MUNICIPAL SOLID WASTE MANAGEMENT

A ROADMAP FOR REFORM FOR POLICY MAKERS

April 2018

Tokyo Development Learning Center

WORLD BANK GROUP

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About Tokyo Development Learning Center (TDLC)
The Tokyo Development Learning Center (TDLC) program is a partnership of Japan and the World Bank. TDLC supports and facilitates strategic WBG and client country collaboration with select Japanese cities, agencies and partners for joint research, knowledge exchange, capacity building and other activities that develop opportunities to link Japanese and global expertise with specific project-level engagements in developing countries to maximize development impact.

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BACKGROUND AND ACKNOWLEDGEMENTS

This roadmap was prepared by the Tokyo Development Learning Center (TDLC) under the auspices of the Social, Urban, Rural, and Resilience Global Practice of the World Bank.

The team would like to gratefully acknowledge the Government of Japan and its continued support of the TDLC.

This roadmap is based on analyses of the experiences with waste management in Azerbaijan, Belarus, Bulgaria, Japan, Romania, and the European Union (EU) generally. The experiences of other countries concerning waste management - Bosnia and Herzegovina, Kosovo, Ukraine, Kazakhstan, and Russia - have also informed the document.

By comparing implementation conditions across the case studies, the roadmap draws lessons and emphasizes that enhancing the waste management sector is a gradual process, changes should be introduced incrementally, and the sector is to improve steadily achieving organic growth. Special attention is paid to the building blocks of a well-functioning waste management system, including reliable data, legislation, institutional framework, financing, public communication and participation, management capacity, and operations. The intention of this roadmap is to provide a simple list of key issues and their sequencing that may be used by national and regional/local authorities in the conceptualization and implementation of municipal solid waste management reforms. The issues identified are not exhaustive and are intended as a guideline for policy makers who are not sector specialists.

The work was led Daniel Levine. The roadmap document was developed by Kremena Ionkova and Gerard Simonis. The research team was composed of Shiko Hayashi, Mihail Staynov, Diana Gheorghiu, Anatol Shagun and Gerard Simonis. The team is grateful for the inputs, comments, guidance and support received from Frank Van Woerden, Nikola Doychinov, Silpa Kaza and Haruka Imoto.

Lessons and recommendations provided in this document are subject to the limitations inherent in the availability of site-specific information, and are based on the authors' assessment, experience and knowledge.

CONTENTS

INTRODUCTION

There is evidence of publicly-organized waste management systems as early as the Roman Empire. Historically, the focus was on collection and disposal of waste to protect the health of city inhabitants and to improve the aesthetic appearance of territories. In the 19th century, as cities grew and industrialized, more waste was produced and its composition changed dramatically; for the first time, it included a large non-putrescible segment. Environmental protection and conservation started to receive increasing attention, and by the 20th century waste was increasingly viewed also as a resource to recover materials and energy. In the more economically developed countries of the Organization for Economic Cooperation and Development (OECD), waste management gradually evolved from a focus on disposal to a focus on prevention, recycling, and recovery. Today, the EU with its 28 member-states and population of 510 million, as well as Japan with its population of 127 million, are global leaders in the development and application of environmental policies in the waste sector. Other countries are studying and replicating their examples.

The 'sound material-cycle society' policy principle adopted by Japan (2000) and the 'waste hierarchy' policy principle adopted by the EU (2008) have established an

BOX 1

WASTE MANAGEMENT HIERARCHY

Disposal in landfills implies loss of the economic value of waste. Moving up in the waste hierarchy implies re-introduction of resources into the economy.

Source: http://ec.europa.eu/environment/waste/framework/

overarching vision for the waste sector, where the society consumes fewer natural resources and causes less environmental impact. These policies promote waste prevention, reuse, recycling, and recovery, in this order, over waste disposal (see Box 1). It should be emphasized that market conditions initially did not support these policies per se. The contrary was true: disposing waste in a landfill generally is cheaper than recycling it or recovering energy from it. Thus, Japan and the EU had to enact regulations to foster a new sector environment and guide the development of market conditions in support of the new waste policies and make them implementable. These interventions were based on the perceived environmental benefits and the benefits to safeguard the planet's finite virgin materials for future generations.

The new sector environment was created through a combination of sophisticated legislation, economic instruments, and regulation. Taken together, these measures made disposal of untreated waste expensive or impossible in practice. Gradually, landfilling of untreated waste has been prohibited, while new landfill development has been made purposely difficult. Economic instruments in support of the waste hierarchy include landfill taxes that increase the cost of disposal, 'green tariffs' for waste-derived products, fiscal relief, and so forth. Consequently, in the past fifteen years in the EU[1] and Japan, both a steady decrease in landfilling and an increase in recycling and recovery have taken place. The combination of regulatory instruments and economic incentives has also caused a spike in research and development, and investments in new and more efficient waste treatment technologies.

This last aspect is usually underestimated and sometimes poorly understood in countries at the beginning of the transformation of their waste sectors. The tendency is to adopt or copy approaches that are working in high-income countries with the expectation that they would work everywhere. However, this shift from disposal to reduction, treatment, and recycling results in (much) higher costs that are often poorly considered in countries that want to embark on this type of development. Actors in the waste sector follow market rules and chose the lowest cost option to fulfill their responsibilities. This means that if waste treatment were costlier, it would not be chosen by the waste actors, unless they were required to do so by regulation or if treatment was made financially attractive due to, for example, landfill taxes.

Going forward, the EU intends to deepen its efforts and achieve 'circular economy'[2]. Under this concept, in order to reduce both the total impact on the environment and resource use, products are to be used in the most efficient way possible. 'Circular economy' is therefore an expression of an economic model that highlights business opportunities with circular loops rather than linear processes. Consequently, a proposal to increase the recycling rate among EU members is currently under review and it is expected that the earlier target for recycling of 50% of municipal waste by 2020 will be replaced by a higher target of 65% by 2030 along with a binding landfill target of maximum 10% of municipal waste. Similar efforts are underway in Japan; the country

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1 Performance in this area among EU members varies significantly.

2 On 2 December 2015, the European Commission (EC) put forward a package to support the EU's transition to a circular economy, where "the value of products and materials is maintained for as long as possible. Waste and resource use are minimized, and when a product reaches the end of its life, it is used again to create further value. This can bring major economic benefits, contributing to innovation, growth and job creation." (https://ec.europa.eu/growth/industry/sustainability/circular-economy_en)

BOX 2

COMMON PRINCIPLES IN WASTE MANAGEMENT

Affordability is defined as the ability of households to pay for a certain level of waste management services. The threshold payment for waste collection, separation/recycling, and final disposal services is internationally accepted as 1-1.5% of average household spendable income. Social measures, such as reductions or exemptions of payment, can be instituted for low-income households.

Polluter pays principle is the commonly accepted practice that those who generate pollution should bear the costs of managing it to prevent damage to human health or the environment. Thereto the costs have to be defined, as well as the elements to be included in the costs. Polluter payments could be established on the basis of waste delivery by weight, 'pay as you throw' such as the bag purchase system in Japan, by proxy based on the number of generators, and based on other considerations. In most OECD countries, fixed monthly or quarterly charges, sometimes depending on the number of people in the household, are the most common payment method.

Sustainability in service rendering means full cost recovery, i.e., user charges should cover the direct financial costs and any associated negative environmental effects. Failures may result when the price of goods and services does not reflect the full cost or when government interventions could distort the market mechanism by grants, taxation policies, price control, etc.

currently incinerates 80% of its waste in more than eleven hundred incinerators, but significant efforts to increase recycling and reuse and decrease incineration are underway.

As such, implementing the 'sound material-cycle society,' the 'waste hierarchy,' and the 'circular economy' policies bring important economic and environmental benefits. At the same time, they increase the financial cost of the sector. The World Bank's What a Waste publication[3] reports that the financial cost of recycling and incineration is high often exceeding USD 100 per ton. In the EU, where the cost allocation follows the principle of "polluter pays" along with the principles of "affordability" and "sustainability" (see Box 2), households pay on average USD 260-350 per year[4] for waste service. In Japan, the cost of the waste system is estimated at approximately USD 500/ton and is financed through a combination of property taxes, subsidies, and more recently - waste fees. In general, the populations in most of the EU member states and Japan have developed an appreciation for resource conservation, embraced the waste hierarchy policy, and accepted its cost.

3 *What a Waste*, World Bank, 2018 (draft)
4 See Table 5 in the EU case study annexed to this roadmap document.

The experience of low- and middle-income countries that have replicated individual sector solutions, such as recycling or waste incineration, from higher-income countries confirms that these are not profit-generating activities[5]. In addition, success requires an adequate enabling environment comprising legal, regulatory, and economic instruments as well as sufficient financing, staff capacity, and public environmental awareness - all the prerequisites that were necessary for the successful implementation of the waste hierarchy in the EU and Japan. It is therefore questionable if individual solutions and technologies can simply be copied successfully. Doing so may result in 'lost' investment, facilities operating under capacity, at a loss, or even standing idle, or other unintended consequences such as an increase in illegal dumping. Low- and middle-income countries' replication of high-income country policies may also result in costs exceeding the level of affordability, thus increasing the risks of failure.

The experience of the EU and Japan indicates that, in addition to the availability of financing, substantial time and effort are required to establish a well-functioning waste management system. Progress was achieved over a period over decades, which included considerable efforts engaging the public and securing its participation in source separation. Essentially, a social contract has been reached between people, industries, and the public sector to cooperate and sustain their environment as a shared public good.

This roadmap is based on analysis of the experience of Japan and the EU, as well as that of Azerbaijan, Belarus, Bulgaria, and Romania. Bulgaria and Romania joined the EU in 2007 while Azerbaijan and Belarus have chosen to follow waste management approaches that are similar to those of the EU according to their strategy and planning documents. The actual case studies are included as separate Annexes. Recent experiences with waste management in other countries, including Bosnia and Herzegovina (BiH), Kosovo, Ukraine, Kazakhstan, and Russia have also informed this document.

The roadmap condenses the accumulated experiences by comparing their conditions for implementation and draws lessons-learned intended to benefit policy makers in low- and middle-income countries. Special attention is paid to the "building blocks" of a well-functioning waste management system, such as reliable data, legislation, institutional frameworks, financing, public communication and participation, management capacity, and operations. As these elements are closely integrated, changes to any one of them results in changes to the others. Similarly, waste collection, transportation, treatment, and disposal are vertically integrated and changes to one part of the system impact the entire value chain. It is therefore essential that intended sector reforms and changes are assessed holistically, and to the extent possible, with the involvement of all stakeholders.

[5] This document focuses on city-wide and sector-wide approaches in waste management; there are examples of individual community-based voluntary activities that are profitable within their small scale.

KEY CONSIDERATIONS AND GUIDING PRINCIPLES TO THIS ROADMAP

1. **Enhancing any waste management system requires a gradual approach**, changes should be introduced incrementally, and the sector should be allowed to improve and grow naturally without outsized interventions.
2. **The very first and basic objective of any waste management system is to provide professional collection and disposal services to its constituencies**, including at least full collection coverage in urban areas, substantial or full coverage in rural areas, and sound environmental practices at disposal sites. As a general rule, investing in more sophisticated infrastructure and technologies should be considered only after the basic level of service provision for the population is available.
3. **Landfilling of waste is a well-established and acceptable environmental option**, assuming it is done properly (at minimum, with bottom liner and leachate capture, landfill gas arrangements, and proper daily landfilling operations) and especially when financial circumstances do not allow for costlier alternatives.
4. **Once full collection coverage and environmentally sound disposal practices are in place, and when affordability allows it, waste separation and recycling should be considered as the next step up in the gradual upgrade of the sector.** Waste re-use, recycling, and recovery are policy choices that bring essential environmental benefits, but in financial terms make the waste management system more expensive. Therefore, moving up the 'waste hierarchy' should be done only when sufficient resources are available to finance the increased costs that come with such improvements.
5. **Recycling of household segregated waste is almost never a profitable activity and is at best cost-neutral[6].** Compared to recovering recyclables from households, recovering recyclables from the commercial/institutional/industrial (CII) sector is easier to operate and less costly. Placing the burden to recover materials on the producers and importers of such materials should be considered by governments in order to reduce the financial burden on the public sector.

[6] Some individual activities such as small-scale community based voluntary activities or capturing selected CII 'clean' recyclables when considered separately are profitable.

6. **Introducing Extended Producer Responsibility (EPR)[7] to capture recyclables such as packaging waste, electric/electronic waste, end-of-life vehicles, and batteries is an effective instrument meeting the principle of 'polluter pays.'** It takes time (often more than five years) to develop comprehensive schemes in cooperation with key parties such as manufacturers of consumer products and packaging materials.
7. **Treatment technologies such as mechanical and biological treatment (MBT) and waste to energy (WtE) schemes will further increase the financial cost of the sector** and should be considered only when a society is ready to pay the higher cost for waste services; is technically feasible (given waste composition and volume) and sufficient technical capacity exists.
8. **Financing is the backbone of waste management.** Waste management is not an economic activity for generating income but a public service requiring financing for cost recovery. Most countries studied here collect waste fees and charges and aim to achieve 'pay-as-you-throw' systems; some countries subsidize the sector partially or substantially from general revenue. Regardless of the sources of funds, sufficient financing is essential to run the waste management system in place. However, it should be noted that subsidies do not create a sustainable waste management system and may distort market conditions.
9. **Private sector involvement makes sense only if there is sufficient and reliable financing available to the sector**, and if the public sector has the capacity to provide meticulous contract enforcement and supervision of private activities. The private sector may improve efficiency on the margins and bring in private capital, but will rarely be able to solve larger sector issues; indeed, it may compound existing problems.
10. **The waste management system should be guided by appropriate legislation and controlled at national, regional, and local levels, while local authorities should be left with the responsibility of actual service delivery and implementation.** This requires adequate staffing capacity at all levels.

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[7] Extended Producer Responsibility (EPR) is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. See OECD (2001) *Extended Producer Responsibility: A Guidance Manual for Governments*, OECD, March, Paris.

THE SEQUENCING OF REFORMS

The steps below provide general guidance for the steps and sequencing for upgrading the waste management sector in a country. Since the different technical, financial, environmental and institutional aspects are closely inter-related, these steps should not be seen as strictly sequential and should be viewed only as providing general direction for reforms.

STEP **1**

Designate and empower a professional institutional leader for sector development and reforms.

A line ministry such as a ministry of environment or a ministry of regional development is typically assigned with the responsibility to develop policies, draft legislation, and oversee waste management in a country. A waste management section within the line ministry should be established, staffed with professionals and empowered to initiate and carry out the intended reforms. The waste management section could be dedicated exclusively to the waste sector and become the nucleus and driver of reforms (see Box 3).

- Typical functions of a waste management section would encompass policy formulation; legislative drafting; preparation of national waste strategies and plans; preparation of national standards and guidelines, including clear definition of municipal waste and its fractions as well as stakeholders' responsibilities; setting up of waste information database; monitoring and enforcement especially of EPR Schemes; and coordination and consultation with stakeholders.

- The amount and complexity of the work required by such a section is often underestimated by countries at the beginning of the transformation of their waste sectors. Typically, they have insufficient staff in the line ministry designated with the functional responsibility to oversee waste management; these officers often cover large environmental portfolios spanning various topics. In the absence of a competent and committed institutional leader, sector reforms may be sporadic, chaotic, expensive, or even counter-productive. In case of moratoriums or other restrictions on hiring preventing the establishment of a waste management section, a local consulting company could be hired for few years to work on behalf of the ministry. Among its tasks, it could be asked to train ministerial staff and create inter-ministerial capacity, while implementing the reform agenda under the auspices of that ministry.

BOX 3

WASTE MANAGEMENT INSTITUTIONAL SET-UP IN BULGARIA

The Ministry of Environment and Water is the national competent authority in charge of waste management policy and legislation in Bulgaria. The Waste Management and Soil Protection Directorate of the Ministry comprises three departments responsible for (i) municipal, biodegradable, and construction and demolition waste; (ii) industrial and hazardous waste and trans-frontier shipments of waste; and (iii) management of special waste streams like packaging waste, end-of-life vehicles, spent batteries and accumulators, and electrical waste and electronic appliances. There are 24 employees in the Waste Management Directorate. In addition, the Monitoring of Waste Department at the Executive Environmental Agency, with six employees, is responsible for the national waste management information system, including reporting, data processing, and analysis. The control functions of the Ministry are implemented through 15 Regional Inspectorates for Environment and Water, each of which has 3 to 5 inspectors. The number of employees cited above does not include experts in charge of large industrial installations (including landfills and waste treatment plants), experts providing legal and communications support, staff of the specialized departments charged with management of investment projects, and the waste management specialists at the State Enterprise for the Management of Environmental Protection Activities.

The municipalities in Bulgaria are responsible for organizing the municipal waste management in their jurisdictions. There are 318 total municipal employees *directly* in charge of waste management functions, corresponding to an average of less than one public servant per 1000 residents. The actual number of municipal servants *partly* in charge of waste management is approximately three times higher. These figures do not include the staff of the municipal companies and enterprises providing municipal waste management services.

STEP **2**

Introduce adequate incentives and regulatory oversight.

The central government should use a 'carrot and stick' approach to establish a set of incentives and enforcement mechanisms for local governments responsible for service delivery in order to advance the sector in the desired direction.

- New EU member states have adopted a policy where central governments promote desired sector investments through financial incentives. For instance, capital grants are made available where municipalities partner together to establish regional treatment and disposal facilities and operations rather establish individual municipal projects.

- Similarly, central governments often require mandatory, sometime centrally organized, waste accounting and reporting systems which is the basis for regulatory oversight and enforcement.

STEP **3**

Establish a permanent platform for dialogue on the sector with key stakeholders.

Establish a consultative group to review key aspects of intended reforms. Such a consultative group should be broad based and comprise representatives of essential stakeholders, including associations of municipalities, associations of utility companies, the Ministry of Finance, the central Statistical Office, the Environmental Protection Agency, EPR organization(s), and one or two key citizen organizations/NGOs. Such a consultative group should be viewed as a permanent establishment and provide an ongoing platform for sector consultations.

- In the EU, associations of municipalities are typically strong proponents of local needs and key counterparts to the central government on issues of waste management. Important decisions in the sector are rarely carried out unless key stakeholders have been consulted and their endorsement has been secured. Other stakeholders are equally important for the process of negotiating complex implementation schemes requiring the consent of industries, national governments, and municipalities.

- By contrast, many of the countries studied in the process of preparing this document do not carry out sufficient consultations with sector stakeholders. Indeed, such consultations are often deemed unnecessary; however, top-down decisions involving little or no prior consultation often bring institutional and public opposition while the power of committed stakeholders remains untapped.

BOX 4

REGIONAL COLLECTION IN IRELAND AND HOLLAND

Ireland is divided into three waste regions, each covering several local authorities (counties). Generally, one county in each region leads the implementation of a Regional Waste Management Plan, which is supervised by a Regional Waste Management Office. Waste collection is carried out on a regional basis by private companies. The role of local authorities is focused on regulatory, educational, and enforcement aspects.

In the Netherlands, small municipalities may cooperate to generate larger quantities of waste in order to reduce costs. A typical example is an inter-municipal company established originally in 2001 by the municipalities of Voorburg, Leidschendam and Rijswijk (125,000 inhabitants) and subsequently joined by four additional local governments (Wassenaar, Delft, Pijnacker and Midden-Delfland). The company currently serves about 325,000 inhabitants, collecting 140,600 tons of waste with 70 trucks.

STEP **4**

Develop a national waste management strategy and/or implementation plan to ensure access to waste management services and environmental protection.

Professional collection and disposal services that include full collection coverage in urban areas, full or substantial coverage in rural areas, and sound environmental standards at disposal sites should be provided by local authorities as the minimum, basic level of service provision.

- In most non-EU countries in Europe, the Caucasus, and Central Asia, urban collection is satisfactory, although disposal practices are often poor. An out-of-sight, out-of-mind attitude has been the norm for a long time. There are thousands of wild dumps, small and large, scattered around their territories, while many of the authorized disposal sites lack some or all environmental controls.

- Regional landfills with associated regional waste sheds (or landfill capture areas) is the established concept in all the countries studied as well as an internationally accepted practice due to economies of scale in capital costs, reduced fixed costs, and reduced environmental risk associated with fewer sites.[8] Some of the studied countries have followed a top-down division of their territories into regional waste sheds where each is

[8] It should be noted, however, that in certain countries it may be challenging to establish a regional infrastructure due to national legislation allowing local governments to engage in corporate activities, the fiscal policy of local governments favoring investments, and contract laws to set up meaningful inter-municipal arrangements.

served by a regional landfill, while other countries have left it entirely to municipalities and market forces to determine their landfill caption areas. A centrally-led approach accompanied by public consultations and local endorsement seems to be the faster and more efficient among the two approaches. The development of regional landfills should be done in parallel with permanent closure of other disposal areas and wild dumps, as well as strong control and enforcement. There are multiple examples where, following the introduction of regional landfilling, municipalities revert to old sites or unauthorized dumps due to new higher transportation costs to regional sites and weak monitoring and control.

- Authorities may consider introducing into existing national legislation graduated standards for landfills based on their environmental legislation, local environmental assessments, and the quantity and composition of waste. Requirements could be reduced for small landfills, such as the need for criteria for gas treatment and minimum leachate effluent.

- In addition to regional disposal, regional collection can offer advantages for sparsely populated small settlements where efficiency is difficult to achieve. Regional collection is a well-established practice inside the EU and could be considered if applicable to local circumstances (see Box 4).

STEP **5**

Advance institutional improvements at regional and municipal levels.

- Regional waste management plans should be prepared in line with the national strategy/plan and municipal waste management plans should be prepared to guide local implementation. To do so, a process should be adopted to align municipal and regional waste management plans with the national strategy/plans. When building new infrastructure and facilities, individual municipalities should be encouraged to follow the adopted plans to ensure cohesive development of the sector across the whole country. This would ensure the efficient use of limited public resources and the coordinated development of the sector.

- Inter-municipal cooperation in service provision should be promoted and could be supported by the central government through a variety of guidance tools and incentives, such as access to financial resources for capital investments.

- Large municipalities should establish a dedicated solid waste management unit within their municipal administrations with the responsibility of preparing municipal waste management plans and municipal regulations for households and the CII sector; regulating and monitoring service delivery; overseeing fee collection; and engaging the population.

- Municipalities should issue municipal regulations on solid waste management service provision. The regulation should outline the roles and responsibilities of the

municipality, service providers, and waste generators, including households and the CII sector. In most EU countries, municipal regulations obviate the need for individual contracts between the service provider, who holds a geographic monopoly, and individual households. Individual contracts, on the other hand, are typically an unnecessary administrative and financial burden making waste collection costlier.

- An independent municipal waste collection organization should be considered where service delivery is not outsourced. In several of the studied countries, municipal enterprises perform various municipal services (waste collection, street cleaning, parks/green area maintenance, beautification, etc.) and their financial statements are bundled. However, an accounting system for dedicated cost allocation is necessary but often missing. This system should have at least a separate budget as well as annual financial statements for municipal waste services where such services form a significant share of the municipal budget.

- Small municipalities with low capacity require a lot of guidance to advance their systems. Capacity building could be provided by an association of municipalities. In principle, associations of municipalities should be strengthened and their role institutionalized as a consultative partner.

- Public communication campaigns should be carried out on a continuous basis. Such campaigns should not be a one-time or ad hoc event, and municipalities should ensure they have specialized staff and a dedicated yearly budget allocation for this activity. Alternatively, the communication activities could be delegated to the waste collection company or could be a required function of the industry under the EPR scheme in place.

STEP **6**

Once a basic level of services is functioning adequately, examine what the sector can realistically afford in order to move up in the waste hierarchy and the timeframe required to achieve the move.

Many countries have rushed to introduce waste treatment while their jurisdictions are filled with wild dumps and their disposal sites lack proper environmental controls. Full collection coverage and proper disposal should be in place before the system is upgraded further into waste separation, sorting, and recycling. Neglecting these thresholds has been shown to directly undermine waste treatment; there are many examples, where despite the availability of treatment facilities, waste continues to be brought to wild dumps or unsanitary sites.

- Waste data is required to understand the status, needs, and potential of the waste system in place. Reliable data is needed to understand the quantity and type of waste being generated, collected, separated, recycled, and disposed. Data is also essential for planning purposes and for determining the investments to be made and the infrastructure to be built. Data about the composition of waste is needed for assessing the potential for recycling and the opportunities for treatment, as well as for monitoring

achievement of targets. Procedures need to be introduced for regular waste sampling and analysis. Systems based on volumes should be replaced by systems based on weight. A waste information system needs to be developed and maintained at the central level with easy-to-understand forms for reporting.

- A comprehensive sector assessment study should be done at this stage comprising a conceptual design for an advanced waste management system and its operations. It should cover legal, institutional, financial, operational, and capacity issues. It should investigate various technical options, especially their financial impacts and whether the country can afford them.

- Internationally, the sector affordability benchmark has been established at approximately one percent of household disposable income. If the country decides to subsidize the cost of service, as the majority of Japanese municipalities still do (although a shift towards the polluter pays principle has begun there), behavioral changes leading to reductions in the waste generation rate may be more difficult to achieve.

- Once the path for the development of the waste management has been established, it should be reflected in national legislation, strategies, and implementation plans. It is critical that the development path selected is realistic in terms of costs, the timeframe for implementation, the required institutional and legal changes, and the potential for community participation to achieve desired goals. The results of the study should be discussed with all stakeholders in order to secure their backing and participation. It should be noted that in many of the studied countries, national strategies were overly optimistic and contained unrealistic objectives and targets, which were then not achieved. In many cases, costs are underestimated while revenues are overestimated, while issues concerning public participation and institutional changes are often neglected.

- If there is reason to believe that the sector is inefficient, a separate study to identify areas of inefficiencies and cost reduction opportunities should be commissioned. Waste collection and transportation often have significant efficiency potential, as they often feature low productivity (expressed by number of staff per waste ton collected and disposed), equipment that is old and expensive to operate (expressed by high maintenance and repair costs and down time), missed opportunities for economies of scale, a low bill collection rate, inefficient routing for waste collection and so on.

STEP **7**

Advance cost assessment and fee setting practices.

- To assess costs, the services to be provided should first be individually defined. These might include: collection of mixed waste/bulky waste/separated waste, transport and transfer, any separation and sorting, final disposal, street cleaning and market cleaning, other services such as waste sampling and analysis, and communication campaigns for the population.

- A national authority should prepare regulations for fee setting procedures, including a methodology and guidelines for cost calculation. The guidelines should define all cost factors to be included in the fee calculation. However, the actual fee setting using local unit rates should be left to the municipal administrations.

- As a matter of policy, some national authorities may decide to exclude certain cost factors, such as amortization and/or VAT, for a given period of time. In addition, capital investments may be financed by municipal administrations fully or partially on a grant basis.

- The prevailing and recommended practice for fee collection is by municipal administrations. The exact fee collection vehicle – attached to a property tax bill, another utility bill, or a stand-alone bill – may vary. In some countries, the fee is collected by service providers, which is generally a less preferred option due to the increased risk for the operators that may impact service quality.

STEP **8**

After having established a well-functioning collection and disposal system, and after understanding the costs in terms of both consequences and financing, a system of separation at source may be developed for dry recyclables (paper/cardboard, plastics, metals/cans, glass) and possibly other priority waste streams like electrical/electronic waste.

- EPR may be introduced for at least packaging waste in order to create extra financing. All EU countries and most developed economies have EPR programs in place, whose benefits are to increase collection and recycling rates, reduce public spending on waste management, reduce overall waste management costs, and provide incentives for eco-design and other innovations. When designing their EPR systems, countries should decide whether to assign the full responsibility for collection, sorting, and recovery of recyclables to the obliged industry or whether this responsibility will be shared with the public sector.

- If municipalities decide to invest in sorting lines for dry recyclables where the volumes generated are small, association with other municipalities should be investigated. The financial viability of sorting lines is very sensitive to waste quantities. A market survey concerning demand for recyclables within the local/regional market will inform what potential revenues are. Many EU countries and developed economies have introduced systems seeking to maximize 'separation at source,' which results in good quality recyclables. Separation at source, however, increases overall costs by adding the cost of collection and transportation to the cost of sorting. Increased costs are rarely offset by the revenue from recyclables.

- Gaining public support for the implementation of waste separation at source (waste segregation by households) and the participation of a significant share of citizens in

different recycling initiatives requires resources to be designated for extensive communication and awareness programs (paid for by EPR and/or municipal budgets). These programs should be scaled for the long-term and allow feedback and improvement cycles.

- The feasibility of a mixed waste separation line, where recyclables are extracted from unseparated, mixed municipal waste, could be investigated. As a general rule, approximately up to 10 percent can be extracted from the mixed waste using a mix of handpicking and electrical separation devices. Higher percentages may be achieved using highly sophisticated electronic devices, which, however, makes the system rather expensive.

STEP **9**

Consider treatment of residual waste and/or the introduction of separation at source for organic waste.

- Using mechanical biological technologies (MBT) to treat residual waste stabilizes the residual waste to be landfilled and reduces its quantities. Refuse Derived Fuel (RDF) production is usually the output of MBT. The feasibility of RDF production depends on a number of factors, such as having sufficient quantities of waste which requires well-established collection systems; the transport distance to the cement and/or power plants; the cost of fossil fuels/coal that the RDF will partly substitute and its buying price; and the avoided cost of landfilling. RDF should meet technical and environmental parameters set by the buyers based on its calorific value, moisture content, chlorine/ash/heavy metals content, and so on. Accepting RDF for co-incineration by cement/power plants requires certain adjustments at these plants as well. Similarly, the cost of incineration depends on the calorific value of the waste, feed-in fee, and gate fee. It's not unusual that revenues from RDF are mainly from avoided disposal costs and not from payments by RDF consumers.

- Bio-waste is defined as biodegradable garden and park waste, food and kitchen waste from households and restaurants, and comparable waste from food processing plants. Countries committed to introduce EU legislation have to comply with the Landfill Directive (1999/31/EC), which obliges Member States to reduce the amount of biodegradable municipal waste that they landfill to 35% of 1995 levels by 2016 (for some countries by 2020). In practice, the production of good quality compost is difficult due to impurities in the household waste. Many municipalities in the EU therefore concentrate on separate collection of garden and park waste, which is then designated to composting or anaerobic digestion.

STEP **10**

Other treatment: incineration with electricity/heat production.

- In the EU, incineration – with or without energy/heat production – is an option for reducing waste to be landfilled.[9] In some of the non-EU countries studied in preparing this document, incineration has been considered more as a business transaction to generate revenue. The general lesson is that the cost per ton of incinerated waste is significantly higher than the cost per ton of alternative waste handling and especially disposal, which remains a widely available option in these countries. Waste incineration and other waste treatment options should therefore not be looked at in an isolated, transactional manner, but should be reviewed against all other available treatment and disposal options in the given country. Although the cost of waste incineration in the EU has dropped by 30-40 percent in recent years due to more advanced technologies and an oversupply of capacity, it remains an expensive treatment option compared to alternatives.

STEP **11**

Continuous monitoring, regulatory frameworks, and economic incentives are needed to steer the sector in the desired direction.

Waste management is a dynamic process requiring constant adjustments both in the regulatory framework as well as in actual operations. Thereto, reliable information on waste quantities, financial aspects, and market conditions is very important. Well-trained professional staff are needed to analyse the information and to propose adjustments. Continuous capacity building is essential.

- Countries with dynamic waste management sectors should adopt flexible approaches and continuously adapt their regulatory frameworks to respond to market conditions in order to have their waste sector react and perform in the desired manner. Waste generation and composition are constantly evolving due to population and economic changes and should be monitored. Markets are also dynamic and impact the performance of national systems. Societies and public opinion evolve as well; societies are increasingly willing to finance improvements towards better environmental sustainability. Public authorities should capture and capitalize on such changes to improve the overall performance of the sector in line with public opinion and public will. Constant consultation with stakeholders enhances the possibility for success in achieving the desired waste management system.

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[9] In the EU, incineration is not considered as a form of recycling; in fact, under the new EU circular economy policies, the tendency is to move away from incineration while promoting waste reduction, reuse, and recycling.

WASTE MANAGEMENT COSTS

Costs assessment for services rendered is the baseline for fee setting. While this is a basic, core principle, it is often neglected in practice.

- Costs allocation for waste management services should be based on a proper accounting system identifying the cost components separately for each type of activity: collection and transport to disposal both for mixed waste and separated fractions; transfer and long-haul transport; landfilling and other treatment options; street cleaning; market cleaning; third party contracts; and any other services such as sorting of pre-separated recyclables. Overhead costs normally include costs for office space, general and operational management, communications, and education.

- Cost components normally include wages; third party contracts; energy, fuel, lubricants; maintenance and repair; energy; tires; insurance; amortization, including interest and depreciation; and banking costs. The costs will be influenced by the number of shifts/day, working hours/day, working days/week and working days/year, capacity of trucks, distance to final disposal, waste composition, and frequency of collection (see Box 6).

- Cost estimates based on the international experience can be compared with actual costs and might reveal inefficiencies, especially when Key Performance Indicators (KPI) are introduced, such as the percentage breakdown of total cost/ton into wages; maintenance and repair of trucks; fuel and tires; and overhead. For example, a high percentage for wages might indicate overstaffing, a high percentage for truck costs might indicate depreciated equipment, and a high percentage for fuel might indicate inadequate route planning or the need for a transfer station.

- Benchmarking with other municipalities will only be useful if the services covered by the cost calculations are clearly defined and similar in nature, i.e., they are similar in population density; method of collection, such as communal containers versus curbside containers; waste density; waste quantities; taxes; transport distance to final disposal; and frequency of collection.

- A proper reporting and registration system is critical to accurately establish the costs for each activity.

- Cost calculations should preferably be based on “sound business” principles – with the exclusion of the profit principle for services to households (See Box 7).

- Cost calculations are needed for financial planning, investment decisions, and improvement in operational performance.

BOX 6

TEMPLATE FOR COST CALCULATION

Waste management activity	Cost items
11. Collection and transport to delivery point of household waste and CII waste (mixed and separated fractions)	Direct costs • wages, including uniforms and training • fuel, lubrication, tires, repair and maintenance • insurance • amortization • 3rd party costs (if applicable) Indirect costs • management; administration • office (cleaning, telephone, energy, repairs, rent, etc.) • communication/advertising • 3rd party services (accountant, ICT, consultancy, etc.) • bank costs (loans, etc.) • monitoring; enforcement • other costs (taxes) • unforeseen
12. Management "bring stations"	See activity 1 less any revenues from sales
13. Transfer and long-haul transport to final disposal	See activity 1 or gate fee*
14. Sorting dry recyclables	See activity 1 plus transport and landfilling costs of rejects, less revenues from sales or gate fee*
15. Any treatment such as composting, incineration, MBT	See activity 1 less any revenues from sales or gate fee*
16. Landfill operations	See activity 1 plus closing/aftercare, leachate management, LFG collection and treatment, and any revenues, monitoring, or gate fee*
17. Street cleaning including emptying litter bins	See activity 1 plus final disposal
18. Market cleaning	See activity 1 plus final disposal
19. Other activities	

* In case services are provided by third parties.

BOX 7[10]

AVERAGE COST ESTIMATES

	Reported / Expert assessment (US$/ton)							
	Low-income		Lower Middle-income		Upper Middle-income		High-income	
Collection and Transfer	40	20-50	16	30-75	98	50-100	121	90-200
Disposal Landfill Open dumping	No data 7	10-20 2-8	No data 25	15-40 3-10	No data	25-65 N/A	53-99	40-100 N/A
Recycling	No data	0-25	No data	5-30	No data	5-50	202	30-80
Composting	No data	5-30	No data	10-40	No data	20-75	No data	35-90
Waste-to-Energy Incineration		N/A		N/A	No data	60-150	134	40-200
Anaerobic Digestion		N/A	No data	20-80	No data	50-100	No data	65-150

Source: *What a Waste*, World Bank, 2018 (draft)

[10] *What a Waste*, World Bank, 2018 (draft).

FINANCING OF WASTE MANAGEMENT COSTS

Waste management is not an economic activity for generating income but a public service requiring financing for cost recovery.

- Operational revenue typically includes (i) fees or user charges paid by households and by commercial/institutional (CII) entities which are normally the main source of revenue; (ii) subsidies from the municipality's general budget, especially for low-income households; (iii) revenue from extra services provided by the waste collection company under a separate contract with the municipality, such as for street cleaning, or with other (private) parties such as for collection and transport of non-hazardous industrial waste; (iv) revenues from sales of separated/sorted recyclables; and (v) income from Extended Producer Responsibility (EPR) Schemes whereby the waste collection company renders services to the Scheme for separation, collection, and transport of packaging waste and electrical/electronic waste. In addition, the City Council can decide that the public waste collection company will be allowed to develop commercial activities, for example, collection of construction and demolition waste and participation in waste recycling facilities.

- Fees are typically the main source of income for waste management organizations, and their level and collection rates determine the ability of the sector to function well. However, budget support and cross-subsidizing between waste streams and types of waste generators is also quite common.

- Typically, municipalities have the authority to set their waste management fees and users are obliged to pay the fee. The fee should be based on "sound business" principles covering at least the operational and amortization costs.

- Many national governments issue guidelines on methods for fee setting, preparation of municipal waste plans (including impact on costs), and model contracts with private sector service providers and their financing conditions. Such guidelines can standardize the approach among municipalities, provide an opportunity for benchmarking, and facilitate waste management operations for small, capacity-constrained local governments.

- Fee setting should preferably be based on the key principles of (i) polluter pays; (ii) affordability; (iii) full cost recovery; and (iv) economic efficiency.

- Actual fee setting, especially for households, usually takes into account social and economic conditions. Internationally, 1-1.5% of average spendable household

BOX 8

AVERAGE FEE PER HOUSEHOLD IN SELECTED COUNTRIES

	Average household fee/year (Euro)	Average household income/year (Euro)*	Percentage of spendable income
EU			
South	225	22,540	1
North	350	37,095	0.95
East	70	8,620	0.8
Japan	353	24,830	1.42
Bulgaria	58	6,476	0.9
Romania	55	6,120	0.9
Bosnia	55	10,000	0.55
Belarus	14	8,160	0.2

* Eurostat: one earner/household with two children.

income is considered an acceptable threshold payment, while for CII entities a full cost recovery principle is the accepted standard (see Box 8). This standard means that subsidies are needed for households living under the poverty line. These subsidies are typically provided from the general municipal budget, but may also partially be provided from cross-subsidization, for example, from higher fees for CII waste.

- Normally, municipalities collect the fee payments from the households, although there are cases where fee collection has been delegated to the waste collection company. This delegation often results, however, in extra costs and risks for the waste collection company due to non-payments and lack of adequate legal enforcement. It could even result in 'cherry-picking,' where waste companies only service areas where people are willing to pay for services.

- Municipalities are often allowed to exclude or include with reduced surcharge the Value Added Tax (VAT) and allowed to operate without a profit principle. These conditions are generally laid down in national law. Fees for CII entities, however, include VAT, and may also be set according to the profit principle.

- Fee structures should be clear and understandable; various principles are used for the basis of household fees. These include the number of persons (most commonly used), pay-as-you-throw (e.g., bag buying system or tag system), size of house plot, size of container, or fixed amount per household. Experience shows that pay-as-you-throw systems result in a decrease of collected waste, and therefore many municipalities are carefully implementing the system using weight or volume-based approach. However, the system also has limitations such as higher costs, increased risks for illegal dumping,

waste deposited in non-registered containers, and increased rates of contamination in recyclables.

- Fees are based on budget calculations for the coming year and take into account the actual costs seen from the previous year. In addition to the actual costs, a number of principles should be agreed upon for fee calculations such as inflation correction, required reserves for financing of investments, full cost recovery principle, VAT surcharge, and expected revenues.

The sequencing of Fee Setting could be summarized as follows:

- Municipalities should identify the waste flows and their fractions, and should assess the activities for each waste flow. Typically, municipalities have the "Duty-of-Care" for managing municipal waste, street cleaning, market cleaning, grass clippings, leaves and separated fractions such as bulky waste, packaging waste, and electrical/electronic waste. Establishing and maintaining a reliable database on the quantities of each waste flow is important for assessing required activities and investments.

