

Modernization of local public services in the Republic of Moldova

- Intervention area 2: Regional planning and programming -



Regional Sector Program on Solid Waste Management: Development Region North

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Acronyms and Abbreviations

€	Euro
CPAA	Central Public Administration Authorities
RDA	Regional Development Agency
LPA	Local Public Authorities
EIB	European Investment Bank
EBRD	European Bank for Reconstruction and Development
WB	World Bank
IMC	Inter-municipal Cooperation
PPC	Possible Project Concepts
VCP	Viable Project Concept
RDC	Regional Development Council
WEEE	Waste electrical and electronic equipment
RD	Regional Development
EIA	Environmental Impact Assessment
EUR	Euro
NEF	National Environmental Fund
NFRD	National Fund for Regional Development
GIZ	German development cooperation through GIZ
WG	Working group
SWG	Sectoral working groups
RSWG	Regional Sector Working Group
GD	Government Decision
ENPI	European Neighbourhood and Partnership Instrument
IFI	International Financial Institutions
IWTS	Improved transfer waste landfill sites
WM	Waste Management
MRDC	Ministry of Regional Development and Construction
SWM	Solid Waste Management
ME	Ministry of Environment
RWM	Regional Waste Management
UN	United Nations
PET	Polyethylene terephthalate
GDP	Gross Domestic Product
ROP	Regional Operational Plan
RWMP	Regional Waste Management Plan
RSP	Regional Sector Program
DRN	Development Region North
DRC	Development Region Centre
REP	Extended Producer Responsibility
RM	Republic of Moldova
RDS	Regional Development Strategy
FS	Feasibility study
MBT	Mechanical biological treatment
CU	Composting units
EU	European Union
PIU	Project Implementation Unit
USAID	US Agency for International Development

Definitions

The following definitions apply for this RSP:

- **Collection** - means the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility;
- **Separate collection** – collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment;
- **Waste** – any substance or object which the holder discards or intends or is required to discard;
- **Hazardous waste** - waste which displays one or more of the hazardous properties
- **Disposal** - any operation which is not recovery even where the operation has as a secondary consequence the recovery of substances or energy.
- **Waste management** - collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker;
- **Preparing for re-use** - checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing;
- **Prevention** - measures taken before a substance, material or product has become waste, that reduce the quantity of waste, including through the re-use of products or the extension of the life span of products;
- **Recycling** - any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;
- **Recovery** - any operation whereby a material or a substance, which otherwise would be lost, is again regenerated/obtained;
- **Re-use** - any operation by which products or components that are not waste are used again for the same purpose for which they were conceived;
- **Treatment** - recovery or disposal operations, including preparation prior to recovery or disposal;
- **Waste oils** - any mineral or synthetic lubrication or industrial oils which have become unfit for the use for which they were originally intended;
- **Recovery** - any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy;
- **Waste electrical and electronic equipment (WEEE)** - electrical and electronic equipment that are waste, including all components, substances and consumables which are an integral part of the product, when it becomes waste;
- **Construction and demolition waste** - inert waste resulting from demolition or construction of buildings, represented by mineral debris originating from demoli-

tion or construction, reconstruction, repair and arrangement of buildings, roads and other civil or industrial structures, excavation of foundations and other, which are not classified as hazardous waste according to the legal provisions in force;

- **General hazardous household waste** - waste which displays one or more of the hazardous properties listed in EU directives concerning waste;
- **Sanitary landfill** – waste disposal site for storage of waste on or under the ground, meeting the requirements of EU directive concerning waste;
- **Municipal waste** - waste from households, as well as other waste which, because of its nature or composition, is similar to waste from household;
- **Biodegradable waste** - waste which can undergo anaerobic or aerobic decomposition, such as food and garden waste, paper and paperboard;
- **Street waste** - waste specific to public traffic routes that originate from everyday activity of the population, from landscaping, animals, deposition of solids in the atmosphere;
- **Bulky waste** - waste types of different origin that are too large to be accepted by the regular waste pre-collection and collection systems, requiring differentiated handling;
- **Micro-zone** - geographical area served by a transfer station;
- **Waste management zone** – geographical area served by an integrated waste management system (sanitary landfill, transfer stations, waste treatment facilities).

1 Introduction

The purpose of the Regional Sector Program (RSP) is to create operational instruments that will be used in the regional planning in Development Region North (DRN).

The regional planning activities in municipal waste management refer to solid waste management and management of waste similar to the latter, which can be generated by institutions, commercial and industrial units. Waste generated by other units includes:

- Bulky waste;
- Waste from parks, gardens, markets and streets;
- Waste electrical and electronic equipment (WEEE);
- Construction and demolition waste;
- Waste oils;
- Waste tires;
- Waste accumulators and batteries;
- Discarded vehicles;
- General hazardous household waste;
- Manure in rural areas;

The management of hazardous waste generated by industries and legal entities is beyond the purpose of this document.

The urgent need for sectoral planning emerged after the experience gained by the central and regional public authorities in regional development and in identification of projects for funding under the two calls for project proposals. The submitted projects were initiated without any real referral to national or operational strategic guidelines. The need for a change became obvious, in order to facilitate design of projects with a better performance, based on both national policy and a more detailed regional planning of the waste sector.

The basis for the development of strategic sector programs is the regional and the national strategic framework for waste management.

In the process of sectoral planning, criteria for identification of possible project proposals (PPP) that will later be developed into viable projects for funding were proposed. These criteria for identification of each PPC are in line with the criteria for identification of waste management areas. According to the regional approach, the waste management zones will be managed by all LPAs in these areas. The DRN has 2 areas identified for this region. Therefore, 2 system PPCs will be reviewed for the DRN.

The RSP is a regional planning operational tool developed to increase the capacity of LPAs to develop sustainable regional development projects and create conditions for the development of energy efficiency projects pipeline, incorporating development needs of the sector concerned in the DRN, observing its compliance with the sectoral policies, the existing practices and the relevant strategic framework. This finding is determined by the fact that the RSP:

- Includes sector development (medium-term) needs, in line with the existing sector policies, practices and the relevant strategic framework;

- Defines the needs for financial investment in the sector at the regional level;
- Helps in decision-making on the financial sources needs for the development of other projects;
- Helps in the dialogue with the potential development partners, presenting a clear vision on the development needs and prospects in the reference area.

At the same time, there is a clear understanding in the working group on delimitation of the regional sector programs' role. Thus:

- RSP do not aim to create an additional set of policy documents in the RD;
- RSP development does not substitute the process of sector policy development at the central level, but facilitates their implementation in the regions;
- The RSP must be perceived as comprehensive programs that would target the exhaustive implementation of all aspects of the national policy at the regional level;
- RSPs are not "master plans or general plans".

This document will provide a basis for waste management, the continuation of activities related to the detailed design and implementation of waste management systems recommended in the DRN, under three phases, namely: short-term (2013-2017), medium term (2018-2022) and long term (2023 and beyond).

Priority will be given to projects that can be implemented in the short and medium term. Implementation of the recommendations of this document will result in the creation of a solid waste management system in the DRN, which will be linked to the national development targets, EU policies and will have a significant contribution to national and regional development.

The RSP development methodology has been applied based on a participatory approach, based on the decisions of the Regional Sectoral Working Group Representatives (RSWG), established under the auspices of the North Regional Development Agency.

RSWG include one representative appointed by each rayon in the DRN, representatives of the Ministry of Regional Development and Construction (MRDC) and the Ministry of Environment (MoE), operating with the technical assistance of national and international GIZ experts.

The participatory approach and public consultations for the RSP were ensured by the workshop format, where all information, analyses and recommendations on sector planning were presented and discussed.

This document was developed in several stages, ensuring a balance between national objectives in the area, local and regional needs and initiatives in the territories and was coordinated with stakeholders:

- Baseline data were collected from all rayons in the DRN. This information includes demographic and economic data, information about the amount and types of waste, data on technical, financial and organizational aspects of waste management and information on current and planned waste management initiatives, ongoing projects funded by the National Environmental Fund and the National Fund for Regional Development, development partners, etc.
- Estimates of the number of population and the volume of waste were developed;

- Options were reviewed for clusters of districts that may work together in a waste management system, based on which appropriate recommendations were developed;
- Waste management technologies that may be used in each cluster of rayons were analysed and the optimal technologies were recommended;
- A financial assessment of the affordability of the proposed waste management system was carried out and financial arrangements were recommended, including tariffs, billing and cost recovery procedures;
- Options for institutional arrangements were reviewed and the preferred options recommended;
- Gender issues were studied;
- An action plan was developed.

2 Current situation review

2.1 Policy, Legal and Regulatory Framework

Policy, legal and regulatory framework relevant to waste management includes policy documents addressing environment protection and the administrative measures relevant to waste management services that do not provide the full range of requirements on environment protection as a result of waste management. This legal framework includes the following laws:

- Law of the Republic of Moldova no. 438-XVI of 28 December 2006 on regional development. This law includes the need to develop a National Strategy for Regional Development, the provisions of which, in turn, are translated into regional development strategies, which become the main regional planning and development documents. At the same time, the Law provides that regional development strategies include operational plans containing programs, projects and major activities. According to this law, the Regional Development Agencies are created to coordinate development in the North, Centre and South regions. Each Region has regional development strategies, the priorities of which include improvement of the environment and implementation of an improved solid waste management;
- Law on public utility services no. 1402-XV of 24.10.2002. The main provisions of the law are:
 - Public utility services (which by definition include waste management) are municipal services within the jurisdiction of municipal territorial unit;
 - Municipal public services can be provided through individual and municipal enterprises, joint stock companies, limited liability companies, companies with other legal forms of organization, including specialized departments of local authorities, businesses, regardless of their legal form organization, or individuals and/or associations thereof;
 - The Government of Moldova supports and promotes inter-municipal partnerships and associations for the establishment and operation of systems and services. As regards the financing of municipal services, priority is given to public-private partnerships, associations of local public administration authorities and private operators;
 - The National Agency for Energy Regulation approves tariffs for supply/provision of municipal public services;
 - Local public administration authorities have exclusive competence in the establishment, organization, coordination, monitoring and controlling of the operation of local public services and the creation, management and exploitation of public assets of municipal infrastructure of administrative-territorial units;
 - The operators established by local authorities for supply of public utility services will be established at the rayon level.
- Law no. 436 of 28.12.2006 on local public administration stipulates the following:
 - Local councils may be associated with other local authorities to take over public works and services and to promote and protect the interests of local public authorities. Each rayon approves the strategy, the forecasts, plans and programs for its economic development, recovery and environmental protection programs, as well as the arrangements for implementation and monitoring of taken actions. Each rayon decides whether to associate with other local au-

thorities in order to carry out public works and services that promote and protect the interests of local public services.

- Law no. 435 of 28.12.2006 on administrative decentralization reads as follows:
 - Waste management is the responsibility of the first level local public authorities (towns and villages). First and second level (rayon) local public authorities have full competence in the regulation and management of any local issues of concern that are not assigned to other authorities;
 - First and second level local public authorities may cooperate in projects or public services that require combining their joint efforts. The activities to be carried out through cooperation will be provided in the agreements signed between the parties in accordance with budgetary resources and responsibilities assumed by these. The agreements involve clear identification of the sources of funding and limits of decision making for each local public authority. Agreements on the provision/supply of services through the private sector may be signed by first and second local public authorities.
- Law no. 1347 of 09.10.1997 on household and production waste provides:
 - The Ministry of Environment has the lead role in formulating policy on waste management and carrying out state control over observance of legislation by legal and natural persons in waste management;
 - Does not include new approach of EU Directives on waste. To meet these requirements, this law must be adjusted to reflect, in particular, the standards and approaches of EU Directives.
- The draft waste law, designed to substitute the Law no. 1347 of 09.10.1997, includes transposition of the requirements set out in the Waste Framework Directive of the EU (Directive 2008/98/EC) and the principle of "extended producer responsibility". This law is currently at the stage of coordination. In addition, a draft law on sanitation was developed, establishing a uniform legal framework for the organization, regulation, management, operation, financing and control, of operation of the sanitation service in localities and communities.
- Law no. 851 of 29 May 1996 on Ecological Expertise and Environmental Assessment states:
 - Environmental Impact Assessment (EIA) is mandatory for new projects, programs, plans, schemes, strategies and concepts, in particular for strategic documents related to national economy, for projects and activities that depend on the expected level of impact assessment. According to this law, the EIA documents must include an assessment of alternatives and an environment protection plan that would address prevention of pollution of water, air, fauna and flora resources against the impact of generated and improperly managed waste.
 - Approval of EIA documentation must be carried out before the design and construction of landfills, regardless of their capacity. This law partially meets the requirements of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment and of the Convention on EIA in a Trans-boundary Context, ratified by the RM in 1993;
 - A new draft law is currently being developed on environmental impact assessment, where EIA is provided at a cross-border and national level for activities in Annex no. 1 and 2 to the law. According to this law, the EIA documentation shall also be mandatory for waste disposal facilities (not included in

Annex no. 1 to this law, with the capacity of 50-100 tons/day). This draft law is currently pending review in the Parliament of the Republic of Moldova.

- Law no. 1540 of 25 February 1998 on payment for environmental pollution, implements the "polluter pays" principle by levying a tax on pollution generating activities and products, including:
 - Pollutant emissions of stationary sources;
 - Pollutant emissions of mobile sources;
 - Pollutant emissions by motor vehicles not registered in the Republic of Moldova;
 - Discharges of pollutants;
 - Storage of production waste;
 - Imports of goods, which, in the process of use, cause environmental pollution.
- Waste Management Strategy, approved by GD no. 248 of 10.04.2013, stipulates:
 - Future waste management should be based on integrated waste management concepts on a regional scale, to be achieved through instruments to harmonize the legal, institutional and regulatory framework with EU standards;
 - Identifies the main problems and solutions related to waste management and the key actions needed to implement d solutions and ensure an integrated socially, economically and environmentally efficient system;
 - Identifies the major problems related to the existing waste management system in the Republic of Moldova, including in the regions;
 - Plans for the next 5-7 years measures to reduce the waste management impact on agriculture, tourism development, drinking water supply and public health;
 - Solutions to the identified problems, which will be developed according to policy approaches: (i) The integrated waste management will be developed by harmonizing the legal, institutional and legal framework with EU standards, (ii) Regional approach whereby more communities and districts are using a single infrastructure for waste management. In this context, the Strategy proposes a preliminary territorial division of the country into waste management regions;
 - The strategy is based on the provisions of the draft new Association Agreement EU - Republic of Moldova, which is being negotiated and which sets up the future legal framework on waste management. The signing of this agreement will establish a closer relationship for progressive development between Moldova and the EU in this area, based on a single policy of strategic directions in the field of waste management and the adoption of EU standards. According to this document, the central and local public administration authorities will have much greater responsibilities in the waste management sector.

Conclusions regarding the existing political, legal and regulatory framework:

- There is a shortage of the legal and regulatory framework for the successful implementation of an integrated waste management system according to EU requirements;
- There is a political, legal and regulatory framework that would support the institutional basis for the development of regional sector programs for the waste management, namely on: adopting a regionalized approach for the development of waste management programs, creating an inter-institutional intermunicipal ("regionalized") framework to guide the development, approval, implementation and

operation of waste RSP; recommending "association of municipalities" as the basic inter-municipal entity for program implementation;

- The existing policy, legal and regulatory framework partially supports the technological basis for the development of waste RSP, but it seems to be insufficient, given that the existing legal framework requires adjustment. Two draft laws have been developed, the waste management strategy is adopted, but there is still no comprehensive legal framework for promoting EU standards in this area. However, the documents concerned can be used as a basis for planning issues related to the inclusion of various technological options on waste management, in accordance with the hierarchy of waste management, but also to assess the options that are defined on the basis of EU standards;
- The policy, legal and regulatory framework does not clearly define the provision of financial support for the sector and only refers to financial sustainability, which is insufficient for the development and implementation of the project;
- The legal framework on cooperation for service provision provides for the possibility of the communities to establish inter-municipal entities for the purpose of waste management. While national entities play important policy, regulation, monitoring and enforcement roles, decision-making on waste management concerning the operational and administrative issues is performed locally, and this factor will apply to the subsequent stages of decentralization that may be promoted by the Government of Moldova;
- The adoption by the Government of the Republic of Moldova of the legislative framework for local public administration and municipal services in 2002 - 2006 assigned the responsibility of APL 1 (communities) to provide public waste management services and APL 2 (rayons) - planning responsibilities related to waste management.

2.2 Institutional Framework

The institutional framework providing specific competences in waste management includes the following:

- The Ministry of Environment is the competent authority empowered with responsibilities for the development, promotion and implementation of state policy in the field of waste management. It performs the environmental assessment of programs, schemes and projects related to transportation, storage, processing, neutralization, recovery, use, burial and disposal of waste, coordinates the projects of construction and reconstruction of economic and social destination buildings;
- The Ministry of Regional Development and Construction is responsible for developing the regional development policy, coordinating and monitoring, in cooperation with the Regional Development Councils, the process of developing regional strategies and development programs;
- The Ministry of Health provides sanitary-epidemiological supervision of formation, transportation, storage, processing, neutralization, use, burial and disposal of waste, coordinates decisions on impact on land for the storage and neutralization of hazardous waste, coordinates, in terms of compliance with sanitary-epidemiological requirements, the project documentation for the construction or reconstruction of enterprises and other facilities generating waste;
- The RDA is responsible for implementing the RDS and ROP containing priorities and measures (RDS), programs and projects (ROP) in the waste management related field;

- LPAs are responsible for the organization, management, administration, monitoring and control of the operation of public utility services and coordination of their activity. Management of public utility services may be provided directly by LPAs or through public-private partnerships. LPAs are responsible for developing programs for rehabilitation, expansion and modernization of the existing facilities, as well as programs for setting up new public utility systems, coordinating the design and execution of technical construction works, in order to achieve their correlation with the country's programs for socio-economic development of localities, with landscaping plans, general urban development plans and environmental programs. At the same time, LPAs are responsible for adopting, jointly with the local environmental and health authorities, decisions on the construction and expansion of sites for the processing and neutralization of waste, systematic tracking of generation, storage and processing of waste on the subordinated territory, organization of waste collection and disposal, preparation of records of waste disposal sites etc.;

The services provided by LPAs in collection and disposal of waste depend largely on their capacity to manage the services and to involve the private sector and the civil society in promoting the separate collection of waste and attracting financial resources from different sources of funding for this sector.

2.3 Sanitation services

The municipal sanitation companies in the DRN provide services for collecting and transporting waste from the storage sites existing in the locations. These companies are established in accordance with the legislation on local public administration and public utility services, as well as other regulatory acts in this area. The quality level of services provided in different regions is different, but their assessment is not conducted by LPAs or other authorities, as there are no regulatory acts developed on services' performance criteria. Waste disposal from localities to storage sites is organized with different frequency, depending on service equipment with necessary machinery for collection and transport units available in each locality. Equipment of services with machinery for collection and storage of waste, and the status of the existing storage sites are shown in Annex no. 1 to this document. According to the Annex, there is an insufficiency recorded in endowment of sanitation services in the DRN with equipment and financial resources necessary for effective management of the sector.

Municipal sanitation companies are responsible for ensuring waste compaction and storage technology, for ensuring the ecological status according to the provisions on operation of such sites, but this is not done because of lack of funds and equipment.

According to the results of the inventory conducted in the DRN, about 25 sanitation services were identified, of which 15 - in urban areas and 10 - in rural areas, which mean a 75% coverage of urban areas and about 1.8% coverage of rural areas with sanitation services. These service providers are conducting collection, transportation and disposal of waste to a local storage site, in an organized manner. These companies are operating under a contract signed with individual waste generators.

In rural areas, where sanitation services are not available, waste disposal is carried out individually by people who generate waste. They dispose waste in recreation areas, in river valleys, green areas, thus damaging the environment. All generated waste, including various categories of waste, get into waste bins, as there is no centralized system for separate collection. There has been a trend recently to cover some rural localities

with waste collection services, including separate collection, by expanding urban sanitation services.

The current separate collection services are provided by some entrepreneurs who purchase certain recyclable materials: paper, cardboard, glass, PET bottles, but this process is not centralized or controlled.

Some sanitation services are delivered under concession agreements. As of 2012, 7 public-private partnership concession contracts for local services were included in the Registry of Assets. Such contracts are registered in Donduseni and Balti. According to analyzes conducted by the Public Property Agency on the enforcement of service concession contracts, it was concluded that the feasibility studies prepared and presented by local authorities to justify the conclusion of service concession contracts did not meet the requirements on the form and content of a feasibility study. The risk of such contracts is that they do not present any thorough analysis of the local sector, based on which sector planning decisions can be made. This may create obstacles in RSP implementation.

In the DRN, the amount of collected and stored waste is not registered because there is no organized and permanent weighing or monitoring of it. Thus, the amount and the types of waste collected or recycled in each locality, rayon and region are not known. Sanitation services apply the method of waste disposal on land or in existing dumpsites, which in most cases are not authorized and are a major source of soil and groundwater pollution. These dumpsites do not meet modern environmental standards in terms of their location, design, construction and exploitation. The disposed waste is not compacted or covered with inert material to prevent fire and the spread of odours.

There is no control of the quality and quantity of waste landfills, no national program for capturing landfill gas or for the collection, recovery/treatment of leachate, the access roads to waste disposal sites are not maintained, vehicles and other equipment are not cleaned, waste disposal sites are not fenced, guarded and marked. Almost every community has its own landfill, and therefore the communities in NRD are full of waste and lighter fractions carried by the wind and light.

Figure 2-1 presents information on existing landfill sites in the DRN, as well as on their legal status.

Figure 2-2 shows the existing equipment used in the waste management system in the region.

Figure 2-1: Existing landfill sites and their legal status

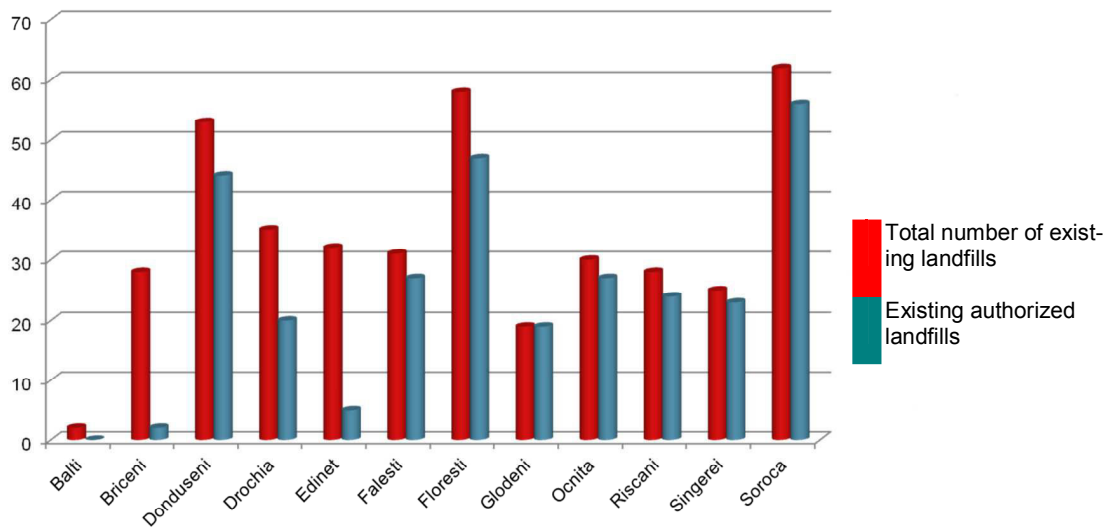
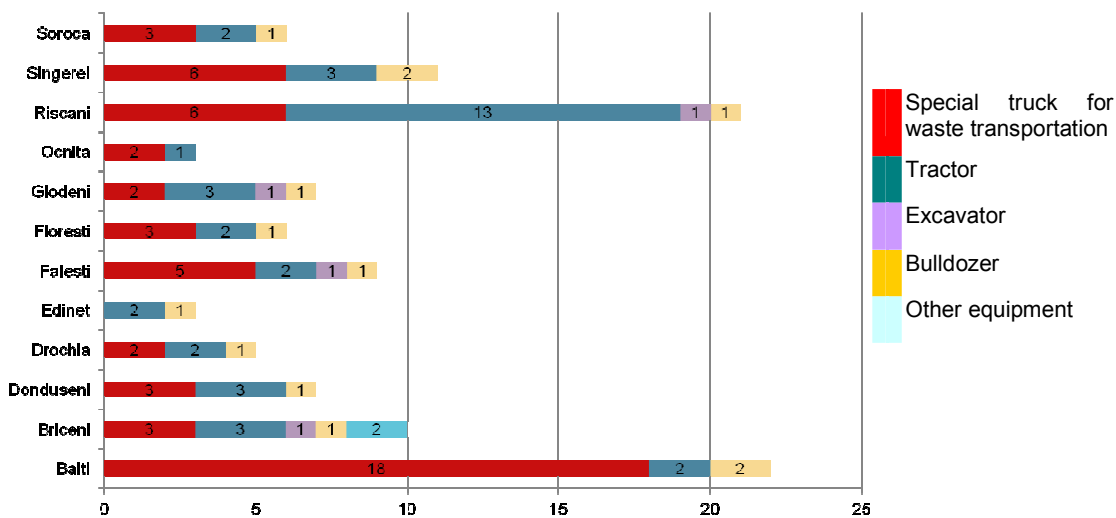


Figure 2-2: Equipment used for waste management



2.4 Existing sector funding sources

The main sources of funding available for the waste sector include: State Budget, National Environmental Fund, the National Fund for Regional Development and the individual contributions of enterprises, and in recent years - international financial resources of development partners. These funds are used to finance a wide range of waste management projects throughout the Republic of Moldova. At the same time, no central national institution currently has any comprehensive record of investments in waste management from the abovementioned funding sources. However, data from the Waste Management Strategy show that in 2002-2006 LPAs received about 1 million

Euros under the EC Good Neighbourhood Program for waste management. Under this program 4 projects are financed, with a budget of about 15 million lei. During 2005-2012, tens of millions of USD were allocated from the abovementioned funds for the purchase of specialized equipment for collection, transportation and liquidation of non-compliant landfills. Only for liquidation of these landfills and organization of others about 100 million lei were allocated from the NEF during this period.

The recent years' experience shows that these investments from various sources are not properly coordinated and did not allow achievement of expected results in waste management.

The operational revenue sources for the waste management system are a combination of budget allocations and revenue from the collected taxes, but they cannot cover expenditures for the management of the entire sector. Budget allocations are made from local budgets and range from 5% to 20% of their value. The level of charges for services varies between 5 and 10 lei/person/month (0.33 to 0.67 €/month) in different rayons. Legal entities pay approx. 70-110 USD per m³/ waste they generate.

Lack of financial sources in the sector is caused by a number of factors, including application of inadequate management in collection of payments from waste generators and in provision of budgets from non-tariff revenues.

To increase the effectiveness of sanitation services, the method of payment for services by waste generators, particularly by the private sector owners who do not honour their obligations of paying for such services must be revised.

Financial resources available for managing the sector are insufficient to cover all expenses related to waste management. According to information submitted by the existing sanitation services, the financial resources accumulated from payments for services cover the transportation expenses only, while the expenses related to burial technology are not covered. There are no resources to support the development of new technologies in the sector. The non-tariff revenues are not accumulated and are not part of the budget of expenditure for provision of services, as the separate waste collection and recycling of the useful fraction are provided by economic agents who, on the one hand, contribute to reducing the volume of waste stored in the landfill and, on the other hand, revenues from the recycling process do not return to the existing system's cash flow.

2.5 Gender issues

Gender issues in planning processes in Moldova are not covered or are not considered. Gender was mainstreamed at all stages of planning, by ensuring equal participation rights in sector planning and consultations, differentiation and disaggregation of data available in the sector subject to review and stakeholders' awareness on the importance of gender equality.

So far the waste management at national and regional levels has not been studied enough to make decisions on the development of the sector with application and mainstreaming of gender issues, namely:

- Attitude towards waste management and public health/hygiene varies between men and women, women having higher requirements for the public health and cleanliness level than men. Poor public health and low cleanliness level of public spaces are often related to improper management and insufficient collection of waste. Thus, women are more likely to pay more for waste management than men, as the benefits of waste management are a more important value for them;

- The roles of men and women influence their perceptions, as the women have the main responsibility for the purchase of daily needs and for cleaning the household (including waste management in the house and disposal of waste in a street container). The procurement decisions of women are thus the key as regards the amount of waste generated in the daily activities (ex. waste related to food packaging). Also, women are more interested than men in some issues related to waste management, such as placement of waste bins and the frequency of emptying street containers.

2.6 Social issues

The standards of living of the urban population differ from those of the rural population, which has fewer economic prospects, lower income per capita compared to the population of the urban areas and difficult access to public sanitation services.

Development of cities as urban centres is an opportunity for regional development policy, including for the implementation of public utilities services, being seen as an opportunity for gradual revitalization of Moldovan economy and raising the standard of living in all regions of the country.

There is a need to expand sanitation services from towns and cities to villages, thus helping to increase the quality of life and living conditions in rural areas, in line with those in urban area. These criteria, as well as national objectives in waste management are taken into consideration when developing the RSP in this area. In this context, it should be noted that, in accordance with EU practice, the total annual cost per capita for solid waste management services must not exceed 1.5% of annual income per capita in the area served by the waste management system.

There is a vital need for planning the waste management sector in the regions and attracting investments that will solve the socio-economic problems related to the following:

- Creating new jobs, including through recycling of materials;
- Improving external exchange reserves by exporting recycling materials;
- Promoting agricultural productivity by producing compost according to quality criteria;
- Ensuring local energy security through energy recovery from waste;
- Obtaining new sources of revenue from actions targeting reduction of carbon dioxide emissions associated with waste degradation;
- Improving access to quality care, the state of the environment and human health.

