of the good practice within the Kula municipality



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This good practice could be implemented as a separate stream in the waste collection system in Kula municipality. Systems of local composting could be applied, as outlined in art.53 of the Ordinance for waste management in the Kula municipality. A common site could be set up for composting of biowaste from the entire town, or neighbourhood composting facilities could be built, that would treat garden waste only. A third option could be the implementation of a system of home composting. This good practice can be used under objectives 1, 3 and 6 of the WMP of Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

In response to a query regarding the separate collection and treatment of biowaste, the following statement has been received from Knjazevac municipality: “The municipality of Knjazevac plans to build a biomass power plant in the future, but for the time being, we have no more data on the extent to which such a project is being implemented. If the biomass power plant is included in the design of the substations at the plant, then it would be possible to use biomass power for heating of the entire waste treatment station.”

This good practice can be used under objectives 1, 2, 3 and 6 of the RWMP of Knjazevac municipality.



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COLLECTION OF WASTE ELECTRIC APPLIANCES, BATTERIES AND ACCUMULATORS

5.2.7 All regions in Greece – batteries recycling

Region	All
Country	Greece
Target group	All citizens
Waste stream	Batteries and accumulators
Population	10 815 197
Number of households	3 746 946
Area (km ²)	131 957
Population density (inhabitants/km ²)	81,96
Total waste (kg/inhabitant/year)	No data

AFIS operates as a non-profit organization with the aim to collect and recycle portable batteries and accumulators in order to fulfill the national obligation to do so, as foreseen in EU and National legislation.

Its operation involves the following:

- Placement of special collection bins for the batteries and accumulators in easily accessible points for the consumers (supermarkets, municipal buildings, schools, public buildings, shops, private businesses etc.).
- The collection of the batteries from the bins and their transport to designated storage facilities.
- The transport of batteries to recycling factories abroad, where the recovery of heavy metals takes place.
- Information and awareness raising campaigns through mass media and other supportive actions.
- Systematic monitoring of all the above activities so as to achieve the maximum possible collection of batteries with the minimum cost.

Implementation of the collection began in 2005.



Image 13: Batteries recycling in Greece

AFIS is making available through its website and by phone, the special bins that are used to collect the batteries and accumulators. The bins are made from polycarbon and they are cheap and light weight. This makes their transport easy. The bins are relatively small. All these facts have helped the system to spread nationwide very rapidly. Schools are very important in the collection chain since they are visited daily by hundreds of children who bring batteries from home. Once the bins are full, AFIS sends a person to weigh and collect the batteries in a matter of 3 to 4 days.

The battery collection bins can be used by public and private institutions. There is an on-line form in AFIS' web site (www.afis.gr) that can be filled in, in order to receive the bin, free of charge. The bin is delivered at the specified address. The collection of batteries begins and the users bring their depleted batteries. Once the bin is full, the owner must call AFIS to report that the bin is full and it must be emptied. In less than a week, a person is sent to empty the bin, who is also responsible to produce a document that certifies the amount of collected batteries in kg, which is then given to the owner of the bin for record keeping. The technical implementation of this good practice is simple and free. The batteries themselves are small and clean. The wide network of bins is a key aspect to the success of this recycling scheme.



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The environmental benefit from the great number of batteries that are diverted from landfill is very important since batteries contain toxic heavy metals that pollute the soil and the aquifers. Another positive result from the operation of the recycling scheme is the positive attitude towards recycling that is formed to the citizens and this promotes their participation in other recycling initiatives.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable in the Kula municipality if collection and transport is organised for batteries collected in battery containers in a regional recycling centre in Vidin region. This good practice can be used for objectives 2, 4 and 8 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice is applicable in the Knjazevac municipality if collection and transport is organised for batteries collected in battery containers in a regional recycling centre in Zajecar region. This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.

In response to a query regarding the separate collection of electric and electronic waste and batteries in Knjazevac, the following statement was received: „The regional waste depot will be located in Halovo, Zajecar municipality, where waste from seven towns in the municipalities of Zajecar and Bor will be destroyed (Zajecar, Bor, Knjazevac, Boljevac, Negotin, Majdanpek and Bor). Despite the completed plan, the conceptual solution has not been officially accepted and therefore the construction of this regional depot has not started yet.”

5.2.8 Sofia in Bulgaria – recycling of waste electronic and electric appliances

Region	Sofia
Country	Bulgaria
Target group	All citizens in the municipality
Waste stream	Batteries
Population	1 257 434 (data of 2011)
Number of households	572 510
Area (km ²)	1 311
Population density (inhabitants/km ²)	959
Total waste (kg/inhabitant/year)	229,55



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In relation to the obligation in the new Law on Waste Management, municipal mayors shall organize separate collection of Waste Electrical and Electronic Equipment (WEEE). These obligations shall be implemented together with the producers and importers of electric and electronic equipment applying the Extended Producer's Responsibility principle. The producers/importers have established associations for joint implementation of their obligations – so called Recovery Organisations.

<http://www.eltechresource.com>

The first such organization - "Eltechresource" was established in 2006 by a decision issued by the Ministry of Environment and Waters granting permit to act as Recovery Organisation of WEEE, according to the Law on Waste Management and to fulfil the obligations of producers and importers arising under the Regulation on the placing on the market of electrical and electronic equipment, treatment and transportation of waste electrical and electronic equipment.

"Eltechresource" is financed by producers and importers which put on the market EEE and it is responsible to fulfil their obligations.

Through its activities "Eltechresource" on one side implements the Extended Producer's Responsibility principle for the companies that place on the Bulgarian market electrical and electronic equipment and on the other side cooperates with Bulgarian municipalities and the Ministry of Environment and Water in the implementation of environmental policy in the country.

As mentioned above, according to the Extended Producer's Responsibility principle and the national Bulgarian legislation the producers/ importers of EEE have to organize and finance the collection, dismantling and recycling/recovery of WEEE. Currently in Bulgaria there are 5 associations of EEE producers/ importers (so called Recovery Organizations) that have obtained permits by the Bulgarian Ministry of Environment and Waters. They are in competition (including price competition) in order to attract more producers and importers. All of them may operate on national level but may choose the method of collection and the settlements where they collect WEEE from, provided that they achieve the targets for collection and recycling/recovery according to their market share. The usual way of collection is through take-back systems at stores or by collection points operated by private companies and financed by the Recovery Organizations through payment for each tonne of WEEE collected. As this practices of WEEE collection are not convenient enough for the population, Sofia Municipality decided to streamline the collection on its territory. In 2009, Sofia Municipality has started a system for separate collection of WEEE, with the assistance of the recovery organization "Eltechresource". In April 2011, a contract with another recovery organization "Ecobultech" has been signed for service on 2 of the 24 regions of Sofia Municipality. Both Organizations are obliged to establish systems for separate collection on request in the regions of Sofia Municipality where they operate as described below.



WEEE are collected from households on request by citizens and according to officially approved schedule that includes two dates per month for each region of Sofia Municipality. The collection schedule is uploaded on the website of Sofia Municipality. There are no restrictions regarding the quantity or the type of equipment for which each household may submit a request. However, currently the collection on request of small WEEE is still not at the desired level as it is not recognized by the general population as waste that needs special way of collection. In order to overcome this problem the efforts both of the Recovery Organizations and Sofia Municipality are focused on awareness raising and education.

Another option that the citizens have is to return their WEEE at the store which sells devices of the same kind. Some market chains offer incentives (price discounts) for returning of equipment (including small WEEE) on one-on-one basis. For the convenience of the citizens they can return their WEEE even during the weekend. The service is funded by the Recovery Organizations and is free of charge.

The categories electrical and electronic equipment which are accept by both organizations are:

1. Large household appliances;
2. Small household appliances;
3. IT and telecommunications equipment;
4. Consumer equipment;
5. Fixtures;
6. Electrical and electronic tools (except large-scale stationary industrial tools);
7. Electrical and electronic toys, articles for entertainment or sport;
8. Medical devices (with the exception of components which were implanted or contaminated with biological agents);
9. Monitoring equipment;
10. Machines.



Image 14: WEEE Recycling in Sofia

Significant benefits to the environment and health of people were achieved, because before the introduction of the system all WEEE from households (not rich in metals) were sent directly to landfills. The collection and environmentally sound dismantling of hazardous containing appliances such as CRT tubes and refrigerators was started providing for removal and proper treatment of hazardous substances and recovery not only of metals but also CRT glass and plastic types contained in the WEEE. Significant private investments were attracted for establishment of modern WEEE treatment facilities as well as new employment opportunities were created including qualified jobs.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for the Kula municipality providing that the collection and transport of WEEE be organised in a common recycling centre in Vidin region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice could be used for objectives 2, 4 and 6 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice is applicable in the Knjazevac municipality if the collection and transport of WEEE is organised in a common recycling centre in Zajecar region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.



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In response to a query regarding the separate collection of electric and electronic waste and batteries in Knjazevac, the following statement was received: „The regional waste depot will be located in Halovo, Zajecar municipality, where waste from seven towns in the municipalities of Zajecar and Bor will be destroyed (Zajecar, Bor, Knjazevac, Boljevac, Negotin, Majdanpek and Bor). Despite the completed plan, the conceptual solution has not been officially accepted and therefore the construction of this regional depot has not started yet.”