- Municipalities must decide the percentage of service costs to be allocated to the fee, which is a policy decision. In general, it is common practice that costs for collection of mixed waste and separated fractions, bring station management, transport to final disposal, treatment, education and communication should be fully covered by the fee. City Council's then must decide which percentage of street cleaning costs, market cleaning costs, and illegal dumping costs are charged to the fee.

- Additional costs to be included in the fee. In addition to direct operational, amortization, and overhead costs, other costs such as the need for reserves might have to be included in the fee in anticipation of future activities set out in a multi-year Waste Management Plan. Incorporating the need for reserves avoids later steep fee increases. Moreover, decisions have to be taken on inclusion of (reduced) VAT rates for households based on prevailing legislation, as well as exemptions or reduced fee payments for social reasons (e.g., low-income households).

- In addition to financing of operational costs, capital financing of investment projects is needed. This could be through (i) existing municipal resources; (ii) loans from banks; (iii) loans or grants from international financing institutions; (iv) inter-governmental grants; or (v) grants from the municipality or government to stimulate specific innovative developments. Any capital financing has to be justified by an investment feasibility study that takes into account the sustainability of the activity, especially its effect on fees and the affordability to pay.

AZERBAIJAN CASE STUDY[1]

Introduction

In 1999, Azerbaijan entered into a Partnership and Cooperation Agreement with the European Union (EU) according to which Azerbaijan was to emulate the EU legislation in the environmental sector. In 2006, the Environment State Program (ESP) was issued with Presidential Decree No. 1697. It established a comprehensive plan for clean-up and remediation of areas polluted by hazardous and non-hazardous wastes; and envisaged a number of related environmental management, legal and regulatory measures as well as the upgrade of existing infrastructure and facilities. A complementary Presidential decree was issued in December 2011 to encourage solid waste recycling activities throughout the country. In 2016, the Integrated Solid Waste Strategy for Greater Baku was prepared; and in 2017 the new, comprehensive National Solid Waste Strategy set the tone for sector reforms in the period until 2035. Guided by these strategic documents, the government has embarked on an ambitious agenda to change prevailing practices in waste management throughout the nation and advance the sector in an environmentally, economically, socially and financially sustainable manner.

Significant advances have been made in Greater Baku area between 2008-2017, including substantially increased waste collection coverage, upgrade of the old city dump into a well-managed sanitary landfill, the construction of a materials recycling facility (MRF) for mixed and pre-sorted waste, a waste to energy (WtE) plant, and an eco-industrial park - a public-private partnership promoting recycling and recovery activities. As a next step, the National Strategy envisages the need for regionalization of disposal services outside Greater Baku into 8 waste sheds serviced by one regional landfill each with supporting infrastructure. Recycling and other treatment of waste outside Baku are also planned on the medium run. A range of complementary efforts intended to improve the overall legal and regulatory environment governing the sector and its performance are also planned. The government has approached international financial institutions (IFIs) for support towards the implementation of these activities. Key among them are the need to improve revenue collection and diminish the sector's reliance on the state budget, strengthen institutional performance, and improve the regulatory and control functions of relevant institutions.

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[1] This case is substantially informed by the Azerbaijan Draft National SWM Strategy prepared by the Ministry of Economy with assistance from a consortium of consultants - Aim Texas and ICP JV. The case study is also informed by the Integrated Solid Waste Management Strategy for Baku drafted by Integrated Skills consultants. Text from the Strategy documents as well as their background studies have been used throughout the case study.

1. General MSW data

Azerbaijan is an upper middle-income country with a total land area of 86,600 km^2 and population of approximately 9.5 million people (53% urban and 47% rural). The largest urban centres are the greater area of the capital city Baku with officially reported population of 2.2 million, and Ganja and Sumgayit with population of 0.66 million. Since this data may not reflect the migrant population living without registration especially in Baku, the population there for sector planning purposes is estimated to be approximately 3.5 million. Population growth in Azerbaijan is estimated at 1.2% per year.

The waste generation rates are assumed to range from 0.25 kg/capita/day in rural areas to 0.70kg in smaller urban areas, 1kg in Ganja/Sumgayit, and1.2 kg in Baku (Table 1).

Table 1: Estimated MSW generation

	Greater Baku	Ganja/Sumgayit	Remaining area
Generation/cap/day	1.2kg	1.0kg	0.2(rural)-0.7(urban)
Population	2.2-3.5 million	0.6 million	6.8 million
Waste (tons/year)	975,000-1,533,000	243,000	1,124,000
Total Azerbaijan	2,342,000-2,900,000 tons/year		

A household survey carried out by the World Bank in 2014, indicated that around 80% of the population in Baku at that time was served with regular waste collection services. Outside the capital, nearly all urban households and establishments receive waste collection. None of the rural areas of the country however have collection service.

A representative sample of the waste composition based on extensive field surveys carried out during the preparation the National Strategy indicates 55% organic waste, 28% dry-recyclables and 17% remaining/other waste. There is practically no separation at source. The separation of mixed waste in Greater Baku is carried out in a MRF located near Balakhani landfill with a reception capacity of 200,000 tons/year. The MRF separates around 10% of the feed-in which is in line with international practice. The remainder, has to be either fed to the WtE or landfilled. The incinerator constructed in close proximity to the MRF and the Balakhani landfill has capacity of 500,000 tons/year. It is estimated that the incinerator produces around 10% (by weight) bottom ash which is also landfilled. Outside the big cities, disposal takes place at uncontrolled dumpsites. Approximately 1 million tons of waste per year is disposed in this way outside the capital. This amount is expected to double in the next 20 years driven by demographic growth and higher incomes.

In order to manage the waste sector efficiently and effectively, accurate and reliable data and information regarding the sources, nature, quantities of waste generated, collected and disposed, costs and revenues are essential. In Baku, significant progress has been made in the past few years with the construction of modern treatment and disposal facilities. These facilities are generally well run and provide reliable information related to the quantities they handle. The waste information system (WIS) developed in Baku is compiling information from multiple entry points and sources and has evolved into a very useful management tool.

In the rest of Azerbaijan, a number of studies carried out in recent years have to some extend substituted the lack of historical data due to lack of equipment for regular weighting and recording of the types and quantities of solid wastes. The government plans to establish a WIS outside Baku as well which is expected to facilitate the planning, management and control of SWM facilities and services there. The national system mandating the regular collection, processing, analysing and dissemination of data and information will need o be strengthened in parallel.

2. Legislation

The sector is governed by the overarching Law on Industrial and Household Waste (1998, amended in 2007). The Law defines municipal waste as "substances, items and materials originating in residential areas as a result of human life". This definition does not include waste from the commercial, institutional and industrial sector (CII), neither street waste and wastes from green areas and parks, which are typically also defined as municipal solid wastes. A number of other laws and legal instruments also govern the sector, among which:

- The Law of the Republic of Azerbaijan (RA) on the "Protection of the Environment" (LEP) (08.06.1999, No: 678-IQ)
- The Law of the RA on "Industrial and Domestic Wastes" (LIDW) (30.06.1998, No: 514-IQ) with further amendments
- The Law of the RA on "the Status of Municipalities" (LM) (02.08.1999, No: 698-IQ)
- The Order by the President of the RA on "Improvement of Municipal Waste Management in Baku City". (BMWO) (06.08.2008, No: 2983)
- The Law of the RA on "Access to Environmental Information" (LAI) (12.03.2001, No: 270)
- The Instruction on "Procedures of Inventory of Wastes Generated during Industrial Processes and from Service Sectors and Classification System" (entered into the State Registry of the Ministry of Justice of the RA) (IPIWCS No: 419) (Registration 14.07.2003, No: 2986)
- Regulations on "the Issuance of special permits (licenses) for wastes management"

The laws and legal instruments listed above are only the main ones pertaining directly to SWM. There are over one hundred laws and instruments currently in force which relate to waste management.

The legal framework governing the sector is currently under revision and amendments to the definition of municipal solid waste (MSW) as well as other aspects are expected. This work has been undertaken within the larger initiative of the government to carry out an inventory of existing laws and regulations concerning waste management and to prepare changes and draft legislation that support the implementation of the recently developed National Solid Waste Management Strategy.

The National Solid Waste Strategy sets a detailed phased roadmap to enhance the sector and its performance. The overall objectives of the Strategy are to (i) improve core collection and disposal processes including the development of regional landfills and transfer stations aimed to provide disposal services for various groupings of rayons

throughout the country, which is then followed by more ambitions targets for recycling and recovery; (ii) ensure safe and efficient neutralization and disposal of hazardous wastes to minimize damage to public health and the environment; and (iii) ensure the efficient use of available resources in setting up the investments and development schemes that would improve solid waste collection, recovery and disposal in all the country's rural and urban areas.

The Strategy introduces the regional approach for disposal, based on 8 waste sheds served by one regional sanitary landfill each and several transfer stations. The Strategy contains several options for sustainable institutional and financial set up of the sector, including the establishment of a national disposal company to run the regional landfills and transfer stations that are to be built in the short and medium term. It envisages establishment of the hazardous waste management infrastructure and facilities. It also proposes to improve the tariff collection rates and financial accounting by attaching it to the electricity bill, following a differentiated tariff scheme depending on household energy consumption level; it further envisages the introduction of effective financial and waste accounting systems and adoption of a gradual tariff increase scheme that should allow to gradually offset the government subsidies by 2035.

The Strategy offers plausible development approaches given the state of the sector in Azerbaijan and provides a solid direction for sector development. As of the time of the present case study, the government has commenced its implementation under (Phase 1 of the National Strategy).

3. Institutional setting

The Republic of Azerbaijan is divided into 59 rayons, 11 cities, 2732 municipalities and the autonomous Republic Nakhchivan comprising 7 rayons and 1 city. The regional executive powers (REPs) govern the rayons and the cities. The President appoints the Heads of the REPs. Municipalities were created by Law in 1999 and started to operate in 2000 with elected Mayors and City Council.

The institutional framework is fragmented and a central coordinating body is envisaged but not yet created although the Ministry of Economy has recently emerged as the leading ministry for SWM policy formulation, strategic planning and legislation. Numerous institutions are directly involved in SWM starting with the President issuing Decrees on specific subjects, the Parliament for passing Laws and its amendments, Cabinet of Ministers for coordination and approval of key strategic directions, Tariff Council for approving tariffs, the Ministry of Economy (MoE) for policy formulation and project implementation, the Ministry of Environment and Natural Resources (MENR) for control and enforcement, the REPs and Municipalities. Going forward, it is important that the legal responsibility and competence for implementation on one hand, and permitting, compliance monitoring and enforcement on the other are assigned to institutionally separate and operationally autonomous agencies with clearly assigned legal monades, delegated powers and adequate budgetary, human and technical resources.

Up to 1999 the REPs were solely responsible for SWM; since then, municipalities were made legally responsible for SWM but the actual transfer of responsibilities and financing has lagged behind. Waste collection is carried out by municipalities/rayons.

Waste treatment and disposal in Baku has been transferred to a state-owned company (as discussed below). While this approach could work well given the state of the sector in Azerbaijan, on the longer run efforts should be made to decentralize the service to the municipal level. As international practice shows, proximity of service providers to the population is an important principle in waste management that ensures citizen engagement and participation in reuse, recycling and other initiatives; and provides better possibility for accountability and monitoring by the end user.

To overcome the weak institutional capacity and fragmentation within the sector, the Government created a state-owned utility, Tamiz Shahar, responsible for the implementation and operation of treatment and disposal facilities in Baku. A similar set up nationally is envisaged under the National Solid Waste Strategy. In Baku, the company has evolved into a professional utility running complex treatment facilities, a sanitary landfill and a segment of the collection services. The company receives significant subsidies for its services from the state budget to offset low tariffs, inadequate waste and financial accounting.

Currently almost all waste services are provided by the public sector and the private sector plays a limited role although the government has contracted a foreign company for the operations of the waste incinerator in Baku.

4. Public outreach

Participation of the waste generators is a precondition for successful SWM services. International experience shows that continuous awareness campaigns are needed to involve the waste generators. These campaigns are normally carried out by national, regional but foremost by local institutions i.e. municipalities. Thereto budgets are made available specifically for public outreach activities. Investments in infrastructure improvements are less effective without public communication and at the same time public awareness programmes should only be introduced parallel with service improvements in order to be effective.

In Baku efforts have been made in the past years to develop communication campaign, inform and engage the population. However, their effectiveness has been limited mostly due to the one-way process instead of a two-way communication stream intended to capture specific response from a specific target group. Outside Baku, hardly any substantial awareness campaign has been carried out besides some small activities by municipalities, as in general these activities are not considered to be a priority. In addition, there is lack of financing, knowledge and human resource capacity. It is not known that any dedicated budgets have been allocated for communications in municipal organizations.

The National Strategy includes specific provisions for social inclusion, public outreach and engagement, among others:

- safeguards for the livelihood of informal sector waste recyclers as formalized systems;
- safeguards for resettlement and compensation of any lands or land-use activities;
- measures to create opportunities for women and young people within the new solid waste systems;

- public involvement as stakeholders in the planning and siting of new solid waste systems and the monitoring of their operations;
- public consultations during the social and environmental impact assessment process before permitting new solid waste sites and facilities;
- responsively developing and implementing mitigation measures for impacts identified as potentially negative;
- attention to minimizing resettlement and arranging equitable compensation for displaced activities and residents; and
- creating consumer responsive complaint and suggestion centers for each major new facility or system.

In addition, the Strategy envisages the need to conduct surveys of all waste pickers that would potentially be affected by the new waste management systems; that to those waste pickers able to undertake employment, efforts to employ them should be made; for others, compensation for lost livelihood would be envisaged. Finally, it envisages the provision of alternative livelihood networking and training.

5. Operations

The urban-rural divide in Azerbaijan in terms of GDP/capita as well as availability and quality of public services is significant and in addition the divide Baku vs. the rest of urban areas is also tangible. Similarity, there is a substantial difference in terms of coverage, level and quality of waste services to the population. Since 2010 Greater Baku has been upgrading its SWM system with financing from the state budget and assistance from IFIs; in comparison, the rest of the country is still lacking essential services especially environmentally sound disposal as well as waste treatment. The government has immediate plans to start addressing these issues but for the moment waste disposal outside Baku remains quite basic and does not meet the needs of the population, protect human health and the environment.

GREATER BAKU

Collection

In Greater Baku the MSW is collected by 45 entities: 39 government departments (collecting 88% of the waste), 6 government joint stock companies (collecting 6% of the waste) and 6 private companies (collecting 6% of the waste). These multiple collection entities are not well coordinated, if at all, making the collection system inefficient and difficult to oversee and manage effectively. In addition, according to the Baku Integrated Solid Waste Strategy, in 2015 there were 8,511 employees responsible for the collection of 840,964 tons/year or approximately 10 persons per 1,000 tons collected. For comparison, in EU member states, the ratio is 1.4-2.0 employees per 1,000 tons collected.

Although nearly all waste is collected from Baku (around 80% from Greater Baku area), only around 60% of it reached treatment and disposal facilities. The rest is being dumped illegally outside of town. This is due to lack of effective control mechanisms in place and effective enforcement. The reasons to not bring the waste to the Baku treatment/disposal sites likely include the avoidance of gate fee payments (arrears have been accumulated with the entity responsible for treatment/disposal operations); lack of financial and other incentives for the collection entities to deliver the waste to final treatment/disposal area

as well as lack of effective control and enforcement. The issue is of significant concern for the government which is contemplating the centralization of the collection services in the hands of a single REP or transfer of the collection service to Tamiz Shaher in which case the entire value chain in Baku will be entrusted with a single entity, a state owned joint stock company.

Two transfer stations (TSs) at Garadagh and Shuvalan are envisaged in the Baku Integrated Solid Waste Strategy but not yet constructed. The government has plans to advance with the actual construction in the short run. The TSs are expected to help the effort to capture all collected waste and diminish illegal dumping outside Baku. As such, they are essential to improve the overall waste management situation in the capital and increase the volumes of captured and recycled waste.

Disposal

Balakhani disposal site started to operate in 1963. Originally it lacked any protective measures (lining, gas and leachate capture, monitoring), was used as a dump, and was home to waste pickers with no safety measures in place. The landfill was rehabilitated, upgraded and expanded with World Bank financing in the period 2008-2012, adding an additional 10-million m^3 storage capacity. A drastic improvement in environmental compliance, operations and management of the landfill took place following the rehabilitation. Daily operations, maintenance and management by Tamiz Shahar – the company operating it - have since been very good. Tamiz Shaher is a JSC established in 2009 by Presidential Decree to operate the landfill and treatment facilities for the Greater Baku area. Before the rehabilitation, the landfill was visited by approximately 80 waste pickers providing daily income for them. Since then, the waste pickers were offered alternative employment at the MRF and many took advantage of it. Today waste picking is allowed in a controlled environment with registration, monitoring and safety equipment in place. The evolution of facilities and operations at Balakhani landfill remains a very good example of successful upgrade and landfill operations.

Treatment

In 2012 a WtE facility (500,000tons/year) and a MRF (200,000 tons/year) were put into operation in order to shift away waste from the landfill. Tamiz Shahar operates both facilities.

The WtE facility was developed under a 20-year design-build-operate contract between the Government of Azerbaijan and the French company CNIM. It consists of two lines and a turbine generating electrical energy. The facility has the ability to process up to 10,000 tons/annum of healthcare waste. It generates around 230,000MWh/annum electrical energy used to both supply the needs for the plant and for export to the grid. It is assumed that the quantities received by the incinerator are close to 500,000 tons/year. The MRF on the other hand received only approximately 81,000 tons of which in 2015 12% was recycled, 33% was incinerated and 55% was landfilled so it operates well below its installed capacity (i.e. corresponding to approximately 45,000 tons rejected and disposed at the landfill and approximately 26,500 tons that were incinerated and only approximately 9,500 tons was recycled). Presently Baku does not have separation at source so the waste received at the MRF is mixed household waste and pre-sorted waste from CII. However, the Baku SWM Strategy envisages introduction of segregation at source and

separate collection of packaging waste, waste electrical and electronic equipment (WEEE) and end of life vehicles (ELV). Also segregation of bio-waste and separate collection on envisaged in the medium run.

The Balakhani Eco-Industrial Park, still under development, covers an area of 70,000m^2 adjacent to the WtE and MRF. The industries targeted for development include recycling of plastics, tyre/rubber, WEEE, lead batteries, non-ferrous metals and scrub, municipal hazardous waste, green (recycled) products manufacturing, green energy production. When completed, the Park is expected to bring benefited by providing an integrated infrastructure in one location, further reducing the negative impacts of waste on the environment, promote recycling by establishment of new production facilities, and increased market access for the sale of recycled/recovered/treated materials and produced goods.

NATIONAL LEVEL (OUTSIDE GREATER BAKU)

Collection

No official waste collection is carried out in the villages and settlements. In cities on the other hand, nearly all urban households and establishments receive waste collection. The Department for Housing and Communal Services (DHCS) under the respective REP is carrying out the municipal waste collection and transport to disposal. The collection of solid waste is conducted on a daily basis in all urban areas. Collection vehicles make at least one collection round trip per day. Trucks, both compactors and flat-bed trucks and sometime tractor/trailer combination, are used. DHCS places containers normally 1,100 litres and open top 750 litres at strategic locations. The collection trucks consist generally of depreciated compactor trucks with side loading or back-loading system with an air volume ranging between 7-10m^3 (3-4 tons).

There are currently no waste transfer facilities in Azerbaijan, including the Greater Baku area (although such are envisaged in Baku). Throughout all Azerbaijan, collected wastes are hauled directly to the dumpsites in collection vehicles. The current direct haul distance varies according the locations of the dumpsites but most dumpsites are very close to collection service zones and within local municipal boundaries. In the newly envisaged regionalized solid waste management system, there will be strategically located transfer stations.

Disposal

All REA's have official (uncontrolled) disposal sites, operated by DHCS, which are generally dumping places. They are not fenced, allowing feral and domestic animals to graze on the wastes, some of which are hazardous; have no protection below the deposited waste for keeping contaminants from the ground water; some are directly in wetlands and flood plains; some are alongside rivers where heavy rains directly carry the wastes into the surface waters; many are set on fire to reduce odors, insects and rodents.

Such dumpsites present significant adverse environmental and public health hazard and are specifically addressed in the National Strategy which envisages that they are closed in parallel or shortly after the creation of new acceptable disposal systems designed to meet international standards. Some of the closed dumpsites will be able to be reclaimed

to enable construction of TSs. The Strategy recommends a phased implementation over the next 20 years starting with the phasing in of regional landfills and closure of dumpsites, construction of TSs, collection equipment, drop-off centres and recycling of green waste by MBT plants. Segregation at source and separate collection of dry recyclables is initially not recommended in view of the weak global and local market conditions.

6. Financial aspects

The SWM sector in Azerbaijan remains underfunded and subsidized by the state budget. The tariffs and the tariff collection rate are low, and collected charges are poorly accounted. Although the country has an official waste tariff, which is 0.3 Manat/person/month by default but some REPs are assigning different tariff on their own to reach the required cost recovery level. Where collected, the 0.3 Manat/person/month is most commonly applied which is 0.12% of the average total household income. In comparison, the international benchmark for waste services to the population is around 1% of disposable income. The accounting of the waste charges is poor and it is not clear to what extent collected revenue is reinvested into the sector. The state budget has been allocating significant subsidy to finance recurrent costs in addition to capital investment financing. The subsidy was estimated at US$24.14 per ton in 2016. In addition, there are no financial incentives for operators to deliver the waste to disposal facilities and consequently large amounts of collected waste are dumped illegally and fail to reach authorized sites as discussed above. So, despite the high subsidy to the sector, its performance remains poor.

To respond to the above issues, the government had made plans to ensure the efficient use of available resources in setting up the investments and development schemes that would improve solid waste collection, recovery and disposal in all the country's rural and urban areas. Several options for sustainable institutional and financial set up of the sector have been prepared. It is envisaged that tariff collection rates and financial accounting will improve by attaching the waste fee to the electricity bill. In this way there will be a differentiated tariff scheme depending on household energy consumption level. It is further envisaged to introduce effective financial and waste accounting systems and adopt a gradual tariff increase scheme that should allow to gradually offset the government subsidies by 2035.

Greater Baku

The tariffs set by the Tariff Council dated November 2011 are also applicable for Greater Baku i.e. AZN 0.3/person/month or approximately AZN 15/household/year for collection and AZN 5.5/ton for disposal or approximately AZN 10/household/year resulting in AZN 25/household/year or AZN 13.6/ton. On the other hand the total SWM cost in 2011 was AZN 58 million or AZN 51/ton. Costs in Baku are substantially higher than in the rest of the country due to the treatment facilities there and sanitary landfilling operations following the rehabilitation of Balakhani landfill. Hence, approximately 80% of the cost there is financed by the state budget. No information could be obtained on the actual tariffs charged and the tariff collection coverage probably due to the fact that there are 45 entities collecting waste and tariffs. However a detailed household survey in Baku carried out by the World Bank in 2014 indicates that households spend on waste collection an average of AZN 16.8/year or 14.22/ton being 60% of the official tariff for households. The situation is envisaged to improve if the waste tariff collection is channelled through the

electricity bill improving the waste charge financial flows and accounting. In addition, if tariffs are gradually increased as proposed by the National Strategy, the financial burthen on the state budget will lessen.

7. Projects

The government has started the preparation of investments and reforms envisaged under the National SWM Strategy. These include the establishment of three waste sheds in Lesser Caucasus, Absheron and Guba-Khacmaz. These regions were prioritized by the Government since they host the largest urban centers beyond Baku (Ganja and Sumgayit), have important economic potential (regional development and tourism sectors), and high level of poverty (Ganja-Gazakh and Guba-Khachnmaz). Together, the three regions host about 2.4 million people or 25% of the population of Azerbaijan. The project's total estimated cost is estimated at $138 million, of which $117 million will be provided by an IFI. The project will support the government's efforts to implement institutional reforms envisaged in the National Strategy, namely the corporatization and strengthening of regional treatment/disposal agency(ies); the TA could include the development of corporate development plan, legal, financial and organizational support for the joint stock Solid Waste Management Company (SWMC) that will be responsible for treatment/disposal nationally, as well as the establishment of entity under the national government that will be tasked with national sector planning and regulatory and oversight responsibilities; (ii) support to the development of a nationally implemented waste fee charging and fee collection scheme with (regulatory) mechanisms to regulate the flow of funds to operators; (iii) capacity building to relevant institutions engaged with the communal sector and SWM as well as to the regional Executive Powers (EPs) and municipalities in the three regions benefitting under the project; (iv) detail design studies and construction supervision of project activities; (v) preparation and implementation of public awareness and outreach program; (vi) design of collection and roll out systems in selected project rayons, route optimization and implementation plan for local SWM providers; (vii) TA for development of hazardous waste management solutions; and other required supplementary technical studies under proposed project, and studies required for post-project investments. The TA for development of hazardous waste management solutions would provide assistance to the identification and GIS mapping of hazardous wastes 'hotspots' across the country, including with POPs, medical and industrial/mercury waste; the review of the national hazardous waste related regulatory and legislative framework, and developing recommendations for its harmonization with international standards such as the EU acquis; and the assessment of investment needs for establishing a national hazardous waste management infrastructure, whether stand-alone, or (partially) combined with the general waste system to be developed under the proposed project.

The project will also support the development of regional waste sheds through procurement of collection and disposal equipment (e.g. trucks, waste containers, weighbridges, bulldozers, etc), construction of new disposal facilities (e.g. landfills and transfer stations) in the selected rayons and initial rehabilitation of existing formal dumps and closure of wild dumps. The investments include measures to create new waste facilities for disposal activities in an operationally and environmentally sound manner.

Risk to financial sustainability of the newly established system however remain high. Currently, operating costs are financed through a combination of revenue from fees and

governmental subsidies. The current cost per ton includes mainly the cost of collection and transportation to disposal. Since disposal is open dumping, its cost is low. Following the development of regional landfills with improved operations and maintenance, disposal costs will increase increasing the overall cost per ton. It is expected that the difference in operating costs will be subsidized during an initial period until local revenues grow as a result of both higher tariff collection, better financial accounting of collected revenues and gradually increased tariff. The National Strategy provides the mechanism to do so by attaching the waste bill to the electricity bill expected to improve the fee collection rate and bring transparency in the flow of funds and their usage. While this will not fully bridge the funding gap given the fees under consideration, it will reduce the need for government subsidies.

BELARUS CASE STUDY

Introduction

Municipal waste collection in Belarus is available for the entire urban and rural population. Approximately 80% of total collected waste is disposed of in more than 156 primary landfill sites at both Rayon and city levels. In general, these landfills utilize a bottom liner and leachate collection with recirculation rather than treatment. At larger landfills, a gas collection system is used. In addition, there are approximately 1,700 mini-landfills used by rural communities; these are gradually being closed as they are not maintained with a bottom liner. A concept of regional disposal is envisaged, but is not yet in place. Waste collection and disposal services are mainly provided by public enterprises, although a few private operators have been active in the past few years for collection of household waste in partnership with public enterprises. Small, private operators are active, however, for the collection of recyclables from commercial/institutional entities.

Belarus' legislation on waste management is gradually being harmonised with international law and practises, particularly those of the EU. A new National Strategy on solid waste management (SWM) covering the period up to 2035 is currently being developed. The Strategy promotes several important principles, including the 'waste hierarchy principle,' the 'polluter pays principle,' the 'sustainable waste management principle,' the principle of introducing the best available and most cost effective technologies, and the principle of openness and transparency. In addition, in 2016 the Government decided to establish a waste-derived fuel policy to co-feed the cement industry in the country. Consequently, investments are being made to improve waste separation and to introduce new treatment technologies such as RDF production and incineration of waste.

However, the current SWM system is still rather centrally-controlled, including the setting of minimum and maximum fees. The fees are low relative to the region and estimated to be at maximum 0.18% of the average household income. Although the waste management sector is subsidized by District and City budgets, low fees hamper investments in the system. Information on waste quantities, which is the basis for all sector planning, is not reliable as reporting is measured in m^3 based on estimates of collected volumes and then converted into tons using a waste density norm. More generally, the waste reporting system is fragmented and divided across several organizations. Public awareness about the generators of waste is low; few substantial awareness programmes are carried out due to the lack of budget support, apparently as it is not considered to be of high priority by the Government.

1. General MSW data

From 1995 to 2015, the total population of Belarus decreased 6.7% from 10,177,000 inhabitants to 9,498,000. The rural population decreased over the same period from 3,246,000 to 2,128,000 or approximately 34%, while the urban population increased 6.3%. Table 1 shows the MSW generation rate (kg/capita/day) for the years 1995 and 2015 compared to the growth of GNI, as well as some waste generation rates for other European countries for the year 2015.

Table 1: GNI and waste generation (kg/capita/day)

	1995	2015		2025[2]
GNI (USD/cap) [1]	1,370	6,460		
Kg/cap/day	325	385		410
Population	10,177,000	9,498,000		9,491,000
		GNI[1]	Kg/capita/day[3]	
Romania		9,500	247	
Bulgaria		7,480	419	
Serbia		5,540	259	
BiH		4,670	322	
Kosovo		3,970	178	

[1] www.dataworldbank.org.
[2] Draft National Strategy for SWM and Secondary Material Resources in the Republic of Belarus up to 2035.
[3] Eurostat.

Characteristics of the treatment of MSW from 2005 to 2015, as well as projections for 2025, are shown in Table 2 below. As noted above, the figures for waste generation should be taken with some caution as the reporting system is in m^3. Weighing scales are present at 138 out of 165 landfills and a density has been assumed of 200kg/m^3. At landfills without a weighing scale, the quantities are estimated on the basis of truck content. According to the draft National Strategy, the landfill diversion rate is anticipated to increase from 16.8% in 2015 (616,500 tons) to 35% in 2025 due to the introduction of other treatment options such as incineration. Substantial quantities of recyclables are transported from CII entities and from buying points ("separation at source") to recyclers without entering the municipal waste collection system (containers).

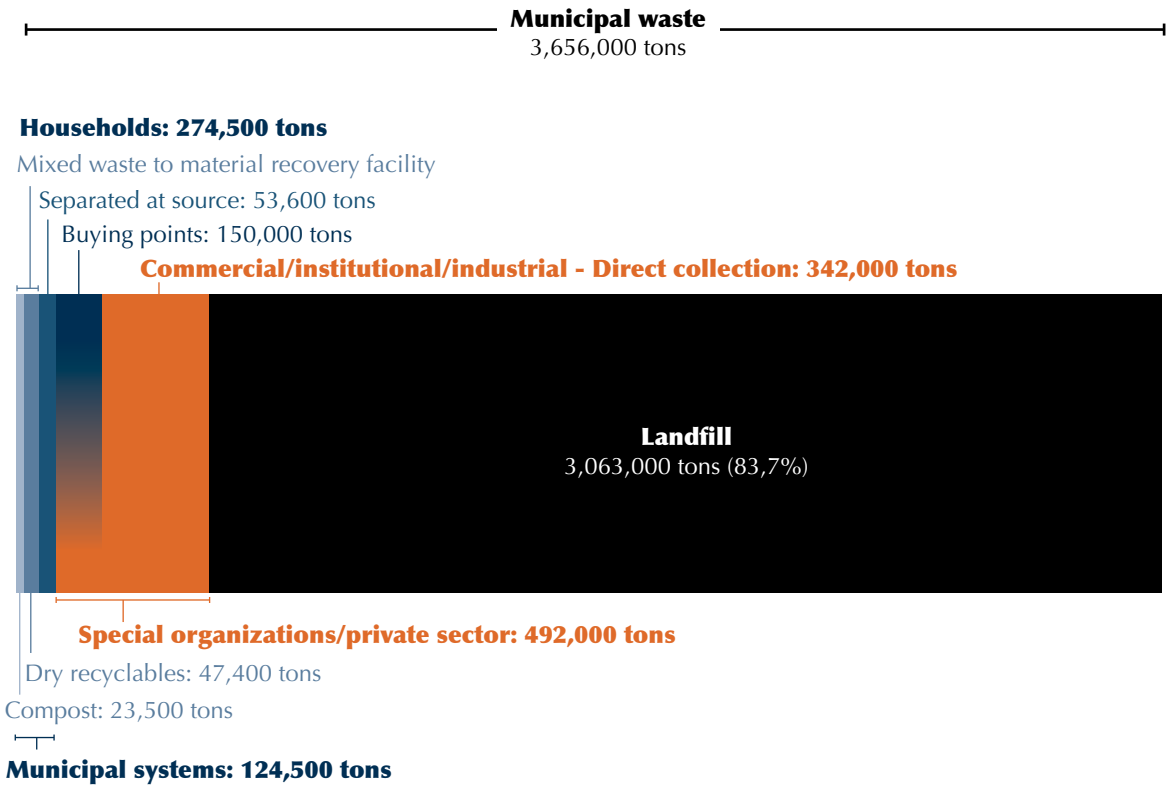
Table 2: Waste generation and treatment – reported and projected

	2005		2015		2025[1]	
	Urban	Rural	Urban	Rural	Urban	Rural
Population x 1,000	6,914	2,716	7,370	2,128	7,783	1,708
Generation (kg/cap)	360		385		410	
Waste quantity (tons)	2,782,000		3,656,000		3,900,000	
Collection rate (%)	100	30	100	100	100	100
Separation at source (tons)	129,500		492,000[2]		790,000[2]	
Incineration (tons)					250,000[5]	
Composting (tons)			23,500[3]		135,000[6]	
MRF + Sorting line	26,500[4]		101,000[4]		130,000[4]	
Refuse-derived Fuel (RDF)					60,000[7]	
Landfill (tons)	2,626,000		3,039,500		2,535,000	

[1] Draft National Strategy for SWM and Secondary Material Resources in the Republic of Belarus up to 2035.
[2] Directly collected from CII entity and from buying points and delivered to recycler.
[3] Separated at a Materials Recovery Facility (MRF).
[4] Net output of dry recyclables.
[5] Assumed construction of incinerator for Minsk.
[6] Partly from MRF (35,000 tons) and partly from parks/green areas (100,000 tons). Compost-like material to be used for closing existing mini-landfills.
[7] RDF for co-incineration in cement plants.

In addition to MSW, non-hazardous industrial waste is also landfilled. In 2015, the quantity of this waste was approximately 1 million tons, as reported by the Ministry of Natural Resources and Environmental Protection (MNREP). Some large industrial entities have their own designated landfill. The waste flow system as of 2015 is visualised in Figure 1 below.

Figure 1: Waste separation in 2015



Source: Ministry of Housing and Utilities

The percentage of recyclables in the MSW of Belarus (see Table 3) is based on mixed waste deposited in containers, thus excluding quantities separated at source. The average of dry recyclables in the mixed waste is reported as 20%. The actual overall amount of dry recyclables would thus be 30% in 2015, i.e., 492,000 tons separated at source and 632,800 tons from the collected waste or 20%. Metal scrap is regulated differently and is officially not part of packaging waste, and thus not included in MSW statistics.

Table 3: Rate of recyclables in the composition of waste (%)

	Urban[1]	Minsk[2]	Belarus[2]	Puhovichy Rayon[3]
Organic	38-46	39.0	42.2	57
Dry recyclables:				
Plastics	1.2-13.9	7.6	6.3	7.6
Paper	3.0-10.4	6.5	4.1	6.5
Glass	2.9-6.7	6.6	5.6	6.5
Metal	0.3-2.8	2.0	2.1	2.0
Average/total (excl. metal)	**20**	**20.7**	**16.0**	**20.6**

[1] Ministry of Housing and Utilities (MHU)
[2] United Nations Economic Commission for Europe (UNECE) 2016
[3] European Environmental Agency-European Topic Centre on sustainable consumption and production (EEA-ETC/SCP) 2014.

There is no separation at source of organic waste in Belarus; any compost-like products are produced by MRF plants and are used as cover material for capping landfills. There is no demand from farmers for compost, which regardless, is also sub-standard in quality.

The availability and quality of data reporting depends on the type of waste. All legal entities report MSW data to the Municipality, Oblast, and Ministry of Housing and Utilities (MHU); recyclables are reported to the State organisation "Operator of Recyclables (OR)," which is an autonomous organisation sub-ordinate to the MHU; and industrial wastes are reported to the MNREP. State ministries/organisations report in a condensed form to the State Statistical Agency. All reporting is in m^3 except for recyclables (tons). All legal entities dealing with collection, transport, sorting, recycling, treatment, or landfilling are obliged to report according to a specific format, but packaging recyclers have to report directly to the OR.

2. Legislation

MSW is defined as: "Household and commercial/institutional/industrial waste as specified in the list of wastes issued by the Ministry of Housing and Utilities the management of which is to be organized by the local executive and administrative bodies." This definition of MSW excludes any waste that results from processing activities of industries. The classification of municipal waste is laid down in Resolution 85/2007 issued by the MNREP. This document describes the type of waste – such as research waste and waste from medical institutions - and its origin in general terms, i.e., households, streets, yards, educational activities, sports activities, trading, social activities, transport, administrative and economic

activities. However, further specification as to the waste fractions, such as tyres and End of Life Vehicles, is not included in the Resolution.

The key legislation related to MSW management is listed in Table 4. All activities related to waste collection and processing of recyclables are regulated by Presidential Decree, such as Decree 313 from 2012 stipulating 40% packaging waste collection in 2017 and 50% in 2020. However, there are no progress reports as to its achievement. Legislation is developed by the MNREP. The Law on Waste Management defines all aspects of MSWM including the responsibility of State administrative units, preparation of national and local waste management plans, introduction of economic incentives, waste management planning, reporting and data collection, monitoring, training, and waste transport. In addition to the legislation there are many Presidential Decrees and Ministerial Resolutions on specific subjects, e.g., Resolution 112 of MNREP on transport of waste and Regulation 18/27 of MHU (2003) setting norms for MSWM.

Table 4: Key MSW legislation

Year	Description
1992	Law on Environmental Protection (N-1982-XII)
1993-2007	Law on Waste (N-2609-XII-1993), replaced in 2007 by Law on Waste Management (N-271-3)
2012	Presidential Decree on introduction of the EPR scheme for packaging waste, WEEE, tyres, batteries, oils, mercury lamps

In addition to the Laws there are various Strategy Plans such as the State Programme "Environmental Protection and sustainable natural resource management" for the period 2016-2020; the State Programme "Comfort Housing and friendly environment" for the period 2016-2020, which includes a sub-programme on municipal waste management and recycling; "National Sustainable Socio-economic Strategy of the Republic of Belarus until 2030;" and a draft "National Strategy on Municipal Solid Waste and Recyclables Management in the Republic of Belarus until 2035," which is expected to be approved in 2017. In addition, Waste Management Programmes are prepared at Oblast and Rayon/municipal level covering a period of five years. At the municipal level, annual decisions are taken on handling schemes for MSW, including procurement of secondary materials such as paper, cardboard, and glass to meet State needs.

The draft National Strategy above proposes five main actions to be implemented before 2030, viz. (i) improvement of existing infrastructure in the areas of accounting, reporting, education, logistics and separation at source, reduction of the number of landfills (including introduction of regional landfills and upgrading of remaining landfills), and legislation; (ii) introduction of a deposit system for plastic, glass bottles, and cans; (iii) production of RDF fuel; (iv) introduction of biological treatment (composting) in addition to mechanical treatment; (v) and construction of an incinerator in Minsk with a capacity of 500,000 tons/year. The total investments are estimated at Euro 1.2 billion. To fund these improvements, an environmental charge (Euro 2/m^3) is proposed on landfilled waste. After 2021, the tariffs have to be increased up to an estimated amount of Euro 40-42/ton compared to the current average fee of approximately Euro 23/ton (USD 25/ton).

Air emission standards are enterprise specific; for example, emission standards for large combustion plants are close to the standards set in EU Directive 2001/80/EC. Sectoral Emission Limit Values exist for the cement industry, energy generation sector, and different types of waste incineration.[1]

Policies currently being developed are focused on increasing waste separation and recycling, including the setting up of a network of buying points, strengthening of the EPR system, improvements to the policy on fees based on the "polluter pays" principle, attracting investment, and introducing competition. A first step toward competition is laid down in the "Integrated Municipal Solid Waste Management Plan" for Minsk Oblast 2015-2029, whereby the territory of Minsk Oblast would be divided into seven areas each having its own waste collection system. It is believed that in this way competition, and thus improved efficiency, will be introduced.