2.7 Lessons learned in the Waste Sector in Moldova

The waste management system is currently insufficiently covering the territory of Moldova and required reforms in order to be developed. For a successful development of the sector in the region the experience acquired in this field and in other areas must be taken into account, as it can provide information support for waste management planning. These experiences concern the following:

- In the Southern region, a Strategy for Waste Management was developed for a 15-years period in 2011 with EU support, adopted by the Regional Development Council of the region concerned. The lessons learned from this activity include:

- The participatory approach involving local decision-makers and stakeholders is an effective mechanism for presenting analyses, discussing issues and making generally acceptable recommendations;
- The regional approach to waste management can achieve a number of national, regional and local development objectives in a cost effective manner and in a way that is acceptable to local authorities;
- Inter-municipal cooperation through various forms of association of local public authorities may become a flexible mechanism to ensure local decisions on the application of an efficient management and coordination of waste management activities for the benefit of all local public authorities. However, the development of legal and regulatory framework must be continued in order to support an efficient performance of LPA association.

In 2012/13 there was a significant interest among local public authorities concerning establishment of partnerships with the private sector for delivery of waste management services based on service concession contracts. No effective planning process supporting concession initiative has been conducted yet, and the signing of concession contracts has not been the object of any earlier public debate. Moreover, the relevant legislation on the development of concession contracts has not been considered.

Concession contracts for a period of 49 years, signed by LPAs, may not have the capacity to implement all aspects of the RSP in the context of the region, which (if legal) impose a significant financial burden and risk of failure by LPAs to implement the planning expected in the RSP. Therefore, there is a strict requirement for the regional planning process to apply the participatory principle, in order to ensure transparency of information concerning the future needs of the community in terms of services related to sector management and the related costs.

It should be noted that 67 local public authorities in the DRN and the DRC have applied certain measures to establish inter-municipal cooperation by signing agreements for joint provision of waste management services, but have encountered some difficulties in terms of planning, enforcement of environmental impact assessment legislation, land ownership, and other problems. Despite these difficulties, significant experience has been gained in the development of inter-municipal cooperation and public awareness on the waste management issue. These experiences were very helpful in developing the RSP for waste management and serve as basis for making decisions on the creation of institutional structures and partnerships in the field.

2.8 Key findings on the existing Waste Management

The main findings on waste management services in the DRN are as follows:

- Waste collection covers the urban population at 75% and the rural population - at a rate of 1.8%, which is a serious issue in the living conditions of the population;
- Approximately 392 existing landfills do not meet the international environmental standards, and therefore are a threat to public health and environmental resources, except for 2-3 landfills that meet the environmental requirements;
- The shortage of capital in the sector for the reason of improper coordination of funding for waste management infrastructure. The domestic budget expenditure is insufficient to achieve minimum standards of service and to protect public health, environment and tourism development in the region;
- Insufficient management and administrative capacity at all levels;

- Drawbacks in sector planning, including in the area related to attracting private capital in financing infrastructure and waste management equipment, which creates confusion and uncertainty as to the actual capacity of the private sector to provide services;
- Incapacity/unwillingness of communities to pay for WMS services;
- The Waste management activities do not comply with the waste management hierarchy, established according to UE directives, which proves the existence of a significant impact on the environment in the region. The way the waste is managed in the EU as a whole, in three countries - Hungary, Poland and Estonia, which joined the EU in 2004, and Romania, which joined the EU in 2007, is presented in Table 2-1. The data resulting from comparison of the share of waste disposed in landfills show that in Moldova, the waste disposal in landfills is the only applied solution, while waste recycling accounts for only a small percentage. This applies to the DRN as well.

Table 2-1: SWM in the EU, selected EU member states and in RM in 2011¹(in %)

Waste management method	EU	Hungary	Poland	Estonia	Romania	Moldova
Storage	37	67	71	70	90	> 98
Incineration	23	11	1	0	0	0
Recycling	25	17	11	20	10	< 2
Composting	15	5	17	10	0	0
Total	100	100	100	100	100	

¹ Source: Municipal waste generation and treatment, Eurostat, 2011;
<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdpc240>

Data for Moldova are tentative;

Data for Romania are taken from Key issues in municipal waste management in EU-11 countries;
[http://www.ey.com/Publication/vwLUAssets/Key_issues_in_municipal_waste_management_in_EU-11_countries/\\$FILE/Raport_eng.pdf](http://www.ey.com/Publication/vwLUAssets/Key_issues_in_municipal_waste_management_in_EU-11_countries/$FILE/Raport_eng.pdf)

3 Vision, objectives

3.1 Strategic vision of the stakeholders

The vision of stakeholders from the DRN was presented by the RSWG in the CNR, which participated in the development of this program and formulated the sector development vision, being inspired by the national strategic directions, particularly on integrated waste management and the regional approach. This vision statement is presented as follows: "Solid waste management must be integrated, modern and efficient in economic and technical terms and based on inter-municipal cooperation through the public awareness perspective (environmental friendly impact), as a cornerstone of a healthy surrounding environment".

This statement shows that the need for cooperation between communities is seen as a central element of future waste management activities and stresses that in the future the waste management will use a variety of technologies to be applied efficiently and meet modern standards.

3.2 Overall and specific objectives of the RSP

The overall objective of the RSP is to improve local public services for waste management in the Development Region North (DRN), through gradual transition to the new standards according to EU Directives.

The overall objective of the RSP in SWM is focused on specific objectives that will contribute to strengthening the potential of implementing the waste management system.

The specific objectives provide as follows:

- Strengthening the political, legal and regulatory framework by 2018 to ensure the establishment and operation of the regional waste management system;
- Strengthening and developing the institutional framework, taking into account the entire regional waste management system;
- Developing waste management infrastructure in the region, taking into account all the elements necessary for the operation of the regional system;
- Informing, raising public awareness of the need for waste management at regional level.

4 Forecasts/ options/ strategic guidelines

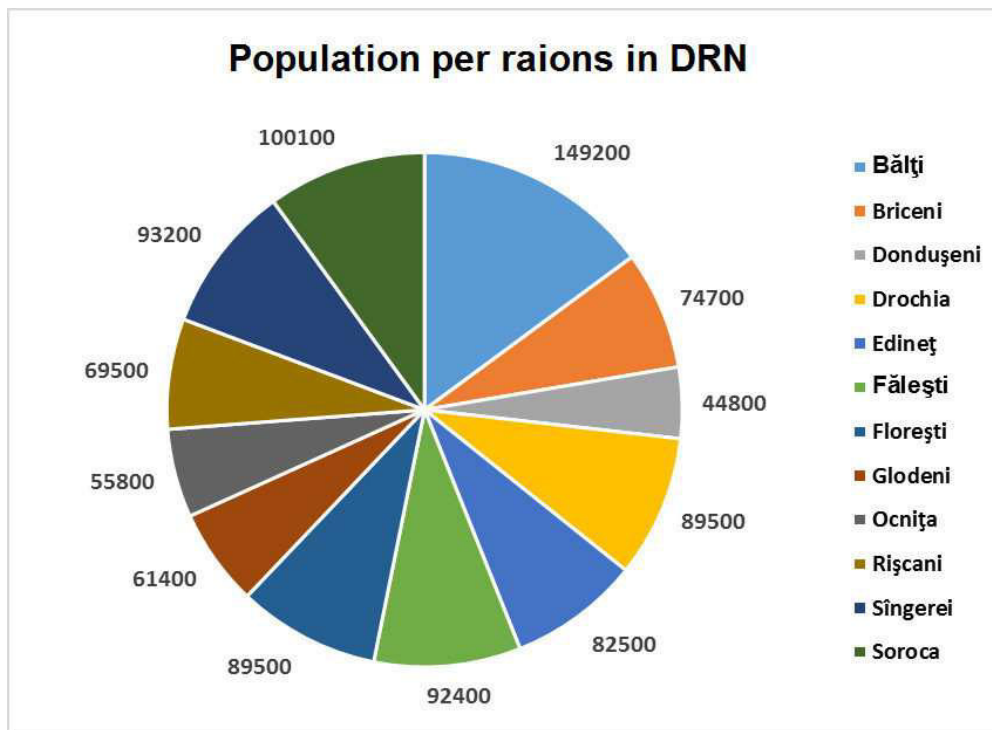
4.1 Projections concerning population, the amount and the structure of waste

The waste sector in the DRN has not been studied so far and as a result the current and historical amounts of generated and manipulated waste are not known.

The projections presented in this document were based on the waste sector audit data, presented at GIZ proposal, for the Municipal Enterprise “Regia Apa Canal Soldanesti” in 2010, also taking into account the data from neighbouring counties of Romania and specialized analyses based on observations during the field visits.

The projections concerning the waste generation depend on two important variables: population and economic conditions in the area for which the projections are made. Therefore, the trends in the population are extremely relevant for the amount of waste generated by households and by legal entities. Figure 4-1 shows the number of population of NDC rayons in 2013, based on data provided by the National Bureau of Statistics, according to which a population decline of 0.2% per year is forecasted.

Figure 4-1: Population of DRN rayons (2013)



The national GDP is expected to grow in the following years at a rate of approx. 5% per year, while in regions outside Chisinau this growth is expected to be half this rate. The economic growth even if slow, allows incurring higher expenditures and results in a higher level of consumption, which increases the amount of waste generated per household and therefore generates a higher overall volume.

The estimated waste amount in the DRN was based on the above data, as shown in Table 4-1.

Table 4-1: Cumulative waste generation (2018-2043)

Year	2018	2023	2028	2033	2038	2043
Aggregate tons generated from 2018 and further	215,916.9	1,340,554	2,470,261	3,599,967	4,729,673	5,859,379

Further details on waste amounts and structure are provided in Annex 2.

4.2 Sector financing

According to studies of the Waste Management Strategy, the waste management sector at the national level requires huge investments, which means, of course, involvement of financial institutions of the state in financing objects designed for recycling and disposal of waste and of foreign financial institutions for building infrastructure related to this sector.

Both domestic and foreign sources will be used for sector financing.

The domestic sources of funding primarily include the State Budget, the National Environmental Fund (NEF), the National Fund for Regional Development (NFRD), individual contributions and those of businesses.

For 2013-2015, the Ministry of Finance identified a budget of approx. 225,755 million lei (approx. 13 million Euro) in the medium term expenditure framework for waste management activities (approx. 0.25 million € or 1.7% of the total) will be attracted from domestic sources and the remaining amount (98.3%) – from the National Environmental Fund.

The value of the National Regional Development Fund amounts to 1% of the approved revenues of the state budget for the relevant year, excluding special purpose revenues provided for by law, and their allocation is made under the Single Programming Document, approved based on Calls for proposals launched for the multitude of priorities and measures at the same time.

The available budget of the National Fund for Regional Development in 2013 is MDL 191 mln, and according to the medium-term budget framework, by 2015 the budget amounts to 625 mln MDL. The external funding is received from the financial and technical assistance, including grants and loans provided by international financial institutions and bilateral donors, resources for the implementation of international agreements and foreign investment.

The external sources of funding include international financial institutions (IFIs) and donor agencies that may have a major contribution in the development of the sector, such as the European Investment Bank, European Bank for Reconstruction and Development, World Bank, USAID, which implement projects on Moldova. IFIs have shown their availability to finance waste management projects, depending on preparation of projects they consider viable. One of the preconditions for IFI participation is the state guarantee.

A number of donor countries and the EU have expressed their willingness to support the further development of the waste management sector. In some cases it is intended for technical assistance and preparation of investment projects. Such assistance is often accompanied by the "grant" component, but development of investment projects -

in accordance with donor standards and international practices on sustainability of projects and thorough analysis of all aspects of feasibility - technical, economic, social and environmental - is absolutely imperative.

The private sector funds are usually made available by concession contracts or other forms of public-private partnership. The availability of private sector funds has been demonstrated in principle by signing several concession contracts in the waste sector and building waste treatment facilities (mechanical biological treatment plant, not functional in Chisinau). Private sector investments require connection to national sector policies and correct and proper coordination respectively. The funds in this sector can provide an important investment opportunity. However, these funds usually involve higher costs for the beneficiary, as the cost of capital is higher in the private sector than the public sector. In addition, it is essential if private sector funds will be used. They must be requested as response to projects that are defined by the public sector in a planned and strategically justified manner:

4.3 Waste Management hierarchy principles

To encourage an efficient management of municipal waste, the RSP will take into account the principle of waste management hierarchy in line with EU policy. In this context, the priority of activities for a sustainable waste management will be as follows:

- **Prevention and reduction:** Minimize waste. Some waste could be avoided completely, while in other cases amounts can be minimized. Particular priority should be given to reducing the hazardous components of waste, while some hazardous materials should be completely removed from the waste stream;
- **Reuse:** Re-introducing objects in use, so that they do not enter the waste stream. Examples include retreading of tires and recharge of bottles;
- **Recycling:** Separation of materials for conversion into new products such as re-processing of used paper into new paper products;
- **Recovery:** Getting more value from waste by turning it into something different, such as converting organic waste into compost and energy recovery from waste;
- **Land disposal:** The least attractive waste management option. A priority in waste disposal would be ensuring that it is carried out at a high standard in order to limit environmental impact.

The application of the hierarchy described above in the management of a new regional waste management system will help ensure its financial and economic sustainability and reduce its environmental impacts. According to these principles, targets for the development of the sector were established.

4.4 Sector development targets

The strategic directions established at the national level are included in the Waste Management Strategy and are geared towards integrated waste management, which is planned to be performed on the whole territory of Moldova by 2027. The Strategy also identifies the short-term period (2013-2017), which will be characterized by planning, strengthening the legal and institutional framework, followed by implementation and investments in the sector, in order to achieve a modern integrated waste management system. The strategy identifies development of the principles of recovery and reuse of resources, together with the gradual reduction and rehabilitation of waste, which will be replaced by a small number of landfills that will serve several regional communities as

a priority. As a result, the sector development in the RSP in DRN will reflect the strategic direction related to promoting regional approach to sector planning in accordance with the Waste Management Strategy.

The implementation of waste management hierarchy principles requires the establishment and achieving of sector development targets, defined for three main development stages, namely short-term (2013-2017), medium (2018-2022) and long term (2023 and beyond), as required by Table 4-2.

The achieving of targets will be connected to specific objectives classified in chap.3.

The RSP for waste management for the DRN focuses on attaining sector development targets for the short and the medium term, while the long term targets will be achieved through more efficient use of infrastructure to be built in the short and medium term.

In this table, the targets are set for each stage of waste collection activities, recovery of resources from packaging waste, organic waste and special waste (hazardous, construction and demolition and bulky waste), as well as for the gradual disposal and land-filling.

Table 4-2: Sector development targets²

Planning Period	Waste Collection	Waste Recovery ³		Special waste ⁴		Transfer stations and waste disposal
			Packaging materials Organic waste	Bulky waste	Construction and demolition waste;	
In the short term:	2013- 2017 100% of urban and 75% of rural areas	15% (rural areas) and 25% (urban areas) of recycled waste	Pilot projects to be developed/implemented for demonstration of the most efficient measures	40% treated properly for safe recycling or disposal	40% treated properly for safe recycling or disposal	Development of a transfer station per micro-zone; Reduction of the number of landfills to 1-3 consolidated locations per rayon; Initiation of construction of a sanitary landfill; Initiation of recovery of old landfills
Medium term:	2018 – 2022 Coverage of 100% of rural areas	25% (rural areas) and 35% (urban areas) of recycled waste	50% (rural areas) and 40% (urban areas)	reused55% treated properly for recycling and/or disposed safely	55% treated properly for recycling and/or disposed safely	Reduction of the total number of landfills to not more than a sanitary landfill per waste management zone, gradual closure/rehabilitation of remaining landfills
Long term: 2023 and beyond		35% (rural areas) and 45%	100% reused	70% treated properly for recycling and/or	70% treated properly for recycling and/or	Waste disposal to a sanitary landfill per waste management

² These sector development targets follow the Waste Management Strategy and have been developed in coordination with the national and local stakeholders for the DRN.

³ The national solutions for the management of this waste will state that each of this categories of waste should be collected separately, stored separately and treated, recycled or disposed separately.

⁴ In addition to the targets identified for these types of waste, targets for the recycling and management can be established in coordination with the national relevant entities and producers, as relevant, for the following categories of waste: hazardous household waste, used tyres, waste oil, waste batteries/accumulators, waste electric and electronic equipment, discarded vehicles.

		(urban areas) of recycled waste		disposed safely	disposed safely	zone
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4.5 Options for the selection of Waste Management Zones

To enhance the efficiency of current waste management services and establish an integrated waste management system in the region, selection of the model for delivery of services and of applied technologies that can be efficiently promoted by management zones, according to the experience of the European countries, becomes important.

Waste management at the level of management area implies that a number of communities use the same technology, facilities and equipment.

Management areas are identified according to the criteria listed in the Waste Management Strategy. These include:

- Issues related to geographical position;
- Economic development;
- Availability of access roads;
- Soil and hydro-geological conditions;
- Number of population etc.

For DRN, waste management zones were selected by drawing and analysing scenarios aimed to determine the preferred clusters of rayons in these zones at the regional level, taking into account the criteria set out in the Waste Management Strategy. The analysis was conducted for three scenarios in accordance with Table 4-3. According to this table, scenario A1 differs from scenario A2 only by incorporation of Floresti rayon.

Table 4-3: Scenarios for potential waste management zones assessment

Scenario A1	Scenario A2	Scenario B	Scenario C
North Region			
Singerei	Singerei	Ocnita	Ocnita
Falesti	Falesti	Donduseni	Briceni
Balti	Balti	Edinet	Edinet
Glodeni	Glodeni	Briceni	Donduseni
Riscani	Riscani		
Soroca	Soroca	Singerei	Drochia
Drochia	Drochia	Falesti	Riscani
Floresti		Balti	Glodeni
		Glodeni	Balti
Ocnita	Ocnita		
Donduseni	Donduseni	Riscani	Falesti
Edinet	Edinet	Soroca	Singerei
Briceni	Briceni	Drochia	Ungheni
			Telenesti

Under each scenario, the clusters of rayons in regional zones for waste management are indicated in grey.

The scenarios were assessed in order to establish a management system for the rayons at the lowest total cost for the main elements of management, technology, transportation and disposal of waste (see Annex 3).

This analysis took into account:

- The amounts of waste generated by each group of rayons;
- The desired location for a sanitary landfill that will receive waste for storage from all rayons in the cluster;
- Adequate distances on access roads, on which waste will be transported from where they are generated to the sanitary landfill;
- The locations for the transfer stations and the equipment for transportation, taking into account the road infrastructure, in order to ensure the availability of adequate roads.

According to data presented in the table below, the total of 375,673 tons/year of waste will require an adequate management in the DRN and DRC as a total. The options for the management of this amount of waste are described in Scenarios A1, A2, B and C, which correspond to the scenarios presented above. The annual operational costs for managing these wastes vary. The costs are higher for some scenarios than for others.

Scenario A1 was identified as the least costly in terms of transportation and disposal of waste (see Table 4-4). This scenario is in line with the rayons' arrangements, included in the Waste Management Strategy.

The configuration of this management zone was coordinated with the RSWG in DRN during the workshop held in April 2013. Thus, 2 waste management zones were identified for the DRN, which are shown in Table 4-3. For DRN, the waste management will be organized in 2 zones that include LPAs in the following rayons:

- Waste management zone no. 1. Singerei, Falesti, Balti, Glodeni, Riscani, Soroca, Drochia, Floresti;
- Waste management zone no. 2: Ocnita, Donduseni, Edinet, Briceni.

Table 4-4: Estimated annual operational costs for the scenarios (2013)

Scenario	Waste managed annually [tons]	Average total annual operational cost [Euro/an]	Average total annual operational cost per ton [euro/ton]
A1	375,673	9,325,000	24.82
A2		9,435,000	25.11
B		10,551,000	28.09
C		10,889,000	28.99

The cost differences between scenarios are due to the fact that the distances and the costs of transportation vary, the opportunities for costs reduction through transfer stations vary and the waste storage requirements vary too. The A1 scenario seems to be one that involves the lowest cost - that is the scenario that reflects the waste management zones that are recommended in the Waste Management Strategy as those involving the lowest costs among the scenarios that have been assessed. However:

- While the A1 scenario is indicated as the one involving the lowest cost, the cost difference between Scenario A1 and A2 is small;

- In accordance with the legal framework pertaining to the local public administration, LPAs have the main role of deciding whether they want to participate in a regional waste management and with what LPAs they would like to work in this context, if such exist.

Figures 4-2 and 4-3 show the clustering of rayons in DRN in 2 waste management zones.

Figure 4-2: Clusters of rayons selected for the management zone no. 1

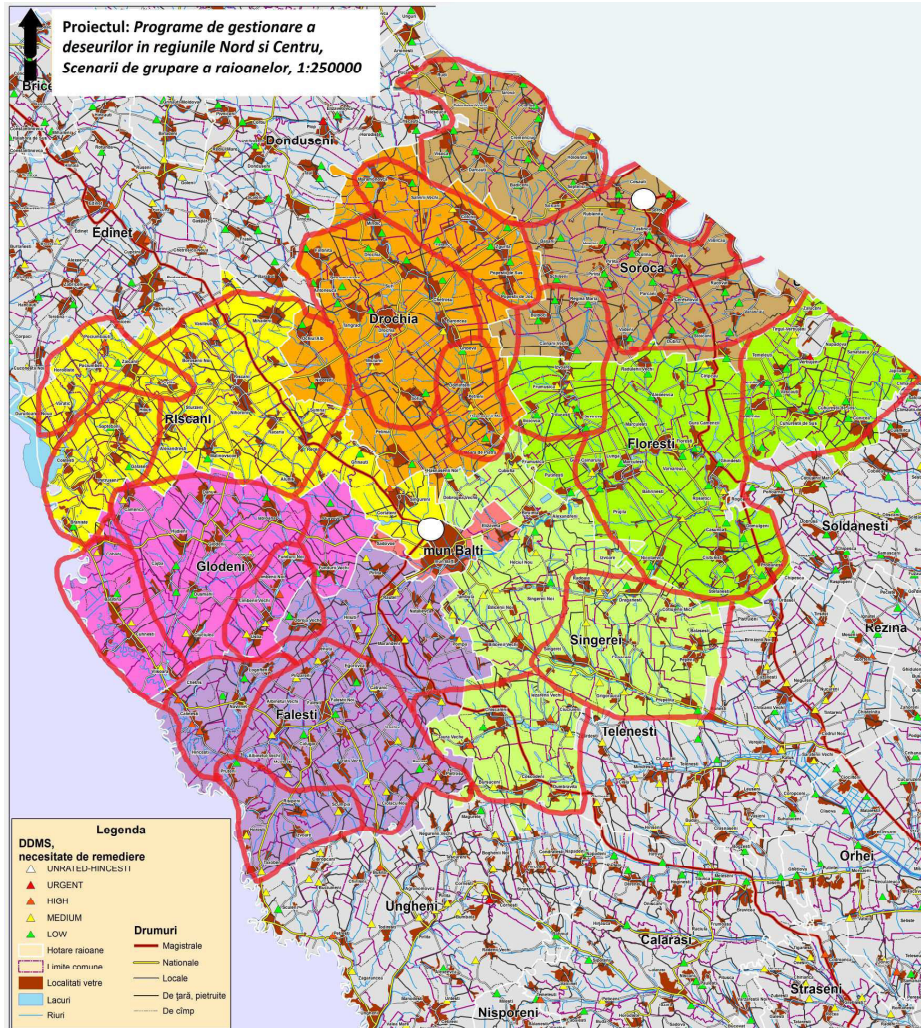


Figure 4-3: Clusters of rayons selected for the management zone no. 2



The implementation of regional plans must be supported by feasibility studies, in order to support the proposed investments. The boundaries of the proposed waste management zones must be checked and, if necessary, adjusted under the arrangements that LPAs can do when initiating feasibility studies.

4.6 Technical and financial assessment of options for selecting the Waste Management Zones

To estimate the costs of activities related to waste transfer and disposal in a sanitary landfill in the region, technical and financial assessment was carried out for each waste management zone in the region. The assessment was conducted taking into account

the current conditions, the trends in the sector and the desired level of sector development.

According to estimates, the costs of waste management activities for clusters of rayons vary against the average shown in Table 4-4. Thus, table 4-5 shows this cost for transportation and disposal of storage in waste management zones in the DRN.

Table 4-5: Estimated costs for activities: transfer, disposal of waste in DRN (2013)

Zone	Waste managed annually [tons]	Preliminary options for landfill location	No. of transfer stations	No. of necessary long-distance trucks [60 m ³]	Cost of investment [Euro]	Operational cost/ton [Euro]
Waste management zone no. 1	145,972	Balti and Soroca	18	13	14,070,000	36
		Balti	20	7	11,099,000	20.77
Waste management zone no. 2	47,102	Edinet	13	2	6,304,000	34.31
		Donduseni	13	2	6,304,000	34.31

The data in the table concerning the transfer stations and trucks are based on the location of waste generation places and the quantities of waste requiring management activities, taking into account local conditions and road quality.

The data related to investment and operating costs are based on costs that are usually incurred in other relevant jurisdictions. However, in all cases these are preliminary data, indicated for regional planning and programming purposes, and will be refined once the specific locations for facilities have been established.

The preliminary options for landfill sites are identified on the basis of technical and financial analyzes, and final locations for landfills will be established at the stage of feasibility studies, depending on environmental legal requirements and other requirements for the placement of landfills, that also require assessment of 3 potential locations for the landfill, in support of the recommendations for each site proposed as a sanitary landfill.

Within the preliminary options, the locations are included for calculation purposes, but the specific locations for the placement of sanitary landfills will be selected at the FS stage. Various technological options for waste treatment have been taken into account for cost assessment. Thus, a set of technical solutions were selected (see Annex 3), that influenced the costs. They were assessed in order to ensure the achievement of the desired levels of waste management in terms of:

- Collection;
- Transfer and transportation;
- Recycling;
- Composting;
- Proper treatment of special waste streams;
- Sanitary storage;
- Mechanical biological treatment.

The process of waste collection for urban areas provides for a system of collection in two bins for separate collection of dry and wet waste fractions. At the same time, the

existing system of collecting PET bottles and other plastics bags will be preserved along with them, and will be operated until the end of the useful life of these. The collection frequency is set to once a day in multi-flat buildings and once a week in private homes.

For rural areas the mixed collection in municipal bins of 1.10 m³ is planned. The frequency of collection will be once in two weeks. In addition to these, nets will be placed for the separate collection of PET and other plastic objects. Separate collection of paper and metals is considered not to be feasible because the paper is used as fuel, and metals end up in the recycling chain through various private collectors.

Table 4-6 and Table 4-7 identify the technical parameters related to the equipment needed for the storage and collection of waste. A constant average density of waste is established for planning purposes for urban and rural areas.

Table 4-8 identifies the equipment required to implement waste collection in the North Region in accordance with specific technical parameters specified in Table 4-6 and Table 4-7.

Table 4-6: Technical parameters for collection in urban areas

Collection trucks in urban areas	[m ³]	16.00
Waste density in collection trucks	[ton/m ³]	0.60
Bins for multi-flat buildings	[m ³]	1.10
Bins for private homes	[m ³]	0.24
Waste density in bins	[ton/m ³]	0.15

Table 4-7: Technical parameters for collection in rural areas (2013)

4Collection trucks for rural areas	[m ³]	10.00
Waste density in collection trucks	[ton/m ³]	0.60
Bins	[m ³]	1.10
Density of waste in bins	[ton/m ³]	0.15

Table 4-8: Collection equipment required for urban and rural areas

Parameters	North region		Urban areas		Rural areas	
	Urban	Rural	Zone no. 1	Zone no. 2	Zone no. 1	Zone no. 2
1,10 m ³ bins	2,900	7,900	2,300	600	5,600	2,300
0,24 m ³ bins	166,100	-	132,700	33,400	-	-
Collection trucks	5	8	5	0	7	1

The table above shows the equipment required for waste collection in DRN. The needs for equipment for waste collection are also divided by urban and rural areas and by various waste management zones. In total 2,900 of 1.1 m³ bins and 166,100 of 0.24 m³ bins are required for waste collection in urban areas in DRN. A total of 7,900 of 1.1 m³ bins are required for the rural areas.

The existing waste storage bins and collection equipment may be used for as long as they are in a good technical condition. These will be gradually replaced and this should be taken into account in the investment plan.

For the transfer and long-haul transportation within a zone identified for waste management networks for the transportation and transfer of waste to the landfill will be organized. As a result, it will help reduce pollution and achieve large-scale savings.

Transfer stations are places where waste is transferred from a collection vehicle with low capacity and speed to a vehicle with larger capacity, in order to be transported over

long distances. This practice reduces transportation of waste on long distances. Each transfer station will serve several communities. The geographical area served by a transfer station is called “micro-zone”. The specific location of transfer stations depends on the location of the sanitary landfill that serves every waste management zone.

Transfer stations will have a ramp, a concrete platform and a roof. The waste will be discharged from the collection vehicle on the uphill side of the ramp, in a container located in the lower part thereof. All transfer stations will be equipped with the same type of containers. Larger transfer stations located near the cities, will work in two shifts, while the lowest in rural areas will be open eight hours a day or part-time.

Table 4-9 shows the specifications for the transfer stations.

Table 4-10 shows the number of transfer stations that will be needed in each of the two waste management zones in the DRN, together with the necessary equipment, taking into account the waste that has already undergone processing (recycling, composting, etc.).

Table 4-9: Technical parameters for transfer and transport

Long-distance vehicles + trailer's capacity	[m ³]	60.00
Waste density in long-distance trucks	[ton/ m ³]	0.30
Bins	[m ³]	30.00

Table 4-10: Equipment required for transfer and transportation

Equipment	Zone no. 1	Zone no. 2
Long-distance vehicles	4	2
Bins of 30 m ³	100	35
Transfer stations	12	5
Tons/year	45,500	21,000

Tables 4-9 and 4-10 reflect the technical parameters for waste transfer and transport equipment for each waste management zone in the DRN. Thus, a total of about 6 trucks (with a capacity of 60 m³) are needed for transportation of 135 bins (30 m³, to be used in 17 transfer stations in the entire region.

The recycling process provides that the packaging and paper waste shall be collected as fraction of dry co-mixed waste, which will be placed by waste generators in bins, separately from the remaining “wet” fraction. In addition, “dry” waste will be collected separately from “wet” waste, in order to separate various recyclable materials from others, according to market needs. Equipment for grading, pressing and balloting recyclable materials will also be needed.