SYSTEMS FOR COLLECTION OF HAZARDOUS WASTE

5.2.9 Tallinn in Estonia – system of household hazardous waste collection

Region	Tallinn
Country	Estonia
Target group	Citizens, small offices
Waste stream	Households hazardous waste (chemicals incl. pesticides, mercury-containing goods, batteries, medicines, solvents, mineral oils etc.)
Population	419 830 (2013)
Number of households	182 535
Area (km ²)	159
Population density (inhabitants/km ²)	2 640
Total waste (kg/inhabitant/year)	495,78

In 2000 new household hazardous waste collection systems were launched in Tallinn. Nowadays, there are 14 working hazardous waste collection points in Tallinn. 4 of them are on civic amenity sites, 6 at gas stations and 4 in residential areas. The single largest waste fraction is paint residues. Car oil and batteries are also collected in large quantities. It is important to have a trained employee to assist in the sorting process and to service the collection point.

Usually stations are open around the clock and for car owners it is comfortable to dispose of hazardous waste in the collection points as they fill their car up for example.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for the Kula municipality providing that the collection and transport of hazardous substances be organised in a common recycling centre in Vidin region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice could be used for objectives 2, 4 and 6 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice is applicable in the Knjazevac municipality if the collection and transport of hazardous substances is organised in a common recycling centre in Zajecar region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.



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5.2.10 Sofia, Bulgaria – hazardous waste collection on demand and in mobile stations

Region	Sofia
Country	Bulgaria
Target group	All citizens in the municipality
Waste stream	Hazardous household waste
Population	1 257 434 (data of 2011)
Number of households	572 510
Area (km ²)	1 311
Population density (inhabitants/km ²)	959
Total waste (kg/inhabitant/year)	229,55



Image 15: Hazardous waste collection on demand and in mobile stations in Sofia



In the beginning of 2012 Sofia Municipality started the system for separate collection of hazardous household waste. Hazardous waste is collected from households after the request in advance on a universal telephone number (the price of a local number) and in mobile collection points once a month with no cost to citizens. Current information about the location of mobile collection points may be found on the website of Sofia Municipality and "BalBok Engineering". The operator of the mobile collection points acts as a guide to citizens on hazardous waste matters, including conveying to citizens that hazardous waste must be delivered to the collection point, not be thrown away with normal household waste. Further recommendations on storing of the waste may be provided stressing the importance of keeping the waste divided in original packaging and tightly closed.

BalBok Engineering has developed an automated waste information system that allows tracking the movement of each batch admitted for treatment of waste and ensures the certification of recovery or disposal. Thus, for each type of delivered waste, the waste producers receive not only documents but are also ensured that their waste is treated in accordance with the requirements of EU and national legislation and scientific advances in the field of waste management, environmental protection and sustainable development.

<http://www.balbok.com/bg/products/tretirane-na-opasni-otpadytsi->

The system includes receiving of the waste in situ at the holder or in Mobile collection points, providing transportation and packaging for safe transport, subsequent treatment and disposal. The main groups of hazardous waste which are collected from households are:

1. Mercury and Mercury-containing equipment (excluding fluorescent lamps);
2. Painting materials;
3. Household cleaners and chemicals;
4. Inks and contaminated packaging;
5. Pharmaceutical products – expired drugs;
6. Other hazardous waste which is thrown in municipal waste containers or on the municipal property, which composition and properties create a risk to human health.

Transportation and disposal is carried out by the contractor licensed to work with hazardous waste. The system of separate collection of hazardous waste from households is financed by Sofia municipality and is free to citizens and provides maximum comfort when citizens give their hazardous waste. It was met with great interest from citizens of Sofia. Evidence of the effectiveness is a significant amount of hazardous waste collected.



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Химикалите в бита могат да бъдат най-различни, например технически продукти, почистващи средства и препарати за борба с вредители.

Ако на опаковките има един от тези **СИМВОЛИ ЗА ОПАСНОСТ**

		експлозивно
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		силен окислител
		токсично
		дразнещо/вредно
		корозивно
		опасно за околната среда

или предупредителния знак

Включването на отпадъци с опасни свойства в общия поток битови отпадъци влияе отрицателно върху здравето на хората, замърсява околната среда и нарушава нормалната експлоатация на депата.

Основните групи опасни отпадъци, образувани в домакинствата са:

- Живак и живаксъдържащи уреди
- Лакове и бояджийски материали
- Домакински препарати, химикали
- Мastica и замърсени опаковки
- Фармацевтични продукти (лекарства с изтекъл срок на годност)

За предаването им за обезвреждане позвънете на тел. **0700 11 750**.

Ако във вашата аптечка има стари живачни термометри, позвънете на телефон **0700 11 750** и направете заявка за предаването им. В случай, че по невнимание счупите живачен термометър, възможно най-бързо поръсете със сяра на прах, внимателно съберете капчиците живак в стъклено шишенце и затворете плътно.

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НИКОГА НЕ УПОТРЕБЯВАЙТЕ СТАРИ ЛЕКАРСТВА, те са опасни за вашето здраве. Предайте ги в Мобилния събирателен пункт!

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Image 16: Hazardous waste collection on demand and in mobile stations in Sofia

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for the Kula municipality providing that the collection and transport of hazardous substances be organised in a common recycling centre in Vidin region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice could be used for objectives 2, 4 and 6 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice is applicable in the Knjazevac municipality if the collection and transport of hazardous substances is organised in a common recycling centre in Zajecar region and then in specialised factory for extraction of the hazardous substances and recycling of the useful materials. This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.



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OTHER SYSTEMS OF WASTE COLLECTION

5.2.11 Odense in Denmark – Civic Amenity Sites

Region	Odense
Country	Denmark
Target group	All citizens in the municipality
Waste stream	All types except residual household waste
Population	193 500
Number of households	93 500
Area (km ²)	305,6
Population density (inhabitants/km ²)	633
Total waste (kg/inhabitant/year)	515,79

Odense operates eight Civic Amenity Sites, i.e. appr. 24 000 inhabitants per site. The average distance to the nearest site is appr. 2 km. All sites have appr. 30 containers for different waste types. There is access control (national medical health card) to register visits. All sites are manned (two employees per site). The opening hours are generally from 9 a.m. to 6 p.m. all weekdays (also holidays).

The objective of the Civic Amenity Sites is to offer an easy way for the citizens to get rid of their waste for recycling in an orderly manner.

Through many containers, explanatory signs and advice from the staff good sorting is made easy and clear for the public. The final aim is to lead ever more sorted waste to recycling treatments.



Image 17: *Odense in Denmark – Civic Amenity Site*

Residual waste is not allowed at the Civic Amenity Sites in Odense.

Here is how to start up a Civic Amenity Site:

- Find a suitable place for the Civic Amenity Site (centrally situated, big enough, easy access),
- Design and build the site for easy delivery and sorting,
- Tell about the site and its facilities to the citizens in every way you know,
- Constantly seek new treatment technologies for new waste fractions and arrange your site accordingly.



Key success factors:

Design (infrastructure): It is important to design the Civic Amenity Sites, so it complies with the following ideals as much as possible: easy access to site, clear overview of site, easy unloading of waste, easy to get advice if in doubt (ask staff or get information from signs, QR codes or similar).

Waste treatment technology (infrastructure): When a new waste treatment method is available on the market, it is possible to place a new container in the Civic Amenity Sites to retrieve the new type of waste. In Odense we have established containers for: old bricks, gypsum, printer cartridges, CDs and DVDs (incl. covers), carpets, metal beverage cans.

Communication (information and motivation): The Civic Amenity Sites are described in our annual waste handbook and on our website. The Civic Amenity Sites are manned, so citizens can get advice on correct sorting. We make guided tours for kindergardens and school classes, and participate in regional festivals where the advantages of the Civic Amenity Sites are explained.

Opportunities for application of the good practice within the Kula municipality

Such civic amenity site could be applied in the Kula municipality if regular transport is provided for the separately collected waste fractions to a regional recycling centre in the region of Vidin. This good practice could be used for objective 2 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.

In response to a query regarding the separate collection of electric and electronic waste and batteries in Knjazevac, the following statement was received: „The regional waste depot will be located in Halovo, Zajecar municipality, where waste from seven towns in the municipalities of Zajecar and Bor will be destroyed (Zajecar, Bor, Knjazevac, Boljevac, Negotin, Majdanpek and Bor). Despite the completed plan, the conceptual solution has not been officially accepted and therefore the construction of this regional depot has not started yet.”

5.2.12 Lisbon in Portugal – collection on demand of bulky waste

Region	Lisbon
Country	Portugal
Target group	All citizens in the municipality
Waste stream	Cardboard, green waste, WEEE, C&D waste, big metals, wood, furniture and other bulky waste



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Population	547 733
Number of households	323 981
Area (km ²)	85
Population density (inhabitants/km ²)	6 444
Total waste (kg/inhabitant/year)	501

The collection is made on citizens' request, through a call service (by e-mail, website or in person), after an appointment with the municipal services. An hour is agreed with the citizens to leave the waste in front of their house in order to assure the collection. This service is free for certain quantities (<1m³) and involves cardboard, green waste, WEEE, C&D waste, ferrous materials, wood, furniture and other bulky waste. Afterwards the waste collected by trucks is sorted out into big containers at municipal facilities, in order to be led to different types of treatment and valorisation. All service is attended at the time accorded with the citizen, within 24 hours. The collection on demand is widely spread and involves more than 90 requests per day. It is certified by quality standards (ISO 9000).