Additional by-laws and regulations are needed to guide implementation and establish conditions of the various Laws and Decrees. This is also called for in the National Strategy for MSW. For example, Presidential Decree 313 calls for the introduction of the Extended Producer Responsibility (EPR) system without detailing the necessary legal framework, monitoring and enforcement, tasks and responsibilities of stakeholders, fines for non-compliance, timing for implementation, and so on.

Currently, the EPR system is operated by the "Operator of Recyclables (OR)," a state-owned, non-profit organization under the MHU. There are two ways for the importer/supplier to fulfil its obligations for 'take back:' (i) create a collection system individually or jointly with others responsibility for achieving the targets; or (ii) enter into a contract with the OR and by paying to the Operator he is assumed to have fulfilled his obligations. Suppliers of packaging material, fillers/packers, or importers of packed goods have to report to the Operator as well as pay the Operator, who will arrange for collection. The Operator will compensate the collector, normally a public entity, for extra costs. The separated materials are the property of the Collector, who can sell them. The EPR system applies to household appliances (WEEE), tyres, batteries, lubrication oils, mercury lamps and thermometers, and packaging materials (glass, paper/cardboard, plastics, composites). Packaging waste excludes ferrous or non-ferrous metals as these materials are regulated under a separate Act. Metals including packaging are collected through buying points operated by the State organization "Belvtormet" under the Ministry of Industry. The fees to be paid by the importer/producer in 2017 are as follows: glass (USD 138.5/ton); paper/cardboard (USD 66.7/ton); plastics (USD 82.1/ton); and composites (USD 82.1/ton). Compensation provided to the collectors for glass is (USD 71.8/ton); paper/cardboard (USD 56.4/ton); and plastics (USD 76.9/ton). The income of the Operator is spent on compensation for the collector, advertising, information dissemination, design and research, and supply and construction of infrastructure. The specific amounts of these expenses are determined by the Council of Ministers.

A unique aspect of the MSWM system in Belarus is that private operators are not required to have an operating license. Rather, a license is only required for handling hazardous waste (by MNREP) and metal waste (by Ministry of Industry). Moreover, there is no law regulating ownership of household waste. Currently, the household waste generator brings

[1] United Nations Economic Commission for Europe.

its waste to a municipal container located at a location approved by the municipality, where the municipality then becomes responsible for its transport. The Law on Waste specifies that a waste generator has to pay for waste management services independent of having an individual contract.

In 2016, the Government adopted the Concept of Production and Use of RDF (Resolution No. 664 of August 22, 2016), which provides for the organization of the production of RDF from waste at regional enterprises and its use at three cement plants. The total market for RDF is estimated at 330,000 tons per year. To implement this initiative, the Government plans to attract foreign investors with experience in the production of RDF and to create the necessary legal and economic conditions for the financial sustainability of the project, including possible co-financing from the Operator.

3. Institutional framework

There are three levels to the administrative structure of the Republic of Belarus. The top layer consists of the Capital (Minsk) and six Oblasts. These Oblasts are divided into 118 Rayons and ten Oblast sub-ordinated cities. Finally, each Rayon is divided into Rayon sub-ordinated towns (102 total), village Councils (1,295 total), and urban settlements (90 total). Local councils are the executive and administrative bodies that head the different territorial governments. Local governments are legally responsible for implementing the MSW services. The following entities are responsible for setting policy:

- *The President* determines the uniform government policy, as well as the terms and mechanisms for provision of state financial support to legal entities and individual entrepreneurs. The president approves the state's programs and establishes the requirements for the management of wastes and the list of goods producers and suppliers are obliged to 'take back' under the EPR regulation.

- *The National Assembly*, comprised of the House of Representatives and Council of the Republic, passes laws regulating waste management and environmental protection.

- The following key stakeholders are responsible for implementing MSWM policy at the State level through an approach utilizing medium-term State programs:

- *The Council of Ministers* (the Government) ensures the implementation of the uniform government policy; regulates, upon clearance with the President, certain issues concerning the management of hazardous wastes; approves the "Target Provision" (annual report and financial targets concerning revenues/costs for the next year) of the State-owned, non-commercial entity "Operator of Recyclables;" and maintains international cooperation.

- *The Ministry of Natural Resources and Environmental Protection (MNREP)* takes measures to implement the uniform government policy; ensures the development and implementation of government programs, plans, and activities related to waste management; coordinates waste management-related activities of other government bodies and other respective agencies except coordination of the management of recyclables; establishes jointly with the Ministry of Health, Ministry of Housing and Utilities, and Ministry on Emergency Situations the rules of waste management;

endorses the Oblast and Minsk Municipal waste management programs; maintains the databank and approves the technical normative legal acts; exercises control of the management of waste; and maintains international cooperation. Environmental control is carried out by the MNREP through its six Oblast and Minsk-based representative offices. This Ministry is specifically responsible for industrial wastes.

- *The Ministry of Housing and Utilities (MHU)* **also** takes measures to implement the uniform government policy and ensures the development and implementation of government programs, plans, and activities related to waste management. It approves the list of wastes classified as municipal waste; establishes the rules of municipal waste management jointly with MNREP and the Ministry of Health; endorses the Oblast and Minsk municipal waste management programs; approves the technical normative legal acts; and coordinates the management of recyclables through the state-owned, non-commercial entity "Operator of Recyclables." This Ministry is specifically responsible for Municipal Solid Waste and recyclables.

- *The Ministry of Health* (MOH) similarly takes measures to implement the uniform government policy and ensures the development and implementation of government programs regarding waste management, plans, and activities related to consumption; endorses the Oblast and Minsk Municipal waste management programs; and exercises sanitary supervision.

Policy implementation at the local level is the responsibility of the following stakeholders:

- *Local Councils* at Oblast, Rayon, city, town, settlement, and village level take measures to implement the uniform government policy and approve territorial waste management programs.

- *Local executive and administrative bodies* (Oblast Executive Committees, Minsk Municipal Executive Committee, Rayon and Municipal executive committees) develop their territory's waste management programs and organize their implementation; organize operation of municipal waste disposal sites; develop and approve - upon endorsement by the MNREP – territorial departments, authorized government bodies, and organizations exercising sanitary supervision; arrange municipal waste management; approve fees; ensure operation of landfill disposal sites in accordance with the legal requirements; organize, jointly with the state-owned Operator of Recyclables, the management of recyclables; organize activities to prevent damage to the environment, human health, and property from MSW; and inform legal entities and individuals, including individual entrepreneurs, about waste management-related issues. The management of municipal waste is to be organized by these local executive and administrative bodies in accordance with the Law on Waste Management.

- *State-owned organizations* are responsible for integrated waste collection, transport, landfill operations, and any sorting/separation activities. These organizations are organized under the municipal department of public utilities, which also coordinates local public services like heat supply, water supply, electricity supply, maintenance of infrastructure, etc. Approximately, 90% of these services are provided by municipally-owned organizations, while in Minsk, they are provided by a joint venture between the Municipality and a (foreign) private company.

All legal entities and organizations are obligated to report to the MHU using a specific format on municipal waste collection, transport, treatment and disposal. A separate reporting system to the "Operator of Recyclables" exists for packaging waste, while a third reporting system, to the Ministry of Industry, exists for ferrous and non-ferrous metals including packaging materials such as cans. Reporting on MSW is prepared by the municipality and sent to the Oblast and from there to the MHU, which distributes the information to MNREP and the State Statistical Agency. MHU manages a database for waste collection, separation, transport, and disposal, while registers on waste disposal sites are managed by MNREP. In addition, the "Operator of Recyclables" manages data on recyclables, including a list of the importers/producers/suppliers as well as entities dealing with collection and recycling. There are 13,140 entities registered on the list of producers/importers/suppliers of which a total of 13,048 have concluded a contract. The Operators also has a list of 379 organizations involved in collection, sorting, disposal and recycling.

Private sector participation in MSWM is limited to a specific portion of services like collection and transport services for legal entities and condominiums. The total share of the private sector in MSWM is estimated at 13% measured in terms of quantities collected and moved.

A visualization of the institutional set-up for MSWM is shown in Figure 2.

4. Public outreach

At the State level, public outreach activities are undertaken by the "Operator of Recyclables" using funds collected from importers/producers. However, the dedicated amounts are rather small. In 2016, a total amount of USD 240,000 was spent representing approximately 2% of the total OR annual budget. These activities are two-fold: (i) providing the population with visual information on MSWM, including rules and conditions for separation of waste, and public awareness raising campaigns concerning collection and processing of recyclables; (ii) school programmes comprising the organization of promotional and educational events. These campaigns involved the financing of leaflets, booklets, posters, TV films, advertising, or presentations at schools.

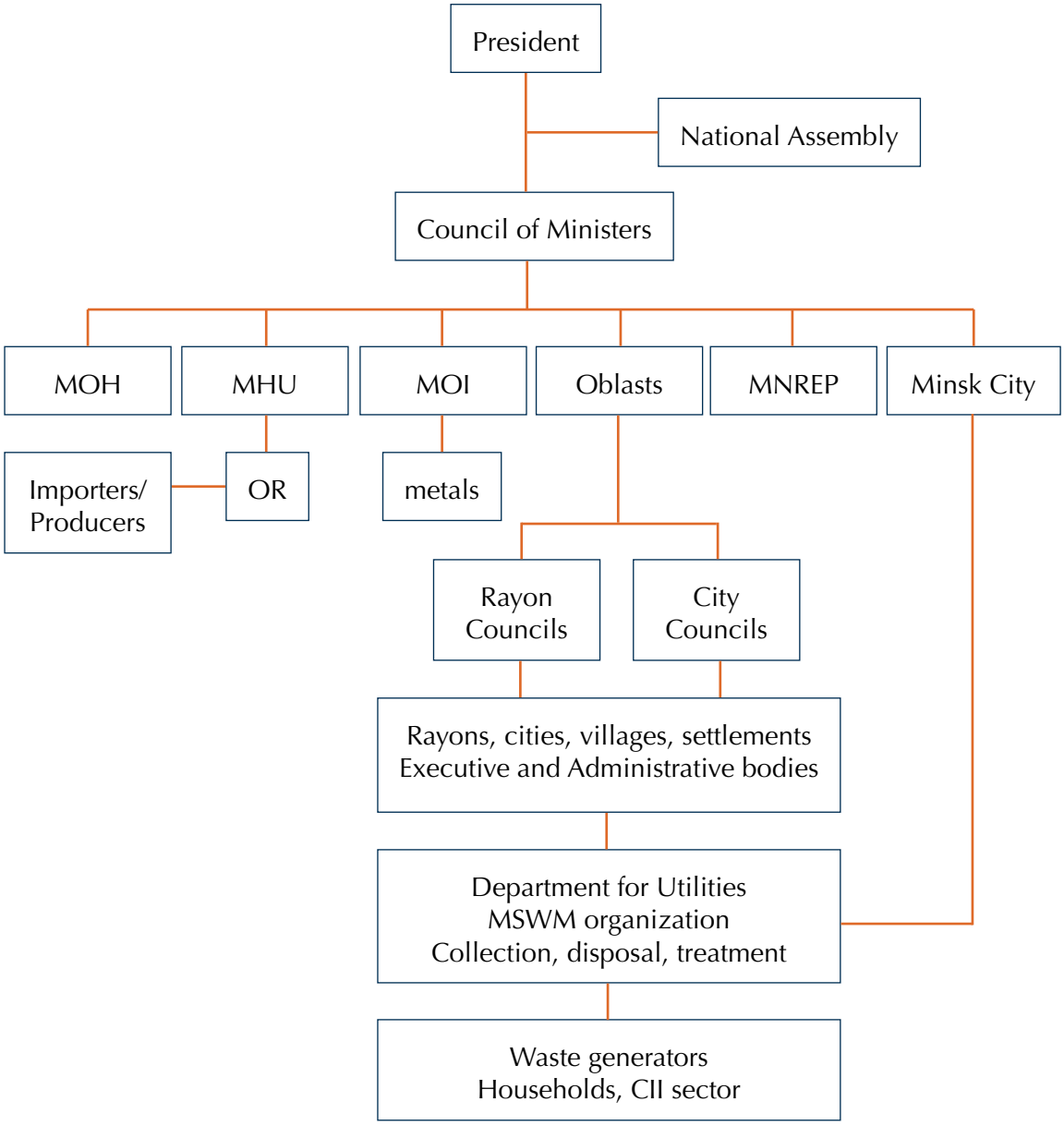
At the local level, waste collectors are responsible for communication with the public. However, no separate funding is provided, and activities are not on a continuous or regular basis.

Transparency is fostered through the publication of statistical information on waste volume, recovery results, etc. on the websites of the National Statistical Committee, MNREP, and the "Operator of Recyclables." The "Operator of Recyclables" also provides information on its website about its annual revenue and how that revenue is allocated to MSW projects and recycling processing.

5. Operations

The collection system in urban areas normally consists of small containers (120/250 litres) for collection from residential houses and large containers (750-1,100 litres located near the building or inside the building under waste chutes) for collection from apartment buildings. The frequency of waste collection is normally daily or twice per week for apartments (72% of the population), while for residential houses (28% of the population) the frequency of collection is once per month or up to twice per week. The general practise is that small containers are collected using rear-loading trucks (496 unit capacity), while the large containers are collected using side-loading trucks (1,265 unit capacity), although Grodno recently procured new, rear-loading trucks for use with both large and small containers. Approximately 30% of the trucks are more than 10 years old, while another 40% are between 5-10 years old.

Figure 2: Institutional set-up for MSWM



Waste collection in rural areas is carried out by the Housing and Communal Services Department of a municipality using the same trucks used for the urban areas. Households put their bagged waste in the passing truck with a frequency ranging from one to eight times per month. However, the use of containers (120-250 litres) is not normal practise.

Entities in the commercial/institutional/industrial (CII) sector have their own designated containers. The size of these containers varies between 0.75-1.1m^3 up to 5-12m^3. The CII entities conclude a contract with the municipality or with a private organization for waste collection. Small commercial entities are allowed to dispose of waste in the household waste containers, but the entity should have a contract with the organization collecting the waste.

Separation at source of dry recyclables (paper/cardboard, glass, plastics) collected from households is accomplished by means of 1,900 buying points or by means of placing extra containers at the container stands. The buying points are managed by various organizations such as Belcoopsoyuz, Belresurcy Holding company, the Municipal Housing and Communal Services Department, or other non-state organizations where households can be compensated for depositing their recyclables (in 2017, paper/cardboard: USD 52/ton; glass: USD 20-27/ton; plastics: 78-83/ton; and WEEE: USD 40/ton). The system may consist of separate containers for each fraction (glass, paper/cardboard, plastics) or may be one container for all three fractions. In both cases, the dry recyclables are transported to a sorting plant for further treatment in view of the many impurities. However, the greatest quantity of separated dry recyclables from CII entities are collected by private companies directly from the CII entities without entering the MSW stream. Both direct collection from large producers of recyclables and the use of buying points by households are financially motivated methods of waste separation in Belarus, while this motivation is absent in the use of public containers for waste separation. Moreover, the number of public containers for separate waste collection are reportedly far below the required number.

There is no separation at source of organic waste, as there is currently no demand for compost. Organic waste from parks/green areas is added to the MSW and transported to the landfill. If there is a MRF is installed at the landfill, the separated organic fraction can be composted but it is used as landfill cover in view of its quality (“dirty compost”).

Pre-separated dry recyclables are sorted by means of waste sorting lines with handpicking constructed at various landfills; there are 100 sorting lines with a total capacity of 360,000 tons/year. The pre-separated recyclables contain a high percentage of impurities, and about 40% is sent to landfills. In addition, high-capacity, mixed-waste separation lines are installed in facilities in the cities of Brest (100,000 tons/year), Baranovichi (30,000 tons/year), Gomel (60,000 tons/year), Grodno (120,000 tons/year), Mogilev (90,000 tons/year), and Novopolotsk (20,000 tons/year) with a total capacity of 420,000 tons/year. The main purpose of the mixed-waste separation lines is to extract recyclable materials (paper/cardboard, glass, plastics); however, composting facilities are only installed in Brest (digestion and biogas production) and in Mogilev. It is estimated that the amount of recyclables that could be extracted from the mixed waste flow is about 10% by weight.

Currently about 80-85% of MSW is disposed of at landfills. There are 165 landfills serving Rayons, towns, and cities, while there are approximately 1,700 mini-landfills serving rural communities. The mini-landfills are gradually being closed, as they lack measures

to protect the environment, such as bottom liner, leachate collection, and gas extraction. A large number of these landfills were built in the 1980-1990 period; although they are officially controlled disposal sites, they lack adequate environmental protection. New landfills are being constructed with bottom liner and leachate collection systems, but without water treatment and gas extraction systems. Illegal waste disposal is not a serious problems in Belarus. The draft National Strategy for MSW provides for the development of a separate State program for the construction of modern landfills to address the need for larger facilities as well as availability throughout Belarus. Landfills normally serve the territory of a single administrative unit; disposal of waste from one Rayon in the territory of another Rayon is rare. Landfills are the property of the municipalities and are operated by the municipal organizations responsible for MSWM. National policy calls for reducing landfilled waste to 40% in 2030.

6. Financing

The total cost for MSWM in Belarus in 2015 amount to USD 92.9 million, which includes collection of the containers, transport to landfill or treatment facilities, and disposal - excluding costs for the collection of WEEE and transport of waste by the CII entities themselves. This cost corresponds to USD 29/ton (using Table 2: USD 92,900,000/3,656,000-492,000). This low rate is due to the fact that amortization costs for the landfill are not included; in addition, an environmental tax to be paid by legal entities is not included.[2]

MSWM revenues are mainly based on income derived from fees - USD 61.4 million from households and USD 23.6 million from the CII sector, where 78% of the waste (0.78 x [3,656,000-492,000] = 2,467,920 tons/year) was collected from households and 22% of the waste (696,000 tons/year) was collected from the CII sector. Local authorities subsidized a total of USD 8.4 million, while USD 0.4 million was generated from other sources such as services for third parties. The fees for households vary per municipality, but the average fee per person is USD 6.3/year or per household is USD 15.1/year (assuming 2.4 persons per household). Only 10% of household fees or approximately USD 1.5 is used for landfill fees. This corresponds with 2,467,920/9,498,000=0.26 tons/year per person or 0.6 tons/year per household. Consequently, USD 15.1/0.6 tons/year per household = USD 25/ton. Based on actual revenues in 2015 (USD 61.4 million) and the total actual volume of waste from households, the average revenue from fees was indeed USD 25/ton. The fees for households exclude VAT, but are allowed to include up to a 10% profit margin, while the tariffs for the CII sector include VAT (20%), a profit margin (up to 30%), and an extra amount for cross subsidy with household tariffs (USD 1.6 million in 2015). The revenues from the CII sector amount to a rate of USD 34/ton.

The collection coverage for fees varies by region, but on average approximately 90-95% of waste generators pay their fees with the waste collection company collecting the fees. The increase in the amount of fees collected over the period 2010-2015 is shown in Figure 3 below. Fees currently cover 85-87% of actual costs; the government plans to ensure fees fully cover the cost of services not later than 2020.

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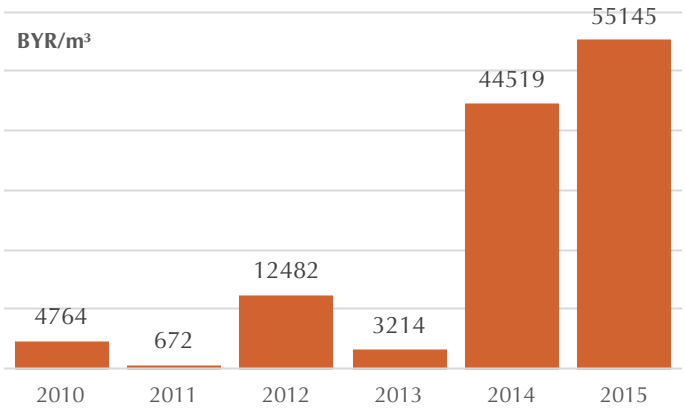
[2] The landfill operator sends a separate invoice to each legal entity after disposal. The rate is based on tonnage and the rate/ton is published in the Tax Code.

Figure 3: Waste fees collected per m³ during 2010-2015



In the 'National Strategy for Solid Waste Management and Secondary Material Resources in the Republic of Belarus for the period up to 2035,' the increase in fee revenue is based on the introduction of an environmental tax on the disposal of household waste beginning in 2020. The Government provides subsidies for low-income households if total fees for housing and utility services exceed 20% of the average monthly household income in cities/towns or exceed 15% for households in rural areas. The subsidy takes the form of limiting these households' maximum fee contributions to 20% and 15% respectively.

Fees are calculated by dividing the actual costs in the preceding year by the actual waste volumes ("production cost limit"). The actual cost amount includes material costs (fuel, lubricants, and repair and maintenance of fixed assets and mobile equipment), labour costs (salaries and social charges), amortization, taxes and mandatory contributions, fees for transfer of payments, third party services, security services provided by the Interior Ministry, auxiliary production costs, overhead costs (management, maintenance, production), profitability, and VAT for CII entities.

In Belarus, the average monthly household income in 2015 was USD 748.[3] Based on the fee rates described above, the fees for MSWM are only 0.18% of average monthly household income, which is below the international norm of 1%-1.5%.

7. Project examples

During the period 2011-2015, considerable investments were made for the installation of three large-scale pre-treatment plants for mixed waste (at Brest, Mogilev, and Grodno) and for 31 sorting lines. The investments amounted to USD 39.6 million for the separation lines and USD 2.2 million for the sorting lines (5,000 ton per year capacity, handpicking, and installed in existing buildings). Revenues provided by these plants are derived from the sale of separated dry recyclables and compensation from the "Operator of Recyclables" for the costs of collection and savings on landfill costs, while the costs include amortization, operation of the plants, and extra collection costs for separation at source.

As of 2017, the average price of mixed dry recyclables (paper/cardboard, glass, plastics) taking into account the waste composition is reported to be USD 77/ton for materials from the MRF/MBT plants where recyclables are contaminated and USD 115/ton for clean

[3] Belstat.

recyclables from the sorting lines. According to the Department of Statistics of the Ministry of Housing and Communal Services, actual revenues in 2015 were USD 12.3 million, including sales and compensation from the Operator. The total cost for separation/sorting amounted to USD 19.4 million in 2015.

The total capacity in 2015 for separation of recyclables was 210,000 tons/year, based on a calculation of 300,000 tons x 10% (mixed waste separation lines) + 360,000 tons x 50% (sorting lines).[4] However, the output at the moment is only 101,000 tons, which means that the plants are operating at 50% of their capacity.[5]

RDF production facilities have been proposed for installation at the MRF/MBT plant in Grodno and at other plants in order to reduce coal imports. The price of RDF for sale to the cement factories is estimated to be USD 10/ton. Studies are under way to investigate this feasibility. The RDF would be co-incinerated at three cement plants, which would have to be upgraded in view of current emission requirements. The total demand for RDF is estimated to be 330,000 tons/year.

8. Key points

Waste collection and disposal costs are low (USD 29/ton) relative to international rates as amortization costs for landfills are excluded. Moreover, the cost also excludes an environmental tax that must be paid by commercial/institutional entities.

Separation at source of dry recyclables is motivated by economic benefits. The largest quantities (13.5% of the total waste flow) are supplied by the CII sector (mostly served by private collectors) and by buying points for household recyclables. However, these activities occur outside the municipal waste collection system.

Separation of mixed waste from container collection results in a total of 3.2% dry recyclables comprised of 1.5% from mixed waste separation and 1.7% from pre-sorted dry recyclables.

Separation of recyclables by MRF/MBT facilities would comprise 16% (47,400 tons) of the nation's installed capacity (300,000 tons). This rate is higher than the international experience of 10% separation of recyclables from mixed waste. This suggests that a substantial portion of pre-separated, dry recyclables is sorted at the MRF lines and that small sorting lines (360,000 tons capacity) are heavily under-utilised.

Approximately 80% of waste generated in Belarus is still disposed of at landfills despite the high level of investment in separation lines. Separation results are 9.4% for direct procurement from the CII entities, 4.1% from buying points, 1.7% from MRF/MBT plants, and 1.5% from separation at source. Economic incentives are the primary motivation for separation of dry recyclables.

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4 Grodno's separation line with 120,000 tons capacity was not yet in operation in 2015

5 In 2015, the installed local capacity included: Brest (100,000 tons/year); Baranovichi (30,000 tons/year); Mogilev (90,000 tons/year): Gomel (60,000 tons/year); Novopolotsk (20,000 tons/year) for a total of 300,000 tons/year. However, as noted, Grodno was not yet operational in 2015. These plants have a capacity to separate 10% or 30,000 tons/year of recyclables. In addition, there are approximately 31 sorting lines with an installed capacity of 360,000 tons/year of which 50% would be saleable. Total actual capacity would therefore be 30,000 + 180,000 = 210,000 tons/year.

BULGARIA CASE STUDY

Introduction

Waste management in Bulgaria became state policy in the mid-1970s through the Spatial Planning Act, which required the designation of waste disposal sites in spatial planning plans. At that time, specialized landfills were designed utilizing bottom isolation, capture, and treatment of leachate. A national concept for collection, transport and disposal of municipal waste was developed and instituted in the late-'80s. The concept envisaged the construction of 40-45 regional landfills in order to serve all settlements in the country. In parallel, 13 incinerators for larger urban agglomerations were envisaged. A small state company, "Communaltechmash," was set up for the production of containers, specialized trucks for transportation and loading, and compactors for transfer stations. At the same time, the first incidents of public resistance to public authorities' decisions started to appear in connection with the identification of landfill sites.

With the fall of the communist regime and the collapse of the country's economy in the early 1990s, it became clear that public investments in the large-scale program of waste incineration with energy recovery could not be assured for the near future. In the newly-created Ministry of Environment (MoE), efforts were focused on developing a new regulatory framework for waste management and on the creation and strengthening of mechanisms for treatment and pollution control through the MoE's existing 16 Regional Inspectorates for Environment and Water. In the meantime, Bulgaria joined the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*. In 1996, the *National Policy for Waste Management* was promulgated, which embodied most of the internationally-recognized solid waste management principles, including the waste hierarchy and regionalization of landfill sites.

This Policy was the basis for development of the first law regulating waste (*Law on limiting the harmful impact of waste on the environment* (1997)) and the National Waste Management Program (1998-2002), and outlined the main areas on WM for attention under the European Pre-Accession Programs (PHARE[1] and ISPA[2]). A national plan for implementation of *Council Directive 1999/31/EC of 26 April 1999 on Landfilling* and for construction of regional landfills was adopted in 2003. Finally, the country was divided into 55 regions[3] for the purpose of establishing regional systems for waste management. The ISPA financed construction of five regional landfills; the "Operational Program

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1 Phare was one of the main pre-accession assistance instruments for the countries of Central and Eastern Europe to join the EU.

2 EU Instrument for Structural Policies for Pre-Accession (ISPA). The general objective of ISPA in the field of the environment is to ensure financial support for infrastructure investments.

3 Bulgaria did not transpose the article for "isolated settlements" and all settlements in the country are included in the capture areas of regional landfills.

Environment 2007-2013 (OPE)"[4] supported the construction of 23 more regional centers for waste (including landfills); 23 more landfills were built primarily with funds from the State Budget; and the remaining four regional systems are still under construction. Within the current OPE program period (2014-2020), the emphasis is on construction of facilities for pre-treatment of waste in order to meet targets for reduction of the quantities for landfilling as well as utilization of the useful fractions. The Enterprise for Management of Environmental Protection Activities (EMEPA) finances projects for the closure of old disposal sites following the construction of the new regional landfills.[5] The National Waste Management Plan 2014-2020 budgeted 90.3 million Euros for the closure and re-cultivation of all closed municipal landfills through the end of 2019. The financing will be provided from the State Budget through EMEPA as well as from municipal budgets.

As part of the Republic of Bulgaria's accession to the EU, the entire EU environmental acquis has been transposed into national legislation. Since 2007, when Bulgaria became a full EU member state, national legislation has been developed according to EU legislation. In terms of municipal waste, transition periods were negotiated only for targets concerning recovery and recycling set in *Directive 2004/12/EU amending Directive 94/62/EC on packaging and packaging waste*. However, these extensions finally expired in 2014.

1. General MSW Data

The population of Bulgaria at the end of 2015 was 7,152,800 inhabitants residing in 5,259 settlements, where 1,133 of the settlements had less than 49 inhabitants. The territory of the country is 110,371 sq. km. with a population density of 64.8 inhabitants/sq. km. Over the past 30 years, there has been a steady decline in the country's population with the trend more pronounced in the rural areas than in the cities.

Table 1: Household income

Year	2010	2011	2012	2013	2014	2015	2016
Total household income EUR / year	4,820	4,923	5,497	6,179	6,219	6,314	6,476

Source: National Statistical Institute

The quantities of waste generated and treated are reported and monitored by the National Statistics Institute (NSI) as part of its monitoring of economic indicators. The amount of waste generated, the average waste generated per inhabitant, the number of settlements

[4] The Operational Program Environment was set up under the National Strategic Reference Framework for the programming period 2007-2013 for the development and improvement of the basic environmental infrastructure. The program determines which areas of the country will receive priority for implementation and financing within this period. The financial assistance for the implementation of OPE mainly comes from the European Regional Development Fund (maximum 85% of total eligible expenditure) and co-financing through the State Budget (minimum 15% of the total eligible expenditures). In some cases, additional financial support has been provided by IFIs – EIB, EBRD, etc.

[5] EMEPA was established by the Environmental Protection Act. It has the status of a state enterprise that does not generate or distribute profit. Its main purpose is the realization of environmental projects and activities at national and municipal levels, as well with the private sector. EMEPA's sources of financing are the state budget, external donors, collected taxes, imposed sanctions, and other contributions set out in the legislation. EMEPA was a beneficiary under OPE 2007-2013, managing about 50,000,000 Euro for municipal projects for the closure and re-cultivation of old municipal landfills.

served, the number of inhabitants served, and the percentage of the population receiving waste collection and treatment services are shown below.

Table 2: Municipal waste – generation and service coverage

Year	2010	2011	2012	2013	2014	2015
Total municipal waste generated (x 1000 t.)	4,068	3,572	3,249	3,135	3,193	3,011
Annual generation per capita (kg/inhab./year)	542	488	446	434	442	419
Served settlements (number)	4,238	4,364	4,431	4,556	4,578	4,593
Population in the served settlements (number)	7,394,983	7,247,946	7,228,808	7,229,318	7,191,325	7,147,847
Share of the population served by organized waste collection (%)	98.2	98.9	99.2	99.5	99.6	99.6

Source: National Statistical Institute

Regarding the generated waste, statistics show a significant reduction in the quantities - 25% over five years - which cannot be explained solely by the measures taken to reduce the generation of waste (such as fee increases, the introduction of a landfill tax, and public communication and education campaigns). It is likely there is a problem with the accuracy of the baseline data provided. Prior to weight-based data collection, waste volumes were calculated in cubic meters based on the number of track loads of waste then converted into tonnage. Today, all new landfills and treatment facilities (where 92% of municipal waste is processed) are equipped with weighbridges for automatic recording and submission of weight data for incoming waste, and thus, more accurate data is obtained. The last four landfills under construction will also have weighbridges when they are completed by the end of 2017.

Organized waste collection services cover almost the entire population of the country (99.6%). The remaining population (0.4%) resides in hard-to-reach settlements; these residents are served by seasonal waste collection campaigns.

Table 3: Methods of treatment of collected municipal waste

Year	2010	2011	2012	2013	2014	2015
Landfilled waste x 1000 t	3,041	2,568	2,323	1,860	1,297	1,856
Delivered for recycling x 1000 t	1,003	979	841	271	298	153
Delivered for pre-treatment x 1000 t	-	-	-	1,005	1,598	1,002

Source: National Statistical Institute
Note: A requirement for pre-treatment of waste for landfilling entered into force in 2013. The NSI explanation note to this table indicates that the figures for "Delivery for recycling" includes "Delivery for pre-treatment as well."

Table 3 shows the results from the official statistical survey. However, the results seem to show that the National Statistical Institute and thosee persons who are obliged to report data about waste are mis-informed about the definitions and standards for waste treatment methods and thus the results obtained are confused. For example, the description "Delivered for pre-treatment" is not informative as to what amount of waste is directed for recycling and what amount will be landfilled.[6]

Table 4: Waste generation and treatment – current and anticipated

	2010		2015		2020	
	Urban	Rural	Urban	Rural	Urban	Rural
Population x 1000	5,375	2,130	5,227	1,927	5,148	1,799
Waste generation (x 1000 t)	4,044		3,011		3,075	
Collection rate (%)	100	80	100	98	100	100
Separation at source (x 1000 t)	N/A		200		400	
Biodegradables diverted from landfilling (x 1000 t)	-		> 320		330	
Incineration	N/A		N/A		N/A	
MRF + Sorting line	-		20		100	
RDF	-		-		> 200	
Landfill (x 1000 t)	3,041		2,471		2,045	

Sources: NSI, NWMP 2014-2020, ExEA

The composition of the waste is presented below as described in the *Methodology for survey of the morphological content of the municipal waste* (MSMCMW), issued by MoEW, 2012.

[6] The definition of "Pre-treatment" means all physical, thermal, chemical or biological processes, including sorting, that change the characteristics of the waste in order to reduce its volume or hazardous properties in order to facilitate further treatment or to increase its recoverability. By this definition, if waste was pre-treated by compacting at a transfer station, a part or all the amount of pre-treated waste could be landfilled.

Table 5: Composition of municipal waste by settlement size 2012-2015

Number of inhabitants in the settlement	Up to 3,000	3,000–25,000	25,000-50,000	50,000-150,000	150,000 and more
Food	15.60%	23.20%	28.00%	30.60%	28.90%
Paper	6.10%	8.50%	8.10%	9.40%	11.40%
Cardboard	4.00%	5.50%	6.90%	8.20%	9.40%
Plastic	10.30%	10.10%	12.80%	15.40%	11.30%
Textile	2.00%	3.70%	2.90%	2.90%	2.80%
Rubber	1.00%	0.90%	1.00%	1.00%	0.90%
Leather	1.00%	0.90%	1.00%	1.00%	0.90%
Garden waste	30.90%	21.70%	13.10%	11.00%	11.00%
Wood	2.90%	2.00%	2.90%	2.10%	2.00%
Glass	2.40%	6.10%	7.00%	7.80%	9.20%
Metals	1.90%	2.00%	2.00%	2.00%	1.90%
Inert	21.30%	14.80%	13.70%	8.00%	9.70%
Hazardous	0.60%	0.60%	0.60%	0.60%	0.60%
Total	100.00%	100.00%	100.00%	100.00%	100.00%
Specific generation kg/ inhab./year	241.7	295.5	334.9	349.6	410.3

Source: *MSMCMW* (2012)

The information on waste is collected and published in accordance with the requirements of Regulation No. 2150/2002 of the European Parliament and of the Council of 25 November 2002 on Waste Statistics. The Regulation requires member states to aggregate and produce representative data at the national level. The information on municipal waste is obtained through questionnaires completed by all municipal administrations. The survey includes landfill sites for municipal waste; data for landfills which lack weighing equipment is usually estimated based on data from transport documents. Total generated municipal waste is the sum of both household waste delivered to the landfills through the waste collection system and waste from households non-served by the collection system.

2. Legislation

According to the Waste Management Act:

- "**Waste**" means any substance or object, which the holder discards, intends to discard, or is required to discard.
- "**Bio-waste**" means biodegradable garden and park waste; food and kitchen waste from households, restaurants, caterers and retail premises; and comparable waste from food processing plants.
- "**Biodegradable waste**" means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, paper, and paperboard.
- "**Household waste**" means "waste from households" and "waste comparable to waste from households."
- "**Hazardous waste**" means waste which displays one or more of the hazardous properties listed in Annex No. 3 of the WMA.
- "**Industrial waste**" means waste generated as a result of industrial activities of natural and legal persons.
- "**Construction and demolition waste**" means waste from construction and demolition corresponding to the waste codes listed in Chapter 17 of the Index to Commission Decision 2000/532/EC of 3 May 2000.
- **"Widespread waste"** is waste, which is formed after the use of products from numerous sources throughout the country and, due to their own features, require special management.

For the purpose of national statistical reporting, municipal waste is the waste resulting from the activities of people in their homes and in administrative, social, and public buildings. Also included here is waste from commercial outlets, crafts, resorts and entertainment facilities, which is not hazardous and where the waste quantity or composition will not prevent its treatment together with household waste.

Bulgaria's national legislation and policies concerning waste management are harmonized with those of the EU and are based on the following basic principles:

- Sustainable Development
- *Best Available Techniques (BAT) Not* Entailing *Excessive Cost*
- Integrated Waste Management
- Participation of the Public
- Manufacturer's Responsibility and Polluter Pays
- Prevention
- Proximity

The waste hierarchy is prioritized in terms of what constitutes the best environmental opportunity in the following order:

a) Prevention of waste generation
b) Preparation for re-use
c) Recycling
d) Other recovery, e.g., recovery to obtain energy
e) Disposal (landfilling, incineration without energy recovery, etc.).

Laws and amendments thereto are prepared by the relevant ministry, in this case the Ministry of Environment and Water, adopted by the Council of Ministers, and submitted to the Parliament, which upon acceptance forwards them to the President for the issuance of a decree promulgated in the State Gazette. Sub-legislative means to implement the legislation, such as regulations, are adopted by the Council of Ministers or the relevant ministry(s).

Like European law in this area, the Bulgarian legislation contains a framework Waste Management Act and a number of specific by-laws, regulations, and orders.

The Waste Management Act (WMA) adopted in 2012 sets out the rights and obligations of central and local authorities, requirements for trans-boundary shipments of waste, and the requirements for waste facilities and installations; introduces economic and regulatory mechanisms and instruments for the implementation of legislation; provides rules for the management of widespread waste; specifies rights and obligations of waste generators and processors; and sets fines and sanctions for non-compliance.

The WMA and the secondary legislation address the following types of waste:

- Household waste, including commercial, industrial and institutional waste (CII) similar to household waste
- Construction waste
- Industrial waste
- Hazardous waste

Further, the WMA implements targets contained in *Directive 2008/98/EC on waste and repealing certain Directives* concerning preparation for re-use and the recycling of waste materials such as paper, metal, plastic, and glass from households. Implementation is foreseen over three phases:

- By 1 January 2016 - at least 25 %
- By 1 January 2018 - at least 40 %
- By 1 January 2020 - at least 50 % of the total amount of these materials

Finally, the WMA requires municipalities to reduce the amount of landfilled, biodegradable municipal waste to 35% of 1995 levels of total waste generated in Bulgaria by the end 2020 at the latest.[7]

A number of secondary laws have been adopted that set requirements in the following areas: sites for the location of waste treatment facilities; the construction and operation of landfills and other waste treatment facilities and installations; the construction and operation of incineration and co-incineration plants; the order and method of calculation of landfill taxes; construction waste and use of construction recycled materials; classification of waste; information on waste and the management of public registers; and separate collection and treatment of bio-waste.

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[7] Concerning municipal waste, transition periods were negotiated only for some targets of Directive 2004/12/EU amending Directive 94/62/EC on packaging and packaging waste about recovery and recycling. These periods finally expired in 2014 and the EU legislation on waste is now totally transposed in Bulgarian laws.

The targets for separate collection and recovery of bio-waste, based on the amount of household bio-waste generated in the region in 2014, are:

- By 31 December 2016 - not less than 25%
- By 31 December 2020 - not less than 50%
- By 31 December 2025 - not less than 70%

Six separate ordinances have been adopted for managing so-called "widespread waste", which includes waste from: packaging, electronic and electrical equipment, end-of-life vehicles, batteries and accumulators, used oils, and automotive tires. The regulations set down requirements for both manufacturers and importers of the products concerned (the "producer responsibility" principle) as well as some commitments for mayors of municipalities.

According to the WMA, The Minister of Environment is obliged to draw up and submit for adoption to the Council of Ministers a *National Waste Management Plan* (NWMP) and a waste prevention program as an integrated part of the Plan.