Urban transfer stations receiving the materials collected separately by wet and dry fractions will be equipped with a small industrial hall and a grading belt allowing the grading of dry waste. These will be equipped with a hydraulic press, suitable for compressing and balloting items of plastic, paper, non-ferrous metals etc.

Rural transfer stations are expected to be equipped with a small hydraulic press suitable for pressing plastic and a concrete covered platform for the storage of such materials until they are retrieved for further transportation.

As result of the grading and baling process, recyclable materials with a market value and a certain percentage of waste will be produced. For the beginning, a 50% yield is expected from the system of segregation and grading from the generator to the press unit.

Table 4-11 presents summary information about the recovery of recyclable materials. In total, about 6,500 tons of PET are expected to be recovered for recycling each year, in the DRN. Most of them will be collected in urban areas.

Table 4-11: Estimated amount of recyclable materials, urban/rural areas (tons/year-2018)

Development Region North	Urban areas		Rural areas	
	Zone no.1	Zone no. 2	Zone no.1	Zone no.2
PET	3,500	900	1,400	700
Other mixed recyclables	12,500	3,400	*	*

The composting process for the regional waste management system is expected to be different for rural and for urban areas.

In urban areas swath composting of green waste from parks and public green spaces will be performed. This will be done using a mobile composter.

The composting process includes unloading of green waste in an assigned place, shredding them and placing in windrows. Aeration is the basic element of the composting process. For this purpose, waste must be loosened by a front loader or a rake machine. The compost shall be made subject to regular tests of temperature and humidity. In order to produce a quality product that will be used for agricultural purposes, it is important to ensure that the materials to be composted do not contain contaminants. Therefore, only green waste will be composted initially.

This composting takes usually between 2 and 6 months and because of a significant loss of water, the weight of the material decreases by 50% compared to the initial mass. The composting of organic materials is not required in the winter, because green waste is not generated in this period of the year.

A concrete composting platform will be built in all urban areas, so that this composting activity can be conducted at the local level. Based on the generated amount of green waste, special mobile composting equipment for the whole region, equipped with a shredder and separator with a production capacity of 40 tons per day, is planned to be purchased for towns.

In rural areas composting of manure and agricultural waste, such as straws, is expected to be conducted. For this purpose, a concrete composting platform will be built at about 0.5-1.0 km way from each village. Equipment with production capacity of 50 tons per day per micro zone is required for the estimated quantities of material to be composted. The set of equipment should include a raking machine and loading machine. No shredder and separator will be needed because these composting plants will not process bulk material.

Table 4-12 presents a summary of the requirements for the composting equipment. Most of the equipment is necessary for the rural areas. The equipment that has been proposed for urban areas is for both waste management zone, for which a composting plant with a capacity of 40 tons/ day is recommended. For rural areas about 5 composting plants with a capacity of 50 tons/day are required.

Table 4-12: The amount of waste that must be composted and the necessary equipment – 2018

Type of item	North region		Urban		Rural	
	Urban	Rural	Zone no.1	Zone no. 2	Zone no.1	Zone no. 2
Tons/year	10,600	59,000	8,500	2,100	42,000	17,000
Composter 40 TPD	1			1		

Composter >=50 TPD		5		3	2
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Sanitary landfills will be built for each waste management zone. They will be designed, built and operating according to EU standards.

Construction of a sanitary landfill requires specific actions, including: preparation of the foundation and bottom sealing, drainage system, embankment, providing gas collection wells, ensuring quality groundwater levels monitoring wells, open channels for collecting rainwater, leachate collection and leachate treatment equipment installation, fence with a gate that can be locked and additional infrastructure at the landfill, including scale, access roads, buildings and offices.

In the short term, i.e. by 2018, the number of existing landfills must be reduced to 1-3 landfills per rayon. Since 2018, the number of landfills will be reduced to a single landfill per waste management zone (a total of 2 for the DRN), except the local landfill sites that have been built according to environmental law and ensure environmental standards, called transitional landfills, which may continue their operation until their capacity has been exhausted.

The location of the landfill will be established only at a later stage (at the stage of the feasibility study), in line with the environmental impact assessment requirements and other provisions of the legislation in force. The final selection of landfills will be subject to a selection process in the manner established by the legislation. The landfills will be placed according to calculations made at the stage of feasibility studies and may be located in the vicinity of Balti town for waste management zone no. 1, and for waste management in zone 2 - in the proximity of Edinet or Donduseni towns.

The mechanical biological treatment (MBT) is a technology which is largely used in some EU countries, particularly the Western ones. However, the capital and investment costs may be large, and the markets for recyclable materials after separation in MBT facilities are not sure. The use of the MBT method only for separation of mixed waste for recycling results in a low quality of the recyclable material, which requires additional processing before a market is identified. MBT used for production of fuel from waste is more efficient when the caloric value of waste is high, but it does not apply to Moldova. MBT has been widely implemented in the EU countries, through the pressures emerged in the regulation process, in order to reduce the amount of biodegradable material expected to be disposed in landfills.

The waste MBT before disposal has been implemented in other countries as well (often with the donors' support). Similarly to other cases, the costs of MBT depend on the specific technologies that are selected.

4.7 Technical options for special Waste Stream Management

The RSP provides for management of special waste streams along with the management of municipal waste. As the rates of generation of such waste per capita will continue to increase against the growth of the GDP, the amount of such waste will increase and under the management of a regional system they will require a proper management according to EU standards. The proper management of such waste implies application of measures for the selection of technologies tested for them, special equipment to ensure the proper management and/or as they have properties hazardous for public health and for the environment. The range of such waste includes waste from construction and demolitions, hazardous household waste and waste electric and electronic equipment (WEEE); waste tires, waste oils, waste batteries and accumula-

tors. Other issues related to the technical options for such waste are presented in Annex no.3.

Construction and Demolition Waste. The proper management of such waste will be based on based collected based on calls. In this context, an order based service will be established, by which the generators of such waste will have the possibility to call and request a bin for inert waste, when necessary. The order service will hold an authorization for the management of such waste, according to regulatory acts' requirements that will be developed. It should be considered that a significant part of construction and demolition waste is recyclable, and a certain share is represented by hazardous materials, thus the collection of hazardous waste will be conducted separately from non-hazardous waste.

The construction and demolition waste can be recycled or stored on a site designed for the disposal of inert waste; it can be reused or recycled. The sites for the disposal of inert waste are similar to sanitary landfills, but their construction and operation is less expensive, because of reduction of the negative impact on the environment and hence less needs for environment protection. The sites for disposal of construction and demolition waste under the RSP are expected to be built in the same place with the sanitary landfills for municipal waste. At the stage of the FS these places will be specified based on the amount of such waste in the urban and rural areas.

General hazardous waste is generated in large amounts by household generators, along with household waste. At the stage of RSP implementation this category of waste will have to be subject to a proper management, which means that it must be collected separately from other waste fractions and be sent for treatment to specialized registered companies. The manufacturers, in cooperation with the competent authorities, will establish at this stage a national system for their proper collection and treatment.

Transfer stations and sanitary landfills planned under the RSP will be able to serve as temporary storage sites for hazardous household waste, provided that these sites are properly equipped with special containers and their treatment will be related to the established national system.

Waste electrical and electronic equipment (WEEE) is generated in very large quantities by the generators thereof. This category of waste is permanently growing, in line with the technical progress and the sale of such equipment on Moldovan markets. The management of such waste at the stage of RSP implementation will be conducted in line with a national system established in accordance with the regulatory documents that must be developed. The RSP provides for separate collection of such waste in special bins in transfer stations. As this waste contains valuable recyclable materials and hazardous materials, their proper handling and recycling will be closely tied to the schemes for implementing the extended producer responsibility principle. The collection of such waste could be achieved through national campaigns held once or twice a year. WEEE disassembly (either mechanical or manual) is required before recycling the various parts of this equipment.

Waste oils, used tires, waste batteries and accumulators are generated both by households and by a number of institutions. According to the Waste Management Strategy, the amount of this waste will be constantly growing. At they are hazardous, these types of waste must be collected separately one from another and from other waste. At the stage of national RSP implementation, measures for waste oils and tires, accumulators and batteries will be developed. These waste management measures will be closely related to the application of the extended producer responsibility principle. This applies to private sector units and to those responsible for such categories of waste.

4.8 Financial assessment options

Currently, the waste management activities are financed from the central and local budget, from subsidies and charges for the service. No other sources that might be used to cover the costs of waste management service delivery have been identified under the studies. The financial analysis of the system proposed in the RSP included the estimation of capital and operating costs on the one hand and the revenue from tariffs, including revenue from the recycling technologies recommended in the identified waste management zones on the other hand.

The analysis used data related to typical unitary costs and the average data collected from the existing waste management operators at the LPAs level. These data have been obtained through the North Regional Development Agency and rayon administrations. The sector baseline data were used to estimate the operating and the maintenance costs and to calculate the depreciation based on the typical life duration of reviewed equipment and assets.

These calculations are used in composing the tariffs applied for service users, in order to ensure the full recovery of costs, but also to maintain the accessibility of the service at the regional level. More detailed information on this issue is presented in Annex 4.

The implementation of a regional waste management system in accordance with good international practices requires substantial investment in this area.

The general assessment of investment costs took into account the measures envisaged for achieving a regional waste management system that are identified in the Plan, which is part of this document.

The value of investments required to achieve the desired service level as result of the regional system implementation is shown in Table 4-13. These values are related to provision of collection, transfer and transportation services and resource recovery aggregatedly by 2018. Investment costs include expenditures for landfill capacity conformed to EU standards, which will further ensure the system needs until 2028 (completion of the first two waste storage cells, assuming that the operations will begin in 2018). In waste management zone no. 1 total estimated investments are higher than in zone no. 2. The second part of the table presents the investment costs in EUR per ton.

Table 4-13: Investment cost for regional waste management (2013, EUR)

Costs	Waste management zone no. 1	Waste management zone no. 2
Total costs of investment in the new system	23,080.902	9,024.876
Cost of investment/ton	191	254

In addition to these costs, investment is needed to expand the capacity of sanitary landfills in the planning period 2028-2043, as shown in Table 4-14. The investment recovery is taken into consideration in establishing tariffs for this period. The table shows the investment costs in thousand Euros for regional landfills built in line with European standards in various waste management areas. For zone no. 1 the investments amount to EUR 5,358 million, for zone no. 2 the investments amount to EUR 3,023 million.

Table 4-14: Investment cost for sanitary landfill development (2013, thousand EUR)

Costs	Waste management zone no. 1	Waste management zone no. 2
Extending the landfill capacity between 2028 to 2043	5,358	3,023

The necessary investment identified in table 4-15 concern closing and rehabilitation of the existing disposal sites. The cost of closing these disposal sites, as it can be seen in the table below, and it is planned that this process would take place gradually over the next 10 years. Investments in closing these landfills are guaranteed in the first year of the investment plan, but later the development of a special tariff-based fund will be necessary. Closing of old waste disposal sites requires a significant investment in all waste management zones. These costs are higher for zone no. 1, which requires EUR 22,011 million, and zone no. 2, which requires EUR 14,421 million.

Table 4-15: Investment required for closing waste landfills and disposal cells⁵

Costs	Waste management zone no. 1	Waste management zone no. 2
Closing of old landfills and the first stage of waste disposal cells	22,011	14,421

4.9 Investment plan

Investment planning for the establishment of the regional waste management system is carried out for each waste management zone, for the short-term planning period. Investments are planned in such manner that they follow the planning programs of projects envisaged for implementation in the following 10 years.

Most investments provided for under this planning are expected to be implemented in 2016 and 2017, in order to have an operational system in 2018. Table 4-16 presents the investment plan with the necessary budget (2013, thousand Euro). The table divides the total investments shown in the second column by an implementation period of 4 years. For each zone a budget for a number of pilot projects, is provided, as shown in the third column. It is proportional to the size of the zone and is expected to be spent in 2014 and 2015. The investment program will be implemented in 2016 and 2017.

Table 4-16: Investment Plan (2013, thousand EUR)

Zone	Budget for the new system and closing of landfills	-project budget	2014	2015	2016	2017
Waste management zone no.1	27,483	1,538	513	1,025	9,382	16,563
Waste management zone no.2	11,909	0	0	0	4,450	7,459

The design, construction of waste management infrastructure, establishment of the regional system in general, will require technical assistance, for which a separate budget is planned. This assistance is calculated depending on the value of investments required for physical infrastructure. The total budget for technical assistance is presented in table 4-17 and is included in the program. The technical assistance budget is presented in the second column of the table, amounting to EUR 3,001 million for zone no. 1 and EUR 1,173 million for zone no. 2. In 2014 the feasibility studies are still being developed and technical assistance for implementation will be available from 2015, as indicated in the table.

⁵ Note: Waste disposal by 2042 (2013, thousand Euro)

Table 4-17: Technical assistance budget (2013, thousand EUR)

Zone	Budget	2014	2015	2016	2017	2018
Waste management zone no. 1	3,001	0	1,616	500	500	385
Waste management zone no. 2	1,173	0	632	196	196	150

Operational costs assessment is an important element of the financial assessment of the system. The operating costs include a wide range of activities that depend on the level and the technological performance accepted for this system. Annual operating and maintenance costs were assessed for activities related to this system and extrapolated to the amount of waste processed in different activities in different waste management zones. These costs are identified in Table 4-18. The operating and maintenance costs are shown for waste management zones, separately for different services and include costs related to collection, transfer, transport, resource recovery, processing and operation of the landfill. The total for operating and maintenance costs is the sum of these costs, amounting to EUR 5,624 million for zone no. 1 and EUR 1,977 million for zone no. 2 per year, as shown in the penultimate row of the table. The operating costs per ton of waste are shown in the last row of the table, estimated at 46.47 Euro per ton for zone no. 1 and EUR 55.53 million for zone no. 2.

Table 4-18: Annual operation and maintenance cost (2013, thousand EUR)

Cost	Waste management zone no. 1	Waste management zone no. 2
Collection cost	2,919	862
Transfer and transportation cost	648	342
Resource recovery and processing	1,454	458
Use of landfills	603	315
Total operation and maintenance	5,624	1,977
O and M costs per ton (EUR/ton)	46.47	55.53

Revenues from non-tariff sources are calculated for dry and pressed recyclable waste fractions, products made from recycling of construction and demolition waste and from compost sale. Revenues planned from other sources than tariffs are identified in Table 4-19. Annual non-tariff revenues are part of the revenues that ensure the recovery of system operating and maintenance costs. Non-tariff revenues amount to EUR 1,383 million for zone no. 1 and EUR 384 thousand for zone no. 2.

Table 4-19: Revenue from non-tariff sources (2013, thousand EUR)

Revenues	Waste management zone no. 1	Waste management zone no. 2
Revenues	1,383	384

Tariffs are an important factor in the rationale for regional system implementation decision and will depend on the costs established for the new waste management services.

These costs will be covered by the users of these services - households and individuals. The recovery of waste management service costs include tariffs and fees paid by users, complemented, if necessary, with subsidies from central and local public authorities. The calculation of fees is also based on the cost of services.

The tariffs will cover all operating costs, including the costs of amortization and replacement. Also, the cost of establishing a fund for closing landfills and for developing storage cells is added to the operating costs. Table 4-20 summarizes the annual costs to be recovered in order to calculate the tariff. The methodology for tariff calculation is

shown step by step in this table. The tariffs shall take into account the costs of operating and maintenance of the modernized system. The costs of taxes will be paid annually and currently amount to 10%, plus the budget to be set for closing landfills. To calculate the total cost, non-tariff revenues presented in table 4-20 all taken into account. Thus, we get the final amounts: 5,465 million Euros for zone no. 1 and 2,164 million Euros for zone no. 2.

Table 4-20: Costs taken into account for tariff calculation (2013, thousand EUR)

Costs	Waste management zone no. 1	Waste management zone no. 2
New system operating and maintenance costs	5,624	1,978
Including costs related to payment of profit tax, property taxes and other taxes - 10%	6,186	2,175
Including reserve for closing landfills and opening new cells	6,848	2,549
Cost with non-tariff revenues	5,465	2,164

Three different scenarios are taken into account for the costs of funding:

- 100% funding from grants;
- Preferential loan for a term of 25 years with an interest rate of 3% (possibly negotiated with an international financial institution);
- Loan from a private bank for a 25-years period, with 9% investment rate (commercial rate that can be available for the private sector). Also, all three scenarios imply that the technical assistance, which is part of the implementation process, will be financed from a grant or the state budget.

The affordability level is expected to be of about 1.2% of income per capita, according to international affordability reference values. To reach operating costs and revenues relevant to the situation in 2018 (i.e. the first year of activity), an increase of 2.5% is expected in both the expenditure and revenues. According to Table 4-21, the tariff to be paid for the new waste management system is designed as follows:

- In the first waste management zone it will amount to about. 8.40-11.96 €/person/year (approx. 148-211 lei/ person/ year), depending on the funding scenario;
- In the second waste management zone it will range between 9.61-14.06 €/person/year (approx. 169.61-248 lei/ person/ year), depending on the funding scenario;

Table 4-21 also shows the affordability degree of the waste management system for private homes owners. As shown in the table, 1.2% of income per capita is equivalent to € 14.13/ person/ year (approx. 249 lei/ person/ year). In all cases the annual cost of the waste management system is smaller than the actual affordability criterion Therefore, it can be concluded that the waste management system is affordable at the local level in each of the analysed funding scenarios, although it is obviously much more affordable in scenarios with lower interest rates.

Table 4-21: Macro-tariffs and affordability (2013, EUR)

Macro-tariffs per capita per year	Grant funding	3% interest rate	9% interest rate

Macro-tariffs per capita per year	Grant funding	3% interest rate	9% interest rate
Waste management zone no. 1	8.40	10.93	11.96
Waste management zone no. 2	9.61	12.77	14.06
Available budget per capita per year 1.2% of income per capita	14.13		
Waste management tariff as percentage of the affordability criterion	%	%	%
Waste management zone no. 1	59.45	77.32	84.61
Waste management zone no. 2	68.03	90.40	99.53

To reach a 100% affordability and resource recovery level, tariffs will be differentiated for individuals and businesses.

Hence:

Legal entities, including institutions and businesses will pay more than households, and

- Urban households will pay more than rural households as urban households will benefit from a higher level of service (higher frequency of collection). This factor is not in contradiction with the cost recovery principle of the existing waste management systems.

Table 4-22 shows a differentiation between urban and rural households. If legal entities will pay for waste management services at a higher rate than households, the tariffs for households may be reduced even more.

Table 4-22: Urban and rural tariffs/household/month (2018, EUR)

Tariffs/household/month	Urban			Rural		
	Grant funding	3% interest rate loan	9% interest rate loan	Grant funding	3% interest rate loan	9% interest rate loan
Waste management zone no. 1	2.22	2.88	3.16	1.62	2.11	2.31
Waste management zone no. 2	2.54	3.37	3.71	1.71	2.22	2.43

To maximize the payment rates, various cost recovery methods and payment enforcement methods can be applied. One of the possible options is unification of tariffs for waste management, by including them in the same bill with those for other utilities (e.g. for water supply). The payment can be done to an administrative entity relevant for waste management or a utility entity that will transfer the charges for waste management to the administrative entity relevant for waste management against an additional charge for such services. Other options can also be identified. These mechanisms will be promoted by the specialized CPA.

Another option is the collection of taxes by public administrative entity or a special agent who goes from one household to another to collect taxes, or by setting up offices where households and legal entities can pay their bills.

In such cases, the enforcement of the payment mechanism should be ensured by the administrative entity, as operators have few levers to control the payments. Moreover, the operators must continue supply the service even in the event of non-payment, in order not to allow accumulation of waste and thus environment and health problems.

Thus, the administrative authority has most means to control the payments through administrative and fiscal measures.

The financing and the additional revenues are provided through a system of economic tools. The most important of these is the extended producer responsibility.

4.10 Institutional options

To support the regional approach to waste management, there should be an appropriate institutional framework. The adequate structure must take into account:

- LPA multitude in waste management zones;
- The legal, political and policy framework for local public services and waste management;
- The functions that must be performed to achieve efficient waste management services;
- LPAs in each management zone.

LPAs in each waste management zone in a regional waste management system will share the infrastructure and the waste management facilities and will be responsible for planning, implementation, operation and costs associated with these facilities. Accordingly, inter-municipal cooperation (ICM) is required in accordance with the legal provisions for cooperation between LPAs.

Based on the political, legal and regulatory framework on waste management, two general functions are needed to support the regional waste management:

- Administrative functions. These functions include decision making, planning, administrative management, tariff policy formulation and implementation, waste management performance monitoring, service contracting (where applicable), resource records, communication and similar functions;
- Service delivery functions. These functions include operational tasks related to waste management services provision;
- The first category of functions is close to the LPA council functions while an LPA organizes its waste management on its own territory. The second category of functions is close to the functions provided by a service provision agent, such as a municipal company or other entities belonging to municipalities or a private contractor.

4.11 Forms of cooperation

Inter-municipal cooperation (IMC) is supported by the political, legal and regulatory framework, under which the IMC can provide local public services. IMC can take different forms. A proper form of the IMC is specific to the circumstances of LPAs participation. The Waste Management Strategy refers to and recommends the “Associations” as a proper form for some functions. In parallel, other forms of IMC can be taken into consideration for service provision functions, including joint ventures, municipal enterprises and other forms of organization, in order to obtain benefits from the participation of LPAs.

The appropriate form of cooperation for each waste management zone will be established jointly with LPAs in the examined zone/region, at the FS phase.

4.12 Waste Assets Management in the transition period

A number of LPAs have recently invested in new infrastructure and equipment for waste storage, collection, recycling and/or treatment and may have other waste management assets according to the legislation in force. These LPAs can continue using the assets after accepting the regional waste management system as long as these assets are functional, after which these LPAs can join the regional system.

After accepting the RSP, 1-3 landfills will be assigned in each rayon, with improved transitional landfill sites, that will continue to function until a new sanitary landfill for all rayons in the waste management zone is built, according to the current environmental laws and EU requirements. These sites will be organized in operated in a manner that ensures mitigation of impact on the environment. The environmental impact of these sites will be assessed and cost effective measures to improve the environment will be identified.

All sites identified as IWTS will have to meet the provisions established in the typical technological plan for solid waste management landfills, approved by the order of the Ministry of Environment and Landscaping no. 67 of 02.05.2001, or implement a mechanism for the mechanical biological treatment of waste (see below), in order to stabilize organic waste and hence reduce the negative impact of waste on the environment in the landfill sites. Identification and operation of these sites as IWTS is a temporary measure, which does not reduce the need for developing modern waste storage facilities in line with EU requirements.

Waste treatment by the mechanical biological method (MBT) before disposal can be an efficient approach for reducing the environmental impact of waste that requires disposal to improved transit waste storage sites. A pilot MBT project is planned to be implemented in Soldanesti, in an IWTS, in order to demonstrate the technical and financial needs of this approach. The results and the lessons learned, related to this pilot project, can be later disseminated and applied in other areas.

At the stage of the feasibility study a schedule for closing the existing landfills (other than IWTS) will be developed. The schedule will reflect what is achievable in technical and environmental terms, as well as the timeframe for closing these sites.

All closed landfills will require rehabilitation. In some cases certain landfills might be used as location for transfer stations, which will continue to serve the needs of the regional waste management system.

The existing contracts will be adjusted as necessary, when the regional waste management system starts operating. This may require amendment of existing contracts (collected waste will be taken to a transfer station instead of a local landfill). The contracts can also be reorganized into a larger contract that covers one of the necessary services at the regional level, under a new waste management system. If necessary, some adjustments can also be made.

The actions taken at the national level in order to facilitate implementation of a waste management system include the following:

- Closure of landfills that do not meet the environmental requirements;
- After the local landfills are closed, the interdiction of waste disposal in unauthorized landfills will apply and the waste will be managed through the regional waste management system, including through IWTS;
- After this regional program has been approved, 1-3 IWTS will be selected in each rayon, with appropriate approval by the specialized central public administration

authority. These locations will be able to operate before modern sanitary landfills have been built according to EU standards, and after this IWTS will be closed and rehabilitated;

- Approval of landfills which have been designed in accordance with the laws and standards equivalent to those in the EU;
- Adoption of the new Law on waste, the regulatory framework that provides a clear and unambiguous legal basis to ensure the sustainability of the regional waste management;
- Ensuring that all initiatives that are funded from various investment funds contribute to the regionalization of waste management activities, the priorities in this context should include allocation of funds for the establishment of IWTS;
- Revision by entities of commitments assumed under the existing contracts, particularly concession contracts, for delivery of specific services, since they can be significantly affected by amendments to the legal framework and the applied standards. Long term tariff agreements, based on the undertaken service standards, might not be adequate for the management of new facilities or services, that are necessary as result of new approaches and environmental or performance standards. As a result, achievement of modern waste management standards may require their renegotiation or cancellation, and higher costs resulting from high standards can help raise the awareness of the community about the need to participate in the waste management system;
- Adopting of waste management standard in line with those of the EU.

Problems taken into account in development and, hence, implementation of the RSP in the DRN, include the following:

- Delimitation of preferred waste management zone is a technical exercise, which however requires agreement of key stakeholders: communities and rayons that will include identified groups. To reach an agreement, the stakeholders must:
 - Understand the benefits of collaboration within a zone; and
 - Agree on analyses that lead to identification of waste management zones.
- The costs of waste management should be accessible to communities. In rural areas communities might have never had any waste management service in the past, but they may be willing to pay for a service that was not delivered before. Therefore, adequate financial technologies that have been demonstrated in similar conditions and the cost structures of which are well known and predictable in the context of the Republic of Moldova and the DRN are necessary;
- Selection of a location for the placement of infrastructure elements for the regional waste management system (regional sanitary landfill, transfer stations, composting plants, recycling units etc.);
- Identification of appropriate institutional mechanisms. Two aspects are crucial in this respect:
 - Communities/rayons do not have a tradition of cooperation in providing public services and therefore will require institutional arrangements that include mechanisms that establish and strengthen trust between communities/ rayons;
 - The range of investments will have to be absorbed by associated organizational structures, modified as necessary in the institutional arrangements for the RSP.

ties in this document (Annex 5), that will help achieve the specific objectives for the Waste management RSP.

In order to attract investment from various funding sources, both domestic and foreign, 2 system project concepts will be developed for the implementation of the abovementioned Plan of Measures and Activities. These concepts will contain the description of specific data related to each waste management system for each zone, as identified in the RSP.

The RSP shall be approved by the Regional Development Council.

Feasibility studies and environmental impact assessments are documents to be developed in order to implement the decisions to invest in the new waste management system in every waste management zone. The legal framework provides that the selection of a landfill must meet the requirements of legal and regulatory acts in this area, including those related to EIA. Therefore, EIA must be integrated in the feasibility study, as at this stage the location of sanitary landfills in each waste management zone will be selected. The development of the feasibility study and the EIA will begin immediately after approval of the RSP for waste management. Feasibility studies and the EIA will be completed in Q2, 2015.

Feasibility studies and EIA will be submitted to the central public administration authorities, responsible for approval of these documents in the manner established by law. These documents are expected to be approved in Q2, 2015.

Permits for land use are obtained in accordance with the provisions of the national law, while the conditions for the location, design and construction of landfills shall meet the EU and other international experience, as well as the requirements for landfills' location in Moldova.

The surface of the land required for such purposes will have to be established at the stage of the feasibility study. However, the selected land is classified mainly as "agricultural" or may be private and in this case the process of changing the purpose of the land must be initiated, as well as a process of obtaining authorization of the use of this land for the location of the landfill, in order to be able to build the landfill infrastructure. This process is expected to be completed by the end of Q4, 2014.

Relevant local and regional public authorities, in cooperation with relevant national institutions are responsible for the selection of the land, obtaining of necessary permits for its use for placing sanitary landfills.

Institutional development can take place immediately after completion of waste management RPS and its approval by the Regional Development Council.

Strengthening the legal framework in support of implementation of the RSP for waste management will continue. It is expected that the new law on waste may be approved in Q2, 2004. Also, regulatory acts addressing waste management standards will have to be developed jointly with the extended producer responsibility requirements and supervision of waste management system.

Local authorities will be responsible for creating the necessary institutional arrangements. The Regional Development Agency will be responsible for coordinating this process and for collaboration with the public authorities in rayons and communities, in order to achieve the establishment of the necessary institutional arrangements.

The central public administration authority for environmental protection will be responsible for strengthening the legal framework for the waste management sector.

It is expected that the implementation of waste management RSP will require funding from external sources, which may be provided by a single donor or a group of donors or international financial institutions. This will require negotiation of a financing agreement based on results of the feasibility study. Completion of necessary financing agreements is planned for the end of Q3 2016.

The Government of Moldova through the Ministry of Regional Development and Construction and the Ministry of Finance will be responsible for ensuring the availability of financial resources needed to implement this RSP for waste management in collaboration with the North RDA.

The project documentation will comprise the detailed project and technical specifications for equipment, that will be necessary for building the facility and purchasing equipment. Project documents will be developed through a public bidding, which will start immediately after completion of the financing agreement. These documents will be prepared by an international and a national company with experience in detail design of waste management infrastructure according to EU standards.

This activity will be completed by the end of Q3, 2016, and the approval of documents will be complete by the end of Q4, 2016.

The procurement of equipment and the construction process will be implemented in accordance with the bidding procedures. Completion of both processes is expected for the end of Q4 2017.

Both procurement of equipment and the construction works will be conducted based on a corresponding bidding process. The necessary supervision and reporting support in procurement of equipment and constructions will be provided by an international company with experience in implementation of waste management infrastructure according to EU standards. This support will be provided in accordance with the provisions concerning the technical assistance of the Financial Agreement.

Measures and activities described above will enable the new waste management system in the DRN to start its operations in early Q1 2018.

The implementation of the RSP for waste management in accordance with the identified program is subject to the following risks:

- Legal uncertainty;
- The time required for the activities;
- Public opposition;
- Delay in approvals;
- Political instability.

6 Monitoring, evaluation and reporting of RSP Implementation

RSP is to be implemented through the Plan of Measures and Activities, approved as an annex to it.

The Plan of Measures and Activities serves as a basis for operational programming and promoting of projects for funding in order to achieve the overall and the specific objectives of the RSP. Deadlines and indicators, by which the degree of implementation of actions will be checked, are shown in Annex 5.