Image 18: Lisbon in Portugal – system for collection of bulky waste on demand

Opportunities for application of the good practice within the Kula municipality

This good practice could be implemented in the Kula municipality if a site is provided for storing the collected bulky waste and a regular transport to a regional recycling centre in the Vidin region is organised. This good practice is applicable for objective 4 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality



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This good practice can be used for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.

In response to a query regarding the separate collection of electric and electronic waste and batteries in Knjazevac, the following statement was received: „The regional waste depot will be located in Halovo, Zajecar municipality, where waste from seven towns in the municipalities of Zajecar and Bor will be destroyed (Zajecar, Bor, Knjazevac, Boljevac, Negotin, Majdanpek and Bor). Despite the completed plan, the conceptual solution has not been officially accepted and therefore the construction of this regional depot has not started yet.”



LEGAL AND ECONOMIC INSTRUMENTS

5.2.13 Flanders in Belgium – restrictions on landfill and incineration of waste

Region	Flanders
Country	Belgium
Target group	Waste producers
Waste stream	All
Population	6 381 859 (2013)
Number of households	2 604 786 (2009)
Area (km ²)	13 521
Population density (inhabitants/km ²)	472
Total waste (kg/inhabitant/year)	395,19

The Flemish Government implements landfill and incineration restrictions. As a result, landfilling of bio waste, unsorted waste, separated waste suitable for recycling and combustible waste are banned. Incineration of separated waste streams and unsorted waste are also banned.

Levies on landfilling made the tariff for landfilling higher than the tariff for incineration of waste streams in order to discourage final disposal of waste on the landfill sites. For those waste streams that can be recycled, levies ensure that recycling (or pre-sorting) becomes economically more interesting.

The increase of landfill and incineration levies over the time in Flanders had an effect on the landfilling and incineration rate in favour of re-use, recycling, composting and recovery.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for objective 8 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



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5.2.14 Limerick in Ireland – household pay-per-weight charging system

Region	Limerick/Clare/Kerry
Country	Ireland
Target group	Waste collectors & producers of household waste
Waste stream	Mixed municipal waste
Population	454 507
Number of households	171 476 (occupied)
Area (km ²)	10 700
Population density (inhabitants/km ²)	42,5
Total waste (kg/inhabitant/year)	599,93

In the Limerick/Clare/Kerry region (now part of the Southern Waste Region of Ireland), a significant number of household waste collectors have implemented a pay-per-weight charging system in order to comply with the PBU charging system required in their Waste Collection Permit (WCP).



Image 19: Limerick region in Ireland – pay-per-weight charging system

Under the pay-per-weight charging system the householder pays for the amount of waste they produce: the less waste they produce, the less they pay. An electronic micro-chip is fixed to each wheelie bin which identifies the customer and allows the bins to be weighed on collection. The bins are weighed automatically by a weighing system on the collection vehicle. When the bin is lifted the system records the full weight and the empty bin weight when it is lowered. There is no manual calculation and customers are only charged for the net weight recorded. Their annual production of waste is then presented on their waste bill, allowing them to monitor their own waste production and sorting.

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objectives 4 and 8 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



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5.2.15 Cities of Valongo and Gondomar, Porto region in Portugal – loyalty fee card

Region	Porto (two towns – Valongo and Gondomar)
Country	Portugal
Target group	Mainly citizens of Valongo and Gondomar
Waste stream	Recyclable waste
Population	268 000
Number of households	114 000
Area (km ²)	207
Population density (inhabitants/km ²)	1295
Total waste (kg/inhabitant/year)	474,5

In two municipalities of the Porto region (Valongo and Gondomar) a loyalty free card enables citizens to accumulate points on the card, which can later be exchanged for goods or services, listed in a catalogue. Points can be gathered through voluntary surrender of waste, in two civic amenity sites. The technical implementation of the project is facilitated by a computer software that is responsible for managing the users' registration, material inputs and managing customer points. The project only started in November 2013, which limits the current result analysis. However, a comparison of the first quarter of 2014 with the same period in 2013 shows an increase in waste collection at civic amenity sites, in particular for paper and cardboard (+14%), plastic (+9%), glass (+75%), batteries (+24%) and used cooking oils (+74%).



Image 20: Cities of Valongo and Gondomar in Portugal – ECO SHOP loyalty card scheme

Opportunities for application of the good practice within the Kula municipality



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This good practice can be used for objective 5 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.

5.2.16 Brussels in Belgium – Subsidies to social economy

Region	Brussels
Country	Belgium
Target group	Enterprises (SME)
Waste stream	Bulky waste (furniture), WEEE, textiles
Population	1 138 000
Number of households	550 000
Area (km ²)	161
Population density (inhabitants/km ²)	7 000
Total waste (kg/inhabitant/year)	No data

In Brussels, financial support is provided to social economy actors according to the quantities of waste collected and recycled and products reused. Four categories of items are subsidised: textile, bulky waste, WEEE and printer related consumable goods. An increase in the subsidy is also foreseen in case the reuse rate increases from one year to the next. Data and proof of collection and recycling are sent by the beneficiary of the subsidy to Brussels Environment, the administration for environment and energy in the Brussels Region. Follow-up is also ensured via an annual meeting and field visits.

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 5 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



5.2.17 Austria – remediation of confirmed contaminated sites

Region	Austria nationwide
Country	Austria
Target group	All citizens
Waste stream	all
Population	8 500 000
Number of households	3 700 000
Area (km ²)	84 000
Population density (inhabitants/km ²)	101
Total waste (kg/inhabitant/year)	398,2

In Austria the national legislature had to react in order to find an appropriate solution for the problem of non-regulated landfilling. By passing the Act on the Remediation of Contaminated Sites (ALSAG) on 1 July 1989, Austria became one of the first European countries to implement binding and important steps towards a targeted registration of suspected and confirmed contaminated sites. In addition to setting out the framework for instructing the containment and remediation of sites, the Act provides for a financing basis to support suitable measures.

The aims of the Act on the Remediation of Contaminated Sites are:

- Introduction of a fee system for landfills in order to foster waste prevention
- Regulation of source streams (introduction of recycling)
- Decontamination of sites with the aim of re-establishing the original environmental conditions
- Establishment of a funding scheme for the remediation of contaminated sites by earmarking landfill fees
- Reduction of risks of unregulated landfill sites (for humans, animals and the environment)
- Registration of historically contaminated sites within one generation (2025)
- Implementation of measures (decontamination, containment, observation, restriction of use) for heavily contaminated sites within two generations (2050).



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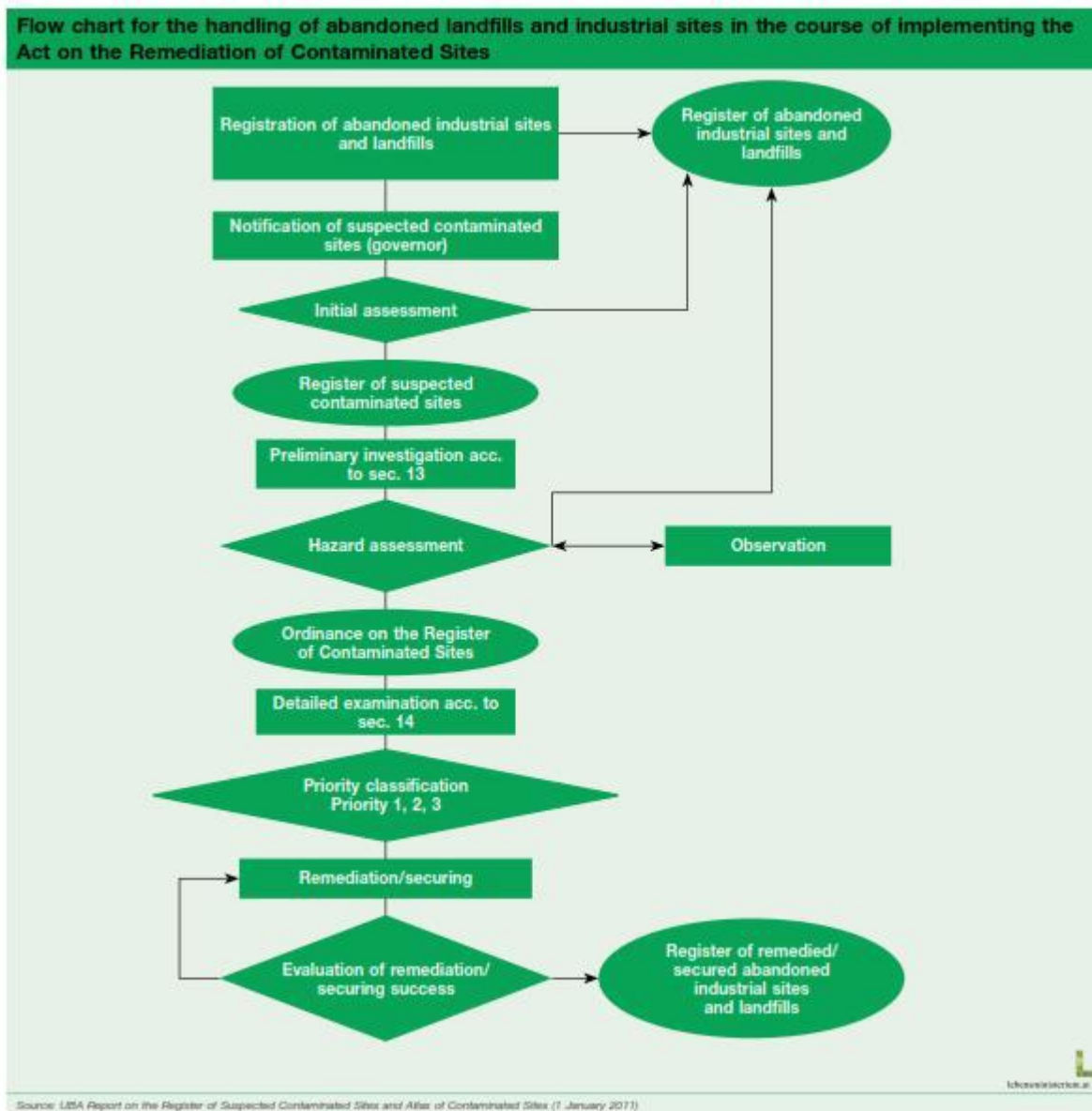