The main programming document at the local level is the *Municipal Waste Management Program* (MWMP). The municipal mayor is responsible for drawing up and implementing the waste management program for the territory of the relevant municipality. This program is an integral part of the *Municipal Environmental Program*. However, it is drawn up in accordance with the structure, objectives and estimates of the *National Waste Management Plan*.

In addition to national legislation, each municipality must adopt local waste management regulations for its territory in accordance with the WMA and provisions of the Spatial Planning Act concerning waste management and in accordance with the *Local Taxes and Charges Act* on determinations of fees for waste service.

Local waste management regulations consist mainly of:

- Waste Management Ordinance
- Ordinance on the definition and administration of fees and rates for services

All three documents (MWMP and the two ordinances) are prepared by the municipal administration in consultation with the public and are approved by the municipal council.

The mayor of the municipality is subsequently responsible for planning and organizing the management of municipal and construction waste, as well as the control of all types of waste on the territory of the municipality.

In addition, in accordance with the WMA, all municipalities included in each of the regions referred to in Article 49, paragraph 9 of the Act are required to establish a regional association for waste management, at a minimum, to deal with the matter of regional waste treatment facilities.[8]

EXTENDED PRODUCER RESPONSIBILITY

Extended producer responsibility (EPR) has been defined as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle." Based on the EPR principle, the WMA sets the requirements for products, which, after use, form ordinary waste and the procedure and methods for their separate collection, re-use, recycling and/or recovery. The targets for separate collection, re-use, recycling and/or recovery, are specified in ordinances issued by the Council of Ministers.

The specific measures that enable the extended producer responsibility principle in the WMA include acceptance of returned products and of waste that remains after those products that have been used; the subsequent management of waste and the financial responsibility for such activities; and the obligation to make informational publicly available as to the extent to which the product is re-usable and recyclable. Consequently, Businesses which place products on the market which, after use, form ordinary waste, are responsible for their separate collection and treatment, as well as for attaining the relevant targets for their separate collection, re-use, recycling and/or recovery. These businesses are permitted to discharge these obligations by means of collective schemes, which utilize a contract with a recovery scheme operator holding a valid permit.

[8] Although the country is divided into 55 regions for the purposes of waste management, 52 regional associations for waste management have been established by the municipalities designated by the WMA. This is due to the fact that three regions contain only one municipality and therefore for these cases there is no reason to establish associations.

3. Institutional framework

The state is governed by the Council of Ministers under the authority of the Parliament. The territory is divided into 28 regions (Oblasts), which are governed by a regional authority appointed by the Council of Ministers. Further, the territory is divided into 265 municipalities, which are governed by local authorities in the form of directly-elected municipal Mayors (administration) and Municipal Councils. Responsibility for waste management resides with the Council of Ministers (national) and municipal authorities (local). The obligations and responsibilities of state institutions and local authorities in relation to the organization, authorization, financing, monitoring and control of waste management activities is established by the Waste Management Act (WMA) and its implementing legislation.

NATIONAL LEVEL

- The *Ministry of Environment and Water (MoEW)* is the competent authority responsible for the development and implementation of national waste management policy, including the development and implementation of legislation, strategies, programs, international projects, and regulation of activities in the public and private sectors. Some of these activities are carried out by the Executive Environment Agency (ExEA) and through the network of 16 Regional Inspectorates for Environment and Water (RIEW), which are specialized bodies of the Ministry.[9]

- The Minister of Environment and Water issues permits for activities involving hazardous waste and for activities for the disposal and/or utilization of domestic, construction, and industrial waste when those activities take place on the territory of more than one RIEW. The Minister controls, including design and planning, the activities of RIEWs.

- The MoEW issues permits to recovery organizations for the fulfillment of their obligations stemming from the WMA. In addition, the Minister is the competent authority for the Republic of Bulgaria for the implementation of Regulation (EC) No 1013/2006 on shipments of waste. The MoEW is the responsible institution for issuing a Complex Permit[10] under the EPA whereas, RIEWs issue permits and control the collection, transport, temporary storage, recovery and/or disposal of hazardous waste, as well as for the activities for disposal and/or recovery of municipal, construction, and industrial waste where there are no hazardous properties involved.

- The MoEW develops and submits to the Council of Ministers a National Program for Waste Management. The Ministry issues guidelines for the development, scope, and content of waste management programs for municipalities and enterprises and prepares an annual report on waste management in the country, which is then included in the overall report on the state of the environment. Moreover, the MoEW manages public registers of permits issued and registrations filed for waste treatment activities, as well as documentation concerning closed landfills and other sites.

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[9] The territorial scope of responsibility for these 16 RIEWs covers the entire territory of the country.

[10] A Complex Permit is an integrated pollution prevention and control permits (IPPC permit), a preventive tool in the construction and operation of new or existing plants and facilities for certain categories of industrial activities.

- The MoEW's Executive Environmental Agency (ExEA) monitors and collects data on the quality of water, air, soil, radiation, and waste in the country. The Agency establishes and maintains the National Automated System for Environmental Monitoring; the Waste Information System is a specialized sub-system for monitoring of all waste sources. Finally, MoEW and ExEA create, process and report information to international institutions.

- According to the Law on the State Budget of the Republic of Bulgaria, the Minister of MoEW, annually proposes specific funds for the construction of facilities and installations for treatment of municipal and hazardous waste, as well as for cleaning and re-cultivation of sites polluted by waste. The Ministry of MoEW may also provide funding for waste management projects through the Enterprise for Management of Environment Protection Activities (EMEPA) in the form of grants or loans.[11]

- The RIEWs carry out inspections and oversee the implementation of waste management legislation. RIEWs review and approve waste management programs prepared by those generating or handling waste and exercise oversight over their performance. In their duties, the RIEWs ensure the compliance regarding information provided by the waste producers, by the persons carrying out processing and disposal, and by municipal administrations.

- Other national institutions which are concerned in some respect with the municipal waste management are the Ministry of Health, Ministry of Finance, Ministry of Regional Development and Public Works, and Ministry of Interior. The National Statistical Institute collects and processes information on household and industrial waste for the country in the areas of waste type, quantity, economic activities, and regions, etc.

LOCAL LEVEL – MUNICIPALITY

The mayors of municipalities are responsible for the development and implementation of waste management programs, which must be drawn up in accordance with the "*Guidelines on the Scope and Content of Waste Management Programs*" issued by the MoEW. The municipalities report the annual activity and the implementation of the programs to RIEW. At the local level, waste operations are managed operationally by municipal administrations and regional associations for waste management, and legislatively by municipal councils. The mayor of the municipality organizes the management of activities concerning waste generated on its territory, in accordance with the requirements of the WMA, by setting requirements for each waste generator concerning the organized collection and treatment of municipal waste. The mayor of the municipality is responsible for: provision of containers for the storage of household waste; collection of municipal waste and transport for treatment or disposal; cleaning of public places; site selection, construction, maintenance, operation, closure and monitoring of closed sites for waste; separate collection of municipal waste; and prevention of illegal dumping.

The mayor of a municipality may organize collection and treatment of municipal waste by contracting with a licensed private company in accordance with the procedures of the Public Procurement Act or by assigning these activities to the licensed municipal entity. "The mayor of municipality with district divisions may conclude contracts with waste

[11] See also footnote 5.

treatment entity for each district individually."[12] In addition, mayors of municipalities have the authority to issue penalty decrees and to impose fines and sanctions for violations referred to in the WMA.

Regional Associations for Waste Management

Municipalities that build or use a regional landfill or regional treatment facility establish associations for the purpose of regional waste management.[13] Regional associations are created in order to lower costs for waste services. Municipalities participate in regional associations in order that costs for treatment of waste can be borne by and are equitable to all members. Such an association between municipalities is one of the obligatory requirements for financing of OPE projects. Municipalities agree on key issues related to waste management and may delegate some specific decision-making roles to the Regional Association.

Municipal councils

Municipal councils adopt ordinances that set the conditions for collection and disposal of municipal waste, including transportation, pre-treatment, and recycling according to existing requirements. They also set fees for the provision of the relevant waste services in the municipal ordinance for local taxes and charges.

The contract for collection services covers the whole territory and population of the municipality (or district). Commercial waste generators may undertake separate contracts with different providers. The waste management charge for real estates is determined proportionally on the basis of the tax assessment for the property. The charge consists of three components: waste collection and transport; treatment at landfill or other facility; and cleaning of the areas for public use. The charge for an enterprise which contracts for the collection and transport of its waste separately from the municipality consists only of the components that have been received from the municipal service.

ROLE OF THE PRIVATE SECTOR

The private sector plays a significant role in the business of waste management. Private sector entities may be generators of industrial or commercial waste or producers of goods, which after use become waste, or they may be processors of waste, which collect and care for proper treatment and disposal of waste. And in many cases, a private sector entity is both a generator and a processor of waste. Industry is a major generator of waste, and the activities of waste generators in the various industrial sectors are greatly influenced by the strict environmental protection requirements for waste operations.

The WMA regulates obligations and responsibilities of waste generators. In addition, municipalities, through municipal regulations, set further local requirements to be met by waste producers in the territory of the respective municipalities.

Private sector entities may build and operate their own waste treatment facilities. In addition, the WMA allows shared ownership between the private partner who provides

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[12] The last paragraph of the WMA holds that if the municipality is not divided into districts, waste collection should be assigned to two or more collectors.

[13] According to the WMA the territory of the regions is determined by the National Waste Management Program 2009-2013, developed by the MoEW and adopted by the Council of Ministers.

financing and the municipality (or municipalities in the case of regional associations) that provides the site.

Finally, in accordance with national legislation, separate waste collection is a responsibility of the mayor of the municipality (for recyclable waste, including biodegradable waste, in contrast with "producer responsibility" schemes) and organizations involved in widespread waste recovery. For organization and operation of separate widespread waste collection systems, a license fee is collected. Therefore, OPE 2014-2020 does not envisage financial support to these systems.

4. Public outreach

Public information, as well as public involvement and participation in problem identification, decision-making, policy-making, and oversight of activities have been a primary focus since the very first days of democratic change in Bulgaria after 1990. These issues are regulated by a number of normative documents. Bulgaria was an active participant in the elaboration of the United Nations Economic Commission for Europe Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, adopted on 25 June 1998 at the Fourth Ministerial Conference and which entered into force on 30 October 2001. These outreach processes have benefited from the fact that European-funded projects mandate an explicit role for public information and public participation – specifically a requirement to plan these activities and to provide a special budget for the implementation. Public Hearing is an essential phase when adopting regulations, plans and programs and investment projects.

A list of the categories of information within the purview of the MoEW that are subject to publication on the Internet has been approved by the MoEW. For cases outside these categories, there is a procedure for accessing such information. ExEA also maintains public registers for sites which contain ferrous and non-ferrous metals waste, end-of-life electrical and electronic equipment, end-of-life vehicles, and spent batteries and accumulators, and lists of persons licensed for waste activities, persons who sell batteries and accumulators, electrical and electronic equipment, oils, tires, polymer bags, and traders or brokers of waste.

The ExEA organizes trainings for stakeholders on the implementation of new regulatory requirements and on working with the National Waste Information System.

Municipalities are required to provide complete and timely information concerning the requirements and conditions for providers collecting and treating services for waste in their territories. Municipalities (e.g., Burgas) maintain on their Internet sites information on the municipal waste management program, status reports, the weekly eco-newsletter, timetables for the collection of household waste and for construction and large-scale waste, registers for persons licensed to carry out waste activities, and a register of the sites for delivery of plastic, glass, paper, and cardboard waste as well as end-of-life-vehicles in the territory of the municipality.

Specialized waste management enterprises that are licensed and contracted to fulfill the target for packaging waste and other widespread waste are required to undertake measures to inform the public about their activities and about the public's role with them,

and ensure there is a budget for implementation of these public information measures. The Internet sites of these enterprises maintain information on the system and rules for separate collection, system benefits, and operational performance. The annual reports of these enterprises, which must be submitted to the MoEW and which are available on their websites, have information concerning:

- Measures undertaken towards consumers;
- Media cooperation;
- Measures aimed at kindergartens, schools, and universities;
- Measures targeted at local authorities.

Public information campaigns are included in all municipal WM programs. The sources of financing are most often the municipal budget, revenues from waste charges and fines, Extended Producer Responsibility contributions, and international aid. The budget provided for public information campaigns (PICs) usually amounts to approximately 10% of the total budget of the project. For example, the WM Program 2016-2020 of Burgas municipality amounts to 30 million Euro with the budget for the PIC at 300,000 Euro. In the National Waste Management Plan 2014-2020, there is a separate program for public information and public involvement in the solution of waste management issues and 28.8 million Euro has been allocated for implementation of this program.

5. Operations

Until 1990, waste was collected and treated in two different lines:

- Waste from paper, cardboard, ferrous and non-ferrous metals, and reusable packaging separated at the point of generation were handed over to a state-owned company (deposit system). This company held a network of reception points across the country. The company paid deposits at reception points for the received waste to those providing it.
- Mixed household waste was collected, transported, and landfilled by companies owned by municipalities.

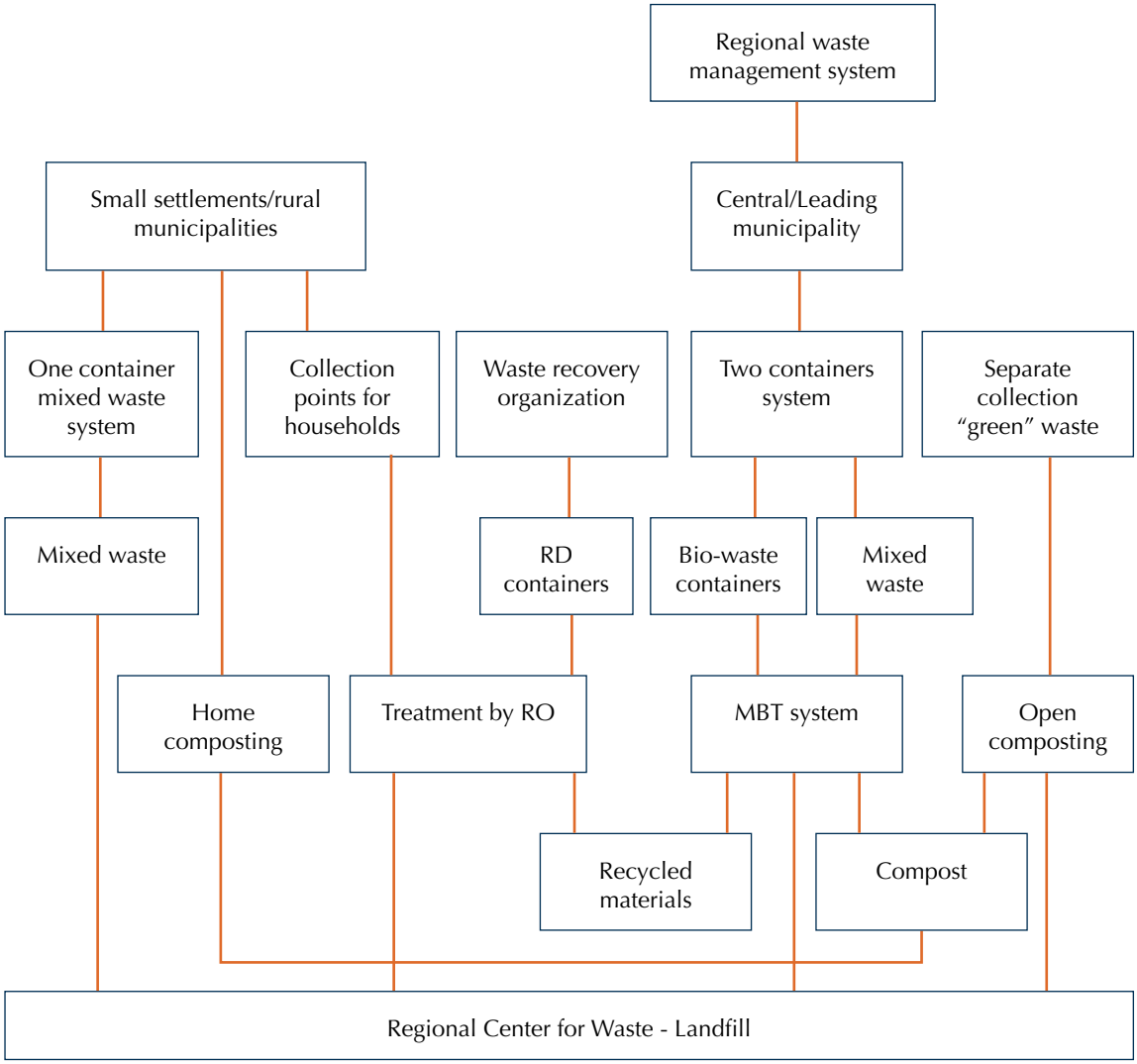
Today, with the introduction of requirements for separate collection, pre-treatment, waste reduction and extended producer responsibility (EPR), several waste collection and treatment systems already operate in parallel.

For example, the regional waste management system (see Figure 1 below) includes:

- Municipal systems for collecting and transporting municipal waste - mixed or separated
- Domestic composting of green/biodegradable waste
- Separate collection of widespread waste by licensed recovery organizations with specialized containers and/or collection points
- Open composting of separately collected “green” waste at municipal centers for waste or at the regional center for waste
- Separation and/or mechanical-biological treatment at a private plant or regional center for waste
- Landfilling at the regional center for waste

Figure 1: Principal schematic of Regional Waste Management System

The Regional Center for Waste (including the regional landfill) is owned by a leading municipality. Therefore, the system for waste of the leading municipality contains the elements listed above. Any other municipality included in the regional association decides individually the method for separate collection, the scheme of transportation (directly or through transfer station), the place/plant for composting and separation.



The municipality contracts with a licensed privately- or municipally-owned company for the collection and transport of municipal waste. The *Local Self-governing and Local Administration Act*, designates the municipality as the authority to select the operator by tender for the collection and transport of the municipality's waste which must be done pursuant to the procedures defined in the *Public Procurement Act*. If the activities for all municipalities in a regional association are assigned to one operator, expenses may be reduced and better fiscal result may be achieved.[14] Unfortunately, there has yet to be a case where the municipal councils have delegated this power to the regional association.

[14] Small municipalities are not attractive for operators, as the operator has to ensure vehicles will be used efficiently because of the small scale of the served area. Lower efficiency means higher costs. A larger service area offers better options for operators' technical and organizational decisions.

In situations where a municipality is the owner of a regional landfill or treatment facility, whether fully or partially, the regional associations for waste management contract with licensed companies for operation and maintenance of the treatment facilities and landfills.

For packaging waste, the "Producer's Responsibility" principle applies. Producers and distributors of products that become waste pay charges for placing the product on the market or initiate activities to collect and treat this waste according to the law. Multiple compliance schemes (waste recovery organizations), which producers create in order to meet the targets for collection, recycling, and recovery, meet their quantitative targets by focusing their efforts on the collection of packaging waste from primary commercial and institutional sources. At the same time the amount of packaging in household waste has continued to increase. The MoEW issued an administrative measure requiring schemes to ensure provision of at-source collection service for all settlements with more than 5000 inhabitants, which covers not less than 6 million people in the country. Annual audits of the operations of the schemes shows that the situation has changed and the system is starting to work properly. The most recent audit (2016) shows that of 368,000 tons of packaging placed on the market, 236,000 tons were collected and recycled, the percentage of recycling and recovery stands at about 64%, and at-source collecting systems are working in 173 municipalities covering approximately 6.5 million people.

CAPACITY BUILDING

Projects for technical assistance under the current Operational Program Environment have been used to build and strengthen the administrative capacity for waste management in the country. With this assistance, key documents for practical implementation of the legislation have been developed: the draft plan for the implementation of legislation; the methodology and a practical tool to determine the costs necessary for management; methodological guidelines for oversight institutions; technical requirements for waste treatment installations; management plans for the waste stream resulting from pre-treatment as well as a monitoring methodology for the implementation of recycling targets; technical standards for treatment; programs for study visits in leading EU Member States and training of experts from the state administration and other interested parties (producers, importers, municipal authorities, NGOs); and information materials (user brochures, business information) for distribution to interested parties.

6. Financial issues

COSTS FOR WASTE COLLECTION, RECYCLING, TREATMENT, DISPOSAL

Municipalities are responsible for all activities related to municipal solid waste management. The following waste management elements are defined in the Law for Local taxes and charges:

- Cleaning of public areas
- Waste collection and transport (including transfer)
- Waste treatment and disposal

Municipal governments establish regional waste treatment and disposal whenever definite economies of scale exist.

Whenever services cover waste generated within a municipality, or the municipality is the sole owner of a treatment/disposal facility, the municipality either assigns the provision of the service to private companies through Public Procurement Act (PPA) procedures or provides the service through a specialized unit of the municipality under Article 53 of the Municipal Property Act following a decision of the Municipal Council. Smaller municipalities may be serviced by a single private operator if it has successfully bid separate tenders before municipalities in a WM region, or they may provide waste collection services as a municipal enterprise when there is lack of interest from the private sector.

Regional facilities can be constructed, operated and regulated under the Public Private Partnership Act. Regional facilities may be the joint property of multiple municipalities; in this case, an operator is selected through a joint PPA procedure administered by all municipalities that own the facility.

Waste management service costs to the user include:

- Operation and maintenance costs, including insurance and interest on loans;
- Depreciation of long term assets;
- Profit margin, if service is provided by a private operator;
- VAT;
- Landfill tax (deductions per ton of waste landfilled if recycling and recovery targets are not met)

DEPRECIATION

Prior to 2017, municipal accounting systems did not account for municipal asset depreciation. For example, if containers or trucks were acquired by a municipality, they were valued in each WM budget based on their cost at acquisition. Beginning in 2017, on the basis of Article 164, paragraphs 1 and 3 of the Public Finance law, the Ministry of Finance issued instructions that require accounting for depreciation of long term material assets (LTMA) of organisations that are budgeted from national revenue. Therefore, until 2016 waste management costs only included depreciation if the assets were the property of a private service provider. A draft amendment of the Law on Local taxes and Charges of 2017 will include depreciation as a separate cost item for each cost centre.

DEPRECIATION OF GRANT ASSETS

The inclusion of depreciation costs of grant asset in the price of the waste services generates net revenue or profit.[15] Therefore, the service charge for a facility that is grant-funded also does not include depreciation cost related to the grant part because it cannot be profit–generating.

[15] In line with IAS 20 Accounting for Governmental grants and the relevant NAS 20, grants are recognized as income during the accounting period in the same way that costs are recorded against which these grants are applied. Therefore if CBA for an infrastructure has shown that a certain part of the investment should be grant-funded due to the cost burden, depreciation of grant-funded facilities is not included in the gate fee of the facility.

VAT

Solid waste services are subject to 20% VAT. If the service is provided by a municipal enterprise, the VAT on labour costs is not added.

GUARANTEE PAYMENTS FOR CELL AND LANDFILL CLOSURE AND 30-YEAR MONITORING COSTS

Guarantee payments are established under Article 60 of the WMA[16] to provide funds for closure of cells, landfills, and for monitoring for 30 years after closure. The size of the guarantee payment is defined by the site's owner in BGN per ton of waste based on the investment project or rehabilitation plan's cost to close the cell or landfill measured in tonnes of waste. The guarantee on behalf of the owner of the landfill may be in the form of:

- Monthly transfers to a bank account controlled by the Regional inspectorate of environment and waters (RIEW) in the territory where the landfill is located.
- Bank guarantee in favor of the RIEW. Bank guarantee is defined annually, based on the forecast for waste over the coming year as well as waste that has been disposed in previous years.

Municipalities tender the closure works and submit to the RIEW the detailed design for the closure and the contract for the closure with a request for release of funds.

LANDFILL TAX FOR FUNDING TREATMENT FACILITIES

A landfill tax is provided under Article 64 paragraph 1 of the WMA in order to reduce the amount of landfilled waste and to encourage recycling and recovery. The landfill tax is determined in BGN per tonne of landfilled waste in the event recycling targets and targets for diversion of biodegradable waste from landfilling are not achieved. MoEW Regulation 7 of 2013 defines an increasing level of landfill tax as indicated in Table 6 below.[17]

Table 6: Landfill tax for waste disposal

Year	2013	2014	2015	2016	2017	2018	2019	2020
BGN/t	15	22	28	36	40	45	57	95
EUR/t	7.7	11.2	14.3	18.4	20.5	23.0	29.1	48.6

In case either the recycling targets or the targets for biodegradable waste are reached, the taxes above are reduced by 50%. The funds, overseen by RIEW, are transferred to the account of the municipality that disposed the waste. The accumulated funds are intended to finance investments in treatment/recycling facilities and for equipment for separate waste collection. The funds can be used upon application to the RIEW. The application must include the decision of the general meeting of the regional association for

[16] While accounting rules require initial recognition of LTMA at cost to include an estimate of dismantling and restoring the site if required, as well as provisions for environmental liabilities, this is not yet required in the accounting systems of municipalities.

[17] The deductions for the period 2017-2019 were decreased per amendment of the Regulation as of 20 January 2017.

construction of a regional waste treatment facility (or a decision of the municipal council in case of a municipal investment), a construction permit, and a contract for construction.

SERVICE COST

Service cost is defined in general as price per ton or gate fee per ton (besides cleaning of public areas). The table below summarises waste charge components for some Bulgarian municipalities, 2016:

Table 7: Waste management unit costs (2016)

Municipality	Sofia	Burgas	Ruse	Botevgrad	Etropole
Population	1,322,000	209,000	162,000	31,500	11,500
Waste generation rate, kg/cap/year	445	350	400	320	280
Collection cost (BGN/t)	100	120	63	66	116
Treatment and landfill disposal cost, including guarantees for closure (BGN/t)	78	56	21	22	22
Landfill tax (BGN/t)			36	36	36
Total cost per ton (BGN/t)	178	176	120	124	174
Total cost per ton (EUR/t)	91	90	61	63	89

Notes:

Population data is from the National Statistical Institute (NSI). Data for the waste generation rate is from municipal waste management programmes; data for costs is from municipal waste management budgets. (Unit costs are defined on the budgeted payment for service component per generated waste).

Sofia municipality treats mixed waste and its treatment cost is highest.

Burgas municipality organises separate collection of all types of waste, and sorting, recycling, and composting is performed at the regional landfill.

The municipalities of Ruse, Botevgrad and Etropole did not treat their waste before disposal in 2016, and thus, their entire collected waste is landfilled.

Etropole's transport costs are higher because the municipality's population is low-density, and it transports its waste to Botevgrad regional landfill.

MODES OF FINANCING OF INVESTMENT AND ANNUAL OPERATIONAL/AMORTIZATION COSTS

According to Article 54 of the WMA, WM costs are financed either by the polluter through waste charges in line with the Law on Local Taxes and Charges or the producer through EPR schemes for packaging waste, used batteries, WEEE, tyres, ELV, etc. The waste charge is meant to cover the full cost of the service; however, for affordability considerations, the major share of investment is so far secured by grant funding.

FINANCING OF INVESTMENT

Investments in waste treatment and disposal facilities come primarily from grant funding.

Containers and collection vehicles. Financing costs for containers and collection vehicles are in general reflected in the cost of the waste collection service and covered by the

waste charge. Previously, the Enterprise for Management of Environment Protection Activities (EMEPA) provided soft loans or grants to the poorest municipalities for the purchase of containers and vehicles. Containers and vehicles for separate waste collection (other than packaging) may be funded by the accumulated deductions under Article 64 of the WMA.

Landfill construction. Sanitary landfill construction used to be funded by state budget funds through the Enterprise for Management of Environment Protection Activities (EMEPA), ISPA, and mainly, through Operational Programme Environment (OPE) 2007-2013 and ERDF funding. Thus far, only one regional landfill has been constructed through a Public Private Partnership (Kostinbrod). Construction of future cells are expected to paid for through subsequent landfill charges.

Waste treatment facilities. Construction of waste treatment facilities is funded from accumulated deductions under Article 64 of WMA and mainly through funds of OPE 2014-2020. There are also waste treatment plants constructed through Public Private Partnerships (Varna, Plovdiv). Revenue from the sale of recyclables, compost, and energy from waste, is forecast to provide future revenue from the treatment facilities.

Dumpsite closures. Dumpsite closures are mostly funded by the state budget/EMEPA. Few dumpsites are closed with ISPA funds.

REVENUE FROM SALE OF RECYCLABLES AND COMPOST

There are few municipally-owned sorting facilities funded by OPE 2007-2013. Revenue from the sale of recyclables covers less than 20% of these facilities' operating costs. The market for compost from waste is also evolving—the current sale price is 7 BGN/ton for compost.

TARIFF CALCULATION AND BILL COLLECTION PRACTICES FOR HOUSEHOLDS AND COMMERCIAL/LEGAL ENTITIES

According to Article 67 of the Law on Local Taxes and Charges, the amount of the municipal waste charge shall be determined in BGN based on the amount of household waste. The waste charge is meant to cover the full cost of waste services, including guarantees for cell and landfill closure and deductions (landfill tax), as per Article 66(3) of the Law. Where the amount of household waste cannot be measured, the amount of the charge is determined in levs per user or proportionally on a basis determined by the municipal council.[18] For decades, the basis for assessing the charge was:

- Property tax value for households where the waste charge has been paid together with the property tax
- Long-term assets balance sheet value for legal entities (if a container-based calculation is not an option)

The majority of municipalities manage to collect the revenue needed to cover their waste management costs largely because of significant cross-subsidisation from legal entities.

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[18] The Private sector is not satisfied with this legislative provision allowing municipalities 'to determine the basis for charging waste service different than the amount of collected waste.' Their argument is that with such a legislative provision, every municipality prefers to avoid making the effort to measure the amount of collected waste.

Disproportional cross-subsidisation of waste services by legal entities and inadequately high charges in the case of high-value household properties led to an amendment in the Law for Local Taxes and Charges, which now requires a new basis for determining waste charges. Consultations for the adoption of another basis for determination of waste charges have been on-going for over three years without success. The 2017 draft amendment of the Law sets the number of users as an alternative to waste quantities as a basis for both households and legal entities. In the meantime, for the transitional period 2018-2020, total property area (constructed and/or not constructed) may be used as an alternative basis. As one parameter, the annual growth of user charges is limited to 20% according to a 2017 draft amendment of the Law for Local Taxes and Charges.

AFFORDABILITY AND WILLINGNESS TO PAY

There is no legally-established affordability threshold in Bulgaria for waste services as there is for water and waste-water services. A national guide for cost and benefit analysis, developed by JASPERS for OPE 2007-2013,[19] set 1% of regional per capita income as a threshold for payment for waste collection, treatment and disposal (cleaning of public areas is not included).[20] For a short period of time, the threshold may increase up to 1.5% to ensure sustainability.

Regional per capita income varies considerably—in 2015, the lowest was 2983 BGN annually for the Montana region while the highest was for Sofia city at 7046 BGN annually. The waste generation rate also differs, between 200 kg/capita and 450 kg/capita per annum.

The table below summarises waste management costs per person using municipal waste generation rates and based on the assumption that 20% of household waste is generated by legal entities in the bigger cities – Sofia, Burgas and Ruse – and 10% by legal entities in the smaller cities.[21]

Table 8: Waste management costs and affordability

Municipality	Sofia	Burgas	Ruse	Botevgrad	Etropole
Annual WM cost per person (BGN)	63	49	38	36	44
Annual income per person (BGN)	7046	4237	5236	3789	3789
% of income	0.9 %	1.2%	0.7%	0.9%	1.2%

Note: Data for annual income is from NSI (2015)

Without cross-subsidisation, the affordability threshold is already exceeded in Burgas municipality. Etropole municipality, being smaller and with only few commercial entities, does not have cross-subsidisation as a source; thus, the municipality's revenue from waste charges is less than the budgeted funds and it is not in a situation to pay the deductions under Article 64 of the WMA.

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19 http://ope.moew.government.bg/bg/pages/narachnitsi-ukazania-rakovodstva/66#1

20 Guarantees for cell and landfill closure and deductions for not achieving recovery targets are part of the disposal cost.

21 Mew, *Waste state analysis and forecast*, http://www5.moew.government.bg/?page_id=44826

The average collection rate for household waste charge in 2015 is 68.8% as is the reported rate for collection of property tax.

7. Project examples

CONSTRUCTION OF BASIC INFRASTRUCTURE FOR WASTE TREATMENT USING STATE FUNDING AND EUROPEAN FUNDS

An overview of the budgets of regional landfills for non-hazardous waste built over the last 20 years shows a very wide range of specific infrastructure costs (euro/serviced resident). The first 15 projects were funded by the state budget while five landfills were funded under the ISPA pre-accession instrument. The projects included the construction of a disposal cell with adequate insulation and drainage for surface and underground water; a waste reception point with electronic weighbridge and a staff building; internal roads; and the minimum necessary equipment to operate the landfill. Among the projects, the specific price varies minimally within the range of 35 to 45 Euros per served inhabitant.

The next 20 projects were funded under the Operational Program Environment 2007-2013. Apart from the planned disposal cell (with a capacity for at least five years and arranged with adequate insulation and drainages), the projects included transfer stations (where necessary); facilities for pre-treatment of the waste by separation of recyclable components; a composting site/plant for the biodegradable fraction; and a depository for temporary storage of hazardous waste from households. For this group of projects, the specific cost of investment varies from 50 to 210 Euros per inhabitant. The significant range between the specific costs per inhabitant of the projects cannot be explained solely by their different size ("scale" factor). Grant financing makes some receipient municipalitis less sensitive about the efficiency and effectiveness of their planned investments. Some municipalities apply for expensive high technology equipment, although they have no current necessity or the capacity to utilize it. Once the capacity of cells built under the current investment is filled, new projects for expansion and reconstruction will have to be undertaken using the municipality's own financing. In such cases, the municipalities will be expected to be more selective in their investment approaches.

SOFIA WASTE INTEGRATED PROJECT (SWIP)

Plant for Mechanical and Biological Treatment (MBT) and Refuse-Derived Fuel (RDF) production, Sofia (a part of the first phase of SWIP): The capacity of the plant is 410,000 tons/year corresponding to 1,300 tons/day. The daily amount may vary depending on the season, holidays, and the days of the week, so the reception area is designed to be able to absorb a maximum waste flow of 1,500 tons/day. Waste processing technology includes:

- Admission and pre-separation, including separation of dangerous and large-scale materials;
- Mechanical treatment for the disposal of about 40,000 tons/year of recyclable materials and the production of 180,000 tons/year of RDF fuel;
- Biological treatment through a patented process of biological drying, stabilization, and production of high-quality RDF and fine compost.

The entire process is fully automated and controlled in real time through integrated process monitoring and a data acquisition system. Emissions from the plant into the air are controlled by integrated dust and deodorizing systems. Waste-water is treated in a local treatment plant.

The following recyclable fractions are separated by manual sorting: mixed paper waste, cardboard, plastic foil, polyethylene terephthalate, and high-density polyethylene/polypropylene. After sorting, the waste is shredded, passed through ferrous metal separators, and transferred to the Biological Drying Plant.

Biodegradation takes place in the biological drying reactor. The dried and stabilized material is transferred to an RDF plant, where metals, glass, inert materials and the materials for the production of RDF are extracted.

The entire technological process at the MBT plant is managed by an automated data processing and control system, which establishes, regulates, controls, records and analyzes the technological processes of the MBT and its entire technical component.

During the first year of the Waste Treatment Plant in Sofia's operation, the revenue reported from sales of recyclable materials was more than 228,000 Euros. During this first year, the plant processed 221,693 tons of waste, produced 105,253 tons of RDF fuel, recovered in excess of 9,000 tons of recycled materials, and landfilled less than the estimated amount of waste (33,040 or 14.90% of total waste processed).[22]

Separately from the MBT plant, the Installation for Biodegradable and Installation for Green Waste (the second phase of SWIP) produced compost and electricity, and over the 12 month period generated total revenues of 281,000 Euros from the sale of electricity.[23]

FURTHER DEVELOPMENT OF SWIP

In the next program period of OPE (2014-2020), Sofia Municipality plans to submit one major project supporting the implementation of waste-to-energy solutions, namely the third phase of SWIP. RDF, one of the products currently produced, will be used as alternative fuel in a co-generation facility at the power plant Toplofikatsia Sofia (Sofia District Heating Company). Thus, the goal of using RDF as a fuel for the generation of thermal energy will be realized, as well as adherence to the principles of the waste management hierarchy, in particular, recovery.

SWIP enables the realization of more than 10% in savings over the current fuel source of natural gas and will meet the requirements for securing the basic load by accumulating thermal energy generated during low-consumption periods and using it in the heavy-consumption periods. The implementation of this project will contribute to the fulfillment of the resource efficiency targets set out in the EU 2020 Strategy. It will also contribute to the specific objective under the investment priority, namely, to ensure sustainable management of municipal waste by making the most efficient use of resources and in doing so, ensure that the regional waste management system of Sofia operates with maximum effectiveness.

- Additional capacity for recovery of waste (to generate energy): 180,000 tons/year
- Planned investment costs: 130,000,000 EUR

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22 Data from http://spto.bg.

23 Ibid.

8. Key points

1. There are concentrated efforts to build facilities for the treatment of bio- and biodegradable waste in order to ensure that targets for 2020 will be met. To that end, central authorities should assist the municipalities in their search for other sources of investment besides OPE and state and local budgets.

2. Small municipalities have difficulties in meeting WM legislative requirements due to higher waste collection costs and lower income. Regionalization of waste collection services might prove beneficial in reducing collection costs per unit.

3. The inclusion of assets depreciation in municipal budgeting, the provision of funds for cell and landfill closures, the use of funds from a landfill tax in order fund municipal and regional waste treatment facilities are each important steps to ensure the sustainability of WM services.

4. The end of cross-subsidization of waste management charges and the introduction of a new basis for waste management charges will create problems with the collection of sufficient revenue to support services during the transition period.

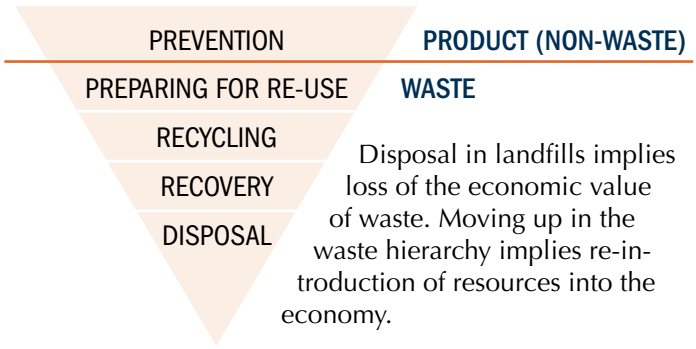
EUROPEAN UNION CASE STUDY

Introduction

The protection of the environment has been a leading principle of the EU; in fact, its first Strategic Policy Document (1973) stated: "Economic development, prosperity and protection of the environment are mutually interdependent." Since that declaration, the European Commission (EC) has developed several Environmental Action Plans (EAPs) with the result that European policy has evolved from "hot spot management" to a "holistic and integrated approach." The EU experience with environmental protection demonstrates that policy development has to be closely coordinated with the member states and that overly ambitious plans might meet serious resistance from individual member states. A key example of this came about under the 5th EAP (1992-1999), wherein the Commission proposed to introduce a Community tax on energy consumption and CO2 emissions. This ambitious proposal had to be devolved to action at the Community level to action at the national level. Starting in the mid-1990s the policy changed to developing and implementing target-oriented initiatives where the responsibility to achieve the targets was placed with each member state. Coincidentally, EU member states were also becoming active in the development of legislation due to increasing complaints by both national industries and NGOs.

The EU's first Waste Framework Directive (WFD) was published in 1975 and introduced the "polluter pays" principle. It also outlined the responsibility of member states towards prevention, recycling, and processing of waste to energy. It was revised in 1991 and again in 2008 when the overarching "waste hierarchy" principle was adopted (see Figure 1 below) with the aim of turning the EU into a recycling society. In addition to the WFD, the Packaging Waste Directive (1999) and the Landfill Directive (1994), additional target-oriented directives came into force after 2000, such as directives on Waste Electrical & Electronic

Figure 1: Waste Management Hierarchy



Source: http://ec.europa.eu/environment/waste/framework/

Equipment (WEEE), batteries, and End of Life Vehicles (ELV). 2015 brought new proposals to increase the targets further.