The activities included in this RSP, which will be included as measures planned for implementation in regional operational plans will be monitored and evaluated according to the requirements of these documents.

The responsibility for RSP implementation will lie with all institutions with corresponding competences, identified in the Plan. At the same time, to ensure consistent implementation of the RSP, mechanisms, efficient and result based monitoring/evaluation instruments will have to be developed within the regional policy documents (e.g. monitoring and evaluation plans with clear specification of expected outcomes, progress indicators, baseline data), with participation of national and regional institutions and key stakeholders, including the LPA. The evaluation of RSP implementation is recommended to be conducted at the middle and at the end of RSP implementation.

In the process of monitoring regional policy documents, monitoring reports will be developed (quarterly/annually) on the progress of implementation of actions and achieving the expected results, according to provisions established for reporting on the implementation of regional policy documents, which will ensure the required transparency.

Under the implementation of objectives and actions set out in the RSP, the responsible institutions will be guided by performance and progress indicators set out in these. In accordance with the specific objectives of the RSP, the following preliminary monitoring indicators are proposed:

- Changes in the national legal and normative framework on waste management - number of approved documents;
- Establishment of institutional arrangements - the number of operators active in the field of waste management;
- creation of systems for collecting/processing data on waste management - regional statistical system established;
- Development of waste management infrastructure at the regional level - regional system established (number of transfer stations built, sanitary landfills built, number of closed landfills);
- Information, raising awareness of waste treatment and disposal facilities - the number of programs, public awareness campaigns, the number of informed people, the number of NGOs concerned with waste management.

Annexes

Annex 1	Waste Management Profile of DRN rayons
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Annex 3	Technical evaluation of the options
Annex 4	Financial analysis
Annex 5	Plan of measures and activities for Waste Management RSP implementation
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Annex 1: Waste Management Profile of DRN rayons

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1 Balti municipality

1.1 Geographical location

Balti municipality, residence of the Development Region North of the Republic of Moldova, is located in the middle of Balti steppe, with a fragmented plain relief at a distance of 138 km north of Chisinau, 65 km from the border with Romania and 120 km from the border with Ukraine. It is bordered by the towns of Falesti, Glodeni, Riscani and Singerei that are located at distances of 20-40 km. Balti municipality is composed of Sadovoe and Elizaveta communes. The city's water resources consist of 2 rivers - Raut and Rautel, which cross the city along a length of 17 km, and two little rivers - Copaceanca and Flamanda - Raut river tributaries, and 7 lakes. The municipal area is about 78.01 km², of which 41.43 km² are urban areas and 36.58 km² are rural areas.

Figure 1-1: Geographical location of Balti municipality



Table 1-1: Data about Balti mun.

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	144,000	4,900	148,900
Number of communes / settlements	1	2	3
Existing sanitation services			
Balti mun.	1	-	1
Elizaveta v.		1	1
Existing landfills			
Number of existing landfills	1	1	2
Extension capacity of landfills	-	-	-
Waste generated / stored			
Waste generated (tons / year)	38,712	939	39,651
Technical equipment of the waste management sector			
Trucks	18	-	18
Tractor with trailer	2	-	2
Bulldozer	2	-	2
Financial aspect of sanitation services			
Number of services	1	-	1
Average rate for services (MDL / month)	No data	No data	No data

1.2 Existing waste management system

The waste management system consists of two landfills that serve the inhabitants of the entire municipality (Balti and Elizaveta). Both landfills are located violating the regulations in force; the landfill from Balti is located on the slope and that one from Elizaveta - in Raut meadow. Both landfills have an access road - with asphalt and gravel (Balti city) and with gravel only (Elizaveta v.). The household waste from Balti city is collected and transported centrally by JV "Gospodaria Auto specializata" being stored on the municipal waste disposal site, located at approx. 8 km from Balti city. This SHWL has been working since 1972 without authorization and is overloaded; the waste layer reaches up to 15-20 m thick. The waste is not collected separately. The waste collected is piled, is compacted and covered with soil / clay. At present it is difficult to recommend a landfill that would be able to arrange/ use it in common with other settlements in the neighbourhood. The landfill from Elizaveta v. requires urgent remedial actions. Balti SHWL should be liquidated and a new landfill should be built.

There are two official sanitation services in the municipality, which are technically equipped to serve all the settlements. The sanitation services from the municipality are conceded for the period 2012-2061 (to the companies "Terra Cleaning Nord" and "Terra Sanitate").

1.3 Service providers

Currently sanitation services exist in two settlements in the municipality (Balti city and Elizaveta v.) that are technically equipped enough to be able to cover the settlements of the municipality. The responsibility for maintenance of existing services lies with the relevant local public authorities.

1.4 Key challenges

The development of the waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Falesti, Riscani, Soroca, Glodeni, Drochia and Floresti, according to the preferred scenario of the regional planning and the Waste Management Strategy, approved by GD no. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

1.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Balti mun. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, long and medium term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region/ management area and of the legal framework in the field.

1.6 View on service development

By 2017, in Balti municipality access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

2 Briceni rayon

2.1 Geographical location

Briceni rayon is located in the extreme northwest of the Republic of Moldova and is bordered by Ukraine on the north, Edinet rayon – on the south, Ocnita rayon – on the east and Romania - on the west. The rayon area is about 810 km², of which 28 km² constitutes urban areas and 728 km² – rural areas.

Figure 2-1: Geographical location of Briceni rayon



Table 2-1: Data about Briceni rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	9,900 (Briceni)	65,400	75,300
Number of communes / settlements	2	26/37	28/39
Existing sanitation services			
Briceni town	1	-	1
Lipcani town	1	-	1
Criva v.	-	1	1
Existing landfills			
Number of existing landfills	1	27	28
Extension capacity of landfills		Cotiujeni Bogdanesti Medveja	3
Waste generated / stored			
Waste generated (tons / year)	4,131	11,363	15,495
Technical equipment of the waste management sector			
Trucks	3	-	3
Tractor with trailer	3	-	3
Excavator	1	-	1
Bulldozer	1	-	1
Financial aspect of sanitation services			
Number of services	2	1	3
Average rate for services (MDL / month)	8 (apartments) 78,92 (legal entities)	65 (households)	-

2.2 Existing waste management system

The waste management infrastructure includes a range of waste burial facilities located almost in every settlement. They do not meet the location and arrangement requirements. Many of the landfills are located either in the protection area of rivers (Lopatnic r.), in Tabani v., or at very small distances from houses of people (Coteala v., Sirauti v., Grimancauti v.), or on the territory of former farms, in silage pits (Cotuijeni v., Coteala v., Beleavinti v., Caracusenii Vechi v., Mihaileni v., Marcauti v.). The landfills are not fenced, are not guarded and do not comply with the waste compaction technology. There are three sanitation services in the rayon, with technical equipment that would ensure the collection and storage of waste from several settlements of the rayon. The waste is collected in a mixed way. The landfills from Corjeuti v. (for Tetcani v., Balasinesti v.), Bogdanesti v. (for Grimesti v., Bezeda v.) and Medveja v. (for Larga v., Pavlovca v., Slobozia v.) have service expansion capacities for other settlements. Urgent remedial actions are needed for the landfills from Coteala v., Halahora de Sus v. and Balcauti v.

With the NEF support, in 2010-2011 the rayon received financial assistance to improve the waste collection and storage infrastructure.

In 2012 most settlements in the rayon benefited from feasibility studies for sanitation service concession.

2.3 Service providers

At the moment there are sanitation services in Briceni town, Lipcan town and Criva v. In the region the service from Briceni town has service expansion capacities for other settlements. The responsibility for maintenance of existing services lies with the relevant local public authorities.

2.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Ocnita, Edinet and Donduseni according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

2.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Briceni rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

2.6 View on service development

By 2017, in Briceni rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

3 Donduseni rayon

3.1 Geographical location

Donduseni rayon is bordered on the north by Ocnita rayon, on the south - by Drochia rayon, on the south-west - by Riscani rayon, on the east - by Soroca and Ukraine, and on the west - by Edinet rayon. The total area of the rayon is 645 km².

Figure 3-1: Geographical Location of Donduseni rayon

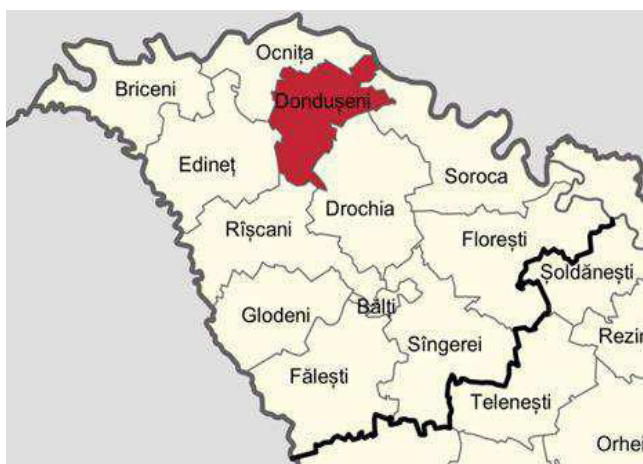


Table 3-1: Data about Donduseni rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	10,700	34,400	45,100
Number of communes / settlements	1	21/29	22/30
Existing sanitation services			
Donduseni town	1	-	1
Taul v.	-	1	1
Existing landfills			
Number of existing landfills	1	52	53
Extension capacity of landfills	Donduseni	Taul	2
Waste generated / stored			
Waste generated (tons / year)	2,871	6,534	9,405
Technical equipment of the waste management sector			
Trucks	2	1	3
Tractor with trailer	2	1	3
Bulldozer	1	-	1
Financial aspect of sanitation services			
Number of services	1	1	2
Average rate for services (MDL / month)	No data	No data	No data

3.2 Existing waste management system

The waste management infrastructure in Donduseni rayon includes a large number of waste burial facilities. These landfills do not meet the location and arrangement requirements. The location of the landfills is quite various, being located either in silage pits (Taul v., Scaieni v., Sudarca v., Arionesti v., Teleseuca v.) or in river meadow (Cubolta r.) - in Poplars v., etc.

All landfills have access road, in most cases it is a country road, and only to the landfill from Donduseni town the road is covered with gravel. The landfills are not fenced or guarded. There are in the rayon two sanitation services, located in Donduseni town and Tirnova v., which need technical equipment in order to serve several settlement in the rayon. The waste is collected and stored in a mixed way. The landfills from Donduseni town and Taul v. have service expansion capacities for other settlements. Urgent remedial actions are needed for the landfills from Donduseni town and Frasin, Rediu Mare, Mosana, Briceni, Plopi, Pocrovca villages. In 2012 the rayon benefited from feasibility studies for sanitation service concession.

The sanitation services from Climauti v. were conceded to VIXENOL SRL, on contract basis for the period 2011-2060.

In the period 2012-2014 the rayon has been benefiting from a project within the Environmental Programme "Ecogreen – solid municipal waste" (Romania). The project involves the development of waste management measures that include waste collection, sorting, recovery of recyclable materials, waste treatment and neutralization. The construction of a waste treatment plant is planned, with a capacity of 90 tons / day, and a disposal site will be arranged with an area of 3 ha, equipped with specialized equipment for waste sorting, processing and neutralization. The plant will be located in Climauti v.

3.3 Service providers

Currently there are sanitation services in Donduseni town and in Taul v. The Sanitation Service in Donduseni town has service extension capacity to other settlements. The responsibility for maintenance of existing services lies with the relevant local public authorities.

3.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Ocnita, Edinet and Briceni according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

3.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Donduseni rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region/ management area and of the legal framework in the field.

3.6 View on service development

By 2017, in Donduseni rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

4 Drochia rayon

4.1 Geographical location

Drochia rayon is located at the north of the country, at a distance of 167 km from the capital of the republic. It is bordered by the following rayons: on the north – by Donduseni, on the south – by Balti mun., on the east - by Soroca, on the south-east – by Floresti, on the west - by Riscani, on the south-east it is bordered by Transnistria and on the east by Ukraine. The rayon area is about 1000 km².

Figure 4-1: Geographical location of Drochia rayon



Table 4-1: Data about Drochia rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	20,400	69,700	90,100
Number of communes / settlements	1	27/39	28/40
Existing sanitation services			
Drochia town	1	-	1
Existing landfills			
Number of existing landfills	1	34	35
Extension capacity of landfills	-	Moara de Piatra Nicoreni Zgurita	3
Waste generated / stored			
Waste generated (tons / year)	5,473	13,241	18,714
Technical equipment of the waste management sector			
Trucks	2	-	2
Tractor with trailer	3	-	3
Bulldozers	2	-	2
Financial aspect of sanitation services			
Number of services	1	-	1
Average rate for services (MDL / month)	6 (apartments) 85 (businesses)	6 (households)	-

4.2 Existing waste management system

The waste management system in the rayon is a network of landfills located almost in every settlement. These landfills are located variously – in liquid manure pits in former complexes / cattle farms - (Miciurin v., Hasnasenii Mari v., Gribova v., Baroncea v., Salviri v., Popestii de Jos v.), clay pits (Cotova v.), sand pits (Palanca v.), hills (Dominteni v.), river meadow - Cubolta r. (Petreni v.), Raut r. (Antoneuca v.) or in the lake protection area - (Ochiul Alb v.). All landfills have access road, in most cases it is a country road, and only in some cases the road is asphalted or covered with gravel (Drochia town). A relatively well arranged landfill is considered the one in Drochia town. The waste is collected in a mixed way and is stored in existing landfills. The landfills in Moara de Piatra v. (for Lazo v., Hasnaseni v.), Nicoreni v., Zgurita v. (for villages of Cotova, Holosnita, Popesti, Palanca) have potential service extension capacities to other settlements.

Urgent remedial actions are needed for the landfills from Moara de Piatra, Petreni, Dominteni, Ochiul Alb, Mindic villages.

With the NEF support, in 2004-2009 the rayon received financial resources to improve the infrastructure for waste collection and storage. With the NFRD financial support in 2012 the Project "Household waste collection and transport system in Riscani and Drochia interregional micro-region" was implemented, which 6 settlements from Riscani rayon and Pelenia village from Drochia rayon benefited of. In this project 24 platforms were constructed for waste collection, technical equipment for sanitation, garbage bins and euro-containers were purchased.

4.3 Service providers

Currently there are sanitation services in Drochia town, which have potential to expand services to other settlements in the rayon. The responsibility for maintenance of the services lies with the local public authorities.

4.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Falesti, Glodeni, Riscani and Floresti, as well as Balti mun. according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

4.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Drochia rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region/management area and of the legal framework in the field.

4.6 View on service development

By 2017, in Drochia rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

5 Edinet rayon

5.1 Geographical location

It is located in the north-west of the republic and is bordered on the north by Briceni rayon, by Riscani rayon – on the south, by Donduseni and Ocnita rayons – on the east and by Romania - on the west. The area of the rayon is about 933 km².

Figure 5-1: Geographical location of Edinet rayon



Table 5-1: Data about Edinet rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	26,000	56,900	82,900
Number of communes / settlements	2	30/47	31/49
Existing sanitation services			
Edinet town	1		1
Cupcini v.		1	1
Existing landfills			
Number of existing landfills	1	31	32
Extension capacity of landfills	-	Rotunda Corpaci Lopatnic	3
Waste generated / stored			
Waste generated (tons / year)	6,975	10,827	17,802
Technical equipment of the waste management sector			
Trucks	2		2
Tractors with trailer	2	2	4
Bulldozer	1	1	2
Bulldozer-excavator	1		1
Auto-grader	1		1
Financial aspect of sanitation services			
Number of services	1	1	2
Average rate for services (MDL / month)	8 (apartments) 138 (businesses)	10	-

5.2 Existing waste management system

The waste management in the rayon includes a wide network of waste landfills, which are located almost in every settlement.

The landfills in the rayon do not meet the location and arrangement requirements of landfills. Also, they are not fenced or guarded.

The location of the landfills is diverse, such as: in places of silage pits in former complexes / animal farms (Zabriceni v., Trinca v., Cepeleuti v., Stolniceni v., Badragii Vechi v.), on roadside (Viisoara v., Zabriceni v.), on hills (Fetesti v., Hlinaia v.), in dales (Parcova v., Chetrosica Noua v., Bratuseni v.) in meadow (Constantinovca v., Alexeevca v.). All landfills have access road, in most cases this is a country road, and gravel roads are only the roads from the villages of Stolniceni, Blesteni, Fetesti, Gaspar etc., and asphalted roads – those from Edinet town, Terebna v. and Hancauti v. The rayon has two sanitation services - in Edinet town and Cupcini v. that have technical equipment that would ensure waste collection and transport to the landfills in several settlements of the rayon. The waste is collected in a mixed way and is transported to the existing landfills. The landfills in the villages of Rotunda, Corpaci and Lopatnic have potential service expansion capacities to other neighbouring settlements.

However, there are landfills that require urgent remedial actions, such as the landfills from Edinet town and Parcova v., and the landfills that must be liquidated, such as those from Constantinovca v. and Alexeevca v.

With the NEF support, in 2008 the rayon received financial assistance to improve the waste collection and storage infrastructure. In 2012 the rayon benefited from feasibility studies for sanitation service concession.

5.3 Service providers

Currently there are sanitation services in Edinet town and Cupcini v. The Sanitation Service from Edinet town has the capacity to expand services to other settlements. The responsibility for maintenance of the services lies with the local public authorities.

5.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Ocnita, Donduseni and Briceni, according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

5.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Edinet rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of

specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

5.6 View on service development

By 2017, in Edinet rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

6 Falesti rayon

6.1 Geographical location

Falesti rayon is bordered on the north by Glodeni rayon, by Balti municipality – on the north-east, by Ungheni rayon – on the south, by Singerei rayon – on the east and by Romania - on the west. The rayon area is about 1,073 km².

Figure 6-1: Geographical location of Falesti rayon

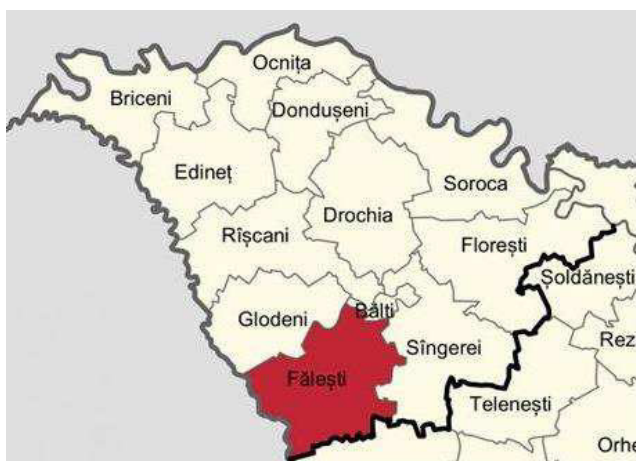


Table 6-1: Data about Falesti rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	16,800	75,800	92,600
Number of communes / settlements	1	32/75	33/76
Existing sanitation services			
Falesti town	1		1
Existing landfills			
Number of existing landfills	1	30	31
Extension capacity of landfills		Iscau	1
Waste generated / stored			
Waste generated (tons / year)	4,507	14,487	1,994
Technical equipment of the waste management sector			
Trucks	5		5
Tractor with trailer	2		2
Bulldozer	1		1
Financial aspect of sanitation services			
Number of services	1		1
Average rate for services (MDL / month)	No data	No data	No data

6.2 Existing waste management system

The waste management infrastructure in the rayon includes a large number of waste burial facilities. These landfills do not meet the location and arrangement requirements. The location of the landfills is quite various, being located either in silage pits or in liquid manure pits (Risipeni v., Scumpia v., Pinzareni v., Catranic v., Glijeni v.), clay pits (Pruteni v.), slopes affected by landslides (Izvoare v., Marandeni v., Natalievca v., Rautel v.) or in dales (Hiliuti v., Pirlita v.). Most landfills have a chaotic storage of

waste, and waste is piled periodically. The landfills are not fenced or guarded. The waste is collected and transported in a mixed way to the existing landfills.

All landfills have access road, in most cases it is a country road. Only the landfills from Catranic, Pompa, Natalievca have asphalted road and Hiliuti, Albinetul Vechi, Navirnet, Pruteni, Ciolacu Nou and Bocani villages have gravel road. The landfills from Pruteni and Rautel villages are considered relatively well arranged. The landfill from Iscalau has potential service extension capacities to other settlements, which would be able to cover Pietrosu, Magura, Bocani, Burghilea and Doltu villages. Remedial actions are needed for the landfills from Chetris, Musteata, Hincesti, Pompa and Horasti villages. During the period 2006-2011 the rayon has received financial support from NEF sources to improve the waste storage activities. However, during 2012 some settlements in the rayon benefited from feasibility studies for sanitation service concession.

6.3 Service providers

Currently there are sanitation services in Falesti town. The Sanitation Service from has the capacity to expand services to other settlements in the rayon. The responsibility for maintenance of existing services lies with the relevant local public authorities.

6.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Glodeni, Riscani, Soroca, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

6.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Falesti rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region/management area and of the legal framework in the field.

6.6 View on service development

By 2017, in Falesti rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of

recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

7 Floresti rayon

7.1 Geographical location

Floresti rayon is located in the northeast of the Republic of Moldova is bordered on the north by Soroca, on the north-west - by Drochia rayon, on the south - by Telenesti rayon, on the east - by Tiraspol city, on the south-east – by Soldanesti rayon and on the west - by Singerei rayon. The rayon area is about 1,108 km².

Figure 7-1: Geographical location of Floresti rayon



Table 7-1: Data about Floresti rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	19,300	70,700	90,000
Number of communes / settlements	3	37/71	40/74
Existing sanitation services			
Floresti town	1		1
Ghindesti town	1		1
Existing landfills			
Number of existing landfills	1	46	47
Extension capacity of landfills		Alexeevca Nicolaevca Cunicea Bobulesti	4
Waste generated / stored			
Waste generated (tons / year)	5,178	13,452	18,630
Technical equipment of the waste management sector			
Trucks	3	2	5
Tractor with trailer	2	1	3
Bulldozer	1	1	2
Excavator	2	1	3
Financial aspect of the sanitation service			
Number of services	2		2
Average rate for services (MDL / month)	No data	No data	No data

7.2 Existing waste management system

The waste management system consists of a large number of waste burial facilities. However, most landfills in the rayon do not meet the location and arrangement requirements. Their location is quite varied, for example, in silage pits in the former complexes/ cattle farmers (Alexeevca v., Iliciovca v., Sevirova v., Putinesti v., Nicolaevca v., Prodanesti v., Domulgeni v.), in clay pits (Gura Cainarului v.), on the territory of the former wastewater treatment plants (Temeleuti v.), on the territory of former chemical waste landfills (Tipordei v.), in river meadow (Cainarca r., Raut r., Ciorna r., Nistru r. - Trifanesti v., Alexandrovca v., Ivanovca v., Bahrinesti v., Rosietici v., Canusa v., Rosieticii Vechi v., Casuna v., Stefanesti v., Bubulesti v., Zaluceni v., Vertiujeni v.). All existing landfills have access road, in most cases this is a country road and only in some cases the road is asphalted (Ghindesti v.) or is covered with gravel (Ghindesti town, Floresti town). In most cases waste is collected in a mixed way and is transported to the existing landfills, except in Floresti town where plastic and paper waste is collected separately. At rayon level a well arranged landfill is considered that one from Floresti town.

The landfills from Alexeevca v., Nicolaevca v., Cunicea v. and Bobulesti v. have potential service expansion capacities to other settlements such as the villages: Gura Camencii, Gvozdova. Also, in the rayon there are landfills that require urgent remedial actions and namely the settlements: Izvoare, Frumusina, Alexandrovca, Gura Cainarului, Marculesti (airport protection zone) Rosietici v., Cenusa v., Sarbesti, Ciripcau, Targul, Vertiujeni.

During the period August-September 2011 Floresti, Soldanesti and Rezina rayons signed an inter-community cooperation agreement for the provision of waste management services. The joint waste management service will cover over 200,000 people in the 3 rayons, of which 13 mayor's offices from Floresti rayon. A sanitary landfill will be built in Soldanesti, two recycling centres in Soldanesti and Floresti and two transfer stations in Floresti and Cotiujenii Mari.

In the period 2008-2012 the rayon also benefited from the NEF financial support for actions aimed to improve the waste collection and transport system, creation of conditions for separate collection of paper and plastic waste, and for people information and awareness on waste management.

7.3 Service providers

Currently there are sanitation services in Floresti town and Ghindesti town. Both sanitation services have service expansion capacities. The responsibility for maintenance of existing services lies with the relevant local public authorities.

7.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Glodeni, Riscani, Soroca, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

7.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Floresti rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

7.6 View on service development

By 2017, in Floresti rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

8 Glodeni rayon

8.1 Geographical location

Glodeni rayon is located in the northwest of the republic, in Prut river meadow. The distance from Glodeni to Chisinau is 168 km. It is bordered on the northeast by Riscani rayon, on the south-east - by Falesti rayon and in the west - by Romania. The area of the rayon is about 754 km².

Figure 8-1: Geographical location of Glodeni rayon



Table 8-1: Data about Glodeni rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	11,700	50,200	61,900
Number of communes / settlements	1	18/34	19/35
Existing sanitation services			
Glodeni town	1		1
Existing landfills			
Number of existing landfills	1	18	19
Service expansion capacity	-	Funduri Vechi Dulmani	2
Waste generated / stored			
Waste generated (tons / year)	3,112	9,543	12,655
Technical equipment of the waste management sector			
Trucks	2		2
Tractor with trailer	3		3
Bulldozer	1		1
Excavator	1		1
Financial aspect of sanitation services			
Number of services	1		1
Average rate for services (MDL / month)	No data	No data	No data

8.2 Existing waste management system

The waste management system includes a network of waste burial facilities located sporadically in most settlements from the rayon. The landfills do not meet the location and arrangement requirements for landfills. Most of them are not fenced and guarded.

The waste is collected in a mixed way and transported to the existing landfills. All landfills have access roads, in most cases they are country roads, and only some of them are covered with gravel – the settlements of Cuhnesti, Ustia, Hijdieni. There is an asphalted road at the landfills in Viisoara and Balatina villages.

The location of landfills is quite diverse, they being in silage pits of complexes / animal farms (Camenca v., Viisoara v., Ustia v., Ciuciulea v.); on slopes affected by landslides (Petrunca v.) in dales (Dusmani v., Limbeni Vechi v.), on roadsides (Hijdieni v.) etc. In the rayon there is only one company that provides waste collection and transport services - JV "Glodeni municipal household." The company is poorly technically equipped and therefore it is difficult to cover with sanitation services several settlements in the rayon. Potential capabilities for the improvement of a common landfill for neighbouring settlements are available at the landfills from Fundurii Vechi and Dusmani villages. Urgent remedial actions are required at the landfills from Camenca and Limbenii Vechi villages.

8.3 Service providers

Currently there are sanitation services in Glodeni town only. The sanitation service from Glodeni town has service expansion capacities to the neighbouring settlements, provided there is proper technical equipment. The responsibility for maintenance of existing services lies with the relevant local public authorities.

8.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Falesti, Riscani, Soroaca, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

8.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Glodeni rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

8.6 View on service development

By 2017, in Glodeni rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for

transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

9 Ocnita rayon

9.1 Geographical location

Ocnita rayon is located in the north-east of the republic, at a distance of 236 km from Chisinau, and is bordered by Ukraine (Cernauti and Vinita regions). The northern tip of the Republic of Moldova is located in Ocnita rayon (in Naslavcea). The area of the rayon is about 597 km².

Figure 9-1: Geographical location of Ocnita rayon

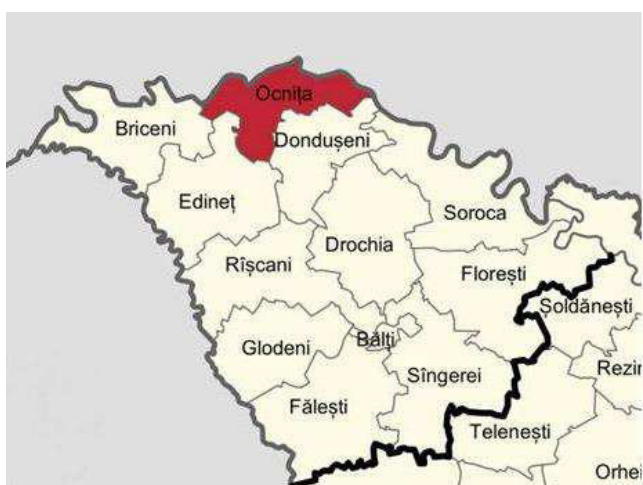


Table 9-1: Data about Ocnita rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	9,300 (Ocnita)	46,800	56,100
Number of communes / settlements	3	18/30	21/33
Existing sanitation services			
Ocnita town	1	-	1
Otaci v.		1	1
Existing landfills			
Number of existing landfills	1	29	30
Extension capacity of landfills	-	Grinauti Otaci Birnova	3
Waste generated / stored			
Waste generated (tons / year)	5,231	6,956	12,187
Technical equipment of the waste management sector			
Trucks	2	-	2
Tractor with trailer	-	1	1
Bulldozer	1	-	1
Financial aspect of sanitation services			
Number of services	1	1	2
Average rate for services (MDL / month)	9 130 (business- es)	10	-

9.2 Existing waste management system

The waste management system is a network of waste burial facilities located in every settlement. They do not meet the requirements of location and arrangement of landfills. Some landfills are located in "accumulation basins" (Corestauti v., Dinjeni v., Grinauti-Moldova v., Unguri v., Lencauti v.), clay quarries (Valcinet v.), lake protection zones (Clocusna v.) or are located at very small distances from people houses (Clocusna v., Hadarauti v.). Waste is collected in a mixed way and is transported to the existing landfills. The landfills are neither fenced, nor guarded. The access road to landfills is covered with gravel (Grinauti-Moldova v., Unguri v. Birnova v., Ocnita town) and only one location has a highroad – Lencauti v. The condition of the landfills from the rayon is unsatisfactory; the waste is stored, in most cases outside the perimeters (chaotically). It is piled rarely, especially on the eve of Christian holidays. There are landfills in the rayon that have potential capacities to expand services to other neighbouring settlements, such as: the landfill from Grinauti-Moldova v. (the villages of Mihalaseni, Rujnita, Barladeni, Paladea), Otaci v. (Calaraseuca v.), Birnova v. (Frunze v.). The rayon also has landfills requiring urgent remedial actions, such as those from Clocusna and Hadarauti villages.