Image 21: Austria – register of the unregulated landfill sites

By 1 January 2011, a total of 256 sites had been registered as a source of substantial environmental hazard in accordance with the Ordinance on the Atlas of Contaminated Sites, and were rated as contaminated sites requiring securing and/or remediation. In the meantime, 108 of these contaminated sites have been categorized as secured or remediated. For an additional 92 contaminated sites, securing and remedial measures are currently underway or being planned.

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 7 of the Kula WMP.



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Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 4 of the Knjazevac RWMP.



COMMUNICATION AND ADVISING INITIATIVES

5.2.18 Lisbon in Portugal – Environmental programs at schools

Region	Lisbon
Country	Portugal
Target group	Students from kindergartens, primary and secondary schools, teachers and auxiliary staff.
Waste stream	All waste streams
Population	547 733
Number of households	323 981
Area (km ²)	85
Population density (inhabitants/km ²)	6 444
Total waste (kg/inhabitant/year)	501

The Municipality of Lisbon promotes two continual environmental education programs, specially designed to different age target groups, called “Lisboa Limpa Tem outra Pinta! (LLTOP)” (Cleaned Lisbon is Cool!) and “Escola a Escola Pró-Ambiente (EEPA)” (School to School Pro-Environment).

The LLTOP program is dedicated to kindergartens (70 schools) and primary schools (91 schools) and covers 19.000 students. In this context, the Municipality of Lisbon conceives and produces leaflets and games in order to exercise recycling subjects. It also organizes paper recycling workshops and explains how many raw materials can be saved when recycling paper, glass, plastic and metal. Mini multimaterial recycling bins are also available to help to understand which one is the right bin for a given recyclable material.

The EEPA program is dedicated to older students, from the 2nd and 3rd levels of Basic Education, who are between 10 and 15 years old. It is annually implemented in 50 public and private schools, covering 20.000 students and 3.000 teachers. This program involves technical visits, paper recycling workshops, pedagogical games, competitions, exhibitions, used object fairs, ecological marches, pedagogical materials and thematic plays.



Image 22: Lisbon in Portugal – educational campaign

These programs are widely implemented in Lisbon’s public schools but also in some private schools. Therefore the Municipality of Lisbon has achieved a long and consolidated experience in environmental education programs.

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 9 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



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5.2.19 Tallinn in Estonia – waste awareness educational campaigns for children and adults

Region	Tallinn
Country	Estonia
Target group	Students from kindergartens, primary and secondary schools, gymnasiums, teachers and staff of educational establishments
Waste stream	All waste streams
Population	431 339
Number of households	183 800
Area (km ²)	159,33
Population density (inhabitants/km ²)	2 707,2
Total waste (kg/inhabitant/year)	515,98

Waste Wolf (in Estonian Prügihunt) is the City of Tallinn’s waste awareness campaign, which was organized since 2003. The waste awareness mascot also bears the same name. The goal of the campaign is to make the behaviour of the residents of Tallinn more environmentally friendly. Public events, competitions, information seminars and public surveys are carried out within the framework of the waste awareness campaign, and excursions to landfills and waste stations are organized.

Waste Wolf teaches children how to discard waste in a manner that is not harmful to the environment. Waste Wolf also shares knowledge concerning the sorting and recycling of waste. One of the tools of this campaign is Sustainable Consumption and Waste Information Trailer, which was designed as a mobile learning class and can be transported to the site where activities are taking place. Waste Wolf and Information Trailer can be used simultaneously or separately depending on the context and content of activity.



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Image 23: Tallinn in Estonia – educational campaign for children and adults

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 9 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.

5.2.20 Elefsina municipality in Greece – door-to-door information campaign

Region	Attiki
Country	Greece
Target group	Households, shops, businesses
Waste stream	Packaging, biowaste, batteries, WEEE
Population	30 000
Number of households	10 000
Area (km ²)	20
Population density (inhabitants/km ²)	1500
Total waste (kg/inhabitant/year)	No data



In Greece, the municipality Elefsina decided to go forward with the suggestion from the Ecological Recycling Society (ERS) to implement a door-to-door information campaign. The campaign was implemented by visiting households individually to provide all the available information regarding recycling facilities of the municipality. A number of young citizens from the municipality of Elefsina, most of them students, attended a training seminar organised by ERS. These citizens were then given leaflets and questionnaires and visited the households of Elefsina. They provided information regarding all the available recycling facilities of the municipality and they also recorded the opinion of citizens regarding the performance of waste management in the municipality. Although there is not a unique link between the implementation of the campaign and the rise of the recycling rates, it is believed that the campaign acted as a very strong force towards recycling.



Image 24: Elefsina municipality in Greece – door-to-door information campaign

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 9 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



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5.2.21 Austria countrywide - municipal waste consultancy

Region	Countrywide
Country	Austria
Target group	Private households, schools, kindergardens, enterprises
Waste stream	All
Population	8 500 000
Number of households	3 700 000
Area (km ²)	84 000
Population density (inhabitants/km ²)	101
Total waste (kg/inhabitant/year)	398,2

In Austria they believe it is better to educate people in order to foster waste prevention and separate waste collection instead of letting them pay for expensive technical solutions. A small NGO (ARGE) developed the concept of “municipal environment & waste consultant” and implemented it all over Austria. Today 340 consultants are the backbone of public waste management, raising separate collection rates from around zero (1980) up to over 70% in some regions, saving costs, generating thousands of new follow-up jobs – one of the biggest success stories of labour agency-funded projects in Austria.



Image 25: Municipal waste consultancy in Austria



Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 5 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.

5.2.22 Brussels in Belgium – network of waste advisers

Region	Brussels
Country	Belgium
Target group	Enterprises (PME)
Waste stream	All waste streams
Population	1 138 000
Number of households	550 000
Area (km ²)	161
Population density (inhabitants/km ²)	7 000
Total waste (kg/inhabitant/year)	No data

In the Brussels region, the Brussels Waste Network was created in 2010 to develop a network of waste advisers for Brussels-based enterprises. This project comes from a public/private partnership with BECI, the Chamber of Commerce and Industry of the Brussels Capital Region. BECI gets a subsidy to hire a waste adviser, whose mission is to monitor the evolution of the sector and to link the private sector and public authorities. The waste adviser must assess the network's performance and ensure its dynamism (organisation of meetings, creation of new tools, improvement of existing tools and of the website, etc.) or implement audits in companies expressing this request. BECI also launches tenders aimed at federations and groups of companies asking for funding and methodological help to realise a specific waste prevention or management project.

Opportunities for application of the good practice within the Kula municipality

This good practice can be used for objective 8 of the Kula WMP.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 5 of the Knjazevac RWMP.



Good practices, presented in the report of the MOEW "VIII. Analysis of the existing measures and applicable indicators for the National Waste Prevention Program", suitable for application in the municipalities of Kula and Knjazevac

5.2.23 Italy – home composting in Turin

In 2004/2005, a campaign to promote positive results from home composting was organised in 19 municipalities around Turin. The campaign continued in 2006, splitting into two target groups – people living in urban areas who are urged to reduce packaging waste and people living in provincial territories where the composting campaign continues. A number of promotional and explanatory events have been held and a 20% household waste tax discount has also been made available for participating households. As a result of the campaign, 7.4% of the target households started composting, after the campaign in 2006, the percentage increased to 9, with 300 composting sets distributed.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for objective 3 of the Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice is applicable for objectives 1, 2, 3 and 6 of the Knjazevac RWMP.