All member states have to implement the EU policies although extensions of time can be negotiated due to necessary institutional changes as well as financial requirements. Achieving the targets is the responsibility of each member state; various instruments can be introduced such as a ban or tax on landfilling, a tax on incineration, a deposit refund system, an eco tax on non-recyclables, VAT tax rebates on recycling, a weight base fee, legislation on Extended Producer Responsibility (EPR), or a requirement for pre-treatment of waste before landfilling. As a result, the costs for Solid Waste Management have increased, although they vary widely between the individual member states and between the municipalities within member states depending on the technologies and methodologies utilized for achieving the targets. In 2015, the "Circular Economy Action Plan" was adopted by the EC setting out legislative proposals to reduce landfilling further and to increase recycling. The objective is to reach targets of 65% of Municipal Waste (MSW) recycling, 75% packaging waste recycling, landfilling reduction to 10% of the waste flow—all by 2030—and a ban on landfilling of separated waste.

1. General MSW data

The population of the countries of the current EU-28 increased from 407 million in 1960 to 510 million in 2016 or an average of 0.45% per year.[1] During the period 2000-2014 when 13 states joined the EU, the population of the current EU-28 country es increased from 487 million to 507 million or at an average of 1% per year. Approximately 22% of the current EU-28 population lives in rural areas, while 43% lives in densely populated cities and 35% in towns and suburbs.[2]

Data on municipal waste generation and treatment for the period 1995-2014 show an increase in waste generation from 1995-2000, but thereafter a declining rate (Figure 2). In 1995, the waste generation rate was 473kg annually per capita and in 2000 it reached 523kg annually per capita, but by 2014 it decreased to 475kg annually per capita.

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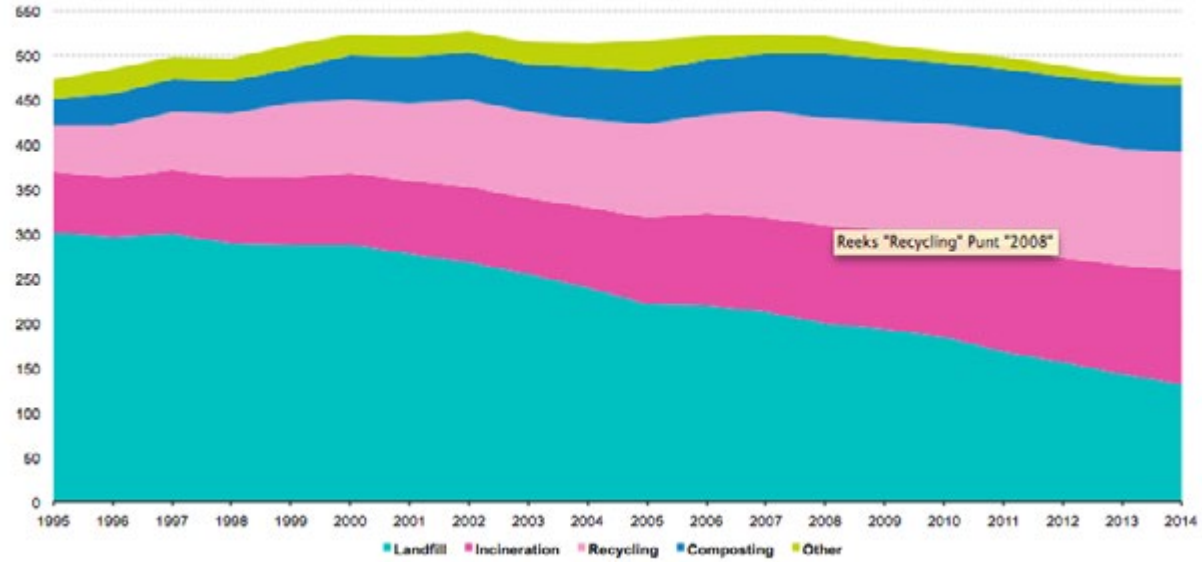
1 In 1960, the European Economic Community consisted of only six countries; others joined after 1973. Croatia, joining in 2013, is the most recent member state of what is now the European Union.

2 Population data drawn from Eurostat Population Statistics.

Figure 2: Municipal waste treatment, EU-27, (kg per capita)



Source: Based on data from Eurostat Municipal Waste Statistics website.

The municipal waste generation rate is related to economic well-being. Table 1 highlights data from a selected number of EU countries (North, East, South) concerning Gross National Income (GNI) and waste generation between 2007 and 2015. It could be observed that (i) there is a distinct relation between the GNI/capita and the waste generation rate/capita showing that one per cent increase in GNI would result in 0.3-0.4 per cent increase in waste generation (2007 and 2015 figures, respectively) and (ii) that waste generation decreased over the period 2007-2015 at varying rates, i.e., at an average of 3% in the highest income countries and 10% in other member states.

Table 1: Relationship between GNI and waste generation rate (in kg per capita annually)

	2007		2015	
Country	GNI (USD)/cap[1]	Waste Kg/cap/year[2]	GNI (USD)/cap[1]	Waste Kg/cap/year[2]
Germany	40,700	582	45,790	625
Austria	44,200	597	47,120	560
Netherlands	49,390	606	48,940	523
Denmark	55,700	790	58,590	789
Average	**47,498**	**644**	**50,110**	**624**
Portugal	20,770	457	20,530	453
Greece	26,350	412	21,090	457
Spain	29,920	653	28,520	434
Italy	35,800	509	32,790	486
Average	**28,210**	**508**	**25,732**	**457**
Romania	6,520	355	9,500	249
Poland	9,940	320	13,370	286
Hungary	11,810	446	12,990	377
Slovakia	14,870	254	17,310	329
Average	**10,785**	**344**	**13,293**	**310**

Sources: Based on data from [1]www.data.world bank.org; [2]Eurostat Municipal Waste Statistics

Waste composition for the same countries is shown in Table 2 and indicates an average organic waste content between 32-38%; paper and cardboard content between 18-23%; plastics content between 3-10%; glass content between 6-9%; and average metals content of 3.5%. The average of total dry recyclables content is 38% for northern EU countries, 31% for eastern EU countries, and 43% for southern EU countries.

Table 2: Waste composition in selected EU countries (% of total MSW)

Country	MSW/yr 10□ tonnes	Organic	Paper/ cardboard	Plastics	Glass	Metals	Rest
Germany	49.1	29.9	16.0	5.4	9.2	3.2	36.3
Neth.	8.22	42.0	34.4	5.8	10.0	2.6	6.2
Sweden	3.81	40.0	37.0	7.0	2.6	3.5	8.9
Austria	4.85	29.2	24.0	8.2	9.4	7.2	22.0
Average		**32**	**20**	**5.7**	**8.9**	**3.4**	**30.0**
Portugal	3.80	37.0	26.0	10.0	6.0	2.0	19.0
Spain	17.20	44.1	22.2	10.6	6.9	4.1	12.4
Italy	26.90	33.6	22.8	10.3	7.2	3.0	23.0
Greece	3.90	47	20.0	4.5	4.5	4.5	19.5
Average		**38**	**22.6**	**9.9**	**6.8**	**3.4**	**18.9**
Poland	11.80	31.7	18.6	3.7	7.5	3.5	36.0
Slovakia	1.02	32.3	14.9	9.7	5.3	6.6	31.4
Hungary	4.30	37.5	16.8	5.2	3.8	3.6	33.1
Average		**33**	**18.0**	**3.25**	**6.4**	**3.7**	**34.0**

Source: EEA, *Managing biodegradable municipal waste in EU* (2000)

Substantial improvements were achieved in waste treatment rates especially after 2000. This could be attributed to the introduction of Directives with targets for separation and recycling combined with the introduction of economic instruments supporting these policy objectives. During the period 2000-2014, landfilling decreased from 57% to 28%, incineration increased from 16% to 28%, composting increased from 10% to 16%, and recycling increased from 17% to 28% in the EU-27.

Eurostat, a specialized Agency established in 1959 for the regular collection of statistical information from member states, plays an important role in this area. Member states are legally obligated to report to Eurostat under the 2002 Waste Statistics Regulation on implementation of legislation and target achievements by the member states. Member States have various reporting obligations concerning implementation of waste legislation. Two main types of reports include:

Reporting on targets: annual (or bi-annual) reporting on the achievement of various targets for waste collection, re-use, recycling, and/or recovery. These reports cover waste streams such as packaging waste, electrical and electronic equipment waste, end-of-life vehicle waste, waste batteries and accumulators, household and similar waste, and construction and demolition waste.

Implementation reports: these thrice-yearly reports are based on questionnaires established for Commission Decisions made in close consultation with the Member States. They cover the main aspects of implementation of waste legislation.

However, the figures published by Eurostat about waste generation, collection, and treatment should be viewed with some caution due to uncertainties about the comparability of the data. Some member states include estimates for areas not covered by waste collection; and some member states define waste fractions differently in their definition of Municipal Solid Waste.

2. Legislation

EU member states' legislation on the environment derives from policy laid down in Environmental Action Plans (EAP) issued beginning in 1973. The 7th EAP came into force in 2014 and sets overall policy to 2020 with the main objective "to turn the Union into a resource-efficient, green, and competitive low carbon economy." The 5th EAP, which covered the period 1992-1995, was not successful in that it faced strong objections by member states (especially the UK and Germany). The Commission was seen has having developed overly ambitious plans without the full support of member states, especially concerning the introduction of "economic instruments" like the ta on fossil energy use and the use of CO2 emission levels as an incentive to use alternative energy systems. Member states feared that 5th EAP initiatives would have a negative impact on industrial development. Since that EAP, the focus has shifted to developing environmental legislation that provides flexibility to the member states to determine what instruments to use and involves obtaining the consensus of the industries. It has consisted of a target setting process while decisions and tasks as to how to achieve the targets are left to the member states. The EU experience shows that the development of environmental protection is a dynamic and gradual process involving occasional miss-steps, necessitating close deliberations with all member states, requiring substantial time, and moving from applying "hot-spot" measures to a "holistic and integrated" approach. The target setting process started with the Packaging Directive in 1994, followed by the Landfill Directive in 1999, after which came several Directives focusing on waste fractions such as WFD, WEEE, ELV, batteries, etc. There are in total six Directives with target indicators. The current EU waste legislation with recovery/recycling targets for SWM is summarized in the following Table 3.

Table 3: Summary of EU legislation on SWM

Name	Targets (by weight)
Waste Framework Directive (WFD) 2008/98/EC	By 2020: 50% of MSW generated will be re-used/recycled Legislative proposal: by 2030, 65% of MSW will be re-used/recycled
Landfill Directive 1999/31/EC	By 2016: reduction of biodegradable waste to 35% of 1995 amount Legislative proposal: by 2025, Landfilling rate of max. 25% of MSW generated; by 2030, Landfilling rate of max. 10% of MSW generated
Packaging and packaging waste Directive 94/62/EC	By 2020: min. 60% to be recovered and 55-80% to be recycled Legislative proposal: by 2025: 65% re-use/recycling of total produced; by 2030: 75% re-use/recycling of total produced
WEEE Directive 2012/19/EC	By 2019, separate collection of 65% of weight put on market in preceding three years with a minimum of 4kg/capita/year
Waste batteries and accumulators Directive 2006/66/EC	By 2016, collection of minimum 45% by weight put on the market that year
ELV Directive 2000/53/EC	By 2015, collection of ELV's with minimum 95% recoverable and 85% recyclable material

The actual performance of the member states in achieving the recovery targets for the year 2014 is shown in Table 4 below, while the overall results for landfilling and composting are highlighted later as Figure 4 in Chapter 5.

Table 4: Actual achievements of recovery targets in EU member states (2014)
Shaded cells indicate values below target values.

Member state	Packaging (%)	ELV (%)	WEEE (kg/cap)	Batteries (%)
Austria	96.2	96.1	9.0	73
Belgium	99.2	94.2	9.9	53
Bulgaria	62.2	95.0	5.7	42
Czech Rep	78.6	86.3	5.2	35
Denmark	89.5	86.1	12.3	42
Germany	97.8	101.4	7.6	45
Estonia	82.0	88.4	3.6	42
Ireland	88.1	90.7	8.1	29
Greece	52.8	85.6	4.0	---
Spain	75.0	93.5	4.3	----
France	74.5	91.3	7.4	39
Italy	76.4	85.1	3.5	---
Cyprus	56.6	90.2	2.6	---
Latvia	58.4	92.4	2.4	26
Lithuania	57.9	94.4	7.2	44
Luxembourg	96.1	95.0	9.8	62
Hungary	59.7	95.6	5.1	41
Netherlands	93.9	96.0	7.9	44
Malta	41.3	---	2.9	---
Poland	60.0	88.0	3.7	37
Romania	57.4	88.5	1.5	---
Slovenia	88.1	---	4.1	37
Slovakia	68.0	96.0	3.9	51
Portugal	64.1	92.7	5.8	34
Finland	98.3	97.3	11.1	45
UK	64.1	90.7	7.9	--
Sweden	77.9	91.3	13.6	60

Source: Based on data from Eurostat Municipal Waste Statistics website.

For the purpose of member state annual reporting, Eurostat defines 'municipal waste' as "mainly produced by households, though similar wastes from sources such as commerce, offices and public institutions are included. The amount of municipal waste generated consists of waste collected by or on behalf of municipal authorities and disposed of through the waste management system." However, the definition also includes waste from the same sources and other waste similar in nature and composition that is "collected directly by the private sector (business or private non-profit institutions) not on behalf of municipalities (mainly separate collection for recovery purposes)." According to the OECD/Eurostat Joint Questionnaire, *municipal waste* includes the following types of materials: paper, paperboard and paper products, plastics, glass, metals, food and garden waste, and textiles. The definition also includes (i) bulky waste (e.g., white goods, old furniture, mattresses) and (ii) garden waste, leaves, grass clippings, street sweepings, the content of litter containers, and market cleansing waste, if these are managed as waste. This definition excludes waste from sewage network and treatment systems as well as municipal construction and demolition (C&D) waste. However, municipalities may accept and count small quantities of C&D waste resulting from house renovation work.

As a condition of membership, EU legislation is superior to all national legislation. EU legislation can be divided into (i) Regulations, which are binding legislative acts and must be applied in their entirety in all member states; (ii) Directives, which are binding legislative acts setting out a goal that must be achieved but where member states may determine how to implement the goal in national law; (iii) Decisions, which are binding and addressed to a limited and defined group of persons such as a member state or a corporation; (iv) Recommendations, which are not binding.

The cornerstone of EU policy is the Waste Framework Directive, which establishes basic concepts, definitions, and waste management principles such as the waste hierarchy setting waste treatment options in order of priority as (i) prevention; (ii) re-use; (iii) recycling; (iv) incineration; and lastly, (v) landfilling. Moreover, the Waste Framework Directive sets overall waste recovery targets such as a 50% recycling rate for all municipal waste by 2020. The Directive also codifies key guidance and principles like the "Polluter Pays Principle,"[3] the "Extended Producer Responsibility Principle,"[4] and the requirement for member states to prepare Waste Management Plans.[5]

The Extended Producer Responsibility (EPR) system is key to the success of recovery and recycling. Under EPR, the business community is responsible for implementation under the supervision of the government as laid out in relevant national legislation. The individual importer/producer/packer has a 'take back' obligation for a specific percentage of materials it has put out on the market. To facilitate this, the affected business community sets up a "compliance scheme" or "Producer Responsibility Organization (PRO)" in order to achieve the targets as a sector; businesses pay an amount to the scheme based on quantity and type of material produced. The "compliance scheme" in the EU

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3 This principle holds that the party producing the pollution should bear the full cost of managing it to prevent damage to human health and the environment.

4 Upon putting specified products on the market for the first time, importers/producers/fillers/packers are required to take back, recycle and provide final disposal of a legally-specified percentage of these products.

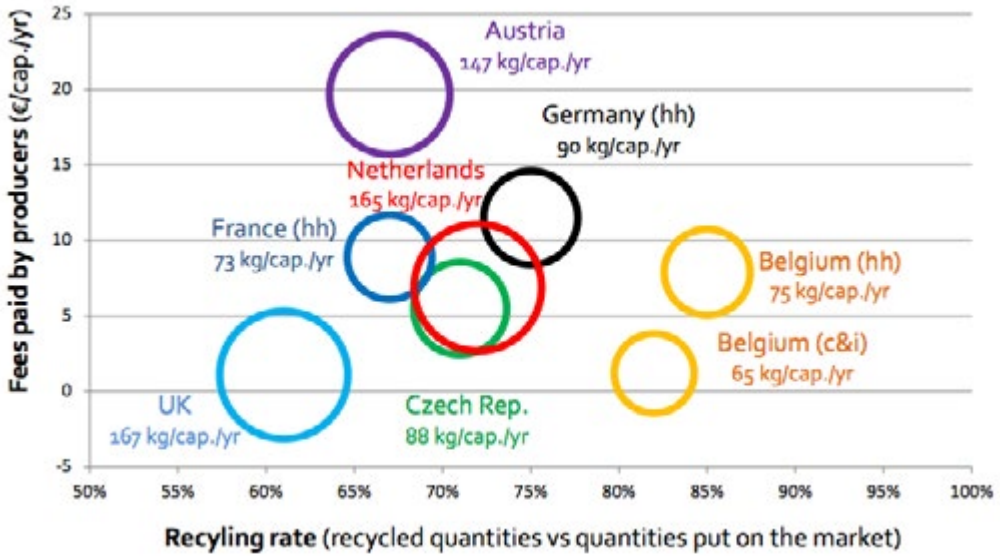
5 Competent Authorities in each member state should draw up a WMP, in accordance with relevant EU Directives, as a planning document. The Waste Framework Directive specifies the content of such SWMPs.

member states is managed by the private sector which may (i) conclude contracts with municipalities/collectors/recyclers; (ii) set up a separate collection and recycling system (e.g., parallel system in Germany); and/or (iii) introduce a deposit system. In addition to the Directives mentioned above, member states may introduce producer responsibility legislation for other waste fractions such as used tires, used oils, etc.

PRO's are structured differently across the EU's member states to include (i) solely financial responsibility (e.g., financing of recovery notes in the UK); (ii) financial responsibility through contracts with municipalities (most member states); (iii) financial responsibility and partial organizational responsibility (e.g., Fost Plus in Belgium); and (iv) financial responsibility and full organizational responsibility (e.g., DSD in Germany).

The PRO's may operate without a profit objective (e.g., Belgium, Czech Republic, Netherlands, France) or with a profit objective (e.g., Austria, Germany, UK). In all cases, the national authorities are in charge of controlling the PRO's. Producer costs and recovery results of some PRO's are indicated in Figure 3 below.

Figure 3: Relationship between PRO recycling costs and results



Source: EC-DG Environment, *Development of Guidance on Extended Producer Responsibility* (2014)

3. Institutional framework

According to the Constitutional Treaties (Rome 1958/Maastricht 1993), the institutional framework for waste management comprises the following bodies: (i) European Parliament; (ii) European Council; (iii) Council of Ministers; (iv) European Commission; (v) Court of Justice; (vi) European Central Bank; and (vii) Court of Auditors.

The Commission consists of several Directorate Generals (DG), including DG Environment, covering different policy areas. Laws and policies are drafted by DG Environment and discussed and approved by the Council of Ministers. Implementation of EU laws in national legislation is the responsibility of the member states. The Commission oversees the application of EU laws by member states through a system of monitoring and

reporting, which may include agencies such as Eurostat, the Joint Research Centre, and European Environment Agency (EEA). In case of non-compliance, the Commission may take action, including referral of the case to the Court of Justice for a ruling. Recently, Greece has been ordered to pay the lump sum of Euro 10 million plus Euro 30,000 for every day Greece does not address its continuous breach of several EU Directives (mainly the landfill Directive and hazardous waste Directive).

A typical institutional structure at the national level consists of (i) a Ministry of Environment, Housing, and Spatial Planning responsible for policy, legislation, and preparation of a National Waste Plan containing strategic objectives and (ii) several autonomous Agencies, including an "Environmental Agency," for daily execution of Ministerial tasks with specialised offices being responsible for reporting, data management, control and enforcement, issuing permits and licenses, etc. Normally, the Agency has several representative offices at the regional level. The regions might also have their own Regional Waste Plan. Municipalities, and in some cases Regions, are responsible for implementation of MSWM tasks.[6] The Regions and the Municipalities are obliged to prepare multi-year Regional/Local Waste Plans with their strategies and objectives. In addition, the municipalities have to prepare annual Action Plans for investments and their effect on user fees. If not limited by specific articles in the law, the Municipalities/Regions in the member states have considerable freedom to issue local legislation and introduce institutional arrangements, fee setting, and control and enforcement. The Municipality/Region will issue a By-Law (Regulation or Ordinance) indicating the tasks and responsibilities of municipal, household and CII (commercial/institutional/industrial) entities, waste collection frequency, applicable fees, collection of fees, etc. This By-Law serves as the legal basis for operations at the local level, such as delivery of the waste to a defined collection company, ownership of the waste, obligation to pay, a penalty clause for non-compliance, and obligation to separate.

In considering institutional arrangements for local waste management, the typical structure of an EU municipality comprises (i) a mayor who is elected every 4-5 years or appointed; (ii) a Municipal Council elected every 4-5 years which, together with the mayor, forms the local legislative body responsible for policy development and implementation; (iii) Executive Committees appointed by the Council that are responsible, for example, for tasks in education/culture, technical and environmental services, financial affairs, and social affairs; and (iv) autonomous operational organisations for rendering public services such as waste collection, although these services may be outsourced to third parties with the municipality maintaining responsibility.

The predominant practise in most member states is that municipalities collect fees from households and pay the (public/private) waste collector, while CII entities have the possibility to contract a publicly- or privately-licensed waste collector. Waste collection from households is organized on the basis of geographic areas per Municipal Regulation, while waste collection from CII entities is on the basis of individual contracts with

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[6] The important role of the municipalities and the regions is highlighted by the following statement in EEA report No2/2013: "In most of the countries where regional recycling data were available, there was substantial variation between different regions, indicating that regional and local policies have a significant influence on municipal waste recycling rates. While EU targets and national targets are the overall drivers of better municipal waste management, regional and local implementation is crucial for achieving positive results."

clients throughout the municipalities. Any sub-contracting by the municipality to private companies is based on a tender procedure.

An Association of Municipalities often plays an important role in coordinating the individual interests of municipalities and acting as a representative partner towards third parties such as the national government. Through this Association, the experience of individual municipalities can be disseminated to other municipalities, advisory services can be provided, inter-municipal cooperation can be initiated, and operational documents can be developed, among other benefits.

The EU promotes the role of the private sector in MSWM by combining EU funds with public-private partnerships (PPPs) through the European Investment Bank (EIB). The involvement can be through (i) a service contract, which is mainly used for short periods; (ii) a concession which is normally used for long periods; or (iii) a joint venture between a public and a private entity. The PPP can be in the field of collection, landfilling, incineration, or recycling. There are approximately 16 large, multinational waste management operators in the EU. If a public organization would like to sub-contract certain services, it should follow the EU's tendering procedures for "public services." However, these procedures are not required if the following three criteria are fulfilled: (i) the public authority intends to exercise control over the undertaking; (ii) at least 80% of the activities of the undertaking will be undertaken for the controlling authority; and (iii) there is no direct participation in the capital of the controlled undertaking by the sub-contractor.[7] Nevertheless, private companies have complained about the cumbersome EU tender application process.

4. Public outreach

The development of EU policy and legislation is a process done in close consultation with member states. EU member state entities publish information on their websites and stakeholders may consult this information and respond to it. Stakeholders might include NGOs, associations of interested groups, private companies, and civil society. The EU itself does not carry out public outreach programmes to citizens, as this is the responsibility of member states. However, DG Environment may provide funding for projects and activities supporting and promoting EU policies, and public outreach activities may be part of projects funded by the EU.

In order to provide maximum transparency, the EU publishes statistical information, studies and reports on waste management issues on its websites, therefore making it universally accessible. The EU has regularly carried out studies on the implementation and achievement of their policies. In addition, the EU publishes proposals on future developments, e.g., "Circular Economy Action Plan," which themselves may containing various proposed initiatives, such as the establishment of a platform to find financing solutions for Circular Economy projects. Third parties can then react to such proposals. The EU may also organize conferences on specific subjects for stakeholders.

Communication is an important aspect of SWM in EU member states in order to ensure the participation of waste generators for successful SWM. The communications are not

[7] European PPP Expertise Centre of the European Investment Bank (EIB).

a "one time event," but a continuous process of engagement to keep the population informed. These activities can include TV spots, letters mailed by municipalities to inhabitants, posters, articles in newspapers, special courses at schools, and public hearings. Depending on the subject, the communications process may involve the national government, the municipality, or the waste collection organization. The municipality or the waste collection company normally carries out public awareness programmes. Toward this end, the entity may employ specialised staff and an annual budget may be made available. EPR Compliance Schemes and industries may be involved in such activities as they have a direct interest in achieving the legal targets for waste recovery. They may also direct finance public awareness campaigns. As both the public and private sector as have an interest in EPR implementation, they are inclined to cooperate closely.

Awareness raising not only involves educating waste generators (households and CII entities), but also educating elected officials, as well as staff and workers at disposal sites, recycling plants, and transport companies, among others. Regular capacity building of such personnel is needed. Fundamentally, such awareness raising activities should be supported by a relevant operational system.

5. Operations

Although EU Directives are a driving force in SWM (for example, in prioritizing reduction of landfilled waste and increasing targets for recovery and recycling), the actual achievements in SWM are a result of a combination of several factors at the national level. These include national legislation; control and enforcement; the instruments used (e.g., landfill bans on biodegradable waste and on non-pre-treated waste, mandatory separate collection of solid waste fractions, taxation on landfilling, pay-as-you-throw); resources to support shifting priorities in the waste hierarchy; the quality of SWM services; public awareness raising activities; and institutional and organizational capacity at the regional or municipal level. To reduce the costs of shifting priorities in the waste hierarchy, neighbouring municipalities are increasingly cooperating in waste collection and disposal, especially among small municipalities, to create regional systems in order to become more efficient.

Collection of residual waste from households in member states includes in general kerbside collection, a 'bring system,' or a combination thereof covering a certain geographical area. Kerbside collection involves the use of small containers (120/240 litres) placed at residential houses for door-to-door collection or the use of bags especially for apartment buildings, while the 'bring system' includes large communal containers (1,100 litres) placed within walking distance on the street. There is a tendency in some EU member states, especially in urban areas, to replace the door-to-door collection system with a bring system that uses underground containers. The frequency of collection of waste, as stipulated by local Municipal Regulation, can vary between five times per week to once every two weeks. In most member states, residual waste collection from households is mainly carried out by private organization,[8] as municipalities prefer to sub-contract the waste collection services to the private sector—governments led by liberal parties tend to involve the private sector, whereas those led by socialist parties to tend to favour public services.

[8] Rate of private collection of home residual waste is 60%. See website of European Federation of Waste Management and Environmental Services (FEAD).

Collection of municipal waste from CII entities is normally carried out by using containers of different sizes (120/240 litres, 1,100 litres, press containers, large skips, etc.) that are provided to the entity depending on the waste quantity generated and its type. Details of costs, waste delivery conditions, frequency of collection, etc., are laid down in a contract between the collector (public or private) and the entity. In most member states, the waste collection from the CII sector is predominantly carried out by the private sector.[9]

Figure 4: Collection systems for separated fractions in EU states

<table>
<tr><th>Collection type</th><th>Paper</th><th>Glass</th><th>Plastic</th><th>Metal</th><th>Bio-waste</th></tr>
<tr><td>Door-to-door (single fraction)</td><td>AT, BE, BG, CY, DE, DK, FI, HU, IT, LU, LV, NL, SI, UK</td><td>BG, FI, LU, LV, NL, SI, MT</td><td>AT, LV, NL, DK</td><td>FI, NL, DK</td><td>AT, BE, CZ, DE, FI, EE, IT, HU, LU, NL, SI, SE, IE, UK</td></tr>
<tr><td>Co-mingled ...plastic + metal</td><td></td><td></td><td colspan="2">BE, BG, CY, DE, FR, IT, HU, LU, SI</td><td></td></tr>
<tr><td>...3 fractions</td><td colspan="4">RO, MT: paper, plastic, metal
UK: plastic, metal, glass</td><td></td></tr>
<tr><td>...all in one bin</td><td colspan="4">EL, IE: paper, glass, plastic, metal</td><td></td></tr>
<tr><td rowspan="2">Bring points</td><td rowspan="2">CZ, EE, ES, FR, HR, LT, PT, PL, SE, SK</td><td rowspan="2">AT, BE, DK, CY, CZ, DE, EE, ES, FR, HR, IT, HU, LT, PT, PL, RO, SE, SK</td><td>SE</td><td>AT, EE, SE</td><td rowspan="2">ES</td></tr>
<tr><td colspan="2">ES, HR, LT, PT, PL
(all plastic/metal in one container)</td></tr>
<tr><td>Civic amenity sites</td><td colspan="5">Primary collection: CZ (metal waste), SK (metal and bio-waste), LV (metal)
Addition collection of all waste streams: all countries
PL: rare distribution of civic amenity sites</td></tr>
</table>

Source: EC-BiPRO, *Assessment of separate collection schemes in the 28 capitals of the EU* (2015)

Final disposal of municipal residual waste is by means of landfilling or incineration. In eight member states, incineration is the principal system while in the remaining 19 states landfilling is the primary system (see Figure 5 below). Private companies or public/private partnerships generally own incinerators, while landfills are pre-dominantly owned by the public sector. As incinerators and (regional) landfills may be located at considerable distances from collection areas, special transport systems are often used such as transfer stations and high compression containers to reduce the transport costs.

Separation of organic waste as required by the EU's Landfill Directive may be carried out at source or from mixed (residual) waste. Separation at source by households is done

[9] Rate of private collection from CII entities is 75%. See website of European Federation of Waste Management and Environmental Services (FEAD).

generally using containers for garden waste (120/240 litres) and by kerbside collection. However, some member states use compostable paper/plastic bags. Kitchen waste separation is problematic given its inherent impurities against the need to meet the required compost quality. Collection is mainly done by public companies. Separation of organic waste from mixed waste by means of a mechanical biological treatment (MBT) results in "dirty compost" relative to compost requirements and therefore is mostly landfilled.

Collection of dry-recyclables separated at source can be as a single fraction or commingled (mostly excluding paper and glass) by providing containers or using special bags. Collection is by the municipality or by partly independent management systems financed and managed by Compliance Schemes under the EPR legislation such as Fost Plus[10] in Belgium and DSD[11] in Germany. Separation at source with door-to-door collection results in higher quality fractions, while bring systems with drop-off points results in a larger percentage of impurities.

Collection of bulk waste is upon the producer's request or by the producer bringing it to a "civic amenity site" in the municipality where other waste fractions may also be disposed of such as small hazardous waste components, WEEE, C&D waste, metals, and tyres.

Recycling of separated fractions is mostly carried out by the private sector utilizing various technologies for organic waste such as composting/anaerobic digestion and dismantling/processing of WEEE, batteries, tyres, packaging waste, ELVs, C&D waste, and production of Refuse-Derived Fuel (RDF) by MBT plants for (co-) incineration. The RDF market in EU member states is comprised mainly of "waste to energy" (WtE) plants whereby countries (e.g., Sweden, Netherlands, Germany) incinerate high calorific imported waste. RDF is mainly obtained from UK sources due to high landfill disposal costs and lack of WtE treatment capacity there. The recipient countries have extra demand for RDF due to spare WtE incineration capacity as a result of recycling and the decrease in waste generation, as well as the tax imposed on the use of fossils fuel in power plants. Starting in 2011 with 300,000 tonnes exported, this market-drive trade reached 3.3 million tonnes in 2015. However, separating high calorific fractions at source, especially paper and plastics, reduces the potential calorific value of RDF pallets.

Figure 5 below presents a graphic summary of EU member states' treatment of municipal waste highlighting the fact that only a few states are complying with the targets for recycling as laid down in the WFD.

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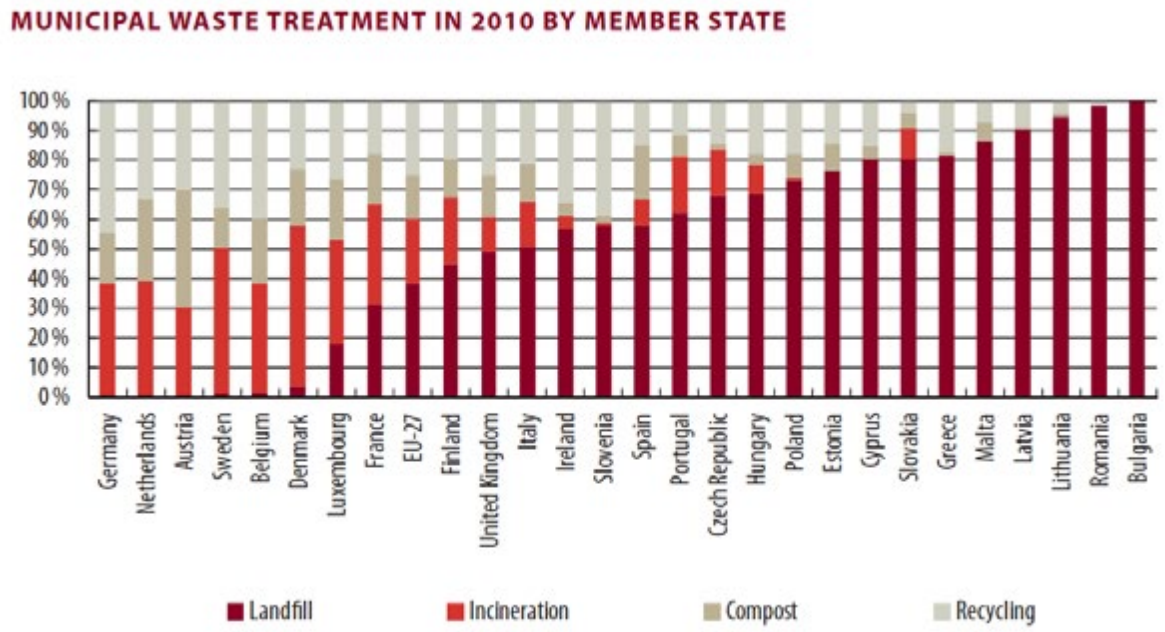
[10] Fost Plus is the national EPR Scheme in Belgium for collection and recycling of household packaging waste.

[11] DSD—Duales System Deutschland—is the largest private company in Germany organizing collection, sorting and recycling of packaging waste and WEEE. DSD operates parallel to municipal waste management systems.

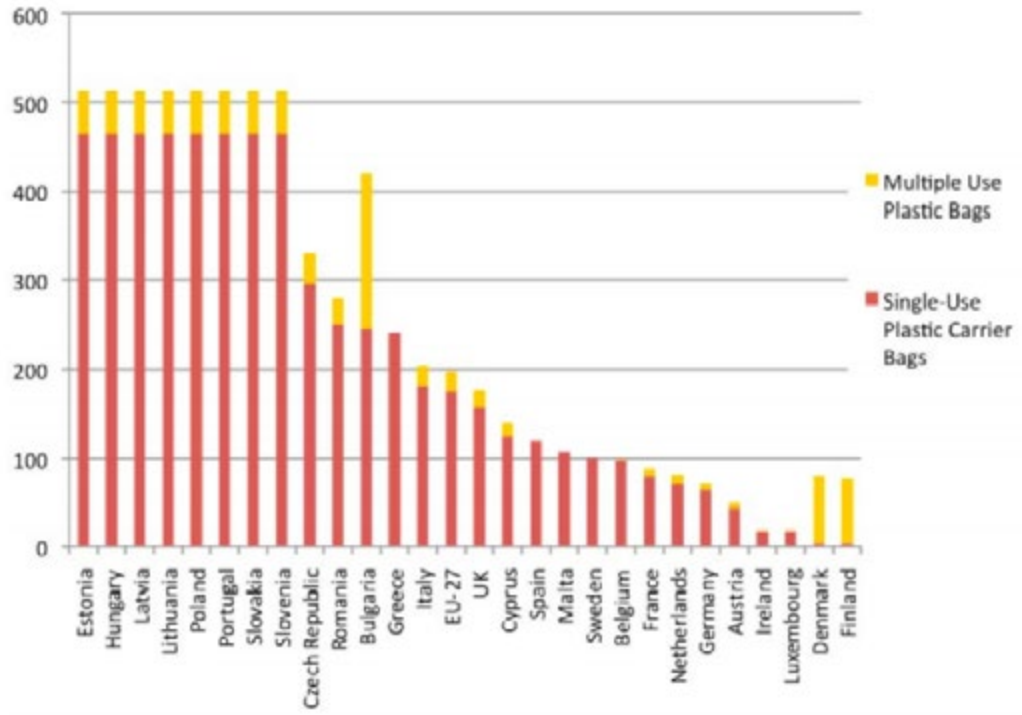
Figure 5[12]



In 2015, the European Parliament passed a law to drastically reduce the use of single-use, lightweight plastic bags from 200/capita/year (see Figure 6) to (i) 90 bags/capita/year by the end of 2019 and 40 bags/capita/year by the end of 2025, or (ii) ensure that by the end of 2018 bags are no longer provided free of charge to shoppers. Some member states have already introduced a compulsory charge for single-use bags (e.g., Netherlands) or have adopted a national ban (e.g., France).

[12] Data in this figure derived from Eurostat Waste Statistics at http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics

Figure 6: Plastic bags used per capita in EU member states (2014)



Source: Data drawn from www.euractiv.com

6. Financing

Implementation of the Waste Directives (improving the waste hierarchy, achieving targets) requires a technical and institutional re-structuring of the waste management sector that inevitably leads to extra investments and higher operational costs for the member states. These costs must be carried by the waste generator based on the Waste Framework Directive's principle of "polluter pays"—for municipal solid waste these are households and CII entities. The fees paid by the waste generators vary considerably between the member states, but also between municipalities within the states. *Fees for households* are based on a wide variety of calculation methodologies such as (i) a fixed fee/year based on the number of persons in the household; (ii) a variable fee based on "pay as you throw" based on the number of plastic bags at a specified capacity;[13] (iii) a variable fee based on the size of a container and the number of pick-ups per year; (iv) a combination of a fee set for a certain waste amount and a fee that can vary by waste amount based on size of container; (v) size of house/apartment in m^2; (vi) a fixed annual fee and extra payment for certain services such as bulky waste collection, delivery at civic amenities, etc.; (vii) a fixed fee for residual waste with free collection or against payment of separated fractions (organic, paper). An analysis of fees paid in the various member states shows that the fee is close to 1-1.5% of the average household income (see Table 5 below). It is problematic to compare fees across member states in view of the great differences in services. However, the amount of the annual tariff reflects the level of WM technology and services available in each country.

[13] Citizens may buy bags of different volumes (litres), but pay for waste disposal based on the bag size.