In the rayon the sanitation services from Ocnita town are conceded to the company SRL "Marin Service" for a period of one year - 2013-2014 - and the company SRL "VIXSENOL" for a period 2012-2016. However, in 2012, in some settlements of the rayon feasibility studies for sanitation service concession were conducted.

9.3 Service providers

Currently there are sanitation services in Ocnita town and Otaci town. The sanitation service from Ocnita town has service expansion capacities. The responsibility for maintenance of existing services lies with the relevant local public authorities

9.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Donduseni, Edinet and Briceni according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

9.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Ocnita rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

9.6 View on service development

By 2017, in Ocnita rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

10 Riscani rayon

10.1 Geographical location

Riscani rayon is located in the north-west of the Republic of Moldova, 166 km from the capital of the Republic of Moldova - Chisinau. In the north the rayon is boarded by Edineti rayon, in the east - by Drochia rayon and Balti municipality, in the south-west – by Glodeni rayon and in the west by Romania. The rayon area is about 936 km².

Figure 10-1: Geographical location of Riscani rayon

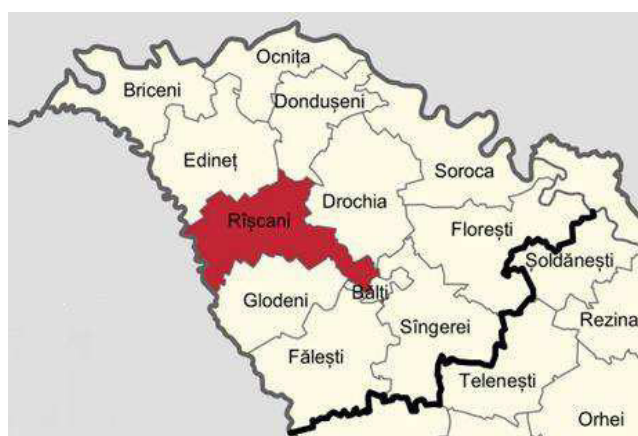


Table 10-1: Data about Riscani rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	13,400	56,600	70,000
Number of communes / settlements	2	26/53	28/55
Existing sanitation services			
Riscani town, Costesti town	2	-	2
Racaria v., Nihoreni v., Duruitoarea Noua v.	-	3	3
Existing landfills			
Number of existing landfills	3	25	28
Extension capacity of landfills	-	Pirjota	1
Waste generated / stored			
Waste generated (tons / year)	4,239	10,290	14,529
Technical equipment of the waste management sector			
Trucks	3	3	6
Tractors with trailer	5	7	12
Bulldozers	2	-	2
Financial aspect of sanitation services			
Number of services	2	3	5
Average rate for services (MDL / month)	4 (apartments) 84 (businesses)	4 (households)	-

10.2 Existing waste management system

The waste management system from the rayon includes a network of waste burial facilities, which are located in almost every settlement. But they do not meet the location and arrangement requirements. Most landfills are not fenced or guarded. Waste is usually collected in a mixed way and transported to the existing landfills. All the landfills

have access road, in most cases it is a country road. The roads from Costesti, Braniste, Riscani, Pirjota are covered with gravel and those from Borosenii Noi v., Varatic v. are asphalted. The location of the landfills is varied: in silage pits from former complexes / animal farms (Grinauti v., Galaseni v., Horodiste v.), on slopes or in river meadow (Malinovscoe v., Nihoreni v., Pocimbauti v.), in dales (Hiliuti v., Zaicani v., Pirjota v.), in field (Varatic v., Singureni v.).

The rayon has 5 sanitation services that have technical equipment that would ensure waste collection and transport to landfills from several settlements.

The landfill with potential capacities of expansion of waste storage services on the neighbouring settlements may be considered the landfill from Pirjota. The landfills from Corlateni, Pociumbeni, Alunis, Alexandreni, Vasileuti villages require urgent remedial actions.

With the NEF support in the period 2006-2011 projects aimed at improving waste collection, transport and storage were implemented. With the NFRD financial support in 2012 the Project "Household waste collection and transport across Riscani and Drochia inter-rayon micro-region" was implemented, which the following settlement benefited of: Singureni, Corlateni, Grinauti, Recea, Racaria and Alunis, but a settlement from Drochia rayon as well (Pelenia v.).

In this project 24 waste collection platforms were constructed, technical equipment for sanitation, garbage bins and euro-containers was purchased. Also, during 2012 some settlements in the rayon benefited from feasibility studies for sanitation service concession.

10.3 Service providers

Currently there are sanitation services in Riscani and Costesti towns and Racarita, Nihoreni and Duruitoarea Noua villages. The sanitation service from Riscani town has potential service expansion capacities. The responsibility for maintenance of existing services lies with the relevant local public authorities.

10.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Glodeni, Falesti, Soroca, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

10.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Riscani rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on is-

sues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

10.6 View on service development

By 2017, in Riscani rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

11 Singerei rayon

11.1 Geographical location

Singerei rayon is located in the north of Moldova, at a distance of 110 km from the capital of Moldova. It is bordered to the north - by Drochia rayon, in the east – by Floresti rayon, in the south - by Telenesti rayon and in the west - by Ungheni rayon. The rayon area is about 1,033 km².

Figure 11-1: Geographical location of Singerei rayon



Table 11-1: Data about Singerei rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	14,600	78,800	93,400
Number of communes / settlements	2	24/68	26/70
Existing sanitation services			
Singerei town	1	-	1
Chiscareni v.	-	1	1
Alexandreni v.	-	1	1
Existing landfills			
Number of existing landfills	1	24	25
Extension capacity of landfills	-	Alexandreni Draganesti	2
Waste generated / stored			
Waste generated (tons / year)	5,017	14,276	19,293
Technical equipment of the waste management sector			
Trucks	2	3	5
Tractors with trailer	1	-	1
Bulldozers	1	1	2
Financial aspect of sanitation services			
Number of services	1	2	3
Average rate for services (MDL / month)	No data	No data	No data

11.2 Existing waste management system

The waste management system includes waste burial facilities located irregularly across the rayon. In most cases these landfills do not meet the location and arrange-

ment requirements. The landfills are not fenced or guarded, and waste is collected in a mixed way and is transported to the existing landfills.

Basically in most of the landfills waste is stored chaotically, and it is piled periodically. A large share of the waste stored in landfills in the villages is animal waste (manure) - between 30-80%. The landfills from the rayon have access road, in most cases it is a country road. Asphalted roads are roads to the landfills from Grigorauca, Octeabrscoe, Bilicenii Noi, and roads covered with gravel – the landfill from Singerei town.

The location of the landfills is varied, they are located in silage pits or in liquid manure pits (Bilicenii Vechi v., Grigorauca v., Draganesti v., Radoaia v., Octeabrscoe v. from Tambula com), clay quarries / pits (Dumbravita v., Chiscareni v., Pepeni v., Cubolta v.), slopes affected by landslides (Singerei town, Coscodeni v.), on roadside (Vechi v.) etc.

However, the rayon has well arranged landfills, such as the landfill from Alexandreni v., which was built under the landfill scheme with the NFRD and NEF funding sources. The landfill from Coscodeni v. that is built with dam, channel and drain pit of filtrate and is fenced, is deemed relatively good.

The landfills from Alexandreni com. (for Heciul Nou, Biruinta, Tiplesti and Grigorescu villages) and Draganesti com. (for Cotiujeni, Radoaia, Alexeevca, Izvoare, etc.) have potential service expansion capacities to the neighbouring settlements. Landfills that require urgent remedial actions are those from the settlements of Bilicenii Vechi, Ciuciuleni, Tauna Veche, Cubolta.

With the NEF and NFRD financial support activities aimed to improve the infrastructure for waste collection and storage took place in the rayon.

In 2012, with the NFRD financial support the construction of a waste landfill was completed in the rayon, which will serve 7 settlements – Biruinta town, Alexandreni, Heciul Vechi, Grigoresti, Tiplesti, Tiplesti and Heciul Nou villages.

11.3 Service providers

Currently there are sanitation services in Singerei town and Chiscareni and Alexandreni villages. The Sanitation Service from Singerei town has potential service expansion capacities. The responsibility for maintenance of existing services lies with the relevant local public authorities.

11.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Falesti, Glodeni, Riscani, Soroca, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

11.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Singerei rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on issues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region/management area and of the legal framework in the field.

11.6 View on service development

By 2017, in Singerei rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

12 Soroca rayon

12.1 Geographical location

Soroca rayon is located in the north-east of Moldova, with direct borders with Donduseni rayon in the north-west, in the west - with Drochia rayon, in the south - with Floresti rayon, in the south-east – with the territorial administrative unit of left bank of Nistru river and in the east – with Ukraine. The area of the rayon is about 1.043 km².

Figure 12-1: Geographical location of Soroca rayon



Table 12-1: Data about Soroca rayon

Data about the rayon			
	Urban	Rural	Total
Overview			
Population [pers] (NBS data)	37,400	63,000	100,400
Number of communes / settlements	1	34/67	35/68
Existing sanitation services			
Soroca town	1	-	1
Existing landfills			
Number of existing landfills	1	61	62
Extension capacity of landfills	-	Ocolina Regina Maria Solcani Parcani Vasilcau Holusnita	6
Waste generated / stored			
Waste generated (tons / year)	10,060	11,996	22,056
Technical equipment of the waste management sector			
Trucks	3	-	3
Bulldozer	1	-	1
Tractor with trailer	2	-	2
Financial aspect of sanitation services			
Number of services	1	-	1
Average rate for services (MDL / month)	No data	No data	No data

12.2 Existing waste management system

The existing waste management system consists of waste burial facilities located almost in every settlement. The landfills do not meet the location and arrangement requirements. The landfills are located diversely: in silage pits (Septelici v., Cremenciug v., Vadeni v., Baxani v., Redi -Ceresnovat v., Iorjnita v.), clay pits (Tatarauca Noua v., Regina Maria v.), sand pits (Slobozia Cremene v., Vasilcau v.), cereal warehouses (Badiceni v.), landfills of chemicals (Slobozia v. and Varancau v.).

The rayon has a single Sanitation Service – Soroca Housing Household that serves only Soroca town and it has 3 trucks, 1 bulldozer and 2 tractors with trailer. In Soroca town plastic, PET, metal and paper waste is collected separately.

The landfills from Ocolina v. (for Tepilova v.), Regina Maria v., Solcani v. (for Curesnita Noua), Parcani v. (for Voloave v.), Vasilcau v. (for Trifauti v.), Holosnita v. (for Curesnita v.) have potential service expansion capacities to the neighbouring settlements.

There are landfills in the rayon that require urgent remedial actions - Bulboci v., Egoreni v., Cerlina v., Varancau v.

The rayon benefited from NEF funding sources for improvement of waste management infrastructure. With the support of NFRD (2012), the project "Establishment of an integrated solid household management in the DRN (Soroca town)" was implemented in the rayon. In this project technical documentation for the construction of a landfill, a waste sorting station and SHW collection platform were developed.

12.3 Service providers

Currently there are sanitation services in Soroca town. To be able to expand sanitation services to the neighbouring settlements, it is necessary that the service to be more equipped. The responsibility for maintenance of existing services lies with the relevant local public authorities

12.4 Key challenges

The development of waste management infrastructure in the rayon is planned to take place in the area of waste management, consisting of the rayons of Singerei, Glodeni, Riscani, Falesti, Floresti, Drochia and Balti mun., according to the preferred scenario in the regional planning and the Waste Management Strategy, approved by the GD. 248 of 10 March 2013.

The key challenges are:

- The association of Local Public Administration Authorities to manage waste in the whole waste management area, according to new approaches to the development of the sector at regional level;
- Construction of a single landfill and creation of infrastructure related to the waste management area.

12.5 Development prospects

Development prospects are associated with improved quality of sanitation services in Soroca rayon. They will be reached as part of the implementation of the development targets of the sector within the RSP related to waste management for the DRN, which focus on achieving short, medium and long term objectives. The objectives focus on is-

sues related to covering population with waste collection services, resource recovery from packages and organic waste, as well as issues related to the management of specific waste stream, while strengthening the institutional capacities in the region / management area and of the legal framework in the field.

12.6 View on service development

By 2017, in Soroca rayon access to safe sanitation services for 100% of the urban population and 75% of the rural population will be ensured. Resource recovery from packaging waste, specific waste treatment, as well as regional infrastructure development for waste collection, transfer and transport (transfer stations) in the micro-zone, reduction of existing landfills down to 1-3 landfills per rayon and locations improved for transition period will be ensured. By 2022 and thereafter the rayon performances shall reach about 100% of coverage of rural and urban population with improved services of recovery of organic and packaging waste, specific waste treatment and a single sanitary landfill to be operated jointly with the group of rayons associated in the management area shall be ensured. All this will result in improved services and living conditions and will ensure sanitary and environment conditions for the entire rayon.

Annex 2: Projections regarding waste amount and structure

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1 Methodology

In Development Regions North and Centre no direct studies on current waste amount have been conducted. Therefore, the current and historic amounts of wastes that are generated in the two regions are unknown, except for the control in this sphere, conducted on GIZ's suggestion, at the City Enterprise "Regia Apa Canal Soldanesti" back in 2010. Due to lack of truthful information, the estimates and prognoses of waste generation have been based on the information delivered by some partial studies on waste and information about waste management from counties of Romania neighboring the Republic of Moldova, as well as on experts' analysis, which, on its turn, is based on observations made during field trips.

The prognosis of waste generation depends on two core variables: population and economic development of analyzed region. Thus, changes in the number of population determine the amount of waste generated by households and legal entities. The economic development will accrue expenses and consumption, which will boost amount of waste generated per household, which, in its turn, will result in increase of amount of waste generated by legal entities.

In order to draft a future estimate on waste a thorough analysis of population and economic development needs to be conducted. These issues are detailed in the paragraphs below together with the estimate, in perspective, of the amount and morphological composition of generated waste.

2 Prognoses on population and economy

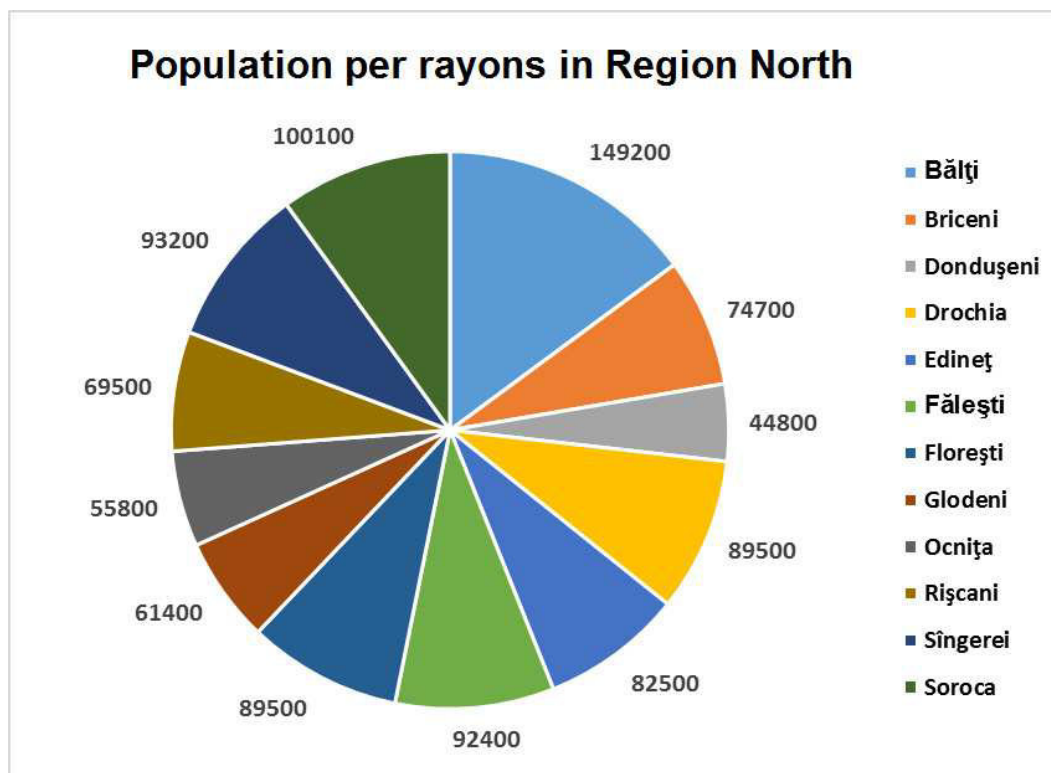
2.1 Population related prognoses

For the elaboration of population related prognosis, information from the National Bureau of Statistics for the last 10 years have been collected and analyzed and the annual national rate of 0.20% drop in number of population has been calculated. The prognosis of number of population is carried out for a 33-year timeframe (2012-2045), assuming that the new waste management plan will become functional to 2018-2020 and that the sanitary landfills will have a 25-year life span.

The current breakdown of population per rayons, in DRN, is shown in the graphs below.

Considering the annual rate of drop in number of population, according to prognoses, the total number of population in DRN will register a decrease from slightly over 1 million in 2012 to 0.930 million to 2045.

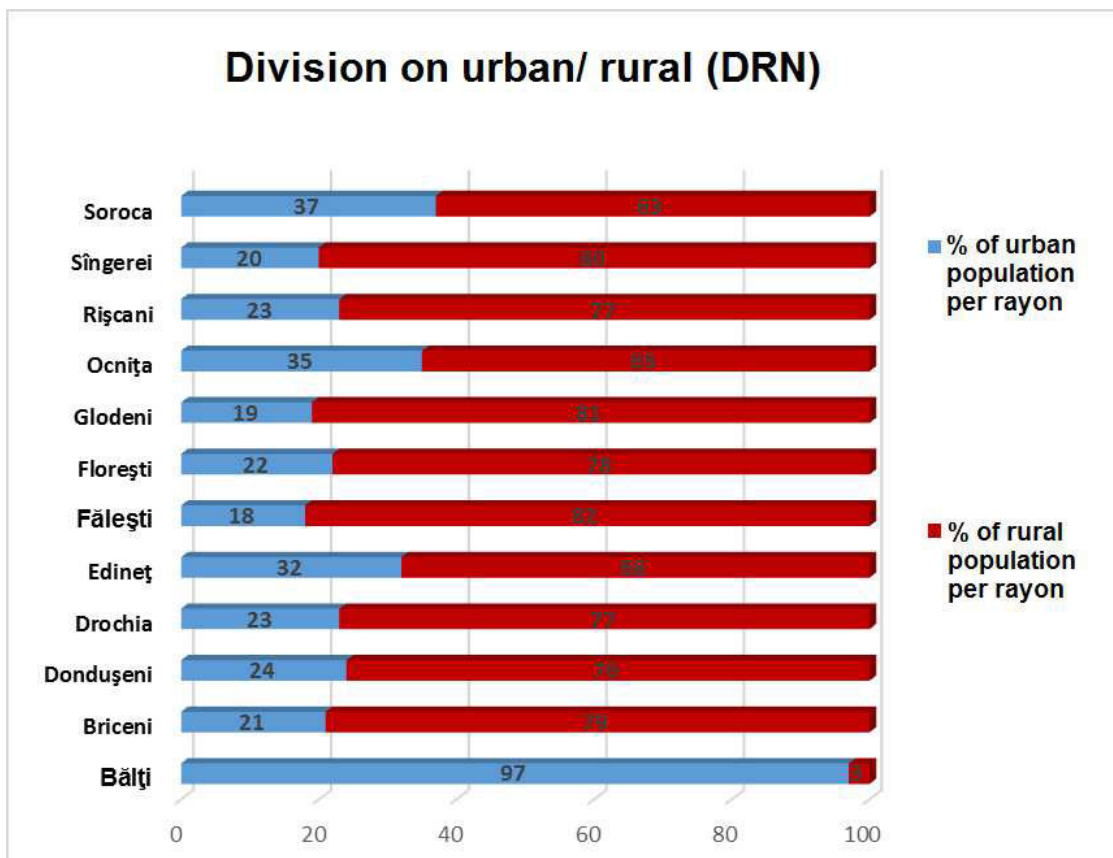
Figure 2-1: Population per rayons in the Development Region North



Currently, most of population lives in rural areas, except Balti rayon, where most of the population lives in the city of Balti.

On the whole, in DRN the total urban population makes up 35.50%. The ratio between the rural and urban population per rayon is shown in the graphs below.

Figure 2-2: Urban/rural population breakdown in DRN



2.2 Economy related prognoses

The evaluation of economy development level is based on the national GDP calculations. According to estimates from the Waste Management Strategy, an annual increase of the GDP by 5% is anticipated. However, GDP is overwhelmingly influenced by the population and economy of Chisinau which is the most developed city and the economical center of the country. In other regions of the Republic of Moldova, according to estimates, the economic boost will not be as equally essential as in Chisinau. Thus, it is anticipated that GDP will register an annual average increase rate of 2.50% in other regions.

3 Prognoses on waste amount

According to the information detailed in national strategies and analyses, the rate of waste generation for 2012 amounts to 0.735 kg/man/day in urban areas and 0.525 kg/man/day in rural areas. Due to GDP increase and in relation with the aforementioned changes in number of population, it is estimated that to the year 2020 the waste generation rate will increase up to 0.89 kg/man/day in urban areas and 0.64 kg/man/day in rural areas.

Considering these calculations, it is estimated that:

- In 2012, in DRN, an amount of 219,411 tons of waste had been generated; it is anticipated that in 2020 this figure will reach 249,634 tons.

The table below shows estimated cumulative values of generated waste amount and waste that need to be stored in sanitary landfills, in DRN, for a timeframe of 25 years, spinning from 2018 until 2043. This timeframe corresponds to the 25-year operating timeframe of sanitary landfills, provided that they will be put into operation in 2018.

Table 3-1: Amount of generated waste and waste that needs to be stored in landfills

Year	2018	2023	2028	2033	2038	2043
DRN						
No of total tons of generated waste	215,917	1,340,554	2,470,261	3,599,967	4,729,673	5,859,379
No of total tons of wastes stored in sanitary landfills	98,009	608,505	1,121,302	1,634,099	2,146,896	2,659,693

In DRN, the distribution of waste generating sources makes up about 44% of the waste generated in urban areas and 56% – in rural areas.

4 Morphological composition of waste

Estimates about waste composition in DRN were carried out considering the data from the project „Finalization of Third National Communication to the United Nations Framework Convention on Climate Change”, financed by UNO. The project has been conducted in February-December 2012 and provides a thorough analysis of morphological composition of waste from 4 locations of sanitary landfills: Chisinau, Balti, Leova and Causeni. 4 sets of analyses have been performed on each location, to examine waste composition depending on the season. Thus, these analyses have been performed in March, June, September and November 2012.

This information has been further matched to the data on waste composition from neighboring counties from Romania and with the analysis of information collected during the activity in the field.

The estimate composition of waste flow for rural and urban areas is shown below.

Table 4-1: Estimate composition of waste flow for rural and urban areas (% of total analyzed waste amount)

	Urban areas			Average values in urban areas	Average values in rural areas
	Chisinau	Balti	Leova/Causeni		
Paper and cardboard	8.00	2.80	5.10	5.30	2.60
Glass	8.10	5.20	5.10	6.10	3.10
Plastics	7.30	3.80	3.30	4.80	2.40
Metal	2.00	2.00	1.30	1.80	0.90
Kitchen waste	46.20	63.20	40.70	50.00	12.50
Garden/agricultural waste	4.30	5.00	22.96	10.80	21.50
Manure					40.70
Textiles	3.30	2.60	2	2.70	1.40
Footwear	0.60	0.20	0.30	0.40	0.40
Furniture	1.40	3.90	0.90	2.00	1.00
WEEE	1.70	1.00	1.00	1.20	0.60
Wood	1.90	1.90	0.60	1.50	0.70
Other (industrial)	15.40	8.50	16.50	13.40	12.20
Total	100.00	100.00	100.00	100.00	100.00

Note: the percentage of manure equals, in rural areas, the percentage of kitchen waste, according to the data from Leova and Causeni rayons, where such type of waste has been reported, but has not been included in kitchen waste category.

Annex 3: Technical evaluation of the options

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1 Scope and methodology

Technical and financial evaluation is carried out according to classical evaluation methodology (described, step by step, in the main report). The evaluation addresses current situation, sector tendencies (targets) and the desired level of development of the sector, presented in the main report. The recommendations for regional waste management system development have been analyzed as to:

- Waste disposal and collection, including sources segregation;
- Resource recovery;
- Treatment;
- Landfills, transfer stations and long distance transportation;
- Special waste management;
- Management and closing of current landfills.
- Waste management in the Republic of Moldova is at its early development stage. However, lately, more actions have been made in this sector, which yields good experience, including case studies that can contribute to the development of RSP and DRN.

2 Technology selection criteria

2.1 Sector's desired development level and objectives

For recommendation of technical solutions and options sector's desired development level and targets apply. These objectives are set in accordance with the safe and secure waste management principles, considering the steps and deadlines provided in Waste Management Strategy.

2.2 Current infrastructure and available plants for treatment and disposal

Technical analysis evaluates current waste management infrastructure and investments for the improvement of waste disposal areas. They are considered when future waste disposal locations and transfer stations in rayonal clusters, that make up recommended waste management areas, are suggested. When suggesting waste landfill locations the infrastructure and quality of roads was taken into account. At the planning stage no waste management system elements locations have been identified. They will be identified and detailed in feasibility studies, according to the legislation, following the evaluation of Environmental Impact Assessment (EIA).

2.3 Appropriate recycling and treatment technologies

Different treatment and recycling technologies are suitable for different economic, social and cultural spheres such services are provided for. Recycling and treatment technologies that are more suitable according to population served by the system, amount and composition of waste flows and approachability, are being chosen so that to comply with the purpose and tasks set in the Waste Management Strategy.

3 Waste management technologies

This section summarizes the information about waste management technologies, which have been demonstrated and can be applied in the Republic of Moldova. The following technologies are presented in a useful manner to raise public awareness and to educate it:

- Selection and recycling;
- Composting;
- Anaerobic digestion;
- Waste fuel production;
- MBT stations;
- Incineration;
- Waste disposal.

Each description details a list of facilities and equipment required for the operation, products (resources) and the process' outcomes, technology applicability. The descriptions are by no means exhaustive; there are more variations of such technologies. The purpose of this material is to better comprehend the technologies and the way they are applied, to ensure that the choice of DRN technologies is well informed.

3.1 Selection and recycling

Recycling is a key component of resource recovery and is one of top components of waste hierarchy, being surpassed only by prevention (reduction and reuse of waste). Recycling starts with the materials' selection, either on production site, or at a sorting facility after mixed collection, followed by different stages of process in which secondary materials are recovered, cleaned, compressed, shredded and, finally, used as secondary material for production.

The highest quality of recyclables and, therefore, the highest incomes and capacity to acquire customer for recyclables is when recyclables are sorted at source (e.g., by the waste generator). The recyclables supply chain can be formed of various intermediary rings, where the value increases either through one type of processing, or through sale of materials in bulk. Often, different types of paper, cardboard, ferrous and nonferrous metals, plastics and glass are subject to recycling; however, textiles, rubber, old oil, wood and furniture, more complex waste sources, such as Waste Electrical and Electronic Equipment (WEEE), batteries and cars out of use and etc. are also recyclable.

Often recycling is carried out, partially or fully, by the private sector. The authorities' responsibility as to recycling often refers to the strengthening of this sector, improving logistics and value chains, supplying large amounts of better materials to the existing recycling industry. Thus, the real steps of solid waste management process are sorting, compression, baling and/or shredding of materials.

3.1.1 Elements of a triage station

Depending on the project of triage station, it can be designed for mixed waste or waste sorted at source. The chosen technology can be power-operated or intensive work force can be used. The basic elements are:

- Industrial shed, disposal areas with roof, concrete platform for sorting;

- Industrial weighing scale to weigh materials;
- Power-operated or manual sorting, usually on conveyor belts;
- Different sorting devices, magnets for metals, screens, dividers, bins;
- Waste treatment equipment, such as washline, grinder, pressers, glass grinder etc.;
- Lift.

3.1.2 Acceptable waste flows

Sorted mixed wastes or source for additional sorting.

3.1.3 Outcome

Different types of paper, cardboard, ferrous and nonferrous metals, plastics and glass are usually sorted as well as textiles, rubber and old oil. Some materials are more complex and require special collection, disruption and treatment; such materials are hazardous municipal waste, such as furniture, Waste Electrical and Electronic Equipment (WEEE), batteries and cars out of use and etc. They can be delivered to a sorting facility to be sorted, disposed of and treated separately.

Some materials will be generated as non-recyclables after sorting and they will usually require disposal, although some of them are suitable for additional treatment (e.g., composting).

3.1.4 Technology applicability

Triage stations are used in areas with no segregation facilities or where the sorting has just been implemented or it is carried out in two fractions. Even if the sorting infrastructure on more fractions is applied, people could wrongly sort the materials, due to poor awareness or lack of motivation. In such case additional sorting is needed. According to special needs, the sorting is required to be carried out in a certain flow, i.e. sorting of different plastics or materials or sorting according to colors.

3.2 Composting

Composting is a popular way of municipal waste and food leftovers treatment. Organic residua can be transformed from waste into useful soil fertilizer through composting. Composting is a biological process of organic waste decomposition, in the presence of oxygen, in a stable matter called compost.

3.2.1 Technological elements

Composting is carried out for large amounts of organic waste. This method is based on a high level of nitrogen, which supports the development of bacteria, which generate high temperatures for the production of compost matter in safe conditions. For this process the retention of air in the system and monitoring of moist level is required.

Industrial platforms or, a building for power-operated systems, are among the core technological elements; rake machines or other equipment for aeration, screens and grinders, mobile equipment for materials in motion.

3.2.2 Acceptable waste flows

A wide range of biodegradable waste can be composted, such as: food leftovers (from households, restaurants and canteens), garbage from public markets (only biode-

gradable material), green waste (from private gardens, parks and public areas), and wood waste (furniture and gross waste is not accepted).

In many farms the main material for composting is the manure and other agricultural waste.