5.2.24 Hungary – web site selling used construction and demolition materials

In 2003, the non-government organisation "Independent Ecological Center" initiated the creation of a web site that offers used building materials for re-use. The development of the web site cost about 4,000 Euros, with 80% of the amount paid by the Hungarian Ministry of Environment and Water. The aim of the initiative is to reduce the amount of building materials (e.g. bricks, roof tiles) and building components (e.g. doors, windows) and increase their re-use. The proposed building materials (a total of 12 categories) are geographically divided so that customers can buy the materials at the lowest transport costs and reduce the emissions of exhaust gases. The web site publishes an average of five announcements per day and over 1,500 adverts per year, with about 21,000 visitors a year. The web site is particularly successful in selling bricks and roof tiles.

Opportunities for application of the good practice within the Kula municipality

This good practice is applicable for objective 3 of the Kula municipality.

Opportunities for application of the good practice within the Knjazevac municipality

This good practice can be used for objective 1 of the Knjazevac RWMP.



5.3 Summary of the good practices

The best practices presented in the report, addressing different objectives of the waste management in EU countries with similar improvement targets, are summarised in the following table, based on the strategic objectives set in the WMP of Kula municipality:

№	Specific objective in the WMP of Kula municipality	Good practice in EU member country
1	Reduction of generated waste	5.2.14 Limerick in Ireland – household pay-per-weight charging system 5.2.15 Cities of Valongo and Gondomar, Porto region in Portugal – lowalty fee card
2	Achieving all predetermined regulatory targets for the preparation of household waste for recycling by 2020.	5.2.1 Door-to-door paper collection in Odense, Denmark 5.2.2 Waste collection in a mixed dry recyclables (MDR) bin in the Limerick/Clare/Kerry region in Ireland 5.2.3 „Eco-container at home” Maia municipality, Porto region, Portugal 5.2.7 All regions in Greece – batteries recycling 5.2.8 Sofia in Bulgaria – recycling of waste electronic and electric appliances 5.2.11 Odense in Denmark – Civic Amenity Sites
3	Achieving predetermined regulatory targets to reduce biodegradable and construction waste streams to landfill	5.2.4 Catalonia in Spain – Biological treatment and separate collection of biowaste 5.2.5 Styria in Austria – separate collection and treatment of biowaste 5.2.6 Milan in Italy – door to door food waste collection for households 5.2.23 Italy – home composting in Turin 5.2.24 Hungary – web site selling used construction and demolition materials;
4	Management of specific waste streams in accordance with the requirements of	5.2.12 Lisbon in Portugal – collection on



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№	Specific objective in the WMP of Kula municipality	Good practice in EU member country
	national legislation.	demand of bulky waste 5.2.14 Limerick in Ireland – household pay-per-weight charging system
5	Sustainable financial budget of the system at affordable prices for the population.	5.2.15 Cities of Valongo and Gondomar, Porto region in Portugal – lowalty fee card 5.2.16 Brussels in Belgium – Subsidies to social economy
6	Environment-friendly disposal of waste.	5.2.9 Tallinn in Estonia – system of household hazardous waste collection 5.2.10 Sofia, Bulgaria – hazardous waste collection on demand and in mobile stations
7	Preventing and reducing the risk of existing waste pollution.	5.2.17 Austria – remediation of confirmed contaminated sites
8	Establish an effective legal framework for waste management at the local level.	5.2.13 Flanders in Belgium – restrictions on landfill and incineration of waste 5.2.21 Austria countrywide - municipal waste consultancy 5.2.22 Brussels in Belgium – network of waste advisers
9	Participation of the public.	5.2.18 Lisbon in Portugal – Environmental programs at schools 5.2.19 Tallinn in Estonia – waste awareness educational campaigns for children and adults 5.2.20 Elefsina municipality in Greece – door-to-door information campaign

Table 1: Summary of the good practices in relation to the objectives of Kula municipality



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The best practices presented in the report, addressing different objectives of the waste management in EU countries with similar improvement targets, are summarised in the following table, based on the strategic objectives set in the RWMP of Knjazevac municipality:

№	Specific objective in the RWMP of Knjazevac municipality	Good practice in EU member country
1	Provision of conditions for separate collection by a system of two containers (container for recycling of waste and containers for other mixed waste)	5.2.1 Door-to-door paper collection in Odense, Denmark 5.2.2 Waste collection in a mixed dry recyclables (MDR) bin in the Limerick/Clare/Kerry region in Ireland 5.2.3 „Eco-container at home” Maia municipality, Porto region, Portugal 5.2.7 All regions in Greece – batteries recycling 5.2.8 Sofia in Bulgaria – recycling of waste electronic and electric appliances 5.2.11 Odense in Denmark – Civic Amenity Sites
2	Construction of a regional landfill depot at the Regional Center in Zajecar.	5.2.1 Door-to-door paper collection in Odense, Denmark 5.2.2 Waste collection in a mixed dry recyclables (MDR) bin in the Limerick/Clare/Kerry region in Ireland 5.2.3 „Eco-container at home” Maia municipality, Porto region, Portugal 5.2.7 All regions in Greece – batteries recycling 5.2.8 Sofia in Bulgaria – recycling of waste electronic and electric appliances 5.2.11 Odense in Denmark – Civic Amenity Sites
3	Selection of one of the options offered by this regional plan and its timely assessment to meet all the requirements proposed by a optional solution;	5.2.4 Catalonia in Spain – Biological treatment and separate collection of biowaste 5.2.5 Styria in Austria – separate collection



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№	Specific objective in the RWMP of Knjazevac municipality	Good practice in EU member country
		and treatment of biowaste 5.2.6 Milan in Italy – door to door food waste collection for households 5.2.23 Italy – home composting in Turin 5.2.24 Hungary – web site selling used construction and demolition materials; 5.2.9 Tallinn in Estonia – system of household hazardous waste collection 5.2.10 Sofia, Bulgaria – hazardous waste collection on demand and in mobile stations
4	Remediation and reclamation of illegal landfill sites in the region in accordance with the relevant acts and regulations.	5.2.17 Austria – remediation of confirmed contaminated sites
5	Provision of continuous education of the public, experts and decision makers from local authorities in order to raise awareness in waste management as soon as possible.	5.2.18 Lisbon in Portugal – Environmental programs at schools 5.2.19 Tallinn in Estonia – waste awareness educational campaigns for children and adults 5.2.20 Elefsina municipality in Greece – door-to-door information campaign
6	Preparation and active work of all municipalities along with the procedure to create a new system that is durable, before building of a new regional landfill and recycling center has started.	All proposed good practices

Table 2: Summary of the good practices in relation to the objectives of Knjazevac municipality



6 Waste Management Programme of Kula municipality

6.1 Introduction

The waste management programme of the Municipality of Kula for the period 2016-2020 was adopted by resolution 103 on the 26th of August 2016 at a meeting of the Kula Municipal Council.

The main objective of the program is to reduce the amount of waste generated and deposited and to meet the regulatory requirements at affordable costs for the population of Kula municipality.

This goal can be achieved in five possible ways, with priority in the following sequence:

- a) Prevention of waste generation;
 - b) Preparation for reuse;
 - c) Recycling;
 - d) Other recovery, for instance utilisation as an energy resource;
 - e) Disposal (landfill, incineration without energy recovery, etc.).
- “Prevention”

of waste is defined in the Directive as measures that are taken before the substances or objects become waste, which reduces:

- the amount of waste generated, including through the re-use of products or the prolongation of their life cycle (quantitative prevention);
 - the content of harmful substances in materials and products (qualitative waste prevention).
- “Preparation for reuse”

includes cleaning, inspecting, and repairing used products that have become waste so that they can be reused (eg repair of bicycles, electrical and electronic equipment, furniture, etc. which after being repaired are sold as second-hand products) . Preparing for re-use is a type of waste recovery.

- „Recycling”

The recycling approach is that one material is processed in order to change its physical and chemical properties and to reuse it for the same or for other purposes. The main objective of the Waste Framework Directive is for the EU to become more of a "recycling society" that seeks to avoid waste generation and to use waste as a resource.



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Specific waste management activities that are classified as recycling under the Waste Framework Directive include (but are not limited to):

- recycling of materials: eg. of plastic products or components in plastic materials; melting waste glass in glass products; use of paper waste in paper plants, etc. Recycling of materials: for example, plastic granulated and pelletized for extrusion or molding, crushed glass waste, sorting of waste paper meeting the end-of-waste criteria
- Production of compost that meets the product quality criteria.

Recycling is a type of waste recovery.

- „Other recovery”

is any activity that meets the definition of "recovery" under the WFD but does not meet the specific requirements for preparation for re-use or for recycling.

Examples for other recovery include:

- incineration or co-incineration where the main use of the waste is as a fuel or other means of obtaining energy. This is a waste management operation with energy recovery classified as R1 in Annex II of the WFD. This contrasts with the incineration of waste without energy recovery classified as disposal operation D10 in Annex I to the WFD.
- piling activities meeting the definition of recovery
- „Disposal” -

landfill (even when landfill gas is used to recover energy); incineration and co-incineration that do not meet the criteria to be defined as recovery (in the case of installations designed to incinerate non-compliant solid household waste using the energy efficiency formula R1 in Annex II to WFD), mounding activities when they do not meet the definition of recovery.

The WMP of Kula is fully compliant with the main objectives of European environmental law in the Waste sector and contains key objectives for which programs of measures are foreseen in the NWMP (National Waste Management Plan) and the NPPW (National Programme for the Prevention of Waste).