Table 5: Net household annual income and WM fees in selected EU states (2015)

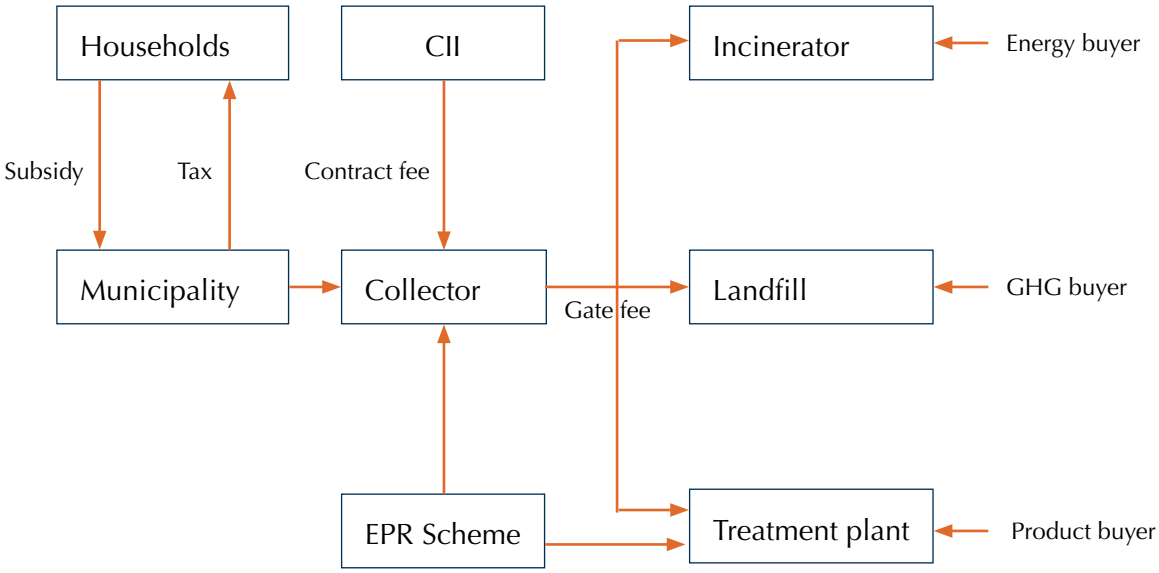
Country	Population (million)	Average income (Euro/year)[2]	Average fee[1] (Euro/year)
Germany	81.9	37,065	330-370
Netherlands	16.8	37,536	330
Denmark	5.6	40,626	House: 338-455 Apartment: 220-286
Austria	8.5	34,197	220-475
Average		37,095	**350**
Portugal	10.7	14,819	
Spain	46.1	22,589	60-135
Italy	61.2	24,835	320
Greece	11.3	17,223	170
Average		22,540	**225**
Poland	38.5	9,764	
Slovakia	5.4	9,970	125
Hungary	9.9	8,506	
Romania	19.2	6,007	70-120
Average		8,620	

[1] Fee is based on 1 pick up per week of 240-litre container as derived from municipal websites and consultant's information.
[2] Source: Based on Eurostat Population Statistics for one family with one earner and two children.

The fees for the CII sector include full cost recovery, profit margin, and VAT. Fee per year are based on actual quantities, size of container, and number of pick-ups per year. In some cases, the fee is negotiated between the collector and the waste generator.

Besides the fees, additional income may be generated from energy production, sales of separated/recycled products (RDF, paper, plastics, compost, etc.), and from EPR payments. A general scheme is shown in Figure 7 below. In addition to the regular payments for operations, member state governments may provide subsidies for innovative projects, start up of new activities, and so on. Normally, municipalities will also subsidize low-income households. The EU may provide further financing for municipalities for innovative projects that support EU policies.

Figure 7: Payment flow scheme for MSWM



In most EU countries, municipalities collect fees without profit margin from the households as a tax (excluding VAT), while the municipality pays the waste collector on the basis of a contract. Fees for waste collection/treatment vary substantially between the member states as they depend on the type of services offered (door-to-door collection, bring system, use of containers or bags, landfilling or incineration, environmental taxes, etc.).

The costs for services for mixed waste vary between Euro 40-90 per tonne plus additional cost for any sorting, composting, incineration, landfilling, etc. (see Table 6 below). Costs are highly dependent on the mode of collection services, treatment technologies, and taxes applied; therefore, the amounts shown in Table 6 are only indicative and reflect an order of magnitude.

Table 6: Indicative average costs for SWM in the EU excluding revenues (Euro/tonne)

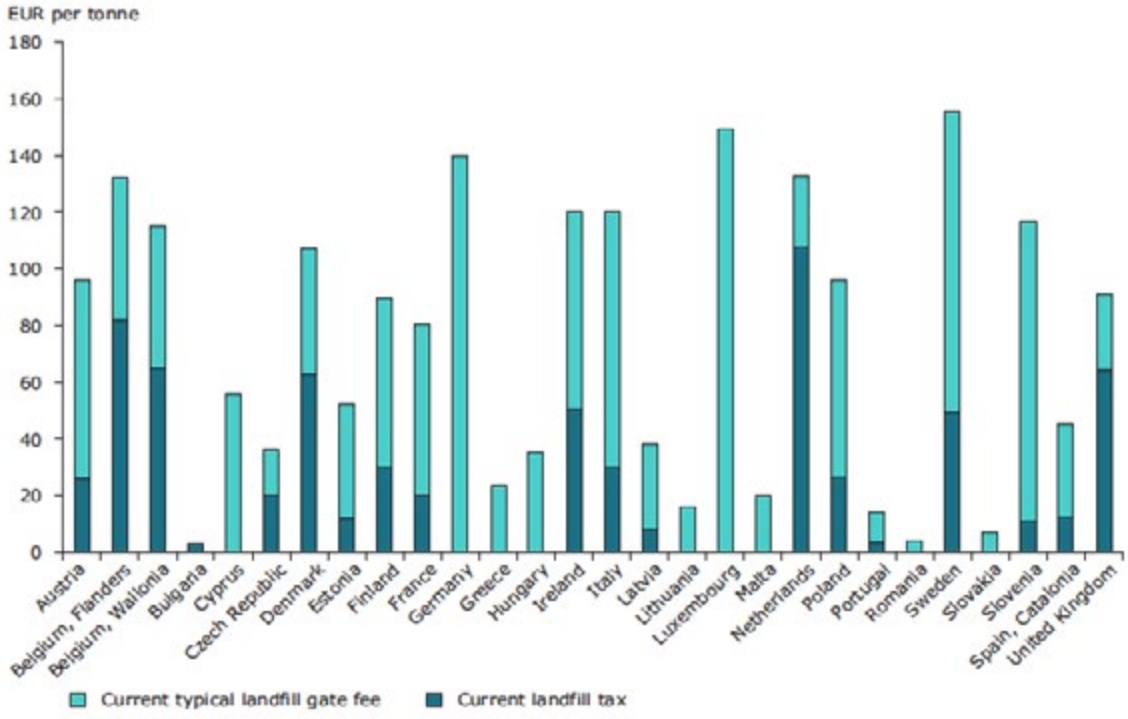
Action	Mixed residual waste	Packaging	Organic
Collection	40-90	100-150[1]	45-110
Landfill			
with tax without tax	See Figure 6		
Treatment plant			
sorting MBT composting Windrow anaerobic	60-90	65-250[2]	 20-60 80-110
Incineration			
with WtE without WtE	20-80 150-200		

Source: *Eunomia-costs for MSW in the EU*; [1] This rate is for co-mingled waste; [2] This range reflects the rates for handpicking to fully automated.

Figure 8 shows the landfill gate fees including taxes. 21 EU member states have introduced a landfill tax, while seven member states don't have such a tax. The average tax is Euro 80/tonne. The high landfill cost in Germany (approximately Euro 140/tonne) is a result of a political decision that as of 1 June 2005 only treated waste is allowed for landfill disposal. This action was a boost to the development of MBT technology. The cost of the MBT technology is approximately Euro 90/tonne; the gate fee for landfill operations is approximately Euro 25/tonne resulting in a total cost of Euro 115/tonne excluding VAT (or approximately Euro 140 including VAT).[14]

[14] This rate is a consultant's estimate drawn from analysis of website information.

Figure 8: Landfill gate fees



Note: Taxes and fees may have changed since the publication of the report in April 2012.

Source: Bio Intelligence Service, 2012.

In order to reduce the economic disparities between the "old" and "new" member states, the EU provides grants through the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) for investment in environmental projects. During 2000-2006, the EU provided Euro 41.1 billion of which approximately Euro 4.6 billion was for solid waste projects in 17 eligible countries; for the period 2007-2013, the amount allocated was Euro 40 billion of which approximately Euro 6.2 billion was for solid waste projects in 15 eligible countries, with 70% going to projects in all EU-12 (new member) states. For 2014-2020, the EU has earmarked Euro 63 billion for 15 eligible countries. ERDF/CF funds play an important role; they were on average 80% of total project costs for the EU-12 countries and 60% of total project costs for the EU15.[15]

In addition to ERDF/CF grants, member state entities may take a loan from the European Investment Bank (EIB) for co-financing or take individual loans. This approach is mainly undertaken by clients located in EU15 countries. The EIB sets the maximum amount for financing at 40% of the total project costs. During the period 1984-2000, the EIB concluded total loans up to Euro 2.4 billion for waste management projects, primarily involving incineration. From 2000-2012, the EIB provided loans of approximately Euro 4 billion for waste projects.[16]

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[15] This data is based on information drawn from the EC's InfoRegio website at http://ec.europa.eu/regional_policy/EN/funding/.

[16] EIB data drawn from http://www.eib.org/infocentre/publications/all/solid-waste-management-projects.htm?f=search&media=search.

7. Key points

The development of environmental legislation requires close consultation between all stakeholders in order to obtain their commitment and ensure their participation. In the case of the EU, this need was on display in the disputes between the Commission and the member states over the 5th EAP. It is now well understood that developing and passing environmental legislation needs to be a gradual, consultative, and inclusive process in which the public sector sponsoring the initiative reaches out to business owners, social groups, environmentalists, and the public-at-large.

A well-established institutional framework is required for achieving established targets, especially at the local level. Waste management is typically a local responsibility and a local service. The EU experience shows that successful waste management practises, i.e., achieving the targets, are a result of locally-planned and locally-managed operations.

Public awareness and cooperation are absolutely critical for achieving targets, especially in the field of waste separation at source and in recycling. Without strong support, buy-in, and participation of the general public, source separation is extremely difficult if not impossible. Budget allocations and dedicated staff for awareness-raising should be a part of the waste management system.

Financing is the key ingredient for waste management success. This is clearly demonstrated in the results achieved in the northern EU member states with high-income levels, and thus high fees, as compared to the achievements in low-income member states with low fees.

The polluter pays principle has been widely introduced throughout the EU. Subsidies are limited to support for certain socio-economic conditions and to support the introduction of new technologies and practises. Apart from that, waste generators finance the cost of service.

The implementation of adequate waste management practises and technologies depends on the financial capacity of each individual country or location. However, improvement in the waste hierarchy always involves extra costs. In practically all EU member states, the fees paid by households are 1-1.5% of the average income per household. Given the relatively high average disposable income of EU states, the fees are sufficient to cover waste management costs even to allow for subsidizing low-income households.

Economic instruments as a public policy tool are a catalyst in achieving environmental objectives such as improving in the waste hierarchy. They can help establish the enabling environment to achieve environmental management objectives, such as waste separation, recycling, and treatment.

JAPAN CASE STUDY

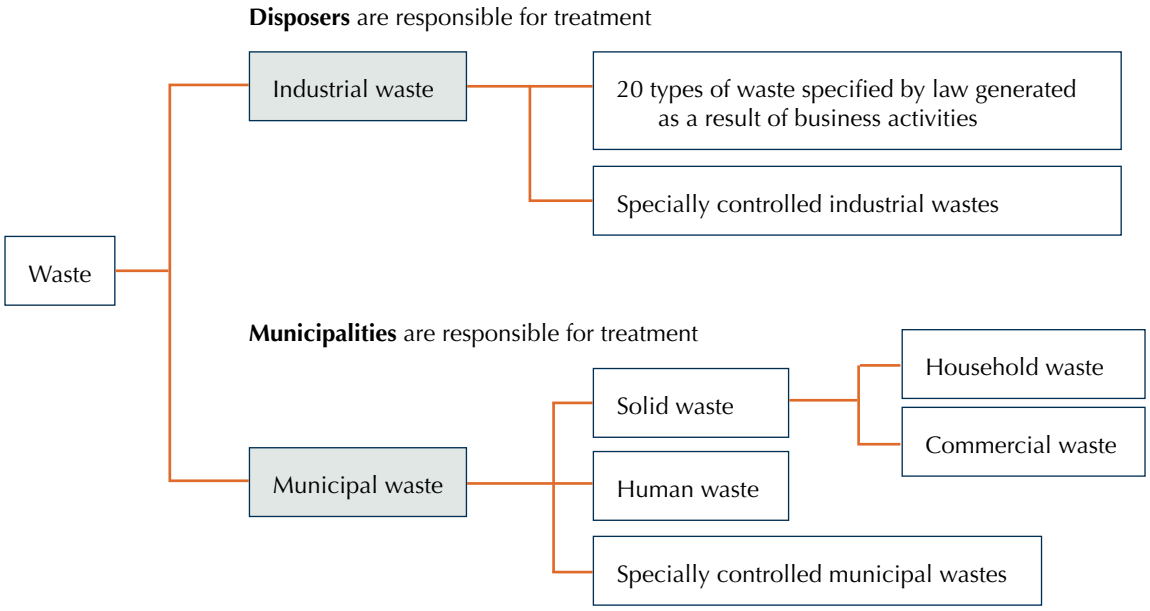
1. General MSW data

WASTE CATEGORIES IN JAPAN

Japan's "Waste Management and Public Cleansing Law" specifies categories of waste in Japan. Waste is classified (Figure 1 below) according to the following characteristics:

1. Waste is defined as any discarded materials in solid or liquid form.
2. Industrial waste generated by business activities has 20 types of waste categories that are specified by law.
3. Waste other than industrial waste is categorized as municipal waste, and classified into solid waste and human waste. Solid waste is also further divided into household waste and commercial waste.
4. Waste that is likely to cause explosions, is toxic or infectious, or has the potential to damage human health or the living environment is designated as "specially controlled waste," and further classified by activity into "specially controlled municipal solid waste" and "specially controlled industrial waste."

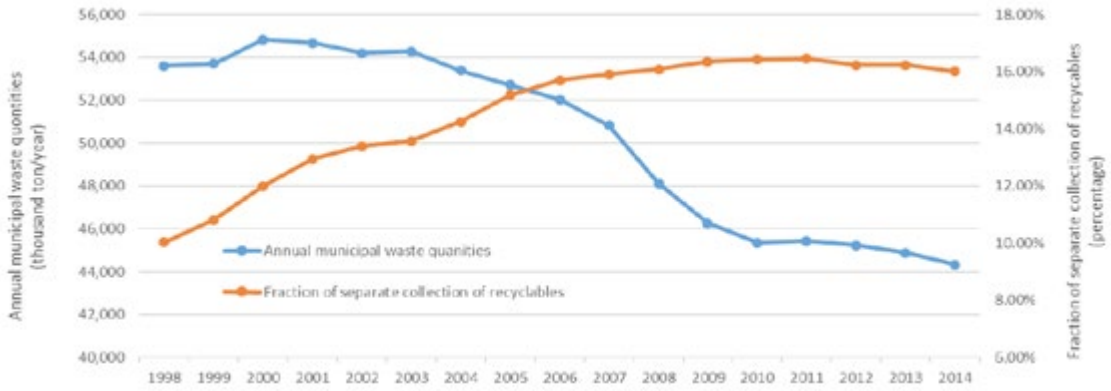
Figure 1: Waste classifications in Japan



ANNUAL QUANTITIES OF MUNICIPAL WASTE

The rate of municipal waste produced annually in Japan between FY1990 and FY2014 is shown in Figure 2 below [1]. Municipal waste continued to increase in the years leading up to FY2000, which was a period of mass production and mass consumption. Total municipal waste quantities declined after FY2000, reflecting the development of a comprehensive policy for a resource-circulation society, including recycling regulations targeting specific products and adoption of the concept of Extended Producer Responsibility (EPR).

Figure 2: Amount of municipal waste produced annually in Japan FY1990 - FY2014[2]



Source: MOE, *Waste Management of Japan for FY2014* (2016)

In Figure 3 below, the amount of annual waste produced daily per capita follows a similar track, declining from 1,185g daily per capita in FY2000 to 947g[3] daily per capita in FY2014. This is a 20% reduction over 14 years.

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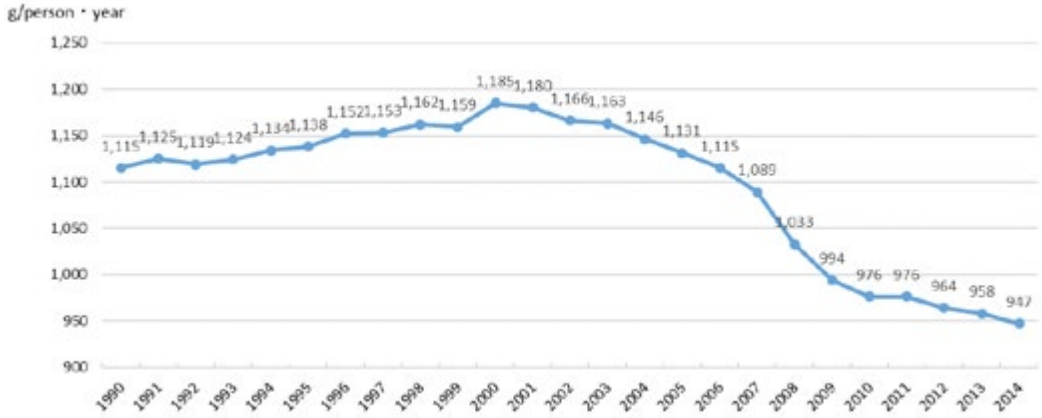
1 The Japanese fiscal year (FY) runs from April 1 to March 31.

2 The fraction of waste separately collected as recyclables is calculated from the quantity of resources separately collected by municipal governments plus the quantity of resources collected through group collection divided by the total quantity of municipal solid waste.

3 The amount includes waste and recyclables collected by municipal governments, waste directly hauled by disposers, and recyclables collected by community group activities.

Figure 3: Annual amount of municipal waste produced daily per capita in Japan between FY1990 and FY2014[4]

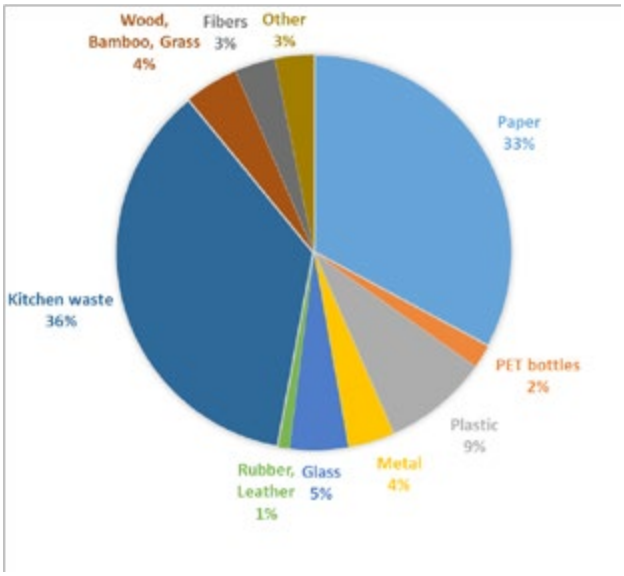


Source: MOE, *Waste Management of Japan for FY2014* (2016)

WASTE COMPOSITION DATA

The composition of municipal waste (disposed as waste at a communal disposal area) in Japan in FY2015, as measured by its wet weight, is shown in Figure 4 below. The highest proportion of municipal waste in Japan is kitchen waste (36.1%) followed by paper (32.8%), plastic (8.6%), wood, bamboo, grass, rubber, and leather (5.3%), glass (4.8%), metal (3.8%), fiber (3.3), PET bottle (1.9%), and other materials (3.2%). Dry recyclable waste, including paper, plastic, glass, metal, and PET bottle, comprises 51.9% of the total, while organic contents, including kitchen waste, wood, bamboo, grass, and fiber is 43.8%. This suggests that about half of the waste disposed as municipal waste is recyclable and recoverable.

Figure 4: Composition of municipal waste in Japan in FY2015



Source: Ministry of Environment (2015)[5]

[4] Ibid.

[5] See http://www.env.go.jp/recycle/yoki/c_2_research/research_11.html

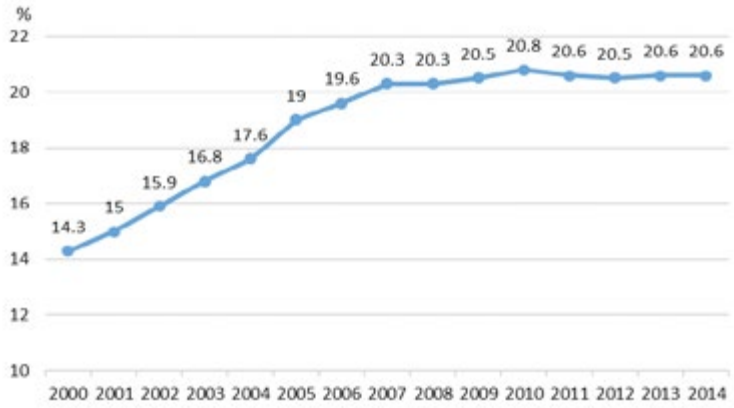
ANNUAL PERCENTAGE BEING SEPARATED AND RECYCLED

The rate of recycling of municipal waste in Japan is determined according to the Ministry of the Environment (MoE)'s formula below. This rate is an index for material recycling, while thermal recycling (i.e., heat recovery) is not taken into account. In addition, the recycling rate only includes municipal waste collected by municipal governments; waste collected by business entities (e.g., waste paper is often collected by the business sector without a contract from municipal governments and PET bottles are often collected in boxes located at grocery shops) is not reflected in the recycling rate.[6] In addition, under the Home Appliance Recycling Law, electric and electronic waste (WEEE) is usually collected through retailers and is also not accounted for in the recycling rate.[7] In this sense, the recycling rate in Japan only reflects the amount collected by municipal governments and thus underestimates the overall recycling rate. Using the MoE calculation, the recycling rate of municipal waste in FY2014 was 20.6%. The recycling rate for municipal waste steadily increased from the 1990s until FY2007 with the development and implementation of The Basic Act for Establishing a Sound Material-Cycle Society as well as various recycling laws. However, as Figure 5 shows, the rate has remained unchanged nationwide after reaching about 20% in FY2007.

$$\text{Recycling rate in \%} = \frac{(\text{Directly recycled}^{1} + \text{Recycled through intermediate treatment}^{2} + \text{Group collection}^{3})}{(\text{Quantity of waste treated} + \text{Group collection}^{3})}$$

*1. Quantity of municipal waste *directly recycled* is the quantity of waste delivered directly to recycling businesses without being processed at recycling facilities.
*2. Quantity of municipal waste *recycled through intermediate treatment* is the quantity of resources (steel, aluminum, etc.) recovered from an intermediate treatment process (This includes residues generated from incineration facilities, e.g., slag from a melting process).
*3. Quantity of municipal waste from *group collection* is the quantity of waste collected as a resource by community groups, such as elementary schools and neighborhood associations, and delivered to recycling businesses.

Figure 5: Recycling rate of municipal waste during 2000s in Japan



Source: MOE, *Waste Management of Japan for FY2014* (2016)

6 Kawai (2016)
7 Ibid.

RECYCLING RATE FOR SPECIFIC PRODUCTS

The recycling rate for specific products under the recycling regulations in Japan are shown in Table 1 below. As noted above, these recycling rates are not reflected in the overall recycling rate of MSW in Japan since municipalities do collect the waste categories highlighted in Table 1.

Table 1: Recycling rates for specific products under applicable recycling laws

	Containers and packaging[8]	Home appliances[9]				Food waste[10]	Construction materials[11]	ELV[12]
		TV (CRT)	Air conditioner	Refrigerator/ freezer	Washing machine			
Year	%	%	%	%	%	%	%	10,000 unit
2001	44.0 (collection rate)	73	78	59	56	37	85 (in 2000)	305 (in 2005)
2011	85.8 (recycling rate)	79	89	79	87	84	96.0 (in 2014)	296

BOX 1

INDICATORS OTHER THAN RECYCLING RATES

Sapporo City conducted a survey to determine what fraction of the waste that is discarded as recyclables is suited for recycling (by subtracting the portion of non-recyclables present in the waste that had been discarded as recyclables). For FY2015, the rates were as follows: glass bottles 97%, cans 94%, PET bottles 96%, plastic containers and packages 55%, paper 61%, and green waste 89%.[13]

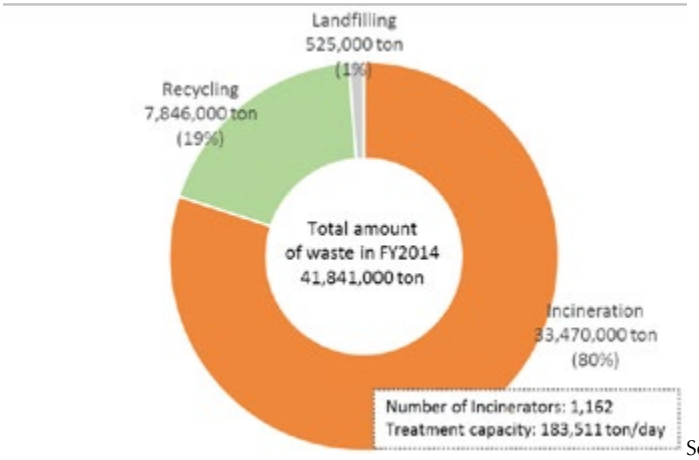
There is another indicator of aspects of Japan's waste recycling called "cooperation rate for source separation." This is calculated as (the amount of recyclables (e.g., PET bottle) separately disposed / the amount recyclables (e.g., PET bottle) separately disposed + the amount of the material (e.g., PET bottle) disposed as combustible waste) multiplied by 100. The result is the portion of recyclables properly separated at source. For example, for the City of Kitakyushu, the cooperation rate for source separation for plastic containers and packages was about 44% in FY2012. The City of Kitakyushu set a goal to increase that rate to 55% by FY2020.

8 Ministry of the Environment, Japan
9 Association for Electric Home Appliances
10 Ministry of Agriculture, Forestry and Fisheries
11 Ministry of Land, Infrastructure, Transport and Tourism
12 Japan automobile recycling promotion center (JARC)
13 http://www.city.sapporo.jp/seiso/houkoku/sosei/sosei_chousa.html

TREATMENT METHODS FOR MUNICIPAL WASTE

The most common methods for the treatment and recycling of municipal waste in Japan in FY2014 are shown in Figure 6 below. Of the approximately 42 million tons of total municipal waste produced in 2014, about 80% is treated by incineration,[14] about 19% is recycled, and only 1% is landfilled.

Figure 6: Methods of treatment and recycling of municipal waste in Japan (FY2014)



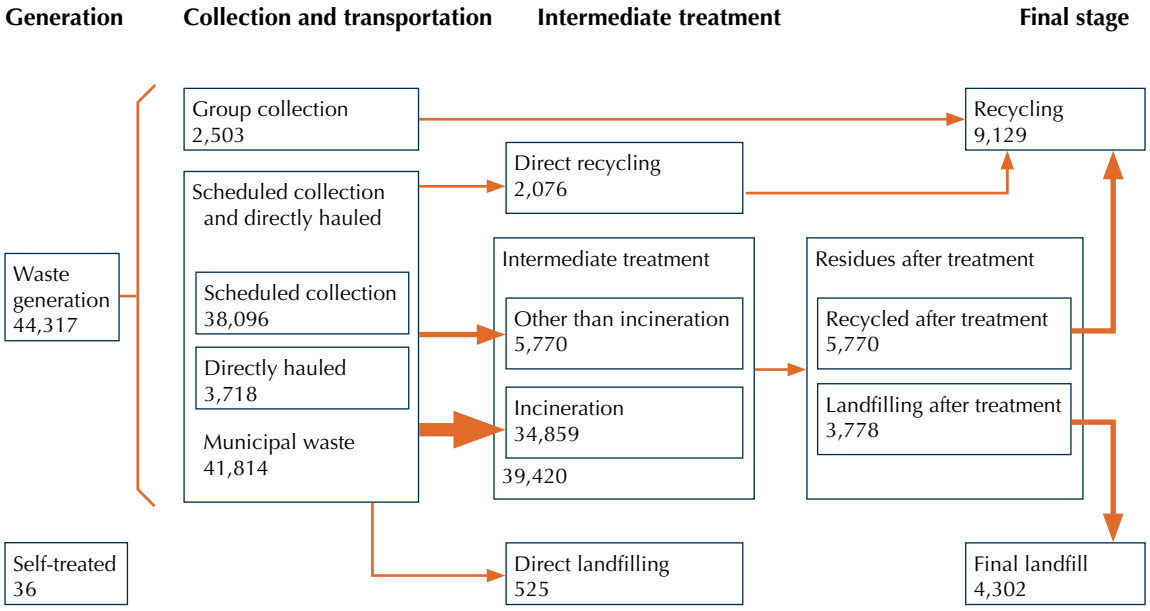
Source: MOE, *Waste Management of Japan for FY2014* (2016)

THE FLOWCHART OF MSWM TREATMENT IN JAPAN

The municipal solid waste management flow in Japan for FY2014 is shown in Figure 7 below. The rates of intermediate treatment methods other than incineration comprise: large article treatment (30.7%), composting (3.0%), feedstock making (0.1%), anaerobic digestion (1.0%), waste-to-fuels processing (11.6%), and others (53.5%).

[14] The number of incinerators in Japan is approximately 1,200.

Figure 7: Flowchart of MSWM treatment in Japan in FY2014



Source: MOE, *Waste Management of Japan for FY2014* (2016)

DATA COLLECTION METHODOLOGY AND DATABASE MANAGEMENT

The Ministry of Environment conducts an annual 'Survey on the State of Generation and Treatment of Municipal Waste' to collect statistical information on waste treatment and recycling in municipalities and special district authorities[15] to be used as basic data for national policies on municipal waste management. The survey results are compiled and published as a report entitled "Waste Disposal in Japan."

1. Survey scope and period: The survey examines the annual amount of waste disposed (from April 1st to March 31st of the following year) for all municipalities that manage municipal solid waste disposal and treatment (1,741 municipalities and 578 special district authorities in FY2016).
2. Survey content: The survey covers the items in Table 1 below. The total amount of waste is calculated by adding the figures submitted by all municipalities nationwide.

[15] Entities established by several municipalities and special wards for the purpose of jointly conducting some administrative services.

Table 2: Contents of Survey on the State of Generation and Treatment of Municipal Waste

Quantity of waste hauled	Quantity collected by municipalities (mixed waste, combustible waste, non-combustible waste, resource waste, other bulky waste)
	Quantity directly hauled to treatment facilities
	Quantity of self-treated waste
Quantity of waste treated	Quantity of waste incinerated
	Quantity of waste with intermediate treatment other than incineration (treatment of bulky waste, resource recycling, composting, feed production from waste, production of methane gas, conversion of waste to fuel, other)
	Quantity of final disposal (waste directly landfilled, as well as landfill of residue generated from both incineration treatment facilities and intermediate treatment facilities other than incineration)
Quantity of waste recycled	Quantity delivered to recycling operators to be used as recycled materials, or the quantity of slag, compost, and fuel produced for use as resources
	Ascertained by recycled item, recycling method, and recycling facilities[6]

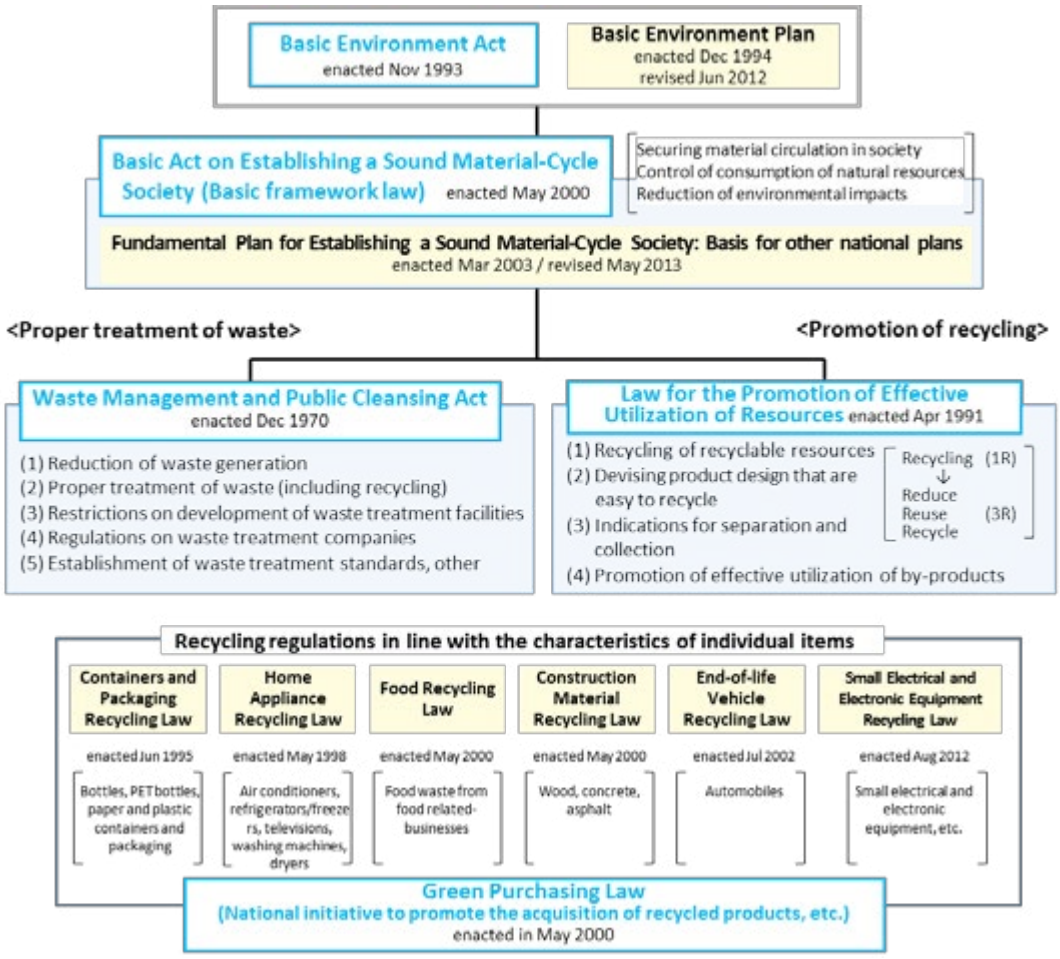
2. Policy development and legal and institutional framework

The legal framework for waste management and recycling in Japan is shown in the figure below. The 'Waste Management and Public Cleansing Act' and the 'Guideline for Development of a Local Waste Management Plan' are the key instruments promoting sound treatment of waste. There are six recycling regulations targeting individual products that reflect the Extended Producer Responsibility (EPR) concept,[17] 'Law for the Promotion of Effective Utilization of Resources,' and 'Green Purchasing Law,' and thus promote a material-cycle society.

[16] The amount of recycling is ascertained by type of the item (paper, metal, glass, PET bottles, plastic, cloth, fertilizer, feel, molten slag, solidified fuel, or other), by recycling method, and recycling facility (direct recycling, incineration facilities, bulky waste treatment facilities, facilities for recycling, waste composting facilities, facilities for the production of feedstock, facilities for the conversion of waste to fuel, group collection).

[17] Extended Producer Responsibility places the responsibility for waste management of their end-of-life products on manufacturers.

Figure 8: Legal framework for waste management and the promotion of recycling



Source: Based on MOE, *History and Current State of Waste Management in Japan* (2014)

The 'Basic Act on Establishing a Sound Material-Cycle Society' establishes a vision for a sound material-cycle society that consumes fewer natural resources and causes less environmental impact. At the same time, the law specifies the order of priority in the management of recyclable resources along the waste hierarchy as (1) reduction of generation, (2) reuse, (3) recycling, (4) thermal recovery, and (5) appropriate disposal.[18]

That Act also specifies the roles of different entities (national and local governments, business operators, and consumers) and implements the 'polluter pays principle,' placing the responsibility for sound treatment and recycling on waste disposers, as well as the EPR principle.[19]

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[18] MOE, *History and Current State of Waste Management in Japan* (2014)

[19] Akenji, Bengtsson, Hotta, & Hayashi,.*EPR Policies for Electronics in Developing Asia: A Phase-in Approach* (IGES Policy Briefs No. 14). (2011).

3. Institutional arrangement

The roles and responsibilities of different stakeholders, including national government, prefectural government,[20] municipal government, and waste generators (e.g., citizens and business entities), are specified in the 'Waste Management and Public Cleansing Act' as following:

- The *national government* is responsible for collecting information about waste and organizing and utilizing that information; promoting development of waste management technology; and providing the necessary technical and financial assistance to municipalities and prefectural governments.
- *Prefectural governments* are responsible for providing technical advice to municipalities, as well as assessing the condition of industrial waste and undertaking necessary measures for proper management of industrial waste.
- *Municipal governments* are responsible for providing service delivery for the proper management of municipal waste; promoting residents' voluntary activities with regard to waste reduction; ensuring capacity development of personnel; and developing facilities and improving working methods.
- *All national, prefectural, and municipal governments* shall endeavor to raise awareness of both the public and businesses about the importance of reducing waste generation as well as ensuring proper waste management.
- *Citizens* are responsible for reducing waste generation (promoting waste prevention), implementing source separation, promoting recycling and reuse, and contributing to the reduction of waste volume and its proper treatment.
- *Business entities* are responsible for properly managing the waste generated from business activities under their responsibility (disposers' responsibility); reducing waste by recycling or reuse; ensuring improvement in product design and providing necessary information about generated by them waste (a concept of EPR); and so on.

RELATIONSHIP BETWEEN NATIONAL AND MUNICIPAL GOVERNMENTS ON MSWM

All municipalities are required to formulate local solid waste treatment plans (with 10-year durations) to carry out the proper treatment of waste. The national government establishes guidelines to formulate the local solid waste management plans. Table 2 below describes both the national guidelines and the Basic Plan for Establishing a Sound Material-Cycle Society of the City of Kitakyushu (FY2011 to FY2020) as an example of a basic plan for the treatment of municipal waste.

[20] The local government system in Japan consists of municipalities and prefectures, which are regional authorities comprising municipalities. There are 47 prefectures in Japan.

Table 3: National guidelines for the formulation of basic plans for municipal solid waste treatment and an example of a municipal basic plan

Guidelines for the Formulation of Basic Plans for Municipal Solid Waste Treatment	Basic Plan for Establishing a Sound Material-Cycle Society of City of Kitakyushu (FY 2011 to FY 2020)
1. Basic principle	
Objective, relationship with other plan/regulation, targeted area	Develop a model sustainable city through which all stakeholders proactively and cooperatively promote 3Rs and proper treatment.
2. Target year	
Time period (10-15 years; mid-term evaluation every 5 years)	2011 - (for 10 years; reviewed every 5 years)
3. Data management	
Collect the current data on waste generation and composition Estimate the quantity of waste generation per person per day depending on population projections and future trends of industry/business activities	Target : Waste generation (less than 470 g/capita/day) Recycling rate (more than 35%) Reduction of CO2 emissions associated with municipal waste management (less than 100,000 t-CO2)
4. Roles of each responsible actors	
Local authority Waste collection charge, introduction of source separation, promotion of environmental education and public awareness, guidance for large-volume generators, green purchasing, etc. *Residents* Community-based collection system for recyclables, reduction of waste packaging, etc. *Business entities* Prevention of waste generation at source (e.g., prevent excess packaging), etc.	*Local authority* Serve as coordinator to promote stakeholders' activities, etc. *Residents* Promote a review of life-style and participate in environmental education and conservation activities. *Business entities* Undertake social responsibility and promote information disclosure. *Non-profit organizations (NPOs)* Promote group collection of recyclables and promote environmental education and socially-responsible business.

5. Waste treatment planning Plan for waste reduction (prevention) and recycling Plan for waste collection and transportation Plan for intermediate treatment Plan for final disposal	*Establish suitable region for material-cycle* Reduce waste generation and promote recycling, promote region-wide treatment of waste, foster discussion about future needs for waste treatment facilities, etc. *Contribute to low-carbon and natural symbiosis[7] society* Promote low-carbon and symbiotic society in the area of waste management, promoting environmental education and awareness raising, improving efficiency and satisfaction of waste management services, etc. *Promote international cooperation and business in the area of environment* Development of environmental industry, promoting international cooperation as well as supporting expansion of environmental business activities abroad, etc.
6. Categorization of source separation Categorize waste for separate collection Keep residents informed concerning the need to clean and separate recyclables	*Regular separate collection using designated bags* 1) Combustibles 2) Cans and glass bottles 3) PET bottles 4) Plastic containers and packages *Station collection* Cartons, trays, fluorescent tubes, metals (pans, pots, etc.), small electronic devices *Community-based collection* Waste paper (newspaper, cardboard boxes, magazines), waste oil, green waste, etc.
7. Waste treatment facility improvement and establishment Set a treatment capacity and a treatment method for each facility Utilize a subsidy for establishing the facility, promoting PFI, etc.	Maintain and improve treatment capacity based on a concept of stock management by reducing financial burden Incineration facilities (3 facilities) Landfill site (1 site) Recycling facilities (3 facilities to sort waste cans and bins)
8. Others Public awareness, education of residents on source separation, relations with other municipal development plans, etc.	Announcement of annual waste management costs, reduction of waste collection costs *Environmental education* Awareness raising and disclosure of useful data/info Environmental education in elementary schools, etc.