3.2.3 Outcome

This process generates compost used in agriculture. Compost can be of high quality, if it is made of selected materials, or of low quality, if the waste flow is contaminated. In the latter case, the compost can be used only for certain purposes, e.g. to rehabilitate contaminated areas or as compost for energetic plants.

3.2.4 Technology applicability

This technology is comparatively cheap and flexible, because it can be applied on different scale, according to the requirements. Local authorities in charge for the maintenance of public open spaces are usually the main buyers of this matter.

3.3 Anaerobic digestion

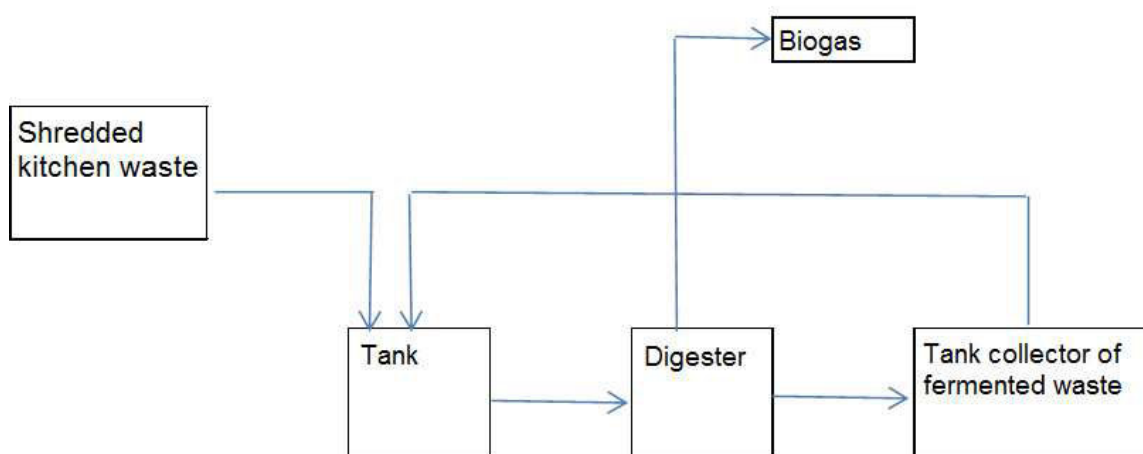
Anaerobic digestion (AD) is a natural process in which the microorganisms decompose the organic matter, in the absence of oxygen, transforming it into biogas (a mixture of carbon dioxide (CO₂) and methane) and digestate (a fertilizer rich in nitrogen). Biogas can be used in combined heating and electricity engines, can be burnt to generate heat or can be refined and used as natural gas or as fuel for vehicles.

3.3.1 Technological elements

The main investment elements are:

- Grinder or other equipment for waste pre-treatment;
- Food tanks, heated fermentation tanks, tank for digestate collection;
- Equipment for biogas production supervision.

Figure 3-1: Anaerobic fermentation system chart



Digesters can be wet or dry, mesophilic or thermophilic, with one or more steps. Dry AD uses minimum power-operated selection and the digestion applies to solid waste only.

3.3.2 Acceptable waste flows

A large variety of organic material can be used to produce energy, such as food waste from households and industries, manure and residua, sludge from water treatment plants and plants grown for energy production. Agricultural waste and sludge can be used; however the use of municipal waste has not proven its efficiency yet.

3.3.3 Outcome

Biogas is the output for the anaerobic digestion, used for energy production. The gas consists of about 60% of methane and 40% of CO₂. Currently it is mostly being used to generate electricity for local use and national power network supply. Besides energy generation the process generates digestate. Digestate is a valuable bio-fertilizer which can be used as regenerating source for critical resources, such as nitrogen and phosphor.

3.3.4 Technology applicability

The stations can be built at different scales, from big water treatment sludge or municipal waste facilities, to small stations for certain agricultural operation waste management.

3.4 Mechanic-biological treatment (MBT)

This technology implies processing of waste mixture to stabilize organic waste and can include also material recovery for recycling or other purposes.

3.4.1 Technological elements

MBT's main advantage is that it can be configured to accomplish several different tasks. Several typical tasks of MBT plants are:

- Pre-treatment of waste that gets to the landfill;
- Discharge of solid non-biodegradable and biodegradable wastes from landfills by power-operated classification of solid municipal waste into recycling materials and/or energy recovery as fuel produced from waste;
- Processing of municipal solid biodegradable waste through: reduction of dry matter of organic waste prior to disposal, reduction of biodegradability of organic waste prior to disposal, stabilization in a matter similar to compost for use on land, transformation into fuel biogas for energy recovery and/or desiccation of materials to produce organic fraction with high energy value for use as waste generated fuel.

3.4.2 Required operating equipment

For MBT the following equipment is involved, which can be delivered as package, to meet special processing requirements:

- Preparation step: grinder, revolving drum, ball mills;
- Waste separation: large sieves (paper, plastics), manual (plastics), magnetic (nonferrous metals), turbidity current separation (nonferrous metals, humid separation for different densities (plastics, organic matter, stone, glass), air classification for weight, optical (for special polymers);
- Biological treatment – biological processes are: aerobic bio-desiccation, basin aerobic composting or anaerobic digestion.

3.4.3 Acceptable waste flows

The following waste flows can be processed through MBT:

- Mixed municipal waste and commercial and industrial waste;
- Recoverable elements: ferrous metals, nonferrous metals, plastics, glass.

3.4.4 Technology outcome

The following results are obtained through MBT:

- Recyclables, such as metals, paper, plastics, glass and etc.;
- Non-used materials (inert materials), safely disposed of at sanitary landfills;
- Biogas (anaerobic digestion);
- Organic stabilized waste fuel (high caloric fraction).

3.4.5 Technology applicability

MBT capital and operating costs can be high as compared to waste management alternative technologies. As a result, this technology has not been adopted on a large scale, unless regulation bodies pushed it (e.g., regulatory requirements on organic waste treatment prior disposal).

MBT stations' fuel is often burnt to produce energy in non-regulated facilities or unduly monitored for emissions in the air. In these cases, fuel production can cause significant damage to health and environment, due to pollutions released in the air. Therefore, MBT use for fuel production is not relevant for the Republic of Moldova.

In Europe the capacity of MBT facilities can vary from 10,000 tons per year in plants with 250,000 tons per year.

3.5 Waste fuel

Waste fuel covers a wide range of waste categories that have been processed to accomplish industry guiding, regulatory specifications to mainly get a high caloric value. According to its composition, the fuel can be used in different industries (furnaces, concrete factories, power stations).

3.5.1 Technological elements

One of the less expensive and well-designed technologies for waste fuel production is the mechanic-biological treatment (MBT). A MBT station separates metals and inert materials, identifies organic fractions (for stabilization composting processes, with or without digestion, are used) and separates high caloric power fraction for fuel.

3.5.2 Acceptable waste flows

The following wastes can be used for fuel production:

- Residua from MSW recycling, industrial/commercial waste, sludge from water treatment plants, industrial hazardous waste, biomatter waste;
- Plastics and biodegradable waste from municipal solid waste, materials with high energy value;
- Wood waste, paper and plastics waste.

3.5.3 Outcome

Outputs can consist of 10-30 mm fractions. Often waste is palletized prior to use, put in bins or stored in bunkers.

According to wastes' initial composition, about 10-20% of MSW can be transformed in fuel. Non-corresponding waste is thrown at the landfill.

3.5.4 Technology applicability

This technology is used in many EU countries, as support of recycling and transformation of organic waste. However, the use of fuel produced from such waste is a controversy subject, due to the fact that during combustion different toxic gases (including dioxins and furans) are being released in the atmosphere. In many countries, including the Republic of Moldova, the regulatory and monitoring framework of air pollution is poorly developed to ensure safe combustion of waste fuel. Therefore, the use of MBT for fuel production is not recommended.

3.6 Incineration

Incineration is a thermic waste disposal process that implies combustion of organic waste. Waste is transformed into ash, gas and heat. Incineration reduces the initial waste volume up to 90%. The generated energy can be used in heating systems. Combustion gas refine equipment is also used in modern incineration plants. Incomplete incineration can generate carbon monoxide, gas dioxins and/or other injurious substances. Incineration with energy recovery is considered a recovery operation. Nevertheless, incineration without energy recovery is considered a disposal operation.

3.6.1 Incineration technological elements

Incineration technologies are distinguished according to the type of incineration grid they use:

- Mobile incineration grid is the most popular type of grid. It ensures a highly efficient combustion process due to high temperatures and well stirred fuel;
- Fluid environment. Incineration in a fluid environment is carried out in a room with sand, where the waste is a part of the material from the furnace.

Gas refining is always part of the process. There are several processes that might reduce pollutants. Gas treatment filters can be divided into several types: cyclone, electrical filter, textile filter, wet purifier.

The energy can be recovered from incinerators. Usually, water is transformed in steams, which can be used directly, if there is a steam plant in vicinity, or can be used to generate electricity.

3.6.2 Acceptable waste flows

The following waste flows are suitable for incineration:

- Certain hazardous wastes, in which pathogen and toxic substances are destroyed at incineration;
- Special industrial waste, such as hydrocarbon, tar residua, used diluents and paint sludge that can be transformed into heat or electricity in special incineration plants or concrete plants;
- Agricultural waste, such as wheat, corn and rice straw;

- Agro-industrial waste from sugar and oil mills;
- Household and similar waste from business and industries.

3.6.3 Technology applicability

This technology is applied in countries with increased need for waste volume reduction. However, an incineration plant requires large investments and expenses; this is the reason why these plants have not been popular in EU countries in the past decade. Also, incineration might not be compatible with recycling programs, once recyclable materials (e.g. plastics, paper, cardboard) are required for incineration as well, due to their high energy value. In countries like Moldova, municipal solid waste consists of a large share of organic waste. Therefore, the fuel value of waste subject to incineration is so low that their combustion cannot be sustained; thus, the use of fuel for incineration is needed, resulting in increase of operating costs.

3.7 Sanitary landfills

Regardless of waste treatment and processing level in different technologies, a certain amount of waste that needs to be disposed of will remain. Sanitary landfill is the technology used in modern waste management systems for waste inhumation. If conducted according to standards, sanitary disposal is an efficient way of waste disposal from economic viewpoint, and safe – from ecology viewpoint. If sanitary disposal assumes organic waste disposal, recovered methane (resulted from organic waste degradation) can be feasible.

3.7.1 Sanitary disposal technological elements

Sanitary disposal consists of the following elements:

- Fence, used to restrict access on the territory and to define plant boundaries;
- Scales used to check the amount of waste, collected and transported by vehicles;
- Plant waterproof, which contributes to the formation of a waterproof layer, preventing leachate outflow from landfills and allowing its collection for treatment;
- Leachate collection and treatment device. Landfill's borders have a lower surface, where any fluid is collected. This leachate needs to be disposed of and then treated at a water treatment plant;
- Rainwater collection system, specially designed to collect water leakage during rainfalls or snow melting, prior to being disposed of from the territory;
- Collection and splay of disposal gases. Disposal gas is produced when the bacteria from the landfill decompose the waste, in the absence of oxygen. Gases should be removed from the landfill, using a network of collection pipes, and later to be duly treated; the methane from the landfill gas can be used to generate electricity;
- Groundwater monitoring system, used to monitor the level and quality of waters and to compare their quality prior to and after they have passed through the disposal area. Thus it is ensured that groundwater is not contaminated;
- Cap or cover to isolate wastes.

3.7.2 Operating equipment

The following equipment is used in landfill operation:

- Compactor, used to spread the waste in layers, over the dump;
- Loader for capping material (e.g. soil, industrial waste), to prevent odor;
- Disposal gas and leachate control/treatment systems.

3.7.3 Best operating practices

Compaction and daily capping with soil or inert waste. Alternative capping materials are temporary layers, woodchips or other output and pulverized polyurethane foam. Waste compaction is important for landfill lay-out.

At the end of its operation landfill should be rehabilitated.

The upper landfill layer is essential in ensuring isolation between waste and environment, by controlling water infiltration, thus reducing leachate generation. Moreover, the upper layer is used to prevent the release of gases or to support vegetation.

3.7.4 Acceptable waste flows

Disposal is appropriate for solid, non-dangerous waste disposal. Fluid waste shall not be disposed of in the landfill. EU waste directives provisions stipulate total restriction for biodegradable waste disposal in sanitary landfills, to reduce methane emission.

3.7.5 Technology applicability

In those 27 EU member state, almost 40% of MSW are disposed, although in some countries (especially in central and Eastern Europe) a larger share of waste is disposed. There are over 150,000 sanitary landfills in the European countries.

4 Recommended technology combinations

4.1 Collection

The purpose of waste collection service is to reach 100% coverage in urban and rural areas of the Republic of Moldova. Currently, waste collection in urban areas is carried out with old equipment. To improve service's standards and efficiency both bins and vehicles need to be renewed. This will reduce trouble related to accumulated waste or waste inadequately collected in old bins and to odor and garbage that the transportation of waste in open vehicles in urban areas leaves behind.

The recommended technical solutions are differentiated between urban and rural areas from the point of view of collection, used equipment and frequency of collection. Currently, each area benefits from services provided by private companies or public enterprises that operate in the rayon's towns and provide services of waste collection and disposal for the related areas.

In the short run the priority is to improve waste collection share and service quality; therefore, the stress will be put on the mixed collection extension and modernization simultaneously with the source segregation and waste separate collection.

Urban waste will be collected 2 times per week in areas with tower blocks and once per week in private houses areas. In tower blocks area joint collection will apply, i.e. bins of 1.10 m³ will be installed on waste collection platforms. In private houses areas selective collection will apply, i.e. each house will use standard plastic bins of 0.24 m³. Mixed rural collection will be carried out once in two weeks. It is recommended the joint collection method, i.e. each inhabitant will have to cover a comfortable distance to take its garbage to the joint bin. Joint bins of 1.10 m³ will be placed not farther than 200-300 meters in rural areas.

The waste collection equipment that is being used at the moment in the Republic of Moldova consists of old tractors and trailer trucks, usually without compactors and sometimes with manual transmission. There are only few cases when waste collection and transportation services are carried out with modern trucks with compactors. It is recommended to replace old equipment with trucks with compactors of 16 m³, for mixed waste collection in urban area, and 10 m³ – in rural area respectively.

Separated collection in 2 fractions in 2 separate bins is recommended in urban areas. Dry bin is used for collection of recyclable waste, such as plastics, paper, glass and metal. Wet bin is used mostly in areas with organic waste, such as kitchen waste, green waste and other non-recyclable waste flows and are not attributed to special waste flows, such as textiles, rubber and etc.

Collection with 2 fraction source separation is a step to the source separation development, where population is actively involved in accomplishing source separation benefits. After a certain time, the system can be transformed in plurifaceted source separation process.

Now, PET and different types of plastics will continue to be collected separately in rural areas, according to current experiences, since paper is used for heating and glass and metal is sold to private collectors.

Two-compartment trucks or separate trucks for each fraction can be used for traction and transportation.

Picture 4-1: Bins



Bins will be placed in densely populated areas and will be bell-shaped or regular, depending on preferences. In some towns of Moldova, metallic nets are used for PET collection. They are a cheap solution, as they can be used permanently.

4.2 Transfer system and transportation

Currently, almost every locality has its own landfill. Most of these landfills are not controlled, although some of them have been recently monitored and transformed in controlled or partly controlled landfills. It is important to regionalize the waste management system in the Republic of Moldova, to reduce environment pollution caused by the large number of landfills and to ensure economy of scale from resource recovery, treatment plants and landfills, which are planned and detailed in the following section hereof.

Waste transfer stations are facilities where solid municipal waste is unloaded from collection vehicles and retained for a short time, prior to being loaded in long-distance transportation vehicles, used to transport waste to sanitary landfills or other treatment or disposal plants.

Such stations contribute to operating costs increase through cutting costs of waste transportation to landfill/treatment plant by reducing the total number of departures to and from final destination and allow long-distance transportation of waste in bulk, by trucks.

Considering the distance, state of the roads and population density (generation rate of wastes in a certain area), the design of a small transfer station in the Republic of Moldova assumes its location at about 25-30 km from the serviced localities. A transfer station will cover 5-10 localities. The capacity of the transfer station will depend on the number of serviced population and generated waste amount. Waste will be brought to transfer stations by collection trucks and then loaded in intermediary bins of 30 m³ or 40 m³, depending on waste amount the transfer station will receive. These bins are designed to fit on platform trailers. Bins will be taken over by bigger transportation vehicles, equipped with trailer able to transport up to 2 such bins.

Transfer stations will work as collection centers for recyclables, hazardous municipal waste, WEEE and gross waste. These types of waste will be stored separately from mixed waste, in appropriate bins, on a platform in the transfer station. Such waste flows will be taken over by companies specialized in hazardous waste recycling and treat-

ment or, if the amount is not enough, they will be transported to a bigger transfer station.

The size of transfer stations will depend on the number of population they cover. Big transfer stations will have an office building and recyclable triage plant.

The place the transfer stations will be located will be identified when conducting feasibility study, which will constitute one of the first steps in the implementation of the regional program.

4.3 Resource recovery

4.3.1 Recyclables

To treat dry matter, triage facilities will be installed at big transfer stations and landfills. These facilities are required to achieve in short time the resource recovery objectives. Triage facilities are required for sorting metal, paper, cardboard and different plastics, glass and other items. Triage facilities provide more power-operated treatment steps (e.g., compression or shredding); however, dry matter sorting will be primarily done by hand.

WEEE represents a special and complex waste source. As a first step, national campaigns will be conducted for WEEE collection. Transfer stations will play the role of collection centers for such waste and will temporarily store them. Companies specialized in waste split and recycling are usually private companies and will take over the waste from transfer stations or will participate in national collection campaigns.

Industrial waste is not part of municipal waste; however, in the Republic of Moldova it is being handled together with municipal waste. One or two recycling facilities at a regional landfill are provided for their recycling. Materials after recycling are used for capping and/or rehabilitation of old landfills or, they can be used in roads construction and etc.

4.3.2 Composting

Composting is a suitable solution for the Republic of Moldova, mostly a rural country, where agriculture holds an important place in the economy and represents a sector with significant development potential. This refers mostly to “biological” and “ecological” outputs, because dependence traditional agriculture continues to be practiced and the climate is favorable. Composting facilities are developing all around the Republic of Moldova, awareness campaigns in this regard being organized. Through these initiatives farmers are encouraged to use biodegradable waste as composting.

Besides these initiatives, it is important to continue awareness composting benefits activities on small scale, especially in rural areas. It is a traditional practice that should be strengthened and improved.

Initially, the wet waste household fraction, including organic materials from waste, will be disposed in regional landfills. Opportunities for value recovery from such waste will be feasible on long run. Nevertheless, development and implementation of standards on materials processing will be a first step in the use of mixed biodegradable waste on a large scale. These standards are required to protect public health and environment from unpleasant and dangerous outcome related to biodegradable waste processing.

4.4 Anaerobic digestion

Anaerobic digestion is an alternative for composting because it results in energy production. In some areas the demand for energy could be bigger than for compost. Mol-

dova has already turned its attention toward biomatter and agricultural waste for heat energy production. There are a lot of programs and initiatives for energy generation from agricultural waste, such as straw, hay and etc. This is due to the fact that there is local biomatter potential and the Republic of Moldova lacks natural resources, such as methane or coal, which can be used for heating.

Therefore it is recommended to consider the use of anaerobic digestion facilities where there are large amounts of agricultural waste or sludge from water treatment plants and where the markets of biogas produced through anaerobic digestion can support high investments and technology's operating costs.

4.5 Other treating methods

Both MBT and incineration can be considered for waste treatment. Among relevant incineration factors are:

- Capital and operating costs are too high;
- Incineration plants operate more efficiently when incinerating waste is dry and with high energy value. Waste in the Republic of Moldova is wet and has low energy value; therefore, additional fuel is needed to sustain adequate combustion process;
- Although energy can be recovered from incineration, the high cost of technology operation and increased demand of additional fuel prove that incineration is an expensive method of energy production and an expensive waste treatment method;
- Incineration plants' maintenance costs are also high and they cannot be operated in safe conditions if there is no thorough maintenance;
- Incineration plants are designed for non-recyclable materials. A big number of jobs can be created due to recycling, encouraging local economy development. The incineration, however, creates fewer jobs.

Due to these reasons incineration is not recommended for the Republic of Moldova.

Relevant MBT factors provide the following:

- Although all wastes can be treated through MBT, the quality of recovered materials is low for recycling purposes. This means that materials cannot be sold at high prices on the recycling market;
- Organic materials recovered through MBT are of low quality for composting. Also, these materials are usually contaminated with different pollutants. For example, plastic wrap and glass can be contaminated with hazardous waste from municipal waste flow (e.g. used oil, dry diluents and etc.). Nevertheless, the volume of organic waste can be reduced and stabilized through MBT, to reduce the impact it has on waste environment from landfills or to create a new stable material, which can be used as capping material for landfill;
- Materials recovery for fuel production through MBT faces problems similar to incineration related problems: the waste is wet and of low energy value, so that it needs to be dried prior to being sold as high quality fuel. It is an expensive process;
- Waste fuel markets are not safe. Many industries have used waste fuel but without due control of environment factors to prevent toxic emissions. Therefore, reg-

ulations related pressures can lead to disappearance of a market and the materials that have been produced at high costs will have to be disposed at a landfill.

Due to this MBT is not recommended for the short run in the Republic of Moldova for materials recovery; however, it will be considered as waste management system ongoing development with the purpose to reduce amount and environment impact of waste that need to be disposed of during “transition” period, when the number of existing landfills is to be reduced (according to Waste Management Strategy, GD No 248 of 2013), and modern sanitary landfills have not been put into operation yet; on a long-term basis, the following requirements for transition period shall apply:

- Safe development and implementation of the basic system; and
- Development of a due national regulatory framework, which would regulate MBT operation.

A pilot project for the development of Soldanesti (Development Region Centre) would show how viable the waste treatment MBT in Moldova is from financial and technical viewpoint. The efficiency of this pilot project will be supervised and evaluated independently and the learned lessons will be applied in other regions of Moldova.

In Chisinau significant private investments have been made in a MBT facility. However, the operator hasn't signed any contract and does not process waste. It is unclear whether the investment is viable.

4.6 Disposal locations and sanitary landfills

Waste disposal on soil is a component part of the waste management in all countries. Waste disposal on soil can have damaging effects on public health and environment when it is carried out without due waste impact examination. On the other hand, application of modern environment standards ensures that waste disposal protects public health and environment. Therefore, sanitary landfills will be an integral part of regional waste management system. However, once progress on waste reuse is accomplished smaller waste amounts will be needed to be disposed of and, finally, the need for sanitary landfills will disappear.

Each waste management area will be serviced by a single sanitary landfill. The size of the landfill depends on the amount of disposed waste. Due to resource recovery and waste treatment processes, smaller amounts of waste will need short-term disposal and larger amount – medium and long-term disposal. This is considered at landfill's capacity calculation.

Waste management strategy anticipates that existing landfills will be closed and a small number of “transition locations improved for waste disposal” will be set in all rayons, until the construction of sanitary landfills. Improved transition locations for waste disposal will meet the following criteria, to minimize their impact on the environment:

- Compliance with the requirements established in type technology scheme of landfills, approved by Order No 67 of the Ministry of Environment and Territorial Development of RM of 2001;
- Simultaneously, if the aforementioned requirements are not met, the waste will be pre-treated through MBT prior to being disposed.

5 Amount and morphological composition of waste

Prognoses about waste management depend on two important variables: population and the economic situation in the area the prognoses are made for. To make a prognosis on the population data from the national statistics of population for the last 10 years have been collected and analyzed. Based on such information a decrease of 0.2% share of population per year has been estimated.

Economic development will leave space for bigger expenses and larger consumption, which will determine the increase of waste generated by households. According to Waste Management Strategy provisions, GDP is anticipated to increase at about 5% per year. The country's GDP is strongly influenced by Chisinau, which is the most developed city and economical center. In other localities economic development is not expected to be as significant as in Chisinau, being foreseen an average 2.5% increase of GDP per year in other regions of the country.

According to this data, Table 5-1 identifies waste generation share that is foreseen both for DRN and DRC.

Table 5-1: Estimated waste generation share

Variables		2012	2013	2014	2015	2016	2017	2018
GDP	EUR/per capita/year	2,893	2,921	2,949	2,978	3,007	3,036	3,066
Average waste generation share	kg/per capita/day	0.551	0.565	0.579	0.593	0.608	0.623	0.639
Urban waste productions share	kg/ per capita/day	0.735	0.753	0.772	0.792	0.811	0.832	0.852
Rural waste production share	kg/ per capita/day	0.525	0.538	0.552	0.565	0.580	0.594	0.609

Waste composition for DRN and DRC was evaluated considering data provided by the "Third National Communication to the United Nations Framework Convention on Climate Change", a project financed by UNO. The project has been implemented during February-December 2012 and the analysis of waste composition was conducted in 4 waste disposal locations: Chisinau, Balti, Leova and Causeni. For each of these locations a series of 4 analyses has been conducted, to analyze waste composition during different seasons. Thus, the analyses have been conducted in March, June, September and November 2012. This information was later matched with data on waste composition in counties from Romania and notice of experts, based on observations in the field. Table 5-2 shows waste's morphological composition.

Table 5-2: Estimated waste composition

Type	Average in urban area [%]	Average in rural area [%]
Paper and cardboard	5.29	2.65
Glass	6.12	3.06
Plastics	4.78	2.39
Metals	1.78	0.89
Kitchen waste	50.04	12.51
Garden/green waste	10.75	21.51
Manure	0.00	40.74
Textiles	2.73	1.37
Shoes	0.38	0.38
Furniture	2.04	1.02

WEEE	1.20	0.60
Wood	1.45	0.73
Others (industrial)	13.45	12.20
Total	100.00	100.03

Rural and urban waste morphological composition mentioned above shows the share of materials disposed of as waste in the Republic of Moldova. These results are used to establish specific geographical areas with different technological potential, such as composting or recycling.

Table 5-3 and Table 5-4 show morphological composition of waste, estimated according to collection in 2 bins (wet/dry), a method recommended in urban areas, and according to collection system recommended for rural areas. In Table 5-4 wet fraction includes kitchen, garden/agricultural waste, while other types of waste are assigned to dry waste fraction.

Table 5-3: Urban waste composition

Type	Share
Dry fraction	34.4
Wet fraction	60.80
Plastics	4.80
Total	100

Table 5-4: Rural waste composition

Type	Share
Agricultural waste and manure	34.4
Plastics	60.8
Other waste	4.80
Total	100

6 Definition of waste management areas

Regional waste management assumes that different collectivities use the same waste management plants and equipment. Some waste management equipment and facilities are used jointly by some collectivities, while other waste management equipment and facilities are used jointly by other collectivities. For example, a transfer station can be used jointly by several collectivities, while other collectivities can be covered by other transfer stations. However, all collectivities from a waste management area are serviced by the same sanitary landfill to dispose of waste. Thus, a waste management area is defined as a geographical area and the collectivities from that area are serviced by one sanitary landfill. Therefore, the best waste management area definition is required.

- The best waste management area delimitation will be the scheme that covers all collectivities at the lowest average cost. Thus, it is required to calculate waste transportation and disposal costs, according to different potential scenarios;
- Three potential scenarios have been developed for each waste management area. They are identified in Table 6-1 for each scenario and rayons assigned to one waste regional management area are highlighted;
- In this table, scenario A1 corresponds to waste management areas suggested in Waste Management Strategy. An option has been considered for this scheme to mirror eventual interest of collectivities from Floresti rayon to adhere to a waste management area, which would also cover Soldanesti, Rezina, Telenesti and Orhei rayons. Rayon clusters presented in scenario B and scenario C have been developed as alternative for scenario A, to evaluate whether lower costs could be reached by modifying the cluster suggested in Waste Management Strategy.

Table 6-1: Waste management areas scenarios

Scenario A1	Scenario A2	Scenario B	Scenario C
North			
Singerei	Singerei	Ocnita	Ocnita
Falesti	Falesti	Donduseni	Briceni
Balti	Balti	Edinet	Edinet
Glodeni	Glodeni	Briceni	Donduseni
Riscani	Riscani		
Soroca	Soroca	Singerei	Drochia
Drochia	Drochia	Falesti	Riscani
Floresti		Balti	Glodeni
		Glodeni	Balti
Ocnita	Ocnita		
Donduseni	Donduseni	Riscani	Falesti
Edinet	Edinet	Soroca	Singerei
Briceni	Briceni	Drochia	Ungheni
			Telenesti

For the analysis of each scenario the following has been considered:

- Covered population and related waste amount to be managed;

- Distance for waste transportation, considering the local roads state; only speed ways and national roads being considered appropriate for long-distance waste transportation;
- Waste transportation conditions, including transfer stations and capacity of waste transportation equipment;
- Unit costs of waste transportation and disposal;
- Besides analytical reasons identified above, in this process it is required to identify the final destination of transportation, i.e. the sanitary landfill location. These locations will be identified during feasibility studies. To calculate transportation and disposal costs during the planning step, in each of the aforementioned scenarios a location for landfill has been identified.

Firstly the role of transfer stations in waste management system, according to each scenario, will be identified. Transfer stations and long-distance transportation cut waste management costs as compared to long-distance transportation in waste collection vehicles. Table 6-2 identifies data for this evaluation.