The following conclusions have been drawn from the analyses within the Kula municipality programme:

1. The amount of reported household waste is relatively stable with a slight tendency to decrease.
2. The rate of accumulation of waste generated by the inhabitants of the municipality is lower than the average for the country.



3. The amount of waste collected for reuse and recycling by the recovery organisation on the territory of the municipality has a slight tendency to increase.
4. The lack of separate collection of waste on the territory of Kula municipality will create a major difficulty in achieving the recycling targets set in the WMA. The municipality should focus on effective pre-treatment and waste separation

6.2 Existing condition

The existing state of waste management has been assessed in the APC of Kula through SWOT ANALYSIS.

SWOT analysis is based on the idea of separating the subject of the strategic analysis from the environment in which it operates. The subject of strategic analysis is examined for its "strengths" and "weaknesses". The environment in which the subject of strategic analysis functions is differentiated into "opportunities" and "threats".

Strengths. Strengths are a resource, skill or other advantage the sector has. The strong side is a distinctive competence that gives a comparative advantage.

Weaknesses. Weaknesses represent the limitations or scarcity of resources, skills and abilities that seriously impede the development of the sector.

Opportunities. Opportunities represent the most beneficial elements of the external environment. These are optimal external factors from which the sector benefits or could benefit.

Threats. Threats are the most unfavourable segments of the external environment. They place the greatest barriers to the current or future (desired) state.

6.2.1 Strengths

- The entire territory of the Municipality of Kula is served by waste collection and disposal.
- 100% of the needs of household waste containers are met.
- Participation in the Regional System for Waste Management of the town of Vidin.
- Kula municipality has developed a municipal ordinance regarding local waste management.

6.2.2 Weaknesses

- Low efficiency of the applied systems for separate waste collection of widespread waste.
- Suspended but still unrecultured landfill on the land of Kula, Deri magare area.
- There are no projects applied, aiming at minimising biodegradable waste through household composting.



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- High level of landfilling of different types of waste.
- There are no measures and incentives to reduce the amount of waste generated at local level.

6.2.3 Opportunities

- Use of EU financial instruments to tackle issues related to effective waste management at the local level.
- Change of public attitudes in favour of reducing the amount of waste generated and their effective management.
- High percentage of separately collected widespread waste on the territory of the municipality.
- High efficiency of the preliminary treatment of waste delivered at the regional landfill.
- Improved administrative capacity with regard to waste management activities.
- Ensuring transparency in setting a municipal waste tax for citizens and businesses and introducing the "pay as per the amount of waste generated" principle.

6.2.4 Threats

- Impoverishment of the population - failure to pay the fee due to cover the costs of services of waste management.
- Significant increase in the cost of household waste management and the need to raise the "Household waste" tax.
- Change in legislation at European and/or national level.
- Low efficiency of the preliminary treatment of waste delivered at the regional landfill.
- Unsuccessful collection and recycling targets for the respective reference years set in the WMA.

6.3 Strategic and specific objectives of the programme

In order to assess whether the objectives have been achieved within the set timeframe, specific objectives are formulated to ensure that the general objective of the programme is attained. The municipal program is being developed and adopted for a period that should coincide with the period of operation of the National Waste Management Plan 2014-2020. The municipal programme has been developed in accordance with the structure, objectives and projections of the National Waste Management Plan (NWMP) in line with the European Sustainable Development Strategy and the Zero Waste Approach:



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OBJECTIVE 1: Reduce the harmful impact of waste by preventing its formation and encouraging its reuse.

OBJECTIVE 2: Increase the quantities of recycled and recovered waste by construction of a network of installations to treat the entire amount of generated waste so to reduce the risk to the population and the environment.

OBJECTIVE 3: Waste management that ensures a clean and safe environment.

OBJECTIVE 4: Making the public a key player in implementing the waste management hierarchy.

The municipal program sets **nine specific waste management objectives** for the period 2016-2020:

1. Reduction of generated waste;
2. Achieving all pre-determined regulatory targets for the preparation of household waste for recycling by 2020;
3. Achieving pre-determined regulatory targets to reduce biodegradable and construction waste streams to landfill;
4. Management of specific waste streams in accordance with the requirements of national legislation.
5. Sustainable financial budget of the system at affordable prices for the population;
6. Environment-friendly disposal of waste.
7. Preventing and reducing the risk of old waste pollution.
8. Establish an effective legal framework for waste management at the local level.
9. Participation of the public.

Quantitative dimensions of the strategic objectives

The legally defined objectives to be attained at the end of the implementation period of this program are:

Domestic waste	Preparation for reuse and recycling of waste materials generated by the population of paper, plastic, glass and metals as a minimum	Increase to at least 50% of their weight by 2020
Construction and demolition waste	Preparation for reuse, recycling and other recovery	Increase to at least 70% of their weight by 2020



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Domestic biodegradable waste	Separate collection and recovery	Not less than 50% of the quantity set up in 2014
	Reducing the amount deposited compared to 1995	Not less than 35% by 2020

Table 2: Quantitative dimensions of the strategic objectives in the Kula Municipality WMP

The existing recycling targets for specific waste streams - packaging waste, ELVs, WEEE are the responsibility of the respective recovery organizations, whilst the municipality is committed to cooperate and support.

ALTERNATIVE SCENARIOS FOR ACHIEVEMENT OF THE OBJECTIVES

Scenario 1: „Zero scenario“.

It is assumed that:

- (1) The regional landfill operates regardless of the contribution of the pre-treatment and recycling of waste to the achievement of the objectives;
- (2) the current waste collection and waste disposal situation as well as the existing level of separate waste collection will be preserved.

Scenario 2: „Dynamic approach to waste management“.

The scenario assures the achievement of goals related to:

- Recycling of household waste from paper, metals, plastics and glass by implementing effective measures for separate collection of household waste at the source managed by the packaging recovery organisation and the municipality, separate collection of waste from other sources, use of the existing technology for the pre-treatment (separation) of mixed municipal waste and the upgrade of the same if proven necessary.
- Recultivation of the non-hazardous waste landfill in the town of Kula. - this objective was achieved and the landfill was reclaimed in 2016.
- Separate collection of waste from maintenance of green areas and transport to the regional landfill.
- Introduction of home green waste composting to reduce the amount of green waste.
- Achieving the objectives of separate collection and recycling of demolition waste and demolition of buildings through the control of construction companies provided by the municipality collecting and transporting small quantities of construction waste from repair works in households; use of RD waste recycling technology for construction waste.

Scenario 1 has the lowest current value. It is likely that the goals will not be achieved.

The costs for Scenario 2 are significantly higher and they include investments for:



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- Upgrade of the existing regional landfill technologies for more efficient domestic waste recovery and prevention of greenhouse gas emissions (if the need for this is confirmed);
- Purchase of composting bins for home composting;
- Purchase of containers for separate collection of household bio-waste.

The scenarios to be formulated should only be considered in the context of choosing the optimal solution for development of the waste treatment technical infrastructure and assessing the cost of implementing the plan.



7 Regional Waste Management Plan of the Knjazevac municipality

7.1 Introduction

The Municipal Waste Management Plan is a document that will be used to organise the waste management process at municipal level. Municipal plans must be in line with the regional plan, by which the joint management of several municipalities is regulated. Knjazevac municipality, together with the municipalities of Zajecar, Kladovo, Majdanpek, Boljevac, Bor and Sokobanja, form a region that will be served with the regional waste management plan for the Timok municipalities.

The municipal waste management plan presents the area of waste management, quantity, type of waste, method of waste collection, treatment and disposal. Guidelines and priorities have been defined, as well as the dynamics and the way to solve the problems in accordance with positive national and European legislation in the field of waste management and in the field of environmental protection. The purpose of the plan is to create a long-term sustainable waste management system, primarily at municipal level but also in the region, with minimal harmful effects on the environment and the health of current and future generations with rational use of resources and following the current principles of waste management as well as coordinated participation of all waste management structures - republican, local authorities of participating municipalities, households, traders and trade organizations, non-governmental institutions, the private sector and, of course, all residents. This implies the need for defining the most acceptable model for achieving full control over all waste streams of formation, separation, collection, transport, treatment and disposal. The management system is required to reduce the amount of waste, recover its useful components, rationally collect and dispose of waste. Given this, investments need to be made, and preparedness in the business, financial and technological approach is needed in order to move to a new work system.

The regional plan provides the following information:

- Allows users to get a full picture of the current waste management situation in 2007 in the region;
- Outlines the waste management objectives at municipal level in accordance with the national and local legislation;
- Defines an optimal waste management system that also includes the possibility of choosing a private partner based on a public auction;
- Determines the method and the optimal timetables for the implementation of the plan;
- Identifies total financial investments as well as financial investments for priority parts of the plan that need to be implemented immediately.

The purpose of the regional plan is to provide answers to many open questions that set out the design of a completely new waste management system based on the guidelines of the National Management Strategy.