21

Figure 9 shows the relationship between municipal governments and the national government on municipal waste management in Japan. While municipal governments are responsible for managing municipal waste, prefectural governments (and the ordinance-designated cities[22]) provide advice or technical support to municipalities. For industrial waste management, prefectural governments gather data on how industrial waste is managed, develop waste management plans, provide guidance and supervision to ensure the

[21] A natural symbiosis society is a society where human beings live and coexist together with other organisms.

[22] Ordinance-designated cities have a population greater than 500,000 and been designated as such by the Local Autonomy Act. There are 20 ordinance-designated cities in Japan.

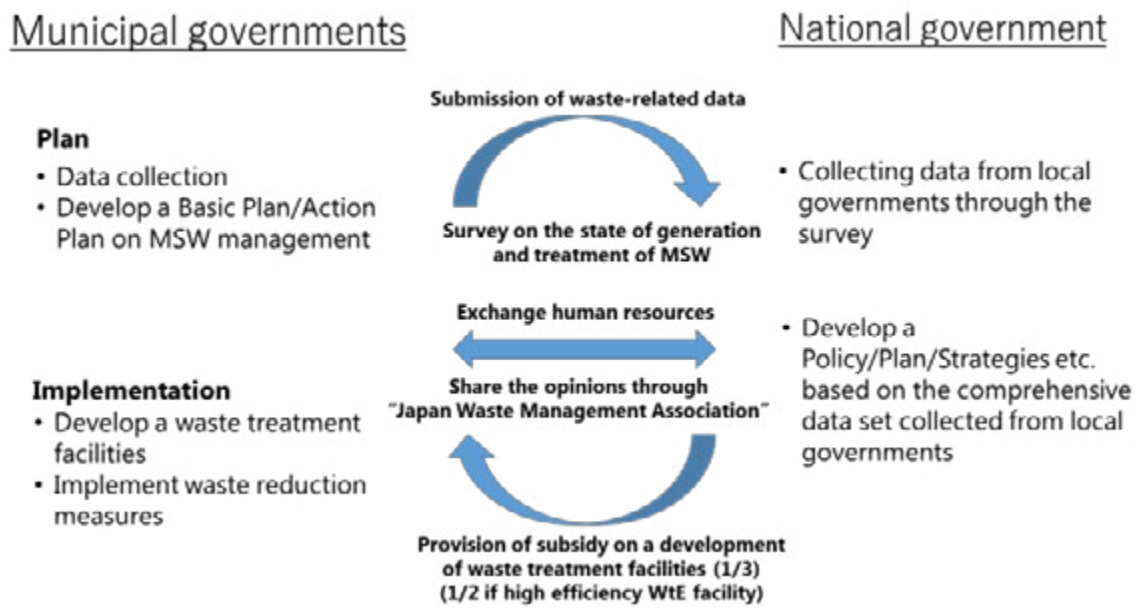
appropriate management of industrial waste, and grant permission for entities to enter the industrial waste treatment business.[23]

The national government's Ministry of Environment (MoE), conducts an annual survey on the state of waste generation and treatment of municipal waste. Municipal governments collect waste-related data and submit it to the MoE. Municipal governments develop a 10-year basic plan and annual action plan based on the data collected, while the national government develops regulations, policies, and strategies based on the comprehensive data collected from municipal governments.

The national government provides a subsidy for the development of waste treatment facilities in order to municipalities to implement the basic plan and action plan. In general, this amounts to one third of capital investment cost. Municipal governments must bear the operation and maintenance costs of the facility, as well as its depreciation costs.

In order to promote mutual understanding and the exchange of information between the national government and municipal governments, there are opportunities to exchange staff between the national and municipal governments. Municipal governments may also channel their opinions to MoE through the Japan Waste Management Association, which comprises 585 municipal governments.

Figure 9: Relationship between municipal and national governments on municipal waste management in Japan



[23] MOE, *History and Current State of Waste Management in Japan* (2014).

4. Costs and financing scheme

AFFORDABILITY OF DISPOSAL INCOME

Based on the example of Nagoya City, municipal waste treatment and disposal costs in Japan are 57,000 JPY/ton (USD 500/ton), using FY2015 data.[24] T**he net adjusted disposable income per capita in Japan is USD 27,323** (3,060,176 JPY)[25] a year according to the "OECD Economic Survey Japan 2015."[26] The household waste fee (assessed through purchase of a designated plastic bag) in the City of Kitakyushu was 17,532 JPY (USD 156) per capita per year.[27] Then, the affordability of disposal income is calculated as 1.42%.[28]

PROVISION OF A NATIONAL SUBSIDY TO PROMOTE THE DEVELOPMENT OF A SOUND MATERIAL-CYCLE SOCIETY

In order to comprehensively promote and achieve the 3Rs (reduce, reuse, recycle) for waste, municipal governments formulate and implement basic plans for the overall development and improvement of waste treatment and recycling facilities. Subsidies are provided from the national government for development and improvement waste facilities as part of these basic plans. Target-setting for the promotion of 3Rs is required in the basic plans (as well as evaluation of the progress in achieving the targets after activities or projects have been implemented).

Table 4: Example of target-setting

Reduction of waste generation	Waste generation per capita per day (% reduction by year). E.g., reduce more than 7.1 % by 2020 from the 2009 level[8]
Recycling	Recycling rates (% increase by year). E.g., increase by more than 4.6% by 2020 from the 2009 level[9]
Final disposal	Amount sent to final landfill (% reduction by year)

Subsidies from the national government can be applied to 1/3 of project costs. However, for some advanced facilities, such as high-efficiency WtE facilities, this subsidy is available for up to ½ of project costs. Target facilities that may receive subsidies include:

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[24] No data is available regarding a national average of the cost of municipal waste management in Japan; data disclosed by Nagoya City is highlighted as an example. The figure of 57,000JPY/ton includes waste collection and transportation costs, intermediate treatment (incineration/shredding) costs, and landfilling costs.

[25] These figures are based on an exchange rate of 1USD = 112JPY.

[26] http://www.oecdbetterlifeindex.org/countries/japan

[27] The amount of waste generated per capita per day in Nagoya City in FY2015 was 739 grams. The designated plastic bag of Nagoya City costs 130JPY for a 20-liter bag; Based on the assumption that 2,000 grams of waste are disposed in a 20-liter bag, the cost to a citizen of Nagoya City to discharge waste is about 17,532JPY (USD156) per year.

[28] The average number of persons per household was 2.49 in Japan in 2014. Therefore, the affordability of disposal relative to income is calculated as household waste fee multiplied by the average number of persons per household divided by the net adjusted income per capita (156 x 2.49 / 27,323).

[29] This example is based on figures for the City of Kitakyushu in "The Basic Plan for Establishing a Sound Material-Cycle Society of City of Kitakyushu (FY 2011 to FY 2020)."

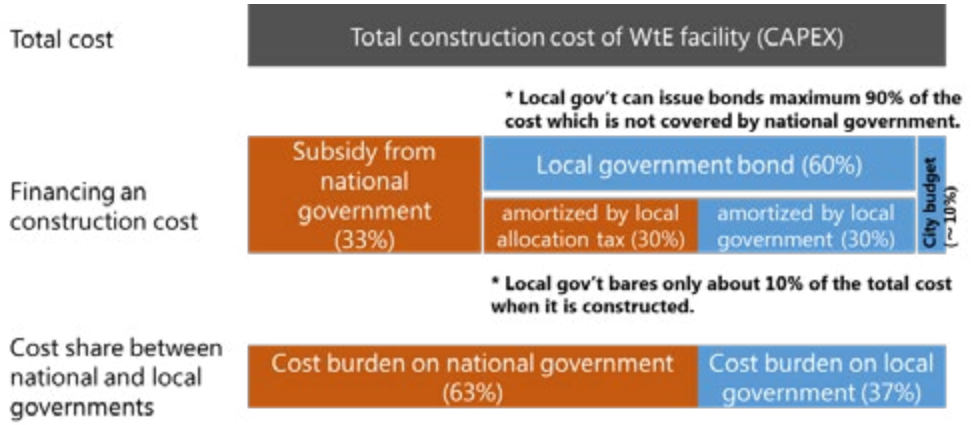
[30] Ibid.

- Material-recycle promotion facilities (Recycling facilities of non-combustibles and plastic, stockyards, etc.)
- Energy recovery facilities (Waste-to-Energy (WtE) facilities, heat-recovery facilities, bio-gasification facilities)
- Organic waste recycling facilities (Recycling facilities for human waste, organic waste, etc.)
- Septic tanks
- Final landfill sites
- Projects for improvement of primary equipment at existing waste treatment facilities
- Projects for the formulation of plans to extend the life of waste disposal facilities

FINANCING SCHEME FOR WTE FACILITY

Figure 10 below shows a typical financing scheme for a CAPEX of a WtE facility, including the relative shares of the national government and a municipal government. As described above, a subsidy amounting to 1/3 of CAPEX of a WtE facility is provided by the national government (the subsidy amounts to 1/2 for CAPEX of advanced facilities, such as high-efficiency WtE facilities). For the rest of CAPEX, a municipal government can issue a local government bond for up to 90% of the remaining cost. In the example provided, half of the local bond is amortized by a local allocation tax,[31] while the other half is amortized by municipal governments. Municipal governments may contribute up to 10% of the construction cost of a WtE facility. In summary, about 60% of the CAPEX is provided by the national government, while the rest of the CAPEX is provided by municipal government in this example of construction financing of a WtE facility.

Figure 10: Cost share between national and municipal government for a construction of waste treatment and recycling facilities (i.e. WtE facility) in Japan



Other sources of financing of WtE facilities (FIT rate, energy recovery rate (kWh/ton), etc.) and average construction costs per ton of capacity

[31] A local allocation tax is a national income tax that is allocated to local governments. The allocations are distributed equally among local governments in order to ensure that all citizens receive a consistent standard of public services regardless of area of residence.

The *Feed-in Tariff (FIT)* scheme for WtE facilities: the FIT rate for municipal waste applied to certified WtE facilities in FY2012 was 17.85 JPY/kWh (USD 0.15/kWh) where the Power Purchasing Agreement period is 20 years.

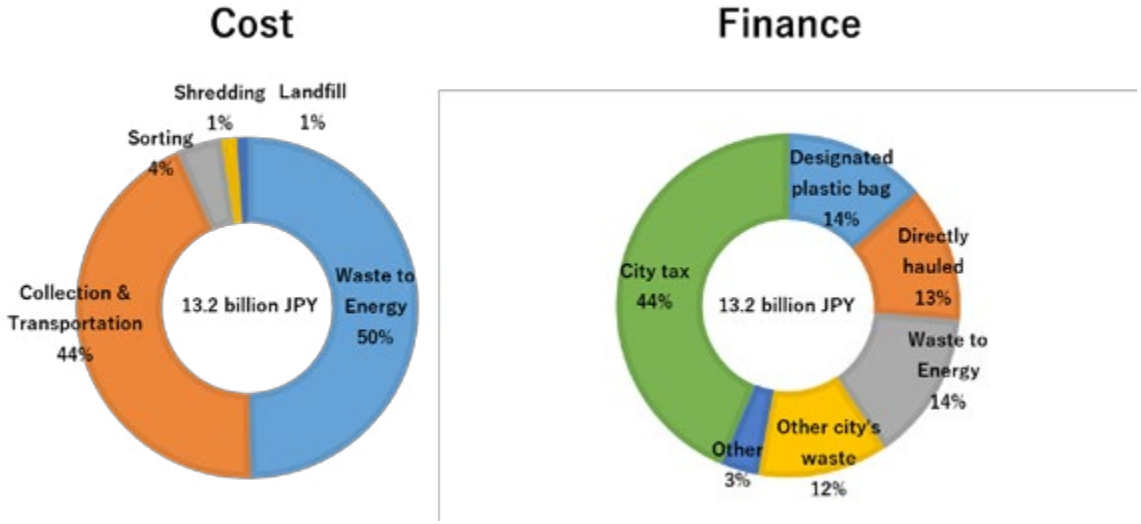
The average *energy recovery rate* (kWh/ton) of WtE facilities in Japan in FY2014 was 234 kWh/ton. In FY2014, the total electricity generation capacity of 228 WtE facilities was 1,907 MW, the power generation efficiency was 12.84% on average, and the total electricity generation for the year was 7,958 GWh/year.

Municipal government financing of waste management costs

In Japan, most municipal governments previously did not collect waste treatment fees directly from citizens, but rather the budget for waste management came from general tax revenues of the municipality comprised of municipal taxes, property taxes, etc. In recent years, however, many municipal governments introduced a system requiring households to purchase a designated plastic bag the fees from which support waste management. This system has now been widely adopted in Japan. According to the MOE's 'Survey on the State of Generation and Treatment of Municipal Solid Waste' in FY2014, 79.1% of Japan's 1,741 municipalities charge for waste disposal while 20.4% of them collect waste free of charge. The primary means of capturing these fees is through a designated plastic bag system and, in some cases, a stamp or letter system indicating advance payment. In the case of the City of Kitakyushu, the designated bag for combustible waste is sold at 50JPY (45 US cents) per 45-liter bag, while a designated bag for recyclables (PET bottle and plastic containers and packages) is sold at 20JPY (18 US cents) per 45-liter bag. Therefore, the price differential between the designated bags encourages citizens to promote recycling over incineration. For the City of Kitakyushu, the sale of designated plastic bags finances 14% of the total costs for municipal waste management in FY2014.

Figure 12 below shows the cost of municipal waste management, as well as how it is financed, for the City of Kitakyushu in FY2014. Of the total cost of managing municipal waste, half of the amount consisted of operation and maintenance costs and depreciation of the WtE facilities. Another 44% was for collection and transportation, 4% was for recycling (separation for material recovery), 1% for shredding, and another 1% for landfilling. On the financing side, the sale of designated plastic bags contributed 14% of financing; the sale of electricity generated at WtE facilities produced 14%; the tipping fee for accepting directly-hauled waste (including business waste) yielded 13%; waste accepted from other cities brought in 12%; and other elements, including the sale of recyclables, took in 3%. Overall, 56% of municipal waste management costs were financed by revenues from waste management and recycling activities, while the remaining 44% of these costs were covered by municipal tax revenues.

Figure 11: Financing MWM costs – the example of the City of Kitakyushu (FY2014)

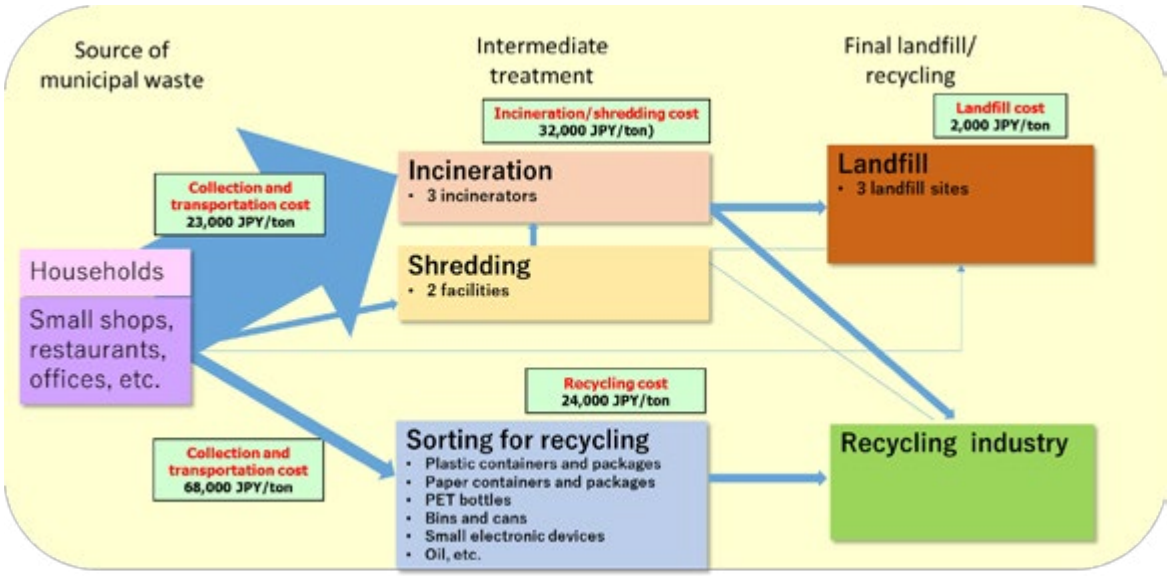


Source: City of Kitakyushu, *Environment Information Magazine (TEITAN PRESS) No. 50* (2015).

The average cost per ton for collection, treatment (incineration), recycling, and final disposal of municipal waste is shown in Figure 12 below using the case of Nagoya City (in FY2015). For waste, the collection and transportation cost is 23,000 JPY/ton, the cost of intermediate treatment (e.g., incineration and shredding) is 32,000 JPY/ton, and the cost of landfilling is 2,000 JPY/ton. For recyclables, the collection and transportation cost is 68,000 JPY/ton and the sorting cost is 24,000 JPY/ton. Consequently, the cost for collection and transportation as well as sorting for *recyclables* was 1.6 times the cost required for collection and transportation, intermediate treatment (incineration/shredding), and landfilling of *municipal waste*. This is mainly because recyclable materials are often much lighter in weight than combustible waste.

In the case of Sapporo City, the cost of collection and transportation and incineration was 37,861 JPY/ton, while the cost of collection and transportation and intermediate treatment of recyclables (can, bin, and PET bottle) was 71,866 JPY/ton in FY2015. Therefore, the cost required for recycling (cans, bins, PET bottles) was 1.9 times the cost required for waste treatment (for incineration).

Figure 12: Average costs of MWM in Nagoya City (JPY/ton)



Source: Waste report of Nagoya City (2014)[32]

5. Citizen engagement and private participation

PUBLIC INVOLVEMENT AND AWARENESS FOR SOURCE SEPARATION

Public participation in source separation is an important component to increasing adoption of recycling. In Japan, not all recyclables are collected by a regular collection system run by municipal governments. For instance, waste paper is usually collected though community activities or entities, such as a children's association. In addition, as in the case of the City of Kitakyushu, those recyclables not covered by a regular collection system – such as fluorescent lamps, small metal articles, small electronic devices, used clothing, used cooking oil, ink cartridges, or batteries – are collected at designated boxes, which are often located at retail shops.

In Minamata City, whose population is 2.78 million, wastes and recyclables are collected at 300 collection stations. Combustible waste and food waste are collected twice per week and plastic containers and packages are collected once per week. PET bottles, waste paper, and cardboard materials are collected twice per month, while other recyclables, such as bins, waste oil, and small electronics, are collected once a month. A total of 21 categories of waste are collected by the City.

In this way, the voluntary efforts of citizens in source separation, as well as citizen participation in group collection systems, contributes not only to increasing the recycling rate, but also to reducing the cost of collection and transportation carried by municipal governments.

[32] http://www.city.nagoya.jp/kankyo/page/0000015557.html

BOX 2

ENFORCEMENT OF SOURCE SEPARATION – THE EXPERIENCE OF THE CITY OF KITAKYUSHU

The City of Kitakyushu reviewed its household waste collection system in 2006 and changed the source separation system as summarized in the table below. In order to start the new waste collection system in July 2006, the City of Kitakyushu announced initiatives to provide information for citizens and to work with citizens in various ways. First, the city explained the role of the "citizen sorting cooperative person," a volunteer who teaches citizens how to sort wastes by visiting households one by one. In addition, the city provided "delivery lectures," where the staff of the Environment Bureau made visits to provide information at times when citizens desired, including Saturdays, Sundays, and evenings.

In the two weeks after the new system "Promotion to increase manners in waste disposal (10 days)" began, more than 13,000 citizens and city staff met with each other for early morning guidance on how to sort wastes.[33] In addition, as PR activities to citizens, the city opened exclusive home page, posted feature articles to city information/environment information magazines, announced information using various media including TV and radio, established notice curtains at some stations, and distributed a set of sorting dictionary and trial bag to all households (about 420,000 households).

After implementation of the revised waste collection system a year, the city reduced waste by about 25% and the cooperation rate for source separation of citizens has generally risen and recycling rate has been promoted.

[33] Ibid.

INDICATORS TO MONITOR PERFORMANCE OF MWM ADMINISTRATION

Municipal governments utilize a Plan-Do-Check-Act Cycle approach for their administration of waste management. The national government provides a set of performance indicators for evaluating performance; some examples are as shown in Figure 13 below.

Figure 13: Indicators for monitoring waste management administration at municipalities

Category	Objective to be measured	Indicator	Unit
Establishing recycling-based society	Waste generation	Waste generation per person・day	kg/person・day
	Recycling rate	Recycling rate from waste	% (ton/ton)
	Thermal recycle	Energy recovery from waste	MJ/ton
	Final Disposal	Proportion of waste sent to landfill-site	% (ton/ton)
Prevention of global warming	GHGs emission	GHGs emission per a person a day associated with waste disposal	kg/person・day
Public service	Residents' satisfaction for waste treatment	Degree of Satisfaction of residents	–
Economy	Cost-effectiveness	Annual waste treatment cost per a person	JPN yen /person・year
		Cost of recycling	JPN yen/ton
		Cost of thermal recycling	JPN yen/MJ
		Cost associated with waste reduction service	JPN yen/ton

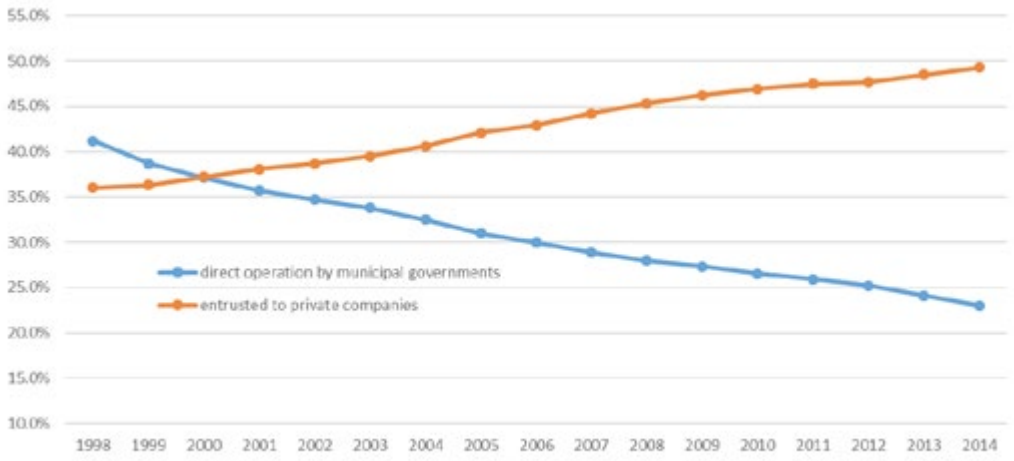
PRIVATE SECTOR PARTICIPATION

The private sector is engaged in the collection and transportation, intermediate treatment, and final disposal of municipal waste through consignment contracts from municipal governments. The wide variety of advanced waste treatment and recycling technologies developed by the private sector has contributed to the appropriate treatment of waste as well as effective resource recovery in Japan.

The privatization of collection and transportation of municipal waste has been promoted for quite a while in Japan. In the case of the City of Kitakyushu, the cost of waste treatment decreased from 16.1 billion JPY in FY2003 to 13.2 billion JPY in FY2015, with the costs for collection and transportation decreased from 8.4 billion JPY to 5.8 billion JPY in part due to the promotion of privatization.[34]

[34] City of Kitakyushu, *Environment Information Magazine (TEITAN PRESS) No. 50* (2015).

Figure 14: Ratio of government and private sector in the operation of collection and transportation of municipal waste in Japan[35]



6. Key points

NATIONAL AND LOCAL COMMITMENT TO A SOUND MATERIAL-CYCLE SOCIETY

While incineration is the dominant waste treatment method in Japan, both national and local governments have had a longstanding commitment to reducing waste and promoting resource circulation. Municipal governments have continually and consistently made efforts to promote the 3Rs as fundamental principles of the establishment of a sound material-cycle society and as guided by 'The Basic Act for Establishing a Sound Material-Cycle Society' and 'The Fundamental Plan for Establishing a Sound Material-Cycle Society.' As shown above, although the recycling option is usually costlier than the incineration option, municipal governments have adhered to the order of priority in the waste management hierarchy to promote a sound material-cycle society.

HIGH LEVEL OF CITIZEN ENGAGEMENT

Japan's high rate of citizen participation in source separation is due to the voluntary efforts of citizens to teach each other how to sort waste at disposal. These grass-root efforts in each community, as well as environmental education in the schools, has raised public awareness and increased public adherence to the rules of waste disposal. In addition, group collection of recyclables through community-based activities contributes a significant portion of the separate collection of recyclables. Consequently, such citizen engagement promotes the rate of recycling.

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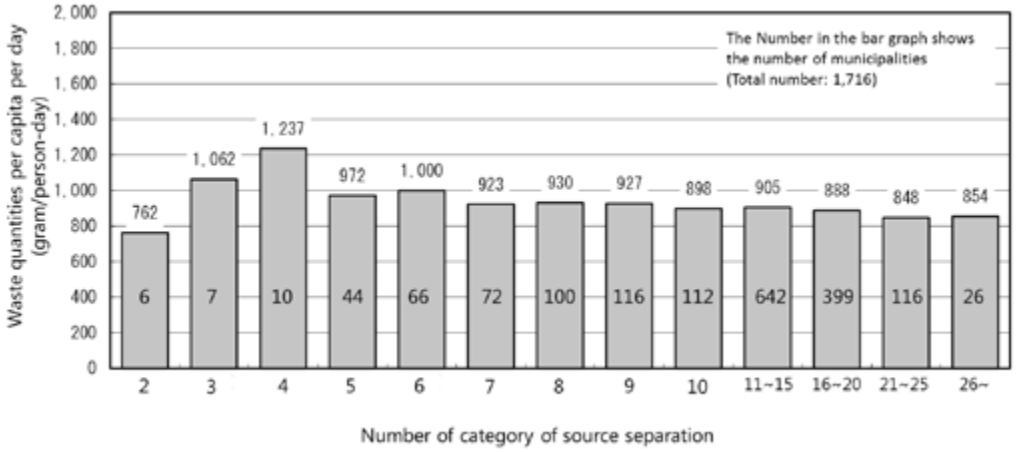
[35] In addition to the government and private sector, the other category of collection and transportation of municipal waste is by licensed contractor.

INCREASE IN CATEGORIES OF SOURCE SEPARATION MAY DECREASE WASTE GENERATION

Figure 15 shows the relationship between the quantity of waste produced daily per capita and the number of categories of source separation and waste. The number in each bar represents the number of municipalities utilizing the indicated number of source separation categories. It should be noted that the source separation category data in the figure are for other collection ways (station collection, community collection, call-based collection, etc.), rather than for regular collections. The key trend is that the quantity of waste produced daily per capita is gradually decreasing as the number of categories of source separation increases.

Figure 15: Quantity of waste produced daily per capita decreases as categories of source separation increase



Source: Based on MOE, *Waste Management of Japan for FY2014* (2016)

INCREASE IN CATEGORIES OF SOURCE SEPARATION CAN REDUCE SOME COSTS

The City of Kitakyushu's introduction of separate collection of plastic containers and packages in July 2006 demonstrates the costs and benefits of separate collection. In this case, the costs for collection and transportation of household combustible waste decreased due to reductions in the volume of household combustible waste. However, the costs for collection and transportation increased overall due to the increase in sorting by item of recycled goods (plastic containers and packages) as shown in Table 4. As noted previously, despite the fact that recyclable materials are usually lighter in weight compared to household combustible waste, the per ton collection and transportation cost for recyclables is usually higher than that of household combustible waste.

Therefore, while recycling is expected to have an effect on waste reduction, it may lead to increases in collection and transportation costs due to the increased number of items for separate collection.

Table 4: Cost and benefits of an introduction of separate collection for plastic containers and packages for the City of Kitakyushu

Contents of System Review	Costs
Collection and transportation costs for household waste with reduction in waste quantity	- JPY 408 million
Collection and transportation expenses for plastic containers and packages Collection and transport costs Sorting costs Share of municipal burdens for small businesses	+JPY 833 million (+JPY 503 million) (+JPY 280 million) (+JPY 50 million)

Source: City of Kitakyushu, *Environment Information Magazine (TEITAN PRESS) No. 50* (2015).

EFFECTIVE MONITORING CAN REDUCE ILLEGAL DUMPING

According to Japan's Waste Management and Public Cleansing Law, illegal dumping is penalized with imprisonment or fines. In order to strengthen monitoring for illegal dumping, the City of Kitakyushu introduced a system of informers who contact city authorities if they find illegal dumping; some 90 citizens have registered as informers.[36] In addition, the city has increased patrols and set up monitoring cameras in areas where waste is easily dumped. With such efforts, there has been a reduction in the number as well as the volume of illegal dumping.

[36] http://www.city.kitakyushu.lg.jp/kankyou/file_0105.html

ROMANIA CASE STUDY

Introduction

The Romanian solid waste management system is still primarily based on landfilling and regulation of the MSW management system still has significant gaps. Beginning with 1993, a database regarding national waste generation and management was developed, under the terms of a contract signed between the Ministry of Environment and Water Management (currently the Ministry of Environment) and the National Research and Development Institute for Environmental Protection. The generated data referred to industrial and municipal waste. Since 1995, Romania reports data on waste to EUROSTAT and to the European Environment Agency.

Since 1999, in compliance with Government Decision 155/1999, companies have the obligation to keep records of their waste, to report them to the environmental county authorities and to classify them according to the European classification requirements. In 2002, the GD was abolished through GD 856/2002 and a new waste classification was developed, including hazardous waste. Also, in 2002 an Extended Producer Responsibility (EPR) scheme for packaging waste was implemented.

Some overall progresses over 2004-2013 has been registered in Romania, especially from 2007. The country is a full member of the European Union from 2007. This year represents the starting point of EU legal instruments enforcements and access to EU financial instruments. Prior to accession, Romania's waste management practices did not meet the requirements of the Waste Framework Directive. The specific problems included: low levels of waste collection, non-compliant landfills, low levels of separation at source and recycling of waste, and inadequate treatment of biodegradable waste and low levels of composting. Romanian authorities addressed these issues through a strategic planning process, which incorporated a National Waste Management Strategy (NWMS) (2004, revised in 2013), a National Waste Management Plan (NWMP)(2004) and Regional Waste Management Plans. The first NWMS was developed in 2003, and published in early 2004 and the NWMP was also developed in 2004 in order to take the necessary actions to reach the objectives of the strategy. In order to increase the efficient implementation of the NWMP, Regional Waste Management Plans for the eight Romanian regions were issued in 2006.

A Sectorial Operational Programme for Environment (SOP ENV) was developed to set out the objectives and priorities for environmental investments in Romania in the period 2007-2013 for European Union funding. The SOP ENV identified 15 integrated waste management priority projects. By 2020 (2025 with derogations), Romania needs to reach a 50% recycling rate for MSW. The recycling rate for 2015 is reported to be 13,1%. Romania will not fulfil its targets if progress continues at the current rate, therefore an exceptional yearly increase in the recycling rate is needed. The present economic

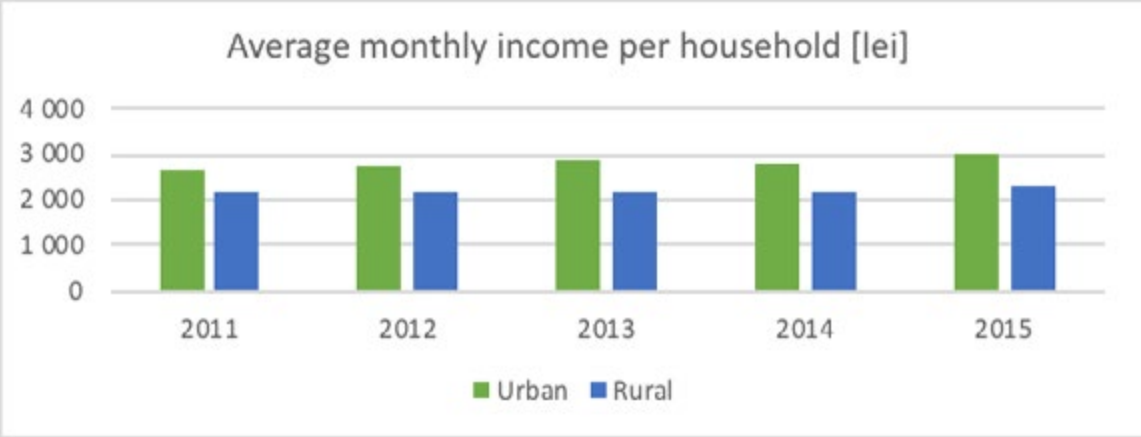
instruments for increasing recycling and landfill diversion in Romania are: Extended Producer Responsibility (EPR) for packaging waste; Landfill tax; Eco-tax for single use plastic bags[1].

1. General MSW data

NATIONAL CONTEXT

According to data from the National Institute of Statistics available for 2016, Romania has a total population of 19.7 million inhabitants, steadily decreasing, from 20.2 million inhabitants in 2011. 46% of population live in the rural areas of the country.

In 2015, 87.2 % of total Romanian household incomes were monetary incomes and 12.2% were represented by in kind incomes. Average monthly income of Romanian households in urban and rural areas is presented in the figure below.



Source: NIS data, 2015

[1] Jaspers 2016, Economic instruments for increasing recycling and landfill diversion in Romania, Final Report (in Romanian)

Definition of waste

Waste is defined in Romanian legislation as "any substance or object that the owner disposes of, intents to or has the obligation to dispose of"[2].

The National Waste Management Strategy[3] classifies waste in the following categories:

Household waste and industrial and institutional waste similar to household waste (general waste collected from offices, schools, etc.) is reported as "household and similar waste" and will be referred to as "household waste" in this report.

DATA COLLECTION METHODOLOGY AND DATABASE MANAGEMENT

Waste data collection and database management in Romania is performed by the National Environmental Protection Agency. Data is collected yearly through NEPA's county branches. Information on waste generation, collection and treatment is obtained from private entities which are municipal and industrial waste generators, waste operators (collectors), public administration which often has their own waste collection services, waste treatment facilities. There is no electronic waste infromation system implemented in Romania.
Data collection and management represent a significant issue for the waste management sector in Romania. In many cases data collected is not reliable or is falsely reported, making it difficult to improve waste management policies. The Environmental Authority needs to implement credible monitoring mechanisms and law enforcement arrangements. A better data collection system and alert mechanisms for potential fraud and inconsistencies would be needed.

Data collection and reporting regarding generation and treatment has been performed in different ways throughout the years, with particular differences between the periods of 2003 - 2011 and 2012 – 2014.

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2 Law 211/2011 on waste management
3 Ministry of Environment and Water Management, National Waste Management Strategy 2014 – 2020, available online at http://www.mmediu.ro/img/attachment/37/strategii-planuri-studii-54786035a7ea7.pdf, accessed May 2017

Data regarding the recycling rate reported to the EU is calculated based on EC Decision 2011/753/EU[4]. The recycling rate has been calculated according to the methodology mentioned in Article 3, Par. 1(b) the preparation for reuse and the recycling of paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins before 2011, later switching onto the method mentioned in Par. 1 (d) the preparation for reuse and the recycling of municipal waste. The composted waste quantity calculated according to the new methodology is much higher than the one calculated based on the previously used methodology.

Since 2012, it appears the "official" recycling rate reported to the EU is calculated by adding up the recycling rate and the composting rate.

ANNUAL MUNICIPAL SOLID WASTE QUANTITIES

The total quantity of generated waste is calculated based on estimated waste generation rates of 0.9Kg/person/day in urban areas and 0.4 Kg/person/day in rural areas.
The total quantity of municipal waste collected in 2014 was close to 5 million tons. Out of this, approximately 79% is household waste, 13% is waste comes from the management of public spaces and other municipal services (street waste, green waste, WWTP sludge, etc.) and 8% is Construction & Demolition waste.

The annually generated waste quantity is generally calculated through including the following types of waste:

- Household waste and waste from municipal services, collected by operators
- Household waste not collected by operators
- Recyclable waste collected from the general public through authorized waste management companies, other than municipal service providers (paper and cardboard, metals, plastic, glass, wood, biodegradables, textile, WEEE, waste batteries and accumulators)

Total quantities of generated MSW and the quantity of MSW collected by operators are presented in the graph below, based on data available in waste management reports published by the National Environmental Protection Agency[5]. Generated waste was not estimated for years 2008, 2012-2014.

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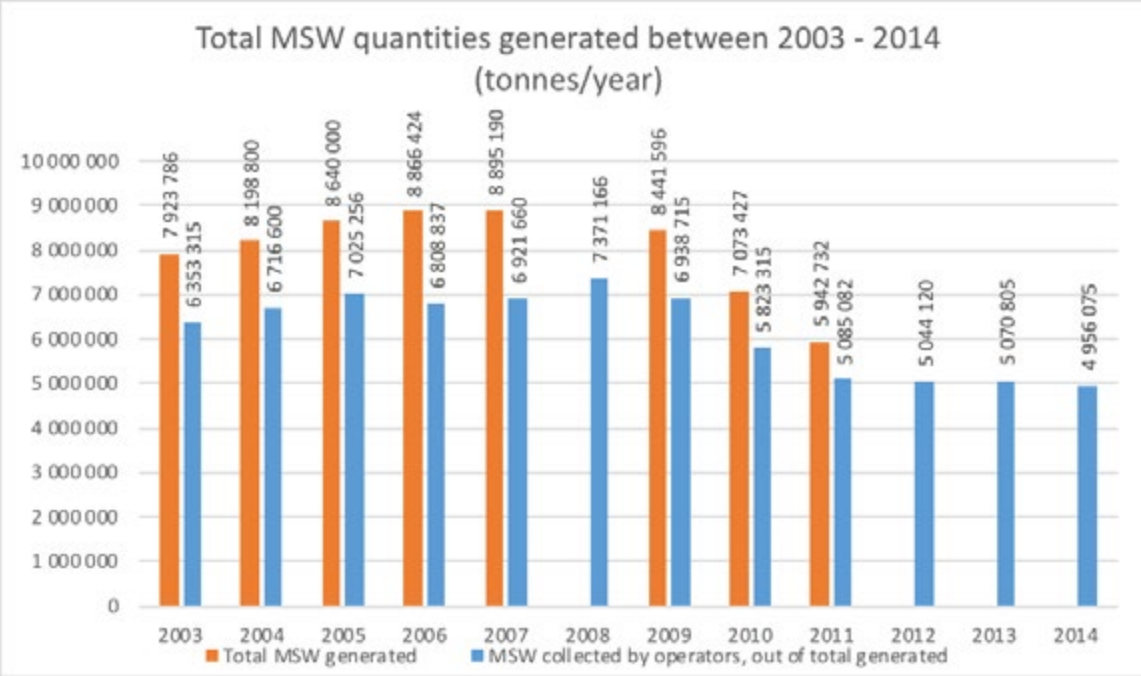
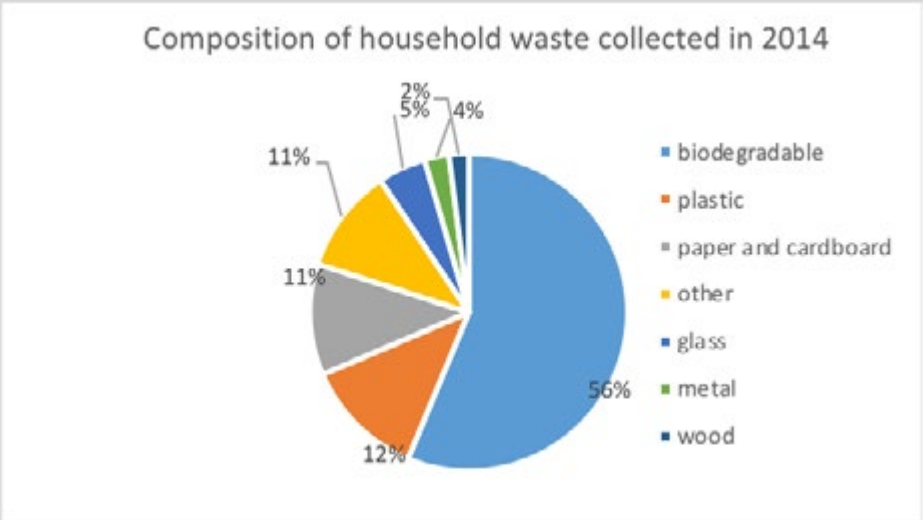
[4] COMMISSION DECISION of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council

[5] NEPA, Yearly information reports regarding waste generation and management for 2003 - 2014, available online at http://www.anpm.ro/cadru-general/-/asset_publisher/Uo4mVebSCOx4/content/informatii_privind_generarea_si_gestionarea_deseurilor?_101_INSTANCE_Uo4mVebSCOx4_redirect=http%3A%2F%2Fwww.anpm.ro%2Fcadru-general%3Fp_p_id%3D101_INSTANCE_Uo4mVebSCOx4%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-2%26p_p_col_count%3D1&redirect=http%3A%2F%2Fwww.anpm.ro%2Fcadru-general%3Fp_p_id%3D101_INSTANCE_Uo4mVebSCOx4%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-2%26p_p_col_count%3D1 (in Romanian), accessed June 2017



As it can be observed in the chart above, even though total MSW generated has not been calculated every year, waste quantities follow a descending trend starting with 2008. One of the reasons for this decrease is the economic crisis from 2008, together with other contributing factors, such as changes in methodology, migration, etc.

Household waste is largely composed of biodegradables, plastic and paper/cardboard, as depicted in the figure below.



Source: NEPA[6]

[6] NEPA 2015, National Environmental Protection Agency, Annual environmental report – 2015, available online at http://www.anpm.ro/documents/12220/2209838/RSM_2015%27.pdf/924aa8b6-429c-46f6-ac75-45f2fdd03e41, accessed June 2017.

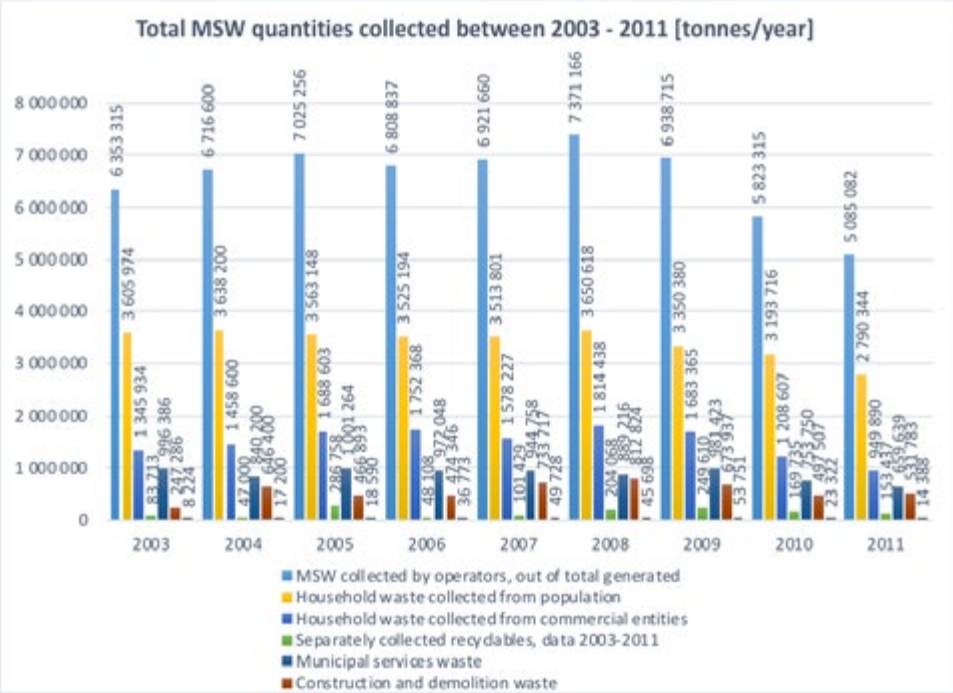
WASTE QUANTITIES COLLECTED

Information on the MSW fractions collected separately is available in yearly reports published by NEPA between 2003-2011. In these reports, the total collected quantity MSW included the following categories of waste:

1. Mixed household waste collected from population
2. Mixed household waste collected from commercial entities/institutions
3. Waste from municipal services (street cleaning, markets, parks and gardens)
4. Separately collected recyclables (quantities also broken down by type of waste, such as: paper and cardboard, glass, plastic, metal, biodegradables, etc.)
5. Separately collected bulky waste
6. Construction and demollition waste

The total quantity of MSW collected by service operators was a sum of the quantities for each category above, as it can be seen in the graph below.

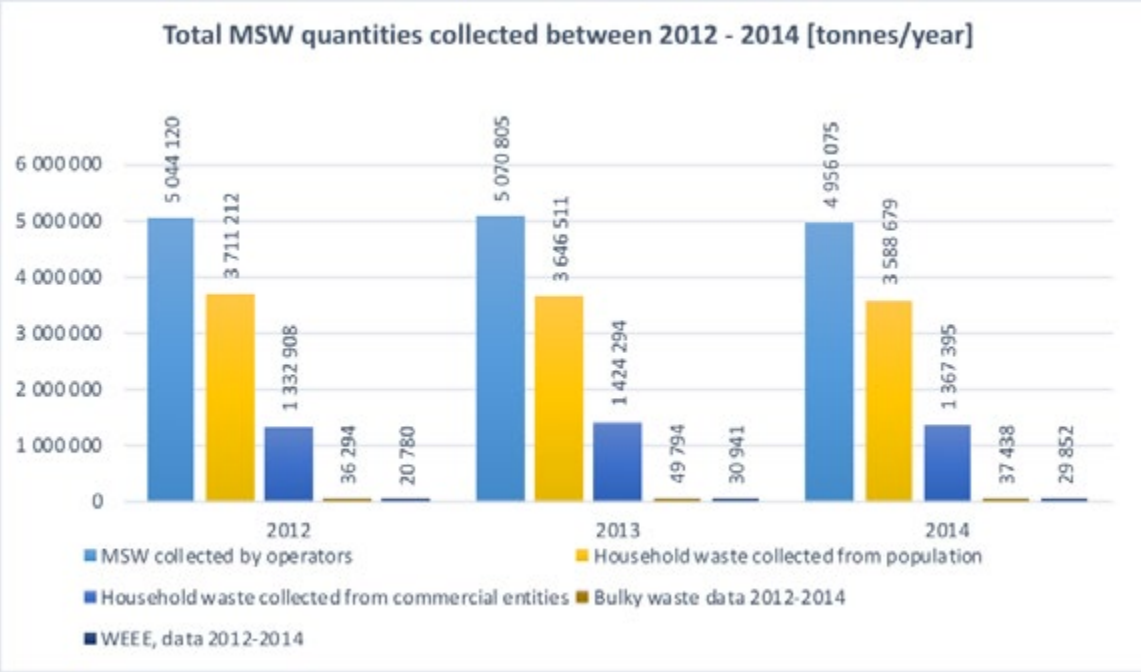
Information published by NEPA on the MSW collected between 2012-2014 is much more condensed than in previous reports, as it can be observed in the graph below.



The municipal waste quantity collected by operators is divided between the following:

- Household waste collected from the population
- Household waste collected from commercial entities

Reports include also information on the quantities of bulky waste and WEEE, as quantities out of total collected MSW.



ANNUAL WASTE DIVERSION AND LANDFILLING

Data regarding recycling is quite scarce between 2003 – 2011, as the only treatment methods mentioned in the reports are "recovery" and landfilling, even though data on different streams of recyclables collected separately is mentioned.

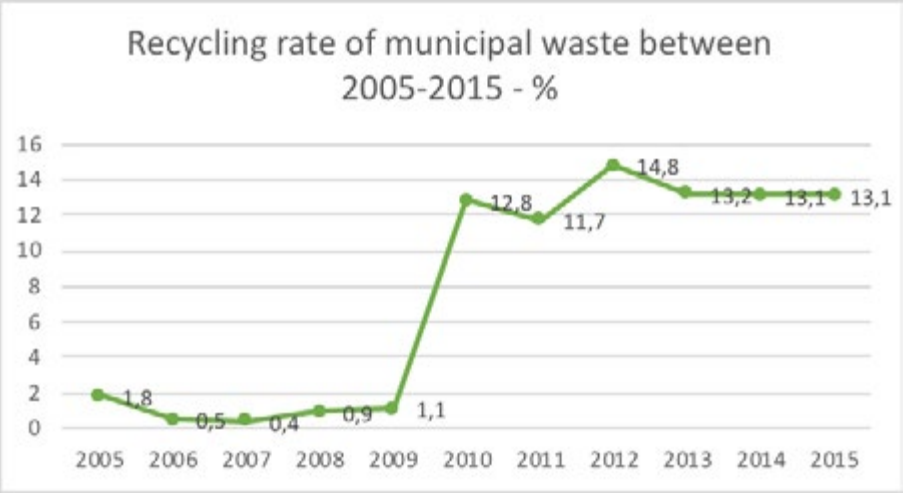
Reports form the 2012-2014 period include more substantial data with regard to treatment methods, mentioning also material recycling, composting and energy recovery as "recovery" methods.

The breakdown of landfilling and waste treatment methods in Romania in 2014 is shown in the figure below. Landfilling prevails, with 72% of the total amount of waste collected by service operators being landfilled. Recycling rate is slightly above 5%, while composting and energy recovery amount to 7.9 and 2.7%, respectively of the collected waste.

ANNUAL MUNICIPAL SOLID WASTE PERCENTAGE SEPARATED AND RECYCLED

The recycling rate of municipal waste in Romania increased between 2005 and 2015, reaching an official reported value of 13.1% in 2014, but it remains considerably lower than the EU average (45% in 2015). Therefore, Romania must heavily invest in recycling in the coming years in order to reach the 2020 recycling target of 50% (see "Legislation" chapter).

The figure below shows the recycling rate of municipal waste reported to Eurostat between 2005 and 2015 in Romania. The sharp increase in recycling from 2009 to 2010, it is very likely that this is due to changes in the way data was reported and not to a real change in the percentages of waste being recycled[1] (further details in the Data collection methodology section).



Source: Eurostat, data from 2005-2015

2. Legislation

LEGAL FRAMEWORK

Romania agreed to harmonize its legislation to the Aquis Communitaire with a few derogations from the targets and obligations, defined in Chapter 22 of the Accession Treaty. The terms of the derogation periods are all passed at the timing of writing of this report, the last of these was the transition period to implement the closure of old disposal sites by 2017 (directive 99/31/EC on landfilling).

Among the EU legislation transposed in the Romanian legal framework, we mention the following as the most relevant regarding waste management:

- the EU Waste Framework Directive EC/2008/98
- EC Regulation No 1010/2006 regarding the transport and transfer of waste
- 31/1999 directive on landfilling
- 76/2000 directive on incineration
- 86/278 directive on agricultural use of sewage sludge
- 53/2000 directive on end of life vehicles
- 62/94 packaging waste directive
- 96/2002 WEEE directive
- 95/2002 Hazardous waste directive
- 66/2006 batteries directive

STRATEGIES AND PLANS

Romania is obliged to periodically plan at national, regional and local level the implementation of the national waste management legislation.

- Romania has approved a National Waste Management Strategy in 2013 for the 2014-2020 planning period
- Having a National Waste Management Plan was part of the obligations with a 2013 deadline, and was an ex-ante requirement for the Large Infrastructure Operational Programme for 2014-2020 period

Romania is facing infringement for failing to fulfil the ex-ante requirement and on the 27th of April, 2017, the EU has taken Romania to the Court of Justice of the EU for failing to review and adopt the national waste management plan and waste prevention programme in line with the EU Waste Framework Directive and the circular economy[7].

[7] http://europa.eu/rapid/press-release_IP-17-1047_en.htm

PROGRESS TOWARDS STRATEGIC OBJECTIVES

A series of initiatives which support the transition to a circular economy, in particular focusing on waste, include[8]:

- The national Law for Waste Management (adopted in November 20119): this law establishes the mandatory character of separation at source for large waste generators and was seen as a major step forward.
- In line with the implementation of the Waste Framework Directive, including of its provisions related to Hazardous Waste and to Waste Oils, has been driving the changes in the Romanian waste management regulations. The Waste Framework Directive, Romania sets a target for preparing for re-use and recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, reaching a minimum of overall 50% by weight by 2020[10]. Romania, together with other member states, has possibility to request a time derogation of maximum 5 years beyond 2020 in case they prove to be unable to meet them and where they comply with certain conditions[11]

Even with the increse in recycling rates, Romania has a hard time meeting the EU targets. The EU Landfill Directive prescribed that all Member States had to reduce the amount of biodegradable municipal waste (BMW) landfilled with a certain percentage (by weight) by 2006, 2009 and 2016 in comparison to the generated BMW level in 1995. Countries that were landfilling more than 80% of their MSW in 1995 had the option to obtain a derogation period of maximum four years. Romania qualified for this derogation and has to meet the targets by 2020.

The EU accession treaty imposed Romania several targets regarding closing of old uncompliant landfills throughout the country. The Sectoral Operational Program Environment 2007-2013 included a priority axis for financing projects (with more than 80% EU contribution) in waste management. The main objectives of this priority axis included reducing landfilled waste quantities, increasing recycling rates and establishment of efficient waste management structures, while increasing service coverage rate at acceptable tariffs. Activities envisioned to be financed were, among others, the construction of sorting, composting and recycling facilities, construction of transfer stations, closing of non-compliant landfills, as well as technical assistance in the field of waste management activities.[12]

The national targets and progress towards achieving them (at the level of 2015) are presented in the table below.

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8 Commission Staff Working Document, The EU Environmental Implementation Review Country Report-Romania, 2017

9 Law no. 211/2011 on waste regime as amended, republished in the March 28th, 2014

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

11 European Parliament briefing, Review of the EU waste management targets: 'Circular Economy Package, January 2016, available online at http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/528826/EPRS_BRI(2016)528826_EN.pdf, accessed June 2017

12 Ministry of EU Funds, Annual Implementation Report for 2014, Sectoral Operational Program Environment 2007-2013 (in Romanian)

Item	Current situation	Target
Recycling rate for the recyclables in the MSW	13.1 %[6] in 2015	50% (2020)
Packaging waste recycling rate	54.8% [6] in 2014	55% (2014)
Landfilling municipal biodegradable waste	53% in 2013[5]	50% (2013) and 35% (2016)
Fully operational ISWMs at county/region level[12]	2	37
Closed non-compliant landfills[13]	92	240

Waste management remains a key challenge for Romania. The majority of the total collected municipal waste is still landfilled in Romania. In 2015 for example, from the total amount of MSW collected, 82,4% (178 kg per capita) was landfilled, 2,8% was incinerated, 6,5% materially recycled and 8,3% composted. (source: Eurostat, 2015). Due to reasons such as the low number of functional composting facilities in Romania (which process mostly green waste) and individual composting not being a mainstream practice, it is considered that the real recycling rate is actually much lower than reported, namely around 5% in 2013[1].

LANDFILL TAX

A landfill tax was introduced on the 1st of January 2017 (80 lei/tonne tax on top of the existing gate fee for landfilling). After much debate and opposition, the way it is implemented has changed, namely the tax will be applied only as a fine to municipalities and operators that fail to achieve the yearly recycling targets (2017 – 20% and progressing towards 50% in 2020) and only for the amounts that fell short of the recycling targets, not the total waste quantities landfilled.

EXTENDED PRODUCER RESPONSIBILITY

Since 2002 Romania has implemented an Extended Producer Responsibility (EPR) scheme for packaging waste. There were 8 Producer Responsibility Organisations (PRO), however they didn't meet the targets for recovery/recycling of packaging waste despite consistent efforts, mainly due to gaps, ambiguity and contradictions in the legal framework. EPR legislation has collapsed in Romania in 2016 as double counting and fraud has been uncovered and PROs and the producers and traders falling under the scheme have been fined. Since the end of June 2016, legislation has changed, allowing packaging producers to fulfil the recycling targets individually (without a licence), through recovering packaging produced by other entities. Currently there are 10 PROs licenced by the Ministry of Environment. Producers generally prefer contracting a PRO in order to make sure they will not need to pay the 2 lei/kg tax for the quantity of packaging waste for which they fail to meet recycling targets.

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[13] Large Infrastructure Operational Programme 2014-2020, http://www.fonduri-ue.ro/poim-2014#rezultate-implementare, accessed June 2017.

3. Institutional framework

Waste management includes collection, transport, treatment, recovery and disposal and responsibilities are assigned to waste generators ("polluter pays" principle) or waste producers ("producer responsibility" principle), depending on the case.

The roles and responsibilities as defined in the World Bank Strategic Planning Guide for Waste Management (Wilson et al, 2001) include those of policy maker, planner, regulator, client, service delivery and revenue collector. Added to these roles often is a change agent, in the Romanian case this is the EU, driving policy change, investments, targets in the sector.

In terms of CII waste, managing this category of waste falls under the responsibility of the waste generator, who needs to ensure through contracts with the municipality or private operators either waste recovery (recycling or incineration with energy recovery) or disposal (landfilling or incineration without energy recovery).

INSTITUTIONAL SETUP

The **policy maker**, the organizations setting the legal and strategic framework at the national level for service delivery at local and regional level, is the Ministry of Environment. The necessity and obligation of the Ministry for drafting and periodically updating the National Strategy is set in the law. The latest governing document in this sense is the strategy for the 2014 – 2020 time horizon.

The **regulator** function for environment in Romania is split into setting legal standards, issuing permits and carrying out monitoring ensured by the National Environmental Protection Agency and its county level agencies and into enforcement of compliance ensured by the Environmental Guard and its county level agencies.

The National Agency for Regulating Municipal Services (ANRSC) has a specific role as a regulator, because the responsibility for licensing waste management operators falls under its obligations. This is also the agency who developed the methodology for calculating and developing tariffs and guidance for preparing public procurement and contracting service operators.

Planning is carried out at national level by the Ministry of Environment while at regional level by the Regional Development Agencies, the Association of Municipalities (county level) and at local level by the Municipalities. There is an obligation for planning since 2007.

The **client**, responsible for ensuring the provision of a reliable waste management system meeting required standards is the Association of Municipalities (county level) for regional facilities and systems and the Municipality for locally managed systems.

Service delivery on the ground is done by either municipal companies or private operators. Municipalities **collect revenues** in the form of taxes or operators collect tariffs directly from service users.

EU AS A CHANGE AGENT

The EU accession has been the key factor for the changes in the legal framework in the sector. Currently, as much of the legal harmonization is completed, the EU is financing a major part of the efforts of Romania to improve its performance in the sector and achieve full compliance. As such, the EU is still a major driving force for all developments in the sector.
Most of the financing for the sector came through the Sector Operation Programme for Environment allocated during the 2007-2013 programming period. The implementation of these funds is still under way; it has financed county level integrated waste management systems. The Ministry of Environment developed the programme.

Connected to the Integrated Waste Management Systems (IWMS) the institutional setup in waste management changed. The Association of Municipalities was created for the special purpose of implementing these integrated projects. The principle of association was that that of equity and fairness, dividing costs among participating municipalities taking into account affordability, size and not factoring in real distances from the regional facilities developed.

For the current programming period, 2014 – 2020, the Large Infrastructure Operational Programme has identified an incineration plant for financing in Bucharest. Preparing these programmes and the related calls and guidelines are embedded in the sector strategies and plans. The Ministry of Regional Development is responsible for this programme

ROLE OF PRIVATE SECTOR

Private recycling companies and the informal sector participate in the recycling business independently from the institutional scheme presented above, collecting and processing waste for the intrinsic value of the materials. The private collectors of recyclables focus on commercial clients such as supermarkets or producers and traders generating packaging waste or other recyclable waste streams.

The informal sector collects by street picking and picking on disposal sites still in operation. These waste ends up in different size scrap-yards, where they are sorted and pressed. The largest processing company in the region is Greentech Buzau, where much of the PET recyclable packaging waste is processed from Romania and Eastern Europe. Greentech is part of Green Group, a group of six recycling companies which also includes glass and respectively WEEE recycling facilities, together with a polyester fibre producing facility, which uses 100% recycled PET (from Greentech) as raw material. For metal recycling, the old national recycling network of REMAT is used that still has a wide network of collection points in the country.

The role of producers and traders in recycling is increasingly important as they take on responsibility for managing and trading recyclable waste streams either by subsidizing the market players through the Producer Responsibility Organizations, or by working directly with collectors and recyclers on the market.

APPROVAL PROCEDURE FOR BUDGET, INVESTMENT, TARIFFS

Budgeting is done annually based on the running costs occurred from previous years and based on the contracts in place. The investment budgets are drawn annually also, and may include small allocations for urgent replacement collection of the fleet, activities to reshape and close old landfills.

Much of the **investment** funds come from either the EU financing programmes or private investors. Authorities tied to such projects prefer to wait and postpone any developments rather than risking major investment funds, often around the bulk figure of 50 million Euros in grant financing.

Another source of investment for improving collection are requirements in investment programme imposed on private service providers, which may include specifications for the fleet, new containers and collection points, etc. There are isolated cases where municipalities have opted for financing through private investment in a sort of PPP arrangement, where the private company has invested in a landfill and treatment facility in a Build Operate Finance Transfer type longer term contract (examples are Oradea and Constanta).
Approval of tariffs happens at the moment of signing a service contract. The municipality at the point of drafting a public procurement for collection services estimates the tariffs; these are reviewed by the ANRSC. The bidder who submits the lowest tariff wins, granted that they fulfil all the technical bidding requirements. After the service contract is signed the tariff may be adjusted annually to the inflation rate. The operator prepares a documentation that justifies the change of the tariffs and submits these with a request for approval to the Municipality.

4. Public Outreach

MAINSTREAM

The Integrated Solid Waste Management regional projects which have been initiated in 32 counties through the Municipal Associations all include awareness components, however these have been only marginally effective. As with the rest of the components of these

SELECTED GOOD PRACTICES

Schools and high schools selective waste collection programs, such as "Green Corner in my school".

RECOLAMP Association, ECOTECA Association, in partnership with Ministry of National Education and Ministry of environment, Waters and Forests launched the project on September 27th 2011 (http://cvsm.coltverde.ro/). The aims of the project were to promote environmental awareness through educational activities and to improve selective waste collection in school units. The project had two stages: in the first stage the pupils disposed a green corner, where they collected waste for recycling; in the second stage, the school's units that collected the largest quantities of waste were periodically awarded.

National project The project "Let's do it, Romania!"

The aim of the project is collecting garbage from the natural areas, in different regions of the Romania. For example, "Let's do it, Danube!" put emphasis on raising awareness towards the environment and it represented a civic example offered by the citizens and the employees of a waste company (Polaris). The 1.2 tons of municipal waste collected, 80% out of which were recyclable waste, proved that the message of this action reached its target. The citizens understood that in order to live in a clean and healthy environment individual action is needed (http://www.polaris.ro/evenimente-csr.php).

"Let's keep waters clean!"

This is an eco-campaign for social accountability that won the Best Green International Campaign prize, with the innovative ideas of "pet-ștele" and "me-doza" (words are similar to Romanian "peștele" (the fish) and "meduza" (jellyfish) but are slightly modified to contain the words PET and "doza" – aluminum can in Romanian) (http://www.ziare.com/stiri/frauda/pet-stele-si-me-doza-au-castigat-premiul-verde-la-londra-479146). On World Water Day, in 2015, Apa Somes Tisa Water Basin Administration and Cluj County School Inspectorate developed a Land Art project, using the plastic bottles collected from the area near Somes river. The volunteers build a symbolic fish out of plastic bottles, called "PET□tele".

Successful national WEEE campaigns

Started in November 2014, the ECOTIC Caravan is one of the most extensive awareness campaign in Romania. The objective of the caravan is informing and educating children and adults with regards to the WEEE collection. The project was co-funded through EU's Life+ Program. ECOTIC's Caravan is an exhibition of WEEE, that went all across Romania and was stationed in places like schools and town public squares. The Caravan was set up to contain two major campaigns: one targeting children, as representatives of the next generation – called "The Eco Days in Your School" and one targeting the general public, called "The Recycling Days in Your City". The first campaign reached over 200 schools and "The Recycling Days in Your City" campaign reached 30 cities in Romania. ROREC and ECOTIC non-profit associations (registered in 2007) take over the responsibility from the producers / importers in managing WEEE. Among other activities, the associations develop annual campaigns in order to increase the rate of WEEE collection and recycling. The incomes to support the collection and recycling costs are guaranteed by the "green stamp" system – a fixed taxed that, according to legal requirements, customers must pay when purchasing new EEE (http://www.regions4recycling.eu/upload/public/Good-Practices/GP_Ilfov_WEEE.pdf).

ELV programme developed by the Ministry of Environment

"Rabla" programme (Romanian word for "Wreck") started in 2005 and is implemented each year by the Ministry of Environment through the Environmental Fund Administration, reaching its 13th edition in 2017. The programme is aimed at encouraging Romanians to change their old, polluting vehicles with new ones, with lower impact on the environment. For each old vehicle submitted, the owner gets a ticket with a value which is assigned yearly (started from ~700 euro equivalent in 2005 and reached ~1400 euro in 2016). The owner can use the ticket at car dealerships for a deduction of the price of a new car, or sell it at a negotiated price to someone willing to buy a new car. Almost every year new features and "bonuses" were added to the programme, to stimulate buyers to purchase hybrid/electrical/low emission vehicles. From 2005 till 2016, the programme helped in the cassation of approximately 553 thousand vehicles, with 311 thousand new vehicles being bought (http://www.afm.ro/main/programe/psipan/evolutie_rabla.pdf).

projects, the awarding criteria for public bids has been the lowest price, resulting in poor quality campaigns which resulted in little results.

Often due to delays in implementing different phases of the ISWM projects, these awareness campaigns have not been delivered in a logical manner. For example, in some cases, years before the infrastructure was in place, citizens were instructed through flyers in the mail, letters and various events how to separately collect waste, as is the case of Cluj Municipality.
Some operators and municipalities resort to awareness campaigns financed from own funds, aiming at improving recycling rates and/or meeting contractual obligations. These actions are however often limited to flyers distributed in mailboxes and information on the operators' websites.

A recent action carried out by the Ministry of Environment was elaborating an Education and Awareness Programme on Waste Management, to be financed through the Environmental Fund Administration. The programme, in its current form, foresees 100% non-reimbursable financing up to 100 000 Euro per project, for waste management awareness projects carried out by administrative units and municipalities, NGOs or education institutions. The Draft Ministry Order for the approval of Financing Guidance document for this programme was submitted for public debate in March 2017, but it is unclear when/if it the programme will be launched[14].

5. Operations

Municipal services, which include collection of municipal waste, cover approximately 82% of the population of the country (2014 data[15]), with 92% of the urban area and 69% of the rural area having access to municipal services. This percentage varies from county to county. The current situation has significantly progressed from the level of 2008, when the coverage rate was approximately 50% at national level, with 80% in urban areas and 20% in rural areas.

TRANSITION FROM LOCAL TO REGIONAL SYSTEMS

Out of the 42 counties in Romania, 37 have applied for EU grants for Integrated Waste Management Systems, these are in various phases of implementation. Information on the state of these developments is presented in the Legislation/Progress towards strategic objectives section above. These regional systems are more or less standard, they include regional sanitary landfill, transfer stations, mechanical biological treatment with sorting and composting, collection of waste on 4 fractions, improvement of the fleet and the containers, awareness raising campaigns.

Even though there were design problems and delays in implementation, authorities do not want to risk losing the financing, which means they will keep the initially designed

[14] Ministry of Environment website: http://www.mmediu.ro/articol/mm-supune-dezbaterii-publice-proiectul-de-om-privind-aprobarea-ghidului-de-finantare-a-programului-vizand-educatia-si-constientizarea-publicului-privind-gestionarea-deseurilor/2148, accessed June 2017.

[15] National Environmental Protection Agency, Annual environmental report – 2015, available online at http://www.anpm.ro/documents/12220/2209838/RSM_2015%27.pdf/924aa8b6-429c-46f6-ac75-45f2fdd03e41, accessed June 2017.

solutions and/or implement in the meantime solutions that are complementary to the projects approved by the EU for financing.

TRANSITION FROM LINEAR TO MULTI-DIMENSIONAL SYSTEMS

Sites like Oradea and Timisoara, where investments were possible through PPP, are more advanced than others in terms of source separating, sorting, composting. Other solutions which have also been viable include RDF production and use of waste for co-incineration in cement kilns, especially for municipalities where waste disposal sites were closing down according to schedule but there were no alternatives for waste disposal in place.

Specialized solutions for processing different streams of waste have emerged in recent years, mostly through private investments. One of the biggest recycling plants of South East Europe, attracting materials from the whole region, is Greentech Buzau, with Chinese investment capital. Anaerobic digestion (AD) is in some cases employed for processing agricultural waste, with 11 plants in 2015, out of which 3 also use manure in the mix of feedstock. Factors driving the implementation of AD for the treatment of agricultural waste include the provision of Green Certificates for clean electricity production, as well as various financing initiatives through national programmes. The AD plant in Seini, Maramures County, is a pilot project implemented with the support of the World Bank and the Global Environmental Fund, through a national programme for Integrated Nutrient Pollution Control. The programme foresees financing other similar projects in the coming period[16].

CAPACITY BUILDING PROGRAMS

Association of municipalities (Intercommunity Development Associations) are weaker than the municipalities in implementing ISWMSs, as they are recently-formed organisms and lack experience. Capacity building programmes are a stringent necessity, and even though projects sometimes include technical assistance components, these are targeted at elaborating technical documentation necessary for project approval, not in implementation support.

CUSTOMER SATISFACTION

Customer satisfaction is related on the one hand to cleanliness and provision of waste collection services, and in urban areas this has considerably improved, and on the other hand to tariffs. Rural areas suffer from littering, lack of proper service and obligation to participate in the regional systems that are usually perceived as expensive.

An issue which is linked to the improper implementation of the awareness campaigns included in the ISWMSs is that in areas where these systems are not yet fully implemented or not functional, the public is frustrated by the lack of a comfortable and reliable service for collection of source segregated waste, as sometimes population source separates but does not know what to do with the source separated waste.

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[16] Integrated Nutrient Pollution Control programme, Ministry of Environment, http://www.mmediu.ro/categorie/controlul-integrat-al-poluarii-cu-nutrienti/96, accessed June 2017

6. Financial

OPERATION COSTS

There is limited publicly available information or data collection on operation costs of waste management in Romania. Nevertheless, these costs can be rather accurately inferred from the user charges, because the most common system for revenue collection in Romania is for the operators to collect tariffs directly from the users. User charges include the cost of collection, treatment and disposal.

User charges in most cities vary between 1.50 to 2 Euros/capita/month that translate into total specific cost of 45 to 75 Euro per tonne for waste management, considering an 80% average payment rate of user charges and a generation rate of 0.9 kg per capita per day. Of these costs 10 to 20 Euro per tonne represents the cost of landfilling as reflected in the typical gate fees, and the rest covers collection, any recycling and treatment that may occur, and a margin for the operator.[17]

Cities where waste management is more advanced, including mostly private initiatives for sanitary landfilling (Sibiu, Oradea) or initiatives for larger scale separate collection of recyclables implemented by the operator (Timisoara) have costs that are on the higher side of this spectrum, namely around 75 Euro per tonne. In cities where the EU financed integrated waste management systems are implemented operation costs have increased (Vrancea[18]) or are expected to increase to about 120 to 150 Euros per tonne. A reason for the steep increase in the operation costs is the scale and complexity of the EU financed systems. These systems are most often designed to operate at county level, include several transfer stations, decommissioning of old non-compliant landfills, larger transport distances, as well as larger and sometimes over dimensioned fleet of vehicles.

EUROPEAN GRANT FINANCING PROGRAMMES

The EU has been a decisive factor in investment in the country. On the one hand, it made large amounts of grant financing available, developing and engaging to finance projects in 39 out of the 42 counties plus the metropolitan area of Bucharest. On the other hand, these projects have been prepared and implemented over the span of 17 years, and the physical results on the field are less than perfect.

Major investments in Integrated Waste Management Systems by the EU financing programmes started already in the pre-accession period through the **Instruments for Structural Policies for Pre-Accession (ISPA) funds during 2000 to 2006**. During this time, 7 investment projects either for integrated systems or part of these were financed (waste management systems in Piatra Neamt, Galati, Ramnicu Valcea, Teleorman, Dambovita, Arges and sanitary landfill in Bacau).[19]

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[17] Own calculation based on information from interview with the Municipality of Cluj Napoca, published in the local newspaper in 2015, *Stiri de Cluj*, http://www.stiridecluj.ro/politic/gunoaiele-din-cluj-napoca-se-scumpesc-cu-1-33-lei-de-persoana-firmele-vor-plati-de-trei-ori-mai-mult; the website of the waste operator of Craiova, 2017 http://www.salubritate-craiova.ro/tarife.html (sites accessed on the 29th of June 2017)

[18] Feasibility study, Technical assistance for the preparation of projects in the waste management sector-Romania, Volume 2, revised, 2011, http://www.vranceacurata.ro/wp-content/uploads/2012/01/STUDIU-FEZABILITATE-SMID.pdf (sites accessed on the 29th of June 2017)

[19] Ministry of Public Finance, About the ISPA measures http://www.mfinante.gov.ro/ispa_mediu.html?pagina=ispa (site accessed on the 30th of June, 2017)

Thereafter, most investments were financed through **the 2007-2013 Sectoral Operational Programme (SOP) for Environment**. The typical project costs about 30 to 70 million Euro per county, where the population ranges from 200 to 700 thousand people per county. The allocated amount for the waste sector for the 2007 – 2013 financing period was 746 million Euro. In 2014, at the end of the financing period, though the progress of the actual construction and operation of the EU financed integrated waste management systems was slow, the project development and contracting was significant, thus the committed funds were 1.117 million Euro, representing about 150% of the originally allocated amount. At the end of the financing period 32 projects were in various phases of implementation, contracted or approved for financing.

36% of the projects were quite advanced, over 50% of completion in terms of progress of the construction works and implementation of the procurement contracts. As there was a significant delay in project development and implementation, 64% of these of these projects were phased and are programmed for financing under the Large Infrastructure Operational Programme (LIOM) during the 2014 -2020 financing period.[20]

The phased projects inherited by LIOM from SOP Environment due to delays and poor performance take up 70% of the available budget available for waste management. New applications for investment projects cannot be proposed until the conditionality related to the existence of a National Waste Management Plan (NWMP) is resolved. The only exception to this rule is the waste to energy project of Bucharest, which can be prepared in parallel to the preparation of the NWMP.

Further funds are not yet allocated and the additional investment needs will be investigated and defined once the NWMP is completed. It is expected that financing will be allocated to prevention, recycling, moving towards circular economy[13]. The reasons for delays in these investments include, but are not limited to, problems in design, either over or under estimation of capacities, insufficient consideration of geological and hydrological conditions, problems with siting for landfills, unclear juridical situation of lands allocated to the projects, lengthy and difficult procurement procedures, lack of administrative capacity, lack of capacity on the part of the service providers, consultants, engineers and operators, difficulties in establishing, negotiating and managing the Inter-Community Development Associations, etc.

OTHER SOURCES OF INVESTMENTS

The integrated waste treatment facility in Oradea, financed through private financing of the operator EcoBihor, and the landfill of Arad, developed by the Austrian operator, ASA have PPP arrangements. In addition, local authorities often used their own resources to invest into closure of disposal sites, or upgrading disposal sites to be able to prolong the period of operation.

Infrastructure for source-separated collection of recyclables was partially financed through the Producer Responsibility Organizations financing bell shaped containers. According to the yearly report of the main PRO, ECOROM, 17.5 thousand containers were placed in the country for separate collection of recyclable materials from households, the related

[20] Ministry of European Funds, SOP Environment, Annual implementation report, 2014

expenditure totalling about 15.5 million Euro in the period between 2006 to 2014 for infrastructure, services and awareness raising.[21] This system, though rather wide spread, was underperforming. After the collapse of the system, the fate of this infrastructure is not clear, they may be withdrawn.

Romania must heavily invest in recycling in the next coming years in order to reach the 2020 recycling target. This is also due to low waste tariffs, which do not generate sufficient income for future investments. The relevant strategies and instruments to divert the waste from landfills are not in place and there is no comprehensive and decisive enforcement action against illegal landfilling.[22]

TARIFFS AND PAYMENT RATES

Two types of revenue collection are available in Romania:

1. (i) as user charges collected directly by the operator with no measures for enforcement and payment rates around 70% in urban areas, 50% in rural areas;
2. (ii) in the form of a tax collected by the municipality, where payment rates are around 80% and the municipality has means to enforce the collection by administrative fines.

Payment rates are especially low in cases where the operator is tasked with revenue collection. This is an expensive system, and operators have no means to enforce compliance while they also cannot seize providing the service to non-payers, as continuous provision of services is a contractual obligation.

Mostly user charges are a flat rate per capita. There are also examples of pilot pay as you throw tariffs (i.e. RER Oradea[23]) and pilot initiatives for giving incentives to those who recycle (household areas operated by Rosal, in Clu[24]j). Tariffs and methods of billing are differentiated between the commercial sector and households, with the aim to cross-subsidize households. This causes many smaller companies to try to avoid having a contract with the operator as a commercial entity. For construction and demolition waste, green waste and bulky waste, there is a special call-on service that can be used and paid per service.

AFFORDABILITY AND WILLINGNESS TO PAY

Tariffs are calculated at the international benchmark of affordability or below, they are politically sensitive. EU financed investment plans have taken into account affordability and include a gradual increase of tariffs.

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[21] Extending the source separated collection of recyclables of packaging waste, Romania, by ECOROM Packaging waste in the period 2006-2014, ECOROM Packaging waste, 2015, www.colecteazaselectiv.ro

[22] Commission Staff Working Document, The EU Environmental Implementation Review, Country Report-Romania, 2017

[23] In Oradea, the system was designed to shift from paying per member of the household, to paying per volume of waste generated. The system includes different sizes of pre-paid bags for non-recyclables, in which the price of the bag includes the collection service (larger bag = higher price).

[24] In areas with individual houses covered by Rosal operator, households that separate the wet and dry fractions, (which are collected on different days), can obtain a reduction in tariff for waste management services, compared to the ones that don't (which pay the usual tariff).

Recent increases in tariffs were linked to the introduction of the landfill tax trickling down to the user charges. Another reason was the need to transport waste to farther locations where sanitary landfills were available after the forceful closure of non-compliant landfills, leading to over 150 km transport distances (for example from Cluj to Oradea; from Alba Iulia to Targu Jiu). In other cases, operators strived to enforce compliance, charging a top-up fee for collection of inert waste, because citizens were not using the special call on service for this waste (Craiova).

The introduction of the landfill tax has been postponed from 2013 to the end of the year 2016. When it was finally introduced in 2017, the waste operators were quick to react, thus one of the landfills of Bucharest, Chiajna, operated by the Iridex Group, closed its gates, forcing collection companies to travel longer distances and disturb traffic in the capital city. Authorities reacted and modified the law to be applicable only to the amount of waste that should be diverted from landfilling to recycling according to the applicable targets. This goes to show that increase in tariffs and introduction of economic instruments spark resistance from service users and operators alike.[25]

[25] The landfill tax survived only for 2 weeks, article published in Ecologic on the 9th of February, 2017, http://www.ecologic.rec.ro/articol/read/reciclare-recuperare/14630/, accessed June 2017

7. Project examples

ECOBIHOR ORADEA – AN EXAMPLE OF FAST MODERNIZATION THROUGH PPP

EcoBihor Company in Oradea, Bihor County, exploits and administers the sanitary landfill of the county on a 20-year contract, within a public-private partnership together with the municipality of Oradea. The company was established for this purpose in 2004, by a Hungarian company. The facilities include a sorting station for recyclable waste, a composting station, a construction & demolition waste processing station and the sanitary landfill with biogas extraction system and CHP production, as well as a landfill leachate treatment station.

The company operates gate fees of 17.5 Euro