Table 6-2: Data used to evaluate transfer stations

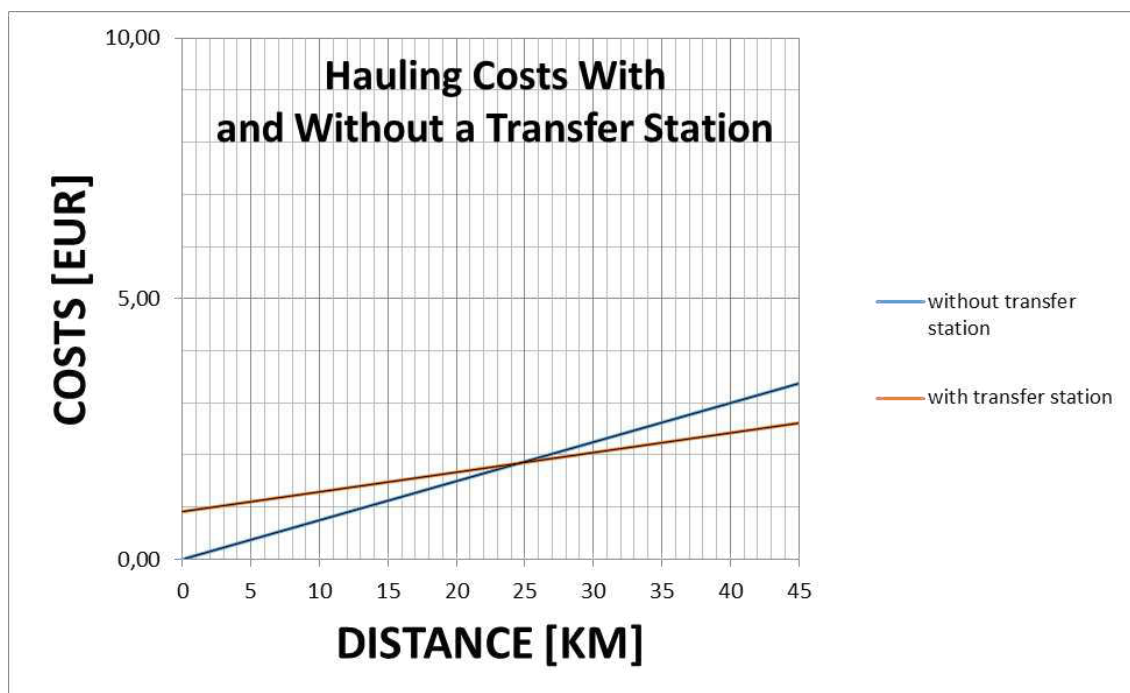
Indicator	EUR, ton/km	Values
Transportation costs without transfer stations	EUR/ton/45km	3.37
Distance to landfill	km	45
Truck transportation costs	EUR /km	0.45
Transported waste	ton	6
Transportation costs with transfer stations	EUR/ton /45km	2.61
Transfer station costs	EUR/ton	0.71
Distance to landfill	km	45
Truck transportation costs	EUR /km	0.76
Transported waste	ton	18

According to this data costs of waste transportation using waste collection vehicles and long-distance transportation are identified (Figure 6-1). As shown in the figure above, costs are lower for waste transportation directly to a landfill when the landfill is at 24 km distance from waste generation place. When the distance to waste disposal location is farther than 24 km, it is cheaper to use long-distance vehicles. That is why it is assumed that transfer stations will be used for waste transportation when the landfill is at more than 23 km distance.

To ensure that scenario analysis of waste regional management mirrors real local conditions, it is required to set likely investment and operating costs that would be incurred within each scenario. Costs include investment and operating patterns related to:

- Transfer stations, where required;
- Bins for waste transportation from transfer stations;
- Vehicles ensuring waste transportation;
- Sanitary landfill for waste disposal.

Figure 6-1: Transportation costs with and without transfer station (EUR, distance in km)



Costs of each these patters depends on the amount of waste that would need management in any of scenarios and performance criteria related to waste management, which are as follows:

Table 6-3: Performance criteria related to waste management

Maximum useful charge of short-distance vehicles (collection truck)	[m ³]	16
Maximum useful charge of long-distance vehicles	[m ³]	60
Bin for transfer station	[m ³]	30
Waste density in compaction truck	[ton/m ³]	0.6
Waste density in transfer station	[ton/ m ³]	0.3
Average speed of short-distance transportation vehicle (collection truck)	[km/h]	25
Average speed of long- distance transportation truck	[km/h]	40
Average speed to transfer station	[km]	24

Estimated operating costs have been elaborated for each waste regional management scenario mentioned above. These estimates refer to waste amount that needs to be managed in each of the scenarios and to requirements for transfer stations/long-distance transportation and to requirements for sanitary landfills associated with each scenario. The results of this analysis are shown in Table 6-4.

Table 6-4: Estimated costs for waste management in different scenarios

Scenario	Rayons	Waste handled per year [tone]	Collection trucks	Preliminary option for landfill	Transfer stations	Long-distance trucks	Investment costs [EUR]	Operating costs/year [EUR]	Operating costs/ton [EUR]	
A1	Singerei	145,972	40	Balti & Soroca	18	7	14,069,900	3,660,446	36	
	Falesti			Balti	20	13	11,373,000	2,974,000	20.37	
	Balti									
	Glodeni									
	Riscani									
	Soroca									
A2	Drochia	47,102	11	Edinet	13	2	5,416,150	1,448,000	30.74	
	Floresti			Donduseni	13	2	5,416,150	1,448,000	30.74	
	Ocnita									
	Edinet									
	Briceni									
	Singerei	131,097	36		Balti	18	6	10,663,400	2,756,000	21.02
Falesti										
Balti										
Glodeni										
Riscani										
Soroca										
B	Drochia	82,768	23	Balti	8	4	7,628,900	2,050,000	24.75	
	Singerei									
	Falesti									
C	Balti	46,666	12	Chetrosu	9	2	5,106,950	1,334,000	28.35	
	Glodeni									
C	Soldanesti	77,374	18	Balti	9	4	7,302,950	1,942,000	24.81	
	Floresti									
	Soroca									
	Drochia	66,840	16	Ungheni	14	5	7,397,700	2,033,000	30.20	
	Riscani			Chiscareni	14	4	7,294,700	1,981,000	29.42	
	Glodeni									
Balti										
Falesti										
Singerei										
Ungheni										
Telenesti										

In preliminary options locations are included for calculation purposes, although actual locations for sanitary landfills will be chosen during FS. Table 6-5 summarizes annual operating costs for waste management for each North and Centre Regions scenarios.

Table 6-5: Estimated annual operating costs per scenarios

Scenario	Handled waste [ton]	Total average annual operating cost [EUR/year]	Average annual operating cost per ton [EUR/ton]
A1		9,325,000	24.82
A2		9,435,000	25.11

Scenario	Handled waste [ton]	Total average annual operating cost [EUR/year]	Average annual operating cost per ton [EUR/ton]
B	375,673	10,551,000	28.09
C		10,889,000	28.99

As shown in the table, an amount of 375,673 tons/year of waste will be managed in DRN and DRC overall. The options for the management of this amount of waste are shown in Scenario A1, A2, B and C, according to aforementioned scenarios. Annual operating costs for the management of such waste varies, costs being higher for some scenarios as compared to others. The cost difference between scenarios is due to the fact that transportation distances and transportation costs vary, opportunities for cost reduction through transfer stations vary, so do the waste disposal requirements. Scenario A1 seems to be the one with lower costs, i.e. it is the scenario that mirrors waste management areas as being the ones with lower costs as compared to other evaluated scenarios. At the same time:

- Differences of costs between Scenario A1 and Scenario A2 are small, while Scenario A1 is the one with the lowest cost;
- According to local public administration legislation, LPAs have exclusive right to decide on their participation in a regional waste management system and which other LPAs outside the system might participate in this system's management.

Application of regional programs should occur after the elaboration of feasibility studies and project documentation. The boundaries of waste management areas suggested in the program should be verified and, if required, adjusted according to schemes LPAs might develop during feasibility studies.

7 Regional waste management in DRN

As established in the previous section, Scenario A1 is the less expensive solution for DRN. Scenario A1 defines two regional waste management areas in DRN:

- Waste management area No 1: Falesti, Floresti, Balti, Singerei, Drochia, Glodeni, Riscani, Soroca;
- Waste management area No 2: Briceni, Edinet, Donduseni, Ocnita.

Additional evaluations have been conducted for waste management technologies to identify the preferred solutions for the desired level of waste management related to:

- Collection;
- Transfer and transportation;
- Recycling;
- Composting;
- Special waste flow treatment;
- Sanitary disposal.

A special attention is given to the fulfillment of waste management tasks in Waste Management Strategy, according to an agreed schedule and as described in tables below. These tasks have been set according to national and local decision making factors and create the grounds for waste management planning. The level of fulfillment of these tasks will depend on more factors, including regulatory, information and public awareness, participation of “producers” to producers extended responsibility, and on other factors as well.

Table 7-1: Municipal waste collection tasks

Planning period	Municipal waste collection tasks
Short term: 2013-2017	100% of urban areas and 75% of rural areas
Medium term: 2018 - 2022	Coverage of 100% of rural areas
Long term: 2023 and further	100% collection coverage

Table 7-2: Composting and recycling tasks

Planning period	Package materials recycling tasks (glass/PET/paper)	Biodegradable waste fraction (garden waste, vegetables, kitchen waste)
Short term: 2013-2017	15% (rural areas) and 25% (urban) recycled	Pilot projects to be developed/implemented to prove the most efficient measures
Medium term: 2018 - 2022	25-35% (rural - urban) recycled	50-40% (rural - urban) recovered
Long term: 2023 and further	35-45% (rural - urban) recycled	100% - 100% (rural - urban) discharged from landfill for recovery

Table 7-3: Special, gross and industrial waste treatment tasks

Planning period	Hazardous municipal waste flows: batteries, accumulators, tires, pesticides, old oil, bulbs	Industrial and demolish waste; Gross waste; WEEE
Short term: 2013-2017	Special treatment according to legal provisions. Separate collection shall start on short run, simultaneously with the development of national solutions.	40% duly treated
Medium term: 2018 - 2022		55% duly treated
Long term: 2023 and further		70% duly treated

Table 7-4: Waste disposal, rehabilitation of landfills and waste transfer

Planning period	Transfer, sanitary landfill, closing of old landfills
Short term: 2013-2017	Development of transfer stations in micro areas; Reduction of waste disposal locations to 1-3 per rayon; Starting rehabilitation of old landfills
Medium term: 2018 - 2022	Reduction of total disposal locations to 1 per waste management area at most, closing/rehabilitation of remained disposal locations
Long term: 2023 and further	Disposal of waste from treatment facilities and resource recovery in a landfill per waste management area

7.1 Collection

The project of a waste collection system depends on the waste collection frequency, waste density and number of available bins for waste disposal between collections. These criteria are valid for waste disposal between collections. However, disposal criteria vary in urban areas as compared to rural areas.

7.1.1 Urban area

For urban area the option of waste collection in two bins is suggested – for separate collection of wet and dry waste. Besides, the existing system of PET recipients and other plastics collection in wire mesh bins will be used until they are out of use.

Frequency of collection in urban areas was set to once per day in tower blocks and once per week in private houses areas, according to developed countries practices. Table 7-5 identifies other technical criteria for waste collection system development.

Table 7-5: Waste collection parameters in urban areas

Collection trucks for urban area	[m ³]	16
Waste density in collection trucks	[ton/m ³]	0.600
Bins for tower blocks	[m ³]	1.100
Bins for private houses	[m ³]	0.240
Dry waste density in bins	[ton/m ³]	0.075
Wet waste density	[ton/m ³]	0.225

7.1.2 Rural area

In rural areas mixed waste from joint waste baskets of 1.1 m³ will be collected. Collection frequency will be once in two weeks. Moreover, wire mesh bins of 4 m³ will be placed to separately collect PET recipients and plastics. Separate paper collection is not deemed viable because paper is considered as fuel. Separate metal collection is also not viable because this material gets to recycling chains through collection private agents.

Table 7-6: Waste collection parameters in rural areas

Collection trucks for rural area	[m ³]	10
Waste density in collection trucks	[ton/m ³]	0.60
Bins	[m ³]	1.10
Waste density in bins	[ton/m ³]	0.15

Waste collection will be organized per “micro-areas”. Every micro-area will be defined according to collectivity covered by a transfer station (please see below). This type of organization will ensure that the collection device is used efficiently and at its full capacity.

7.1.3 Requirements for waste collection devices

According to aforementioned development parameters and criteria, Table 7-7 shows required devices that would comply with waste collection requirements in DRN. These requirements are based on waste collection from 100% of population in 2013. Investments will be divided per step, according to execution deadlines.

Table 7-7: Waste collection requirements in Development Region North

	Requirements per total		Urban area		Rural area	
	Urban area	Rural area	Waste management area No 1	Waste management area No 2	Waste management area No 1	Waste management area No 2
Bins: 1.10 m ³	2,900	8,700	2,300	600	6,200	2,500
Bins: 0.24 m ³	164,100	-	131,100	33,000	-	-
Collection trucks	8	11	8	0	8	3

The table above shows total requirements for waste collection devices. Some of them already exist. Existing devices will be replaced gradually and will be matched with detailed requirements for such devices.

7.2 Transfer and transport

For long distances, transfer stations and long distance transportation to dumpsites have the capacity to reduce costs, as compared to transportation by waste collection vehicles.

Transfer stations will be provided with an access ascending gradient, to allow waste unload, a concrete platform and roof. All transfer stations will be equipped with the same type of bins. The capacity of transfer stations depends on the waste amount to be received. Bigger transfer stations from around towns will operate according to a daily schedule in two shifts and fill in the role of sorting facilities of dry waste fraction for recyclables recovery. Table 7-8 describes required devices for big transfer stations.

Table 7-8: Requirements for transfer stations/sorting facilities devices

Item	No of units
Concrete platform with space for disposal of waste and roof	1
Ascending gradient construction	1
Fence	1
Small office/public bin	1
Small bin for hazardous municipal waste	3
Bin for gross waste	2

Industrial balance	1
Weighbridge	1
Triage stream	1
Waste compression baler	2
Lift	1

Rural area will be covered by smaller transfer stations which will operate according to a schedule in one shift daily or less. Table 7-9 defines typical required devices for rural area transfer stations.

Table 7-9: Requirements for rural transfer stations

Item	No of units
Concrete platform with space for disposal of waste and roof	1
Ascending gradient construction	1
Fence	1
Small office/public bin	1
Small bin for hazardous municipal waste	3
Bin for gross waste	2
Bin for recyclables	2
Hydraulic press	1

Long distance transportation parameters are shown in table 7-10.

Table 7-10: Technical parameters for long distance transportation

Capacity of long distance vehicles + trailer	[m ³]	60
Waste density in long distance vehicles	[ton/m ³]	0.30
Bins	[m ³]	30

Long distance transportation assumes the availability of a sanitary landfill at destination; its location is mentioned in table 6-3. Sanitary landfills from these locations are laid out in the best places from time and distance viewpoint. However, the lay-out land for a sanitary landfill needs to correspond to environment assessment procedures and the final decision on sanitary landfill lay-out land will be made after these procedures are completed. According to these assertions, table below shows data on the required devices for long-distance transportation. At this stage, the amount of waste for recycling and treatment, recovered from the generated waste, has been considered. Table 7-11 refers to waste subject to inhumation.

Table 7-11: Requirements for transfer station and long distance transportation

Item	Waste management area No 1	Waste management area No 2
Long distance trucks	5	2
Bins of 30 m ³	110	50
Transfer stations	12	5
Ton/ year	51,000	23,500

7.3 Recycling

To reach the aforementioned indices separate collection of waste flows is planned, according to EU best practices. Additional devices for triage, compaction and baling are needed for recyclables selected from dumpsite.

Transfer/triage stations from the urban area, where waste is brought separately (i.e. dry and wet), will be provided with an industrial shed and stream for dry waste sorting.

These transfer and triage stations will be provided with a hydraulic press to compact and bail plastics, paper, nonferrous metals and etc.

Transfer stations from rural areas will be equipped with a small hydraulic press to compact plastics and a concrete platform with roof, to dispose materials until their transportation on the market. Following sorting and bailing market value recyclables will result and a certain share of refuse. Initially, a 50% efficiency share of segregation and sorting system from generator and bailing facility is estimated.

Table 7-12 summarizes recyclables amount to be covered.

Table 7-12: Expected recyclables amount

Material	Urban area [tons]		Rural area [tons]	
	Waste management area No 1	Waste management area No 2	Waste management area No 1	Waste management area No 2
Plastics	4,200	1,000	1,800	700
Paper and cardboard	4,600	1,200	2,000	800
Glass	5,300	1,300	2,300	900
Metal	1,500	400	700	300

7.4 Composting

In urban areas composting will be carried out by drying green waste from parks and open spaces in the sun. This technology assumes unload of waste on a specially designed land and its arrangement in pyramid-shaped strips. The material will be regularly upturned for aeration. This procedure can be more efficient if carried out with mobile composting facility, used jointly on more composting lands. Regular tests should be conducted to measure temperature and humidity of compost. This type of composting usually lasts from 2 to 6 months and due to loss of water material becomes about 50% lighter. Composting can be carried out during the entire year. However, the process is slower during winter and the green waste is generated in smaller amounts during winter; which means that they can be stored until spring.

To produce a high quality output, which will be used in agriculture, it is required to ensure green waste composting only. If other organic materials are used, contaminating agents can get into the compost, reducing its potential for use.

For urban area it is recommended to build a composting platform for each town. By one composting device will be allotted to each Region, depending on the amount of green waste generated in towns. The device will consist of a shredder, upturn device and divider, with a 40 ton/day capacity.

In the rural area a composting platform will be built at about 1-0.5 km distance from each village, to treat manure and agricultural waste, such as straw which currently get into municipal waste flow. The platforms will be built from either concrete or waterproof material. For these areas plant with a 50 ton/day and more capacity is needed, considering the amount of estimated waste. The plant will consist of sun dried green waste upturn device and a front loader. There will be no need for shredder and divider, because these composting plants will not process large amounts of material. Machinery requirements are detailed in Table 7-13. Composting plant parameters are mentioned in Table 7-14.

Table 7-13: Composting plant machinery requirements

Item	Number of items at urban composting plant	Number of items at rural composting plant
------	---	---

Concrete platform	1	1
Sieve	1	0
Mobile shredder	1	0
Mobile upturn device	1	1
Disposal tank	1	1
Intensive ventilation forced dry system	1	1

Table 7-14: Waste amount to be composted and CU capacity

Item	Total		Urban area		Rural area	
	Urban area	Rural area	Waste management area No 1	Waste management area No 2	Waste management area No 1	Waste management area No 2
Tons/year	10,600	59,000	8,500	2,100	42,000	17,000
Composter with 40 tons/day capacity	1		1			
Composter with 50 tons/day capacity		5			3	2

7.5 Due treatment of special waste flows

Some types of waste need to be handled simultaneously with municipal waste, because their large amount requires special measures and devices to ensure their due management and/or are dangerous for public health and environment. These are mostly industrial waste, hazardous municipal waste and WEEE, old tires, oil, batteries and accumulators out of use.

7.5.1 Industrial waste

Table 7-13 shows the amount of waste generated from construction and demolition. This type of waste is usually thrown into public waste-baskets. They are heavy materials, which increase collection costs and they are not included in municipal waste collection. This type of waste can be collected by calling to a specialized service to order an inert waste bin, when needed. When a person applies for construction and demolition authorization he may be advised, as alternative solution, to manage industrial waste by specified methods (e.g. collection in special bins and waste transportation to specially designed area for waste disposal and processing).

Table 7-15: Industrial waste amounts

Material	Urban area [tons]		Rural area [tons]	
	Waste management area No 1	Waste management area No 2	Waste management area No 1	Waste management area No 2
Industrial waste	12,000	3,000	9,200	3,700

Most industrial waste is recyclable, a part of it is inert and the other part is hazardous. To duly treat them, hazardous waste flows need to be separated and the rest of waste will be disposed on inert waste lands. These lands are similar to landfills; however their construction and operation is cheaper, due to reduced environment danger, and, therefore, fewer environment protection measures are needed. Machineries for industrial waste processing are detailed in table 7-16.

Excavated soil can be used for many purposes, polluted land rehabilitation being one of them. Besides other advantages, it can be used as capping layer for waste disposal areas. Concrete and gross waste recycling can be carried out after having been sieved; different outputs can be reused in construction. Industrial waste processing can be carried out in a special area within the landfill.

Table 7-16: Industrial waste recycling special unit

Mobile machines	Units
Wheeled loader	1
Bucket for waste demolition	2
Excavator	1
Hydraulic hammer for excavator	1
Sieves	1
Office waste basket	1
Bin spare parts. Bins for Hazardous waste	1
Fuel supply mobile station	1

7.5.2 Hazardous municipal waste flows

Hazardous municipal waste flows consist of oils, batteries, pharmaceuticals and other municipal waste and waste whose chemical and physical properties are dangerous for public health and environment. The management of this waste requires the development of a national solution system. Nevertheless, transfer stations and disposal areas could be used as temporary disposal place of such waste flows, provided that they are duly equipped. Most of such waste can be processed for recycling, while the other part needs special treatment, to make them non-hazardous prior to evacuation.

7.5.3 Waste Electrical and Electronic Equipment (WEEE)

WEEE is a complex waste flow, consisting of recyclables and hazardous materials. Collection of this waste flow can be carried out by organizing local and national campaigns. Transfer stations and disposal areas could be used as temporary places for their disposal, provided that they are duly equipped. Prior to recycling, WEEE need to be disassembled in several parts, if possible. This procedure can be carried out easily at regional and national level, in special processing plants, in accordance with EU safety and sanitary standards.

7.5.4 Out of use tires, old oils and accumulators/batteries

All these materials will be handled separately one from another and from other waste.

Old oil and out of use tires, accumulators and batteries management measures will be developed simultaneously with producer extended responsibility applied to private sector entities, in charge for such waste. The measures will stipulate safe collection of waste, disposal facilities at collectivity level, where waste generators can evacuate the waste free of charge, and actions to ensure that such waste is not contaminated with other materials and that waste planned collection and due transportation for treatment (preferably to recycling plants) according to the legislation is ensured.

7.6 Waste transportation to landfill

A sanitary landfill will cover both waste management areas from DRN. As it has been mentioned above, the waste will be transported to transfer stations by long-distance vehicles, except waste from collectivities located in the vicinity of the landfill, which will be directly transported to the landfill, without being previously transported to the transfer station.

Modern waste landfills are built and operated so as to protect public health and environment from negative waste impact. In this sense, there are three major considerations:

- It is required to collect and treat leachate in special plants. Leachate is a fluid resulting from waste decomposition. The amount of leachate depends on the amount of degradable waste in the landfill and the amount of water that enters the land from rain, melting snow and groundwater. Landfills are designed, built and operated so as to reduce to minimum the amount of water that enters the landfill, to prevent uncontrolled leachate outflow from the landfill, to collect leachate and to treat leachate;
- The gas generated by landfills needs to be collected and treated. Waste gas is an output generated by waste degradation. It is a mixture of several gases, methane being the most important one – one of the main generators of greenhouse effect. Landfill gas control is carried out through collecting it in treatment pipes and treating it by combustion; as an alternative, if there is a sufficient amount of gas, it can be used to generate electricity;
- It is required to prevent waste, rodents/insects odor and dust. Odor waste is caused by its degradation. It is both unpleasant and causes rodents and insects borne infections. Therefore, waste should be covered regularly with earth or similar material, to prevent spread of odor. Dust emissions should also be controlled, especially on access roads, by spraying water.

To ensure efficient landfill management, sanitary landfill that covers each management area from DRN should be designed and built according to EU standards. Sanitary landfill design and construction assumes the following works and a certain infrastructure: preparation and waterproofing of foundation, installation of drainage system, construction of a fencing embankment, leachate collection and treatment facility, fence and gate; groundwater quality monitoring; additional infrastructure for disposal, offices, maintenance and access.

Sanitary landfills are designed for long periods of time, as “cells” that need to comply with necessary disposal requirements in the area they are laid out. Initially, the foundation is waterproofed and the main infrastructure is built, together with the first 2 disposal cells. Each cell will dispose waste for 3-7 years, depending on the landfill’s structure; afterwards the cell is closed and another adjacent cell is put into operation. It is allowed to build a cell above another one, to extend the waste amount that can be disposed on a certain land to the maximum. Thus, ongoing development of landfills for their entire operating period is ensured. Landfill is designed to receive waste for 25 years.

According to preliminary analyses on technical and financial factors and access to roads, in DRN the following locations have been suggested for sanitary landfill lay-out, as follows: in Area No 1 – near Balti and Soroca and in Area No 2 – near Edinet and Donduseni. At the same time, final selection of sanitary landfill locations will be decided according to EIA and other legislations, supporting sanitary landfills’ lay-out in these locations.

Table 7-17: Typical requirements for sanitary landfill required machines

Landfill items
Location, buildings, roads, infrastructure preparation
Cleaning and breaking the ground
Building (bin) for waste control and weighing
Building for waste acceptance
Weighbridge
Road, platform and access infrastructure
Fence

Water supply (spring, pipes)
Electricity supply (cables)
Internal electricity supply
Workshop/garage
Area for wheels wash
Piezometer/monitoring wells
Signs
Land works
Surface soil excavation, dam design and construction
Excavation and waterproofing of leachate pool
Excavation and preparation of water pool surface
Foundation waterproof system
Poring and compacting of a mineral padding layer
Geo-membrane
Drainage layer
Geo-textile protective layer
Protective layer
Special waterproof system with plastic padding
Leachate control
Sump holes with covers, including land works
Perforated and non-perforated pipe
Leachate pumps
Central non-perforated drainage pipe
Leachate control
Leachate treatment
Supply pump
High pressure 1 st step pump
Revolution pump first step
High pressure pump 2 nd step
High pressure pump 3 rd step
Dosing pump inhibitor
Stirring pump (CIP)
Electrical control room
Compressed air station
Heating
Air conditioning
Ventilation
Surface water drainage
Channels (unpaved, with gravel on the foundation)
Gas collection
Gas ventilation pipe
Collecting pipes
Gas supply station
Central collection pipes
Recuperative combustion plant
Gas compression station
Mobile devices for landfill
Steel compactor on wheels
Dump truck

Loader
Pick-up
Water tank

7.7 MBT method potential

MBT is a largely used technology in some EU countries, especially in Western EU. Nevertheless, the capital and investment costs can be high and the MBT markets are not reliable. The use of MBT method only for waste separation for recycling results in low quality of recyclables, which need additional processing prior to find a market for them. MBT used in production of waste fuel (RDF) is more efficient when the waste energy value is high; however, this is not the case for Moldova. MBT was mostly implemented in EU countries through regulatory pressures, to reduce biodegradable matter amount subject to disposal.

MBT use prior to disposal has been implemented in other countries too (often with the support of donors). As in other cases, MBT costs depend on special technology.

Pilot project planned to be developed in Soldanesti needs to be monitored and assessed independently, while the lessons learned could be applied in other parts of the country, if required.

Therefore, MBT is recommended to be further examined in DRN for waste treatment prior to disposal, according to Soldanesti’s experience and “transition requirements” (please see below).

7.8 Closing of old waste disposal areas

The root of requirements for closing old waste disposal areas is shown in Table 7-18. Closing of old waste disposal areas is important to stop potential damage to environment caused by toxic emissions in the atmosphere and leachate that leaks in the earth, underwater and fresh water sources. Waste disposal areas are not duly closed and tend to generate methane, which can cause fire and explosions.

Duly closing of these waste disposal areas assumes their reorganization to ensure stability, their capping with more layers to ensure they are waterproofed and drains and finally cultivation of plants on the rehabilitated area. It is significant to install information boards on the closed landfill, to offer clear information to the population on the layout of a new landfill and transfer station, if required. Ecology inspections will react toward people who continue to dispose of waste in closed landfills.

Table 7-18: Required elements for existing waste disposal areas closure

Old waste disposal area closure
Item
Surface waterproof system
Renovation of landfill
Levelling/compaction layer
Clay layer
Drainage layer
Rehabilitation/soil layer
Cultivation of plants
Gas ventilation pipe

8 New system implementation requirements

Regional waste management system, recommended for DRN, will be purchased in time, gradually and progressively. Three factors worth being mentioned in this regard:

- Use of current investments;
- Management of existing contracts;
- Financing availability.

8.1 Use of current investments

Many LPAs have made significant investments in different areas of infrastructure management and devices. In some cases these investments are allotted for waste disposal and collection, in other cases they are allotted for waste treatment and processing, and in other cases – for waste removal. These investments should be used by LPAs as follows:

- Waste disposal and collection device. This device will be used as planned by LPA, according to effective legislation, until it will need to be replaced. After replacement and regional waste management system's setting into operation, LPA will connect to this waste disposal system and the purchase procedure according to regional system will follow;
- Waste treatment and processing devices and facilities. These facilities and devices will be used as planned by LPA, according to effective regulation, until it will need to be replaced. After replacement and regional waste management system's setting into operation, LPA will connect to this waste disposal system and the purchase procedure according to regional system will follow. Waste treatment and disposal device that is currently operating in LPA will comply with regional waste treatment and processing procedures. In this case the device can be maintained as required component of regional waste management system;
- Waste disposal facilities. The number of waste disposal facilities will be reduced to 1-3 landfills per rayon prior to 2018. As of 2018, the number of waste disposal locations will be reduced to a single sanitary landfill in each area of waste management (2 for DRN), except waste disposal locations built according to environment protection legislation and in compliance with the requirements provided in typical solid municipal waste landfills technological scheme, approved by Order No 67 by the Ministry of Environment and Territorial Development in 2001. Closing of such locations will be agreed with LPA simultaneously with the opening of sanitary landfills. All landfills that will be closed will need rehabilitation;
- Those 1-3 waste disposal facilities, which will be appointed per rayon as waste disposal improved transition locations (WDITL), will operate until the sanitary landfill in waste management area is built. These locations will be organized and will operate so as to reduce the impact of disposed waste on environment. All locations identified as WDITL will comply with the requirements stipulated in the typical waste landfill technological scheme, approved by Order No 67 by the Ministry of Environment and Territorial Development, or will apply waste MBT (please see below) to stabilize organic waste and, thus to reduce the negative impact of waste in disposal areas on the environment. Identification and operation of these WDITL will have temporary character, which will not replace the necessity to develop modern waste disposal facilities, according to EU requirements;

- MBT waste treatment prior to disposal can be efficiently approached to minimize the impact of waste to be disposed in improved transition landfills on the environment. The development of a MBT pilot project in every locality for WDITL stage will prove the technical and financial need, as well as technology's feasibility, and the lessons learned within this pilot project will be shared and applied in other localities;
- New waste management facilities and infrastructure investments. After the approval of regional waste management plan all investments in this sphere will be explicitly matched with the requirements for regional waste management facilities and devices.