7.2 Information on the region

Knjazevac Municipality is located in the eastern part of Serbia along the border with the Republic of Bulgaria and is part of the Timok region as its southernmost municipality. According to the 2011 statistics, the municipality covers an area of 1,202 km², its size being the fourth in the Republic of Serbia. The majority of Knjazevac municipality lies on mountainous terrain. 31,491 inhabitants live in the municipality, of which 18,404 live in the town of Knjazevac (2011 census), which represents the administrative, economic and cultural center of the municipality.

According to the 2011 census, the number of households in the municipality is 11,572, and the average number of household members is 2.7, which is the smallest for the municipality, both in the Zaječar area and in the whole Timok region. The average population density is 31 inhabitants per km², which is classified as a sparsely populated area.

Knjazevac municipality, besides the town of Knjazevac, also comprises 85 towns or villages inhabited by 13 087 inhabitants.

The highest point is Midjur peak in the Balkan Mountains with 2 169m altitude, and the lowest is 176m and is located in the Knjazevska valley.

The climate is continental, the warmest month is July and the coldest January. The relief of the municipality is hilly-mountainous. The snow cover of the Balkan Mountains lasts for 4-6 months, and there is also the famous tourist recreational center Babin Zub. There are also many thermal springs in the municipality.

Agriculture in Knjazevac municipality is predominantly represented by vineyards and orchard growing. The most commonly cultivated crops are grapes, cherries, plums and blackberries. 80% of rural areas are privately owned.

In the municipality there is only the light industry - logging and wood processing, furniture, textile, footwear and food-processing. Production capacity has declined in recent years as well as the employment rate of the population occupied in industrial enterprises.

7.3 Existing situation

In the Republic of Serbia, until recently there was no waste management policy, and the whole process was based on improper disposal of landfill waste, which usually did not meet the requirements for safe and suitable landfill sites.

In Knjazevac, the situation is the same. 55 disposal sites have been identified, where the waste is a heterogeneous mixture without any separation. Waste in the landfill is mixed with both soil and construction waste.

Representatives of the Knjazevac municipality have concluded an agreement for the municipality's participation in the Regional Waste Management and the construction of a regional landfill located close to Zaječar.



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The municipal waste management plan for Knjazevac municipality is in line with the "Regional Waste Management Plan". This municipal plan provides since the start of construction of the Halo waste disposal site near Zajecar for all waste from Knjazevac Municipality to be transported to a conveyor station and from there, through larger vehicles, to the regional landfill.

The waste management and the activities related to their collection and transportation will be carried out by a municipal company.

7.3.1 Quantities of waste

There are about 9,450 tons of waste produced annually in the Knjaievac town (Knjaievac Strategic Action Plan for 2004-2006). There is no accurate and valid data on the quantity and composition of the waste to ensure optimal management of municipal solid waste. According to information provided by the Standart Public Utilities Association, a partner in the Clean and Green Life project, the city produces about 9,500 tons of industrial waste, which is being destroyed along with the municipal depots located on the banks of the Timok River.

The waste data according to the information provided is as follows:

Average daily volume of household waste	m3	28.105
	t	4.015
Average daily volume of inert and non-hazardous waste materials	m3	-
	t	28.105
Average daily volume of other waste (hospital, slaughterhouse, industrial and others)	m3	2.5
	t	-

Table 3: Quantities of waste generated in the municipality of Knjazevac, Serbia

7.3.2 Collection and transportation

Waste collection and transportation in Knjazevac is carried out by the Utility Company JKP Standart. The equipment it operates is outdated and worn out, so the population served by the waste collection system is well below the 80% which is the objective of the Republic of Serbia's National Program of Management. According to JKP Standard data, 52.5% of the population is served by the waste collection system in the Knjazevac municipality.

7.3.3 Landfilling in Knjazevac municipality

The municipal landfill site in Knjazevac is located about 700 m from the city center. It is located between a railway line to the north and the Beli Timok River on the south side. The landfill is limited to the south by the planned transit corridor through the city. The shape of the landfill site approximates a square, with an area of 3.86 ha. The landfill is located in the central part, and space is reserved in the northwest for a newly built wastewater treatment plant. To the southeast there is an empty space designed to expand the existing depot by about 1.74 ha. The height of the landfill is 3 - 5 m on average.



The project for rehabilitation and closure of the Knjazevac landfill site was drafted in 1993 but has not yet been realised. It forecasts a period of nine years for operation. In the existing depot, the process is uncontrolled. The landfill is full to its maximum design levels.

The city depot in Knjazevac has no fence or gate. The access of unauthorized persons is unlimited and therefore there are many individuals collecting secondary raw materials.

In addition to the main landfill in Knjazevac municipality, in 2009 55 more unregulated landfills were identified as part of the project "Identification of unregulated landfills on the territory of the Republic of Serbia". The project was carried out by the Department of Environment at the Faculty of Technical science in Novi Sad for the needs of the Ministry of Environment and Development Planning.

7.3.4 Waste recycling

The term "waste recycling" implies secondary waste treatment to obtain new recycled material that can be reused for some purpose. The recycling concept is mixed with the idea of separation, which is part of the recycling or waste management system, which is the separation of secondary useful inputs at the place of production (primary separation) or after the collection of mixed waste, a secondary separation which is often carried out at the site of the landfill.

The company "Industrosirovina" deals with the collection and processing of industrial waste, with its schedule including collection and processing of secondary raw materials.

According to the available data, it can be concluded that there is no organized recycling or distribution system for secondary raw materials on the Knjazevac municipality.

7.3.5 Other waste treatment processes

Other waste treatment processes include combustion, gasification, pyrolysis and others.

No controlled burning is carried out and neither of the other practices is applied in the Knjazevac municipality and in the region.

7.3.6 Industrial and hazardous waste

In the municipality there are no large quantities of industrial waste, because the industrial works are either out of operation or work with reduced capacity.

On the territory of the Timok region there are plants for the treatment of hazardous waste as well as institutions that are licensed for the management of these wastes.

At municipal level, decisions need to be taken to monitor the quantities and the appropriate management of hazardous waste.

7.4 Waste management plan for Knjazevac municipality

This paragraph presents the proposal for the organization of the management system in the Knjazevac municipality based on the data presented in point 7.3.



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On the basis of the data provided, it can be concluded that a small quantity of waste is produced on the territory of Knjazevac municipality, which is a consequence of the small number of inhabitants, the lower standard of living and the economic lag of the municipality.

Proper waste management, which, among other things, involves the collection of waste from at least 80% of the population, adequate transport, recycling and final disposal of the remaining waste is expensive even for large municipalities. As a rational solution to the problem, the waste management in Knjazevac municipality implicates communication with other municipalities or the establishment of regional waste management. This has been fulfilled by the establishment of a joint waste management of the Knjazevac municipality and the Bor and Zaječar districts.

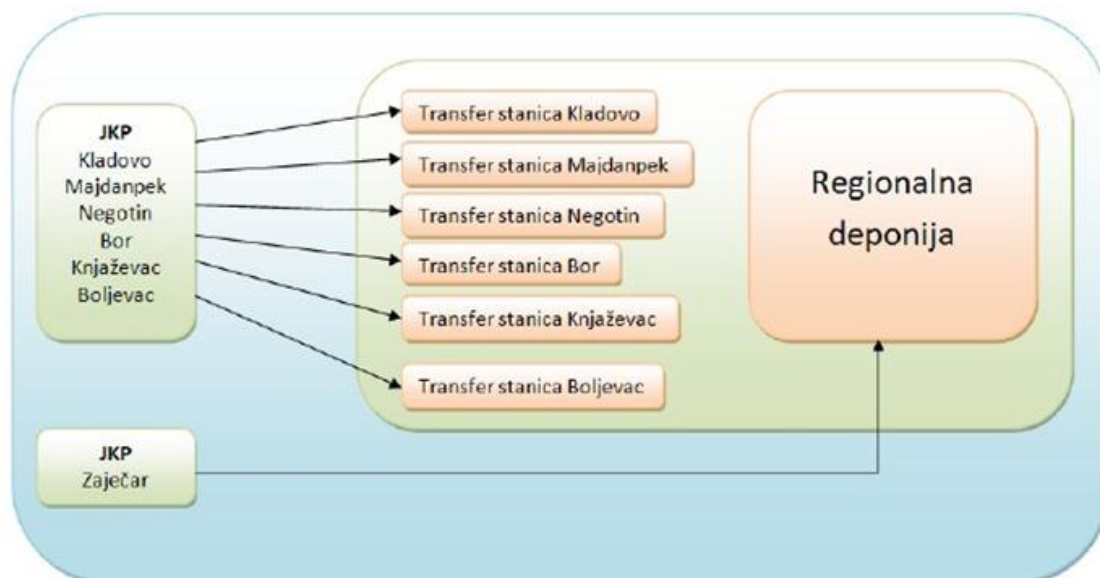


Image 26: Schematic of the regional waste management including Knjazevac municipality

From the analysis of the quantities and morphological composition of the Knjaževac municipality waste, it is evident that the quantities of waste are small, which is favourable for transportation costs and the most of the waste is biodegradable, which necessitates the consideration of options for separately collected and recycled /composted waste.

The municipal plan provides for the construction of a reloading station on the territory of Knjazevac Municipality, where the municipal collection company will deposit the waste. From that the waste will be transported by large vehicles to the regional landfill site. The plan does not provide for a waste separation facility at the reloading station due to its small quantity.

7.4.1 Regional landfill site



The selected site for the landfill covers an area of about 15 ha. It is situated on a junction on the road Veliki izvor - Halovo. Although most of the new sanitary landfills are designed for 20 years operation, based on the calculation of the total amount of waste to be produced in the municipalities of the region, it can be concluded that the landfill can be operated for 30 years if reprocessing measures are in place throughout the period of use of the landfill. The landfill will consist of several trenches, each of which will be filled for approximately five years, after which it has to be closed down and regenerated. After closing a trench, a new one will start filling. The site is large enough to accommodate the necessary service buildings and facilities.

7.4.2 Reloading stations

Reloading (transfer) stations are places where waste from local waste collection vehicles is temporarily stored and transferred to larger vehicles that take them to the regional sanitary landfill. They also provide a place where non-standard vehicles (smaller vehicles, tractors, lifters, containers) and even vehicles will be brought by the citizens at a certain time for recycling or disposal. This will help local waste collection and ensure more economical and efficient transportation of waste to remote sanitary landfills. It will also help to prevent the emergence of unregulated landfills.

A reloading station will be built in Knjazevac municipality due to the great distance to the regional landfill. It will also collect non-hazardous industrial waste, bulk waste, waste oils, batteries and more.

The operating principle of the reloading station is easy: trash is unloaded from the vehicle onto a conveyor belt where the separation occurs, usually manual. Then it goes into containers where it is compacted. After filling the containers with compacted waste, they are loaded and transported to the regional landfill.

7.4.3 Short term objectives in the WMP of Knjazevac municipality

The main objective in the Waste Management Plan in Knjazewac municipality is to build a new regional landfill for the disposal of mixed municipal waste to meet EU requirements aimed at protecting the environment and human health.

Secondly, the objective is to clean up or close down and recultivate all identified unregulated landfills on the territory of the municipality.

7.5 Opportunities for waste management aimed at protecting the environment

Developed countries - the United States and the EU have a range of options for handling household waste. All options are related to the amount and composition of waste, but also with national strategies in the form of supporting one of the options for waste treatment, through subsidies, legal arrangements other taxes or exemptions.

For the purposes of the Plan for Waste Management in the Knjazevac municipality in accordance with the legal provisions in the Republic of Serbia, the highest priority is to build a regional landfill depot. Following that or during the construction of the regional landfill depot, some of the relevant options for waste management need to be introduced. Listed here are the



best opportunities for the region of Zajecar which are based on the amount of waste, composition of waste and EU directives, as the Republic of Serbia aims at EU accession.

7.5.1 Quantities of household waste

Quantities depend on:

- Population growth - a decrease in population in the municipality is observed;
- Economic growth (GDP);
- Increased coverage of waste collection;
- Reduce waste by pre-sorting and preparation for recycling.

Based on an analysis of the quantities of waste and in view of the general economic conditions it is considered that the small amounts of waste currently produced in the municipality would only slightly be affected by an initial separation (as proposed in the plan for waste management in the municipality of Knjazevac).

7.5.2 Prevention of waste

This measure is on top of the hierarchy of waste management. The positive results it would have would affect all areas of waste management - less waste leads to less spending on their management.

Prevention can be achieved in several ways:

- promotion of re-utilization of waste, especially packaging waste,
- promotion of clean technologies, which include recycling and recycling within their own production systems,
- development of the market of secondary raw materials,
- changing the behaviour of the population.

7.5.3 Recycling

Recycling is separation of specific components from the waste, such as paper, glass, plastic, metal, organic compounds and others and their preparation them for reuse. Recycling may be applied in two ways: by separating the components at the locations of the formation of waste or by subsequent (secondary) separation. Because of the small amount of waste generated in Knjazevac, a system of waste separation in households would be less efficient, compared to a set up of public waste separation facilities.



7.5.4 Composting

Composting is a process of recycling of part of the organic waste and converting it into useful material. It is also a way to meet the requirement to reduce organic waste to be landfilled.

There are different systems for waste collection for composting – either garden waste only, or garden waste mixed with municipal solid waste.

Currently Knjazevac municipality does not envisage the construction of composting systems.

7.5.5 Other technologies for waste recovery

In order to maximise the utilisation of resources and to reduce waste and the negative impact on the environment and human health, it is necessary to examine a maximum number of possible technologies for achieving these goals. Such technologies are: incineration, converting waste into fuel, gasification, pyrolysis and many others.

In the construction of the landfill depot, a system should be provided for the recovery of landfill gas.

7.6 Summary of the priorities in the plan for waste management of Knjazevac municipality

The municipal plan for waste management is a document that organizes the process of waste management at the municipal level. The municipal plan must comply with the regional plan or plan that regulates the area of joint management of several municipalities. The Knjazevac municipality will form a regional waste management system together with the municipalities of Zajecar, Kladovo, Majdanpek, Boljevac, Bor and Sokobanja. The municipal plan will be coordinated with the Regional plan for waste management for the Timok region.

The municipal plan for waste management presents the current situation in the region as quantities, type of waste, methods of collection, treatment and disposal. It also determines the direction and priorities, as well as the dynamics and way of solving problems in accordance with applicable national and EU legislation on waste management in the field of environmental protection.

The plan aims to create a sustainable system for long-term waste management, especially at the municipality level, but also for the region. Given that this is a municipality with a relatively small number of people, the system of waste management should be built in a way that has minimal adverse impact on the environment and health of present and future generations, with the rational use of resources and modern principles of waste management. Also, coordinated participation of all stakeholders of waste management - state authorities, local authorities participating municipalities, households, industrial and commercial organisations, NGO structures, the businesses and of course, every individual is needed. This includes determining the most appropriate model to achieve full control over the entire flow of waste, separation, collection, transportation, treatment and disposal. System management should ensure:

- Reduction of generated waste,



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- Separation of useful components of waste,
- Rational collection and disposal of waste.

This will require investments, dynamic activities and financial and technological readiness for transition to the new operating system.



8 Conclusion: Opportunities for implementation of good practices in the Kula and Knjazevac municipalities

The objectives outlined in the WMPs of both municipalities Kula and Knjazevac are similar, as both municipalities seek compliance with European legislation. Therefore, the recommended best practices are applicable to both communities on the objectives given in the table in section 4.3. of this report.

8.1 Kula municipality

The municipal program sets nine specific waste management objectives for the period 2016-2020:

1. Reduction of generated waste.
2. Achieving all predetermined regulatory targets for the preparation of household waste for recycling by 2020.
3. Achieving predetermined regulatory targets to reduce biodegradable and construction waste streams to landfill.
4. Management of specific waste streams in accordance with the requirements of national legislation.
5. Sustainable financial budget of the system at affordable prices for the population;
6. Environment-friendly disposal of waste.
7. Preventing and reducing the risk of old waste pollution.
8. Establish an effective legal framework for waste management at the local level.
9. Participation of the public.

All EU countries seek to achieve the objectives 1 to 9 and all listed practices present ways to achieve these goals.

For the municipality of Kula, given the small quantities of waste, separate collection is applicable of bio-waste, waste paper, plastic, metal and glass in separate containers to be collected and transported to the regional centers for collection of recyclable materials.

Regarding bio-waste, systems can be implemented for composting at local level, as set out in the Kula WMP and Art. 53 of the Regulation on waste management in the municipality of Kula. A common site for composting of bio-waste from the entire municipality could be built, neighbourhood-composting facilities only for garden waste can be provided, or a system of home composting could be applied.

8.2 Knjazevac municipality



The Regional Plan for Waste Management (RWMP) in the municipalities of Zajecar, Boljevac, Bor, Kladovo, Majdanpek, Negotin and Knjazevac outlined the priority tasks (section 11. Conclusion):

1. Provision of conditions for separate collection by a system of two containers (container for recycling of waste and containers for other mixed waste);
2. Construction of a regional landfill depot at the Regional Center in Zajecar.
3. Selection of one of the options offered by this regional plan and its timely assessment to meet all the requirements proposed by a optional solution;
4. Remediation and reclamation of illegal landfill sites in the region in accordance with the relevant acts and regulations.
5. Provision of continuous education of the public, experts and decision makers from local authorities in order to raise awareness in waste management as soon as possible.
6. As described in chapter "7.2.3 Methods of planning and financial management" the Regional plan suggests a particular step in the preparation and active work of all municipalities along with the procedure to create a new system that is durable, before building of a new regional landfill and recycling center has started. Interaction of municipalities will be more beneficial to all parts, compared to the current situation where each municipality works for themselves each using a different approach, more or less successfully, sometimes confronted with its own problems.

For the Knjazevac municipality the following practices are applicable: separate collection of bio-waste, paper, plastic, metal and glass in separate containers that would be collected and transported to a local collection centre for recyclable materials. This facility could be constructed at a site with convenient access for the citizens and with separately placed containers for the different types of waste and with the possibility for expansion when new practices are introduced, such as recycling of fabric, furniture or electric appliances.

Regarding bio-waste, systems can be implemented for composting at local level in the Knjazevac municipality territory. A common site for composting of bio-waste from the entire municipality could be built, neighbourhood-composting facilities only for garden waste can be provided, or a system of home composting could be applied.