8.2 Management of existing contracts

Waste management existing contracts are waste collection and disposal services comprehensive contracts. Existing contracts will shift to existing waste management systems as follows:

- Some existing contracts will be terminated prior to waste management system is put into operation. In this case LPAs can decide to renew those contracts and to extend their term until the waste management system becomes operating. In this case new contractual provisions will be added according to which waste collection to be carried out within micro-areas;
- Some LPAs could simply terminate the existing contract when the waste management system becomes operating and agree on other terms and conditions of waste collection;
- Some LPAs can lack flexibility to terminate contracts. In this case, the contractor may be advised to not transport waste to waste disposal location, but rather to transfer station or directly to sanitary landfill, if it is less expensive. In these cases additional payment may be charged to compensate the contractor that will be in charge of transporting waste farther than before;
- In some cases, LPAs made concession contracts. In these cases LPAs could be obliged to deliver waste to private entity owned facilities. Thus LPAs could continue the implementation of concession contract for waste processing and/or treatment and both LPA and private entity (if required) could use sanitary landfill for waste disposal;
- If LPAs decide to terminate concession contract they will be part of the entire regional waste processing/treatment process. Preliminary information proves that most concession contracts have been signed by LPAs without considering the public interest. Thus, LPAs could have multiple possibilities to cancel such contracts.

While LPA for environment protection develops requirements in compliance with EU standards for the construction and design of waste management facilities, concessionaires will be asked to comply with these requirements; however higher standards assume costs that they cannot incur according to existing assignment contracts. In this case LPAs could renegotiate concession contracts or to deny the fulfillment of these provisions, provided that they are not willing to pay additional fees.

It is anticipated that LPAs for environment protection will develop a regulatory framework to calculate tariffs and in this case the impact on the fees charged from assignment contracts' operators will be negative. However, there could be certain opportuni-

ties for LPAs, and namely to withdraw from an existing contract and to pass to regional waste management system.

8.3 Financing availability

Regional waste management system implementation in DRN depends on financing availability. This, in its turn, is governed by this sphere's policies and strategy priorities, approved by the Government of the RM and financing availability from international and/or domestic funds.

It is required to make financing agreements for regional waste management implementation in the entire waste management area or in both waste management areas from DRN. This approach will boost investment efficiency to maximum and will ensure coordination during transition period from current waste management provisions in every LPA to regional waste management system.

Annex 4: Financial analysis

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1 Current situation

Currently, all waste management activities are financed from state and local budget and grants, on one hand, and from tariffs, on the other hand. Although the bill on waste provides stipulation on producer extended responsibility (according to which the producers and importers are liable to contribute to management costs of own outputs when they become waste), it has not been implemented yet and does not contribute to the accrual of funds for waste management services at the moment.

As contribution to the development of financial analysis, the information received from Regional and Rayon Development Agency was used to estimate current costs and budget for waste management. If the information proved to be insufficient, assumptions were made based on experts' milestones and estimates, to complete the analysis.

1.1 Current costs

To evaluate current costs, information on inventory, operators' expenses and incomes for 2009-2012 timeframe was used. According to this data, in the table below typical current waste management system wage grids are shown.

Table 1-1: Wage grid in 2012 and estimates for 2013

Wage grid	Gross wage /person /month, in EUR	
	2012	2013
Production	178	187
Office employees	288	303
Management team	398	418

To estimate wages for 2013, a 5% increase to the wages from 2012 was considered. Additional to these figures the operator pays 30% of gross wages for social and health insurances.

To estimate fuel and public services price market rates were considered.

Table 1-2: Price per unit for fuel and public services

Item	Unit	EUR
Fuel (diesel)	liter	1.03
Electricity	kWh	0.11
Water	m ³	1.52

1.2 Hypotheses

Due to shortage of data and to the fact that currently the activities are mostly limited to collection and disposal, the following milestones have been applied to maintenance, wear and other operating costs:

Table 1-3: Milestones applied for the estimation of maintenance costs

Maintenance costs as % of investment costs or book value	%
Devices made abroad	12%
Devices made on the domestic market /simply to be repaired	2%
Buildings	5%

To calculate wear and replacement costs, the typical operation life span of different devices and goods was established.

Table 1-4: Operation life span of devices and goods

Specific operation life span of devices and goods	Years
Small bin for personal use	15
Rubbish carts for buildings (1.10 m ³)	10
Big bins (30 m ³)	7
New collection vehicles	12
Latest-generation vehicles	12
Indoor mobile equipment	15
Office bin and similar goods	10
Buildings and similar goods	20

To estimate investment costs typical industrial prices have been applied. For some equipment it was possible to check the price, due to the fact that some operators purchased the equipment (collection vehicles, dredgers and pressers) recently.

2 Investment costs

The investments will be carried out according to the project's special schedule and technical solutions, designed to ensure that the desired level of service provision is reached. It is anticipated that the suggested short-term technical solution to be fully implemented by 2018.

In the table below a sketch of investment costs in the new waste management system is shown, required to accomplish the technical solution:

Table 2-1: Total estimated investment costs (2013, thousand EUR)

	Area No 1 of waste management	Area No 2 of waste management
Total investment costs for the new system	23,081	9,025

2.1 Collection investments

For urban areas, investments will be used for equipment purchase (waste-baskets and bins). For waste collection garbage compactor trucks will be needed.

Table 2-2: Price per unit to estimate waste collection investments (2013, Euro)

Item	Type	Price
Waste-baskets	0.24 m ³	60
Bins for buildings	1.10 m ³	430
Garbage compactor truck	10 m ³	80,000
Garbage compactor truck	16 m ³	90,000

To estimate the required investments recent purchased collection trucks have been considered. Thus, in some places the investment costs for this item are lower or zero. On the other hand, in rural areas there is no waste collection system and the investments reflect the cost of the entire equipment required to render services in such areas in a rate of 75% by 2018.

Table 2-3: Urban area waste collection investments (2013, thousand EUR)

Urban area waste collection	Type	North Region	
		Area No 1 of waste management	Area No 2 of waste management
Waste-baskets	0.24 m ³	7,866	1,980
Bins	1.10 m ³	989	258
Waste collection vehicles	16 m ³	720	-
Total		9,575	2,238

Table 2-4: Rural area waste collection investments (2013, thousand EUR)

Rural area waste collection	Tip	North Region	
		Area No 1 of waste management	Area No 2 of waste management
Bins	1.10 m ³	2,666	1,075
Waste collection vehicles	10 m ³	640	240
Total		3,306	1,315

2.2 Transfer and transportation system investments

For rural and urban areas the solution of transfer stations, as part of transfer and transportation system, is suggested. The waste will be transported to transfer stations by long distance vehicles.

Table 2-5: Price per unit to estimate transfer station investments (thousand EUR)

Item	Type	Price
Big bins	30 m ³	1.50
Long distance trailer truck	30 m ³ + 30 m ³	125

Transfer stations from rural and urban areas will be of different sizes. Please see below estimate prices per one typical transfer station for rural and urban areas.

Table 2-6: Investment costs for a typical transfer station (2013, thousand EUR)

Item	Rural area	Urban area
Concrete platform with storage area and roof	5	15
Construction of ascending gradient	25	35
Fence	2	5
Small bin for office/public	10	10
Small bin for hazardous municipal waste	0.45	2.10
Bin for gross waste	0.30	4
Disposal area with roof	0	10
Bins for recyclables	0.4	0
Total	43	81

According to this data, for each waste management area investments for transfer and transportation system for rural and urban areas have been estimated.

Table 2-7: Investment for transfer stations in DRN (2013, thousand EUR)

Item	Type	North Region	
		Area No 1 of waste management	Area No 2 of waste management
Transfer in rural areas			
Transfer station	rural	302	129
Bins	30 m ³	52	15
Transfer in urban areas			
Transfer station	urban	486	243
Bins	30 m ³	112	61
Transportation			
Long distance transportation vehicles	60 m ³	625	250
Total		1,578	699

2.3 Resource recovery investments

For resource recovery investments are planned to add triage streams equipped with balers and pressers.

Table 2-8: Selection investment costs (2013, thousand EUR)

Equipment	Price
Technical balance	3
Weighbridge	25
Triage stream	17

Baler (2 x 5,000)	10
Lift	25
Total	80

Recycling investment costs start at separate waste collection (see point 2.1.1) provided that the idea for collecting dry and wet waste, sorted at source, in two different bins applies for the entire urban area. The table below shows investment estimate for a simple waste triage plant which will be located in the industrial are of the urban transfer stations.

Table 2-9: Total waste selection and processing costs (2013, thousand EUR)

	North Region	
	Area No 1 of waste management	Area No 2 of waste management
Selection and processing	258	129

Composting shall be performed with the help of mobile equipment. For existing rural and urban areas, there are several appropriate types of equipment. Please see in the table below the price per unit. Additionally to these prices, costs for construction of appropriate platforms have been estimated.

Table 2-10: Typical mobile composting investment costs (2013, thousand EUR)

Mobile equipment	Urban	Rural
Sieve	60	0
Mobile grinder	215	0
Mobile composter	350	280
Total	625	280

The price for composting equipment for rural and urban areas has been calculated according to the needs of each waste management area.

Table 2-11: Total composting investment costs (2013, thousand EUR)

	North Region	
	Area No 1 of waste management	Area No 2 of waste management
Urban composting	416	208
Rural composting	840	280
Total	1,256	488

2.4 Specific waste flows processing investments

Collection and processing of hazardous municipal wastes and WEEE will be organized and financed within a national system. Thus, they are not part of the regional investment plan and are not included in their budgets. However, for starter, several bins will be provided in transfer stations for such types of waste flows, until the launch of the national systems.

These waste flows will be collected and processed by specialized companies, while the financing part will be ensured through Extended Producer Responsibility systems.

Investments for mobile recycling facilities are envisaged for inert waste recycling, one for the entire region, with a capacity of 10,000 tons/year.

Table 2-12: Investment for solid waste processing/recycling (2013, thousand EUR)

Item	Price
Digging, levelling [m ²]	10
Concrete platform [m ²]	17
Fence [m]	2.30
Wheel loader	115
Bucket for industrial waste	6
Dredger	140
Hydraulic hammer for dredger	7
Sieve	100
Office bin	10
Bin spare parts	10
Hazardous waste bins	10
Fuel supply mobile station	12
Total investments	439

2.5 Sanitary landfills investments

In each waste management area of the Region a landfill will be built, in accordance with EU standards. Investments are estimated based on the tons of waste that will be stored during the 25-year timeframe, the landfills' life span. For each waste management area detailed estimations on the landfills' capacity during the first 10 years of life are conducted. At the same time, estimations for cells that will be created during the other 15 years are carried out. These estimations are based on investment costs per each area. If the additional landfill cells have already benefitted from a significant share of investments (communications infrastructure, offices, operating equipment etc.), it is estimated that the investment costs will make up 60% of initial investment of price/ton.

Table 2-13: Sanitary landfill investment costs (2013, thousand EUR)

Item	Area No 1 of waste management	Area No 2 of waste management
Land design, Buildings, Roads, Infrastructure	654	626
Earthworks	150	122
Main closing system	1,950	853
Leachate drainage	1,991	1,122
Surface water drainage	13	9
Gas collection	493	358
Mobile waste landfill equipment	945	555
For the first stage (10 years)	6,816	4,010
For the second stage (15 years)	5,646	3,309
Total investments	12,462	7,319

2.6 Investments for closing of landfills, disposal areas and sanitary landfills

The closing of existing landfills is planned to take place simultaneously with the opening of new landfills. Gradual closing of sanitary landfills is also required to be carried out in time. It is estimated that a part of investment costs will be included in the tariff, as investment fund.

According to estimates, the closing of existing landfills will be, to a certain extent, less expensive, per square meter as compared to the planned closing of sanitary landfills. This is due to that fact that required earthworks are cheaper for existing landfills, which are smaller and relatively even. If old landfills are not provided with main closing systems, the investments for the installment of an upper cap will be enough to ensure wa-

ter leakage. However the cap does not guarantee waterproofness. For these landfills a reasonable solution is sought. To close sanitary landfill cells according to EU standards an integral solution is provided.

Table 2-14: Price per m² for closing of landfills and dumpsites

Item	Existing landfills	Sanitary landfill cell
Redesign of sanitary landfill	1.40	3
Levelling/compaction layer	1	2
Clay layer	3	3
Drainage layer	0	2
Cultivation / soil layer	0.50	3
Plants	0	1.50
Air shaft (gas evacuation)	1	0
Total EURO/m²	6.90	14.50

It is estimated that the closing of about 600 ha of existing landfills and sanitary landfills will be gradual, during a 10-year timeframe.

Table 2-15: Closing of existing landfills and regional waste cells (thousand EUR)

	Area No 1 of waste management	Area No 2 of waste management
Closing of old landfills	22,011	14,421
Closing of sanitary landfills' cells: stage 1	968	423

2.7 Investment plan

Investment planning for regional waste management system will be carried out for each waste management area separately, for a short-term planning period. Investments are planned so that they would follow the planning program of projects to be implemented in the next 10 years.

Most investments within this planning will be made in 2016 and 2017, to have an operating system in 2018.

Table 2-16: Investment plan (2013, thousand EUR)

North region	Budget for new system	Budget for pilot project	2014	2015	2016	2017
Area No 1 of waste management						
Investments for new system	23,081	1,538	513	1,025	7,181	14,362
Closing of old landfills	4,402	0	0	0	2,201	2,201
Total area No 1 of waste management	27,483	1,538	513	1,025	9,382	16,563
Area No 2 of waste management						
Investments for new system	9,025	0	0	0	3,008	6,017
Closing of old landfills	2,884	0	0	0	1,442	1,442
Total area No 2 of waste management	11,909	0	0	0	4,450	7,459

Note:

- Area No 1 of waste management: Falesti, Floresti, Balti, Singerei, Drochia, Glodeni, Riscani, Soroca;
- Area No 2 of waste management: Briceni, Edinet, Donduseni, Ocnita.

2.8 Budget for technical assistance

Technical assistance budgets will be calculated based on physical infrastructure investments. They will be calculated as percent from the physical investments and will be planned according to the project schedule.

Table 2-17: Milestones to estimate technical assistance

Item	% of total investment amount
Investments for new system	100
Detailed design and planning	6
Tenders and contract signing	1
Work supervision	3
Institutional consolidation	1
Public awareness campaigns	1
Project's audit	1

Table 2-18: Budget draft for technical assistance (2013, thousand EUR)

Area No 1 of waste management		2014	2015	2016	2017	2018
Investments for new system	23,081	0	0	0	0	0
Detailed design and planning	1,385	0	1,385	0	0	0
Tenders and contract signing	231	0	231	0	0	0
Work supervision	692	0	0	346	346	0
Institutional consolidation	231	0	0	77	77	77
Public awareness campaigns	231	0	0	77	77	77
Project's audit	231	0	0	0	0	231
Total TA for Area No 1 of waste management	3,001	0	1,616	500	500	385
Area No 2 of waste management						2018
Investments for new system	9,025	0	0	0	0	0
Detailed design and planning	541	0	541	0	0	0
Tenders and contract signing	90	0	90	0	0	0
Work supervision	271	0	0	135	135	0
Institutional consolidation	90	0	0	30	30	30
Public awareness campaigns	90	0	0	30	30	30
Project's audit	90	0	0	0	0	90
Total TA for Area No 2 of waste management	1,173	0	632	196	196	150

Note: The aforementioned TA budgets do not include feasibility studies and the environment impact assessment studies, which will be required prior to the implementation of regional waste management plan is agreed.

3 Operating costs

To calculate operating costs per waste management area expenses for a series of typical activities have been evaluated and applied for tons of waste in different activities and various waste management areas.

Table 3-1: Budget lines in operating costs approach

Amortization
• For all goods
Human resources
• Manager
• Office employee
• Worker
• Personal protective equipment (PPE)
• Social and health insurance
General expenses
• Supply
• Communications
• Ecological permit
Fuel
• Fuel
• Grease
Repair and maintenance
• For equipment made abroad
• For equipment made locally
• For buildings, land works
Utilities
• Water
• Electricity (including heating)

According to these budget lines the typical operating costs per ton for aforementioned items has been calculated, except disposal costs, due to the fact that it is an activity typical of economies of scale. For them the operating costs have been calculated separately for each waste management area. Please see the table below for a series of costs.

Table 3-2: Operating costs per ton (2013, EUR)

Item	Cost/ton
Cost for urban collection	
Cost for urban transportation	16.91
Cost for collection, without transportation	6.94
Cost for rural collection	
Cost for rural transportation	17.88
Cost for collection, without transportation	6.94
Cost for transportation, transfer station	
Rural transfer station	5.62
Urban transfer station	5.36
Long-distance transportations	8.62
Resource recovery	
Recycling of dry materials	17.55
Urban composting	9.76
Rural composting	6.06

Item	Cost/ton
Processing of industrial waste	25.64
Landfill operation	7 to 14

Total costs per each activity within waste management area were calculated according to costs per ton.

Table 3-3: Operating costs per ton per activity (2013, thousand EUR)

Item	Area No 1 of waste management	Area No 2 of waste management
Collection		
Cost for urban transportation	1,477,905	372,013
Cost for collection, without transportation	606,721	152,722
Cost for rural transportation	600,919	243,229
Cost for collection, without transportation	233,248	94,410
Total	2,918,793	862,373
Transfer stations and long-distance transportation		
Rural transfer	45,636	27,098
Urban transfer	216,085	110,278
Long-distance transportation	386,292	204,355
Sub-total	648,013	341,731
Recycling, processing and handling		
Recycling of dry materials	547,481	136,870
Urban collection of green waste	25,316	12,658
Urban composting	82,970	33,823
Rural composting	254,592	103,049
Processing of industrial waste	543,536	171,778
Total	1,453,895	458,178
Disposal		
Landfill operation	603,301	315,357
Total	603,301	315,357
Overall	5,624,001	1,977,640

4 Non-tariff incomes

The incomes are calculated for the dry share of waste that has been sorted and compressed, for products obtained after industrial waste recycling and sale of compost.

It is believed that in the first year of operation of the new system only 50% of recyclables will get in dry waste-baskets. It is assumed that the population will have access to infrastructure, but will not use it or will sort at source a share of generated wastes. Further on, according to estimates, 80% out of this waste flow will be sorted for commercialization and 20% will become sterile waste.

For composting in rural areas we estimate that the share of manure and garden waste will make up 60%, out of which 2/3 will be sold as a smaller finite product, due to loss of water. Due to the fact that in urban areas a significant share of green waste is collected by operators, provided that this activity is ensured by open space public service, we calculated an 80% share at collection and, at the same time, 70% share for sale of obtained material.

As to recycling, according to our estimates, a 40% share, i.e. about 10,000 tons of inert waste, will be collected and recycled. Usually, about 85% of inert waste is mineral fertilizers, and the rest is sorted and transformed into waste. It is said that 80% of processed mineral fertilizers will be sold in the first year of operation at full capacity.

The share of collection and sale can be improved during the years, once public awareness increases, PER principle is implemented and the market of such products develops.

Table 4-1: Non-tariff incomes (2013, thousand EUR)

Secondary product	Price of sale EUR/ton	Area No 1 of waste management	Area No 2 of waste management
Recyclables			
Paper and cardboard	31	115	30
Nonferrous metals	400	96	25
Ferrous metals	100	96	25
Glass	30	127	31
Plastics	188	765	202
Compost			
Manure compost	5	88	35
High quality compost	8	38	15
Inert waste			
Products made of inert waste	10	57	18
Total income		1,383	384

5 Tariffs and approachability

Costs that will be recovered from tariffs will be calculated based on operating costs, including wear and replacement costs. The costs for creation of a fund for landfill closing and future construction of new landfill cells will be added to the operating costs. Non-tariff incomes do not refer to such costs (e.g.: sale of recyclables).

Table 5-1: Annual costs for tariff calculation (2013, thousand EUR)

	Area No 1 of waste management	Area No 2 of waste management
Operating and maintenance costs of the new system	5,624	1,978
Including costs related to income taxes, property taxes, other fees 10%	6,186	2,175
Including a reserve fund for sanitary landfill closing and opening of new cells	6,848	2,549
Cost according to non-tariff incomes	5,465	2,164

To calculate macro-tariffs the financing costs will be taken into consideration. They will vary depending on the available financing scenario. Three different financing scenarios are examined: 1 – full financing from grant funds, 2 – a 25-year subvention financing, with an interest rate of 3%, and 3 – financing from a private bank loan, for 25 years, with 9% interest rate. According to estimates, in all three scenarios technical assistance will be financed from state budget. No grace period for loans has been considered, so that a conclusion on financing impact on tariffs, in 2018, could be reached.

The approachability is estimated at 1.20% of incomes per capita, according to international milestones on approachability. To calculate operating costs and relevant incomes for 2018, it is believed that both costs and incomes will increase by 2.50%. This corresponds to GDP boost, estimated in waste amount prognosis, according to economic development and increase of number of population.

Table 5-2: Macro-tariffs and approachability (EUR, 2018)

Macro-tariffs per capita, per year	Grant financing	Interest rate 3%	Interest rate 9%
Area No 1 of waste management	8.40	10.93	11.96
Area No 2 of waste management	9.61	12.77	14.06
Approachable budget per capita per year	14.13		
At 1.2% of income per capita			
% from the budget spent on waste management, per capita, per year	%	%	%
Area No 1 of waste management	59.45	77.32	84.61
Area No 2 of waste management	68.03	90.40	99.53

6 Cost recovery mechanisms

To draft an affordable tariff scheme that would ensure 100% cost recovery, differentiated tariffs for individuals and legal entities will be applied. The basic principle is as follows: people who are able to pay more should indirectly subsidize people who can afford only smaller payments. Thus, a suggestion was made that legal entities, including institutions and businessmen, pay bigger tariffs as opposed to households. At the same time, urban households will pay bigger tariffs than rural households.

According to a number of estimates, it is believed that tariffs can be set according to the category of service beneficiary. Starting from the assumption that 10% of total waste is generated by institutions and legal entities and that they will pay for generated waste a share of 120% of waste management costs, we manage to get a fairer approximation of macro-tariff per capita for citizens.

Table 6-1: Macro-tariffs according to the incomes of the legal entity (EUR, 2018)

Macro-tariffs	EUR/year/per capita		
	Grant financing	Interest rate 3%	Interest rate 9%
Area No 1 of waste management	7.39	9.62	10.52
Area No 2 of waste management	8.46	11.24	12.38

If these macro-tariffs apply to typical rural and urban households from the Republic of Moldova, with 3¹ persons per household, employed, assuming that urban households will subsidize indirectly those from rural areas in a 20% share, the urban and rural differentiated tariff per household per month is calculated.

Table 6-2: Tariffs in urban and rural areas/household/month (EUR, 2018)

Tariffs/household/month	Urban area			Rural area		
	Grant financing	Loan with 3% interest rate	Loan with 9% interest rate	Grant financing	Loan with 3% interest rate	Loan with 9% interest rate
Area No 1 of waste management	2.22	2.88	3.16	1.62	2.11	2.31
Area No 2 of waste management	2.54	3.37	3.71	1.71	2.22	2.43

To ensure the payment of services to the maximum, different payment collection and consolidation methods can apply. One of options is to include waste management tariff in the same bill for water supply, for example (this approach applies in several LPAs around the country). The payment can be made to a relevant waste management administrative entity or to a utilities entity, which will transfer the fees for waste management to a relevant waste management entity, charging an additional fee for such services. Other options can also be identified.

Another option is that a public administration entity to collect payments, either through a special agent, who goes from house to house to collect payments, or through specially designed offices with such purpose. Out of all these options public administration en-

¹ (National Bureau of Statistics of the Republic of Moldova, Households according to the house they occupy, per area, territory <http://www.statistica.md/pageview.php?!=ro&id=2361&idc=295>, site accessed in May 2013)

tity is preferred, due to the fact that operators do not have enough means to supervise the payment process, as they need to ensure service continuity even when the tariff is not being paid, so that to avoid waste accumulation, which would be dangerous for the environment and people's health. On the other hand, the administrative entity has a lot of possibilities to ensure payment service, through administrative and tax means.

Additional financing and incomes, according to estimates, are provided by economic instruments. The most important one is the PER principle, detailed in the institutional chapter hereof.

Annex 5: Plan of measures and activities for Waste Management RSP implementation

Tables

Table 1: Plan of measures and activities for Waste Management RSP implementation 2

Table 1: Plan of measures and activities for Waste Management RSP implementation

No	Activity	Timeframe	Responsible	Monitoring indicators
General objective: Development of a municipal waste management system in the Development Region North (DRN) by consolidating the legislative, regulatory and institutional framework in line with the EU standards, development of municipal waste management infrastructure, special waste flows, based on regional approach, information and public awareness.				
Special objective 1: Consolidation of political, legislative and regulatory framework				
1	Drafting of waste management strategy in the Development Region North	2013-2014	Ministry of Regional Development and Construction (MRDC), Regional Development Agency (RDA)	Drafted and approved strategy
2	Finalizing and approval of law on wastes	2013	Ministry of Environment (MoEnv)	Approved law
3	Drafting and approval of regulatory acts (on waste storage, authorization, record, classification, on design, construction and exploitation of landfills) for the implementation of Law on wastes	2013-2015	MoEnv, MRDC	Number of drafted and approved regulatory acts
4	Drafting and implementation of financial economical mechanisms (setting up the fees for waste collection and) on the administration of waste management regional system	2014-2017	MoEnv, MRDC, RDA, Local Public Administration (LPA)	Number of approved legal documents
5	Development of extended producer responsibility principle implementation mechanisms for all waste flows, including special ones (accumulators and batteries, worn tires, packages, electric equipment and domestic appliances, vehicles out of use)	2014-2018	MoEnv, RDA, LPA	Number of approved legal documents
Special objective 2: Consolidation of regional institutional framework for regional system management and investment attraction				
1	Development of institutional accords for inter-rayonal waste management system for North Region	2014-2015	RDA, Rayon Councils, LPA	Number of developed institutional accords
2	Consolidation of institutional capacities of each common-hall for waste management	permanent	RDA, Rayon Councils, LPA, ARGD	Number of trained common-halls

No	Activity	Timeframe	Responsible	Monitoring indicators
3	Consolidation of institutional capacities of local waste management enterprises	permanent	RDA, Rayon Councils, LPA, Waste Management Regional Agency (WMRA)	Number of trained enterprises
4	Creation of regional waste management data collection, processing and analysis system	2014-2015	RDA, LPA	Number of created systems
5	Development of a training program on the application of a new system on waste data reporting, according to the new waste classification and record	2014-2015	RDA, LPA	Number of training programs
6	Development and implementation of a professional training program for waste management at regional and local, of public awareness on regional waste management system application	2013-2014	RDA, LPA	Number of training programs
Special objective 3: Waste management infrastructure development at regional level				
1	Extension of services for collection, transportation and storage of wastes from cities to rural areas	2014-2018	RDA, LPA, WMRA	Number of extensions
2	Consolidation of primary waste collection capacities	2013-2018	RDA, LPA	Number of purchased bins, equipment
3	Creation of separate networks for collection of vegetal wastes, livestock manure, wood processing wastes	2016-2019	RDA, LPA	Number of networks / purchased equipment
4	Drafting of a Plan of closing existing waste landfills, that are not in compliance with the EU requirements	2014-2016	MoEnv, RDA, LPA	Number of drafted plans
5	Reducing the number of existing landfills to 1-3 per rayon	2017	MoEnv, RDA, LPA	Number of reduced landfills
6	Choosing the area to build regional infrastructure facilities (regional landfills, transfer stations)	2014	RDA, LPA, ESI	Number of chosen areas
7	Drafting of feasibility studies for the creation of waste management infrastructure in each management zone of the	2014-2015	RDA, LPA	Number of drafted studies

No	Activity	Timeframe	Responsible	Monitoring indicators
	North Region			
8	Drafting of technical projects for the construction of 2 sanitary landfills in DRN	2015-2016	RDA, LPA	Number of drafted projects
9	Drafting of detailed projects for the construction of city/rural transfer stations and treatment facilities	2015-2016	RDA, LPA	Number of drafted projects
10	Construction of 2 regional landfills	2017	RDA, LPA	Number of built facilities
11	Construction of transfer stations and treatment facilities	2017	RDA, LPA	Number of built facilities
12	Purchase of equipment	2017	RDA, LPA	Quantity of purchased equipment
Special objective 4: Public information and awareness on waste management at regional level				
1	Development of public education and awareness programs on the new separate waste collection system: In rural areas – separate collection for PET and mixed collection In cities – separate collection in 2 fractions: humid fraction (kitchen and food wastes) and solid fraction (glass, plastic, paper, cardboard, metal and other fractions)	2014-2017	MoEnv, RDA, LPA	Number of developed programs
2	Development of public awareness programs on “liability of extended producer responsibility and pollution pays principle”	2016 - 2018	MoEnv, RDA, LPA	Number of developed programs
3	Deployment of public awareness campaigns on regional waste management	2017-2018	RDA, LPA	Number of developed programs

Annex 6: Methodology for projects portfolio identification

Content

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1 Methodology for projects portfolio identification

The project pipeline is developed based on the RSP. These projects will help achieve the overall and the specific objectives of the DRN.

The possible project concepts (PPCs) in the field of waste management in DRN will include system projects for each waste management zone. The criteria for identification of each PPC are in line with the criteria for identification of waste management areas. According to the regional approach, the waste management areas will be managed by all LPAs in these areas. The DRN has 2 areas identified for this region. Therefore, 2 system PPCs will be reviewed for the DRN.

Each PPC will include the entire waste management network, starting with transportation, transfer, burial of waste and its treatment for the waste management zone. All assessments and calculations for this system will be made at the stage of the FS, when the system PPC infrastructure elements are also established.

For the PPCs to become viable project concepts (VPC), sub-projects will be developed and will develop, in turn, projects for all the waste management infrastructure elements, including sanitary landfill, transfer stations, sorting recycling, composting, mechanical biological treatment and other facilities, as appropriate. In turn, for each infrastructure element, detailed project documentation will be developed, with all aspects of field location, connection to energy sources, water, sewage and other aspects coordinated with the supervising and the state control authorities.

LPAs in each management zone will be invited to review the approaches related to the identification methodology.

The RSWG will examine the list of “possible project concepts” and will submit relevant proposals.

The list of projects is expected to be submitted to RDC in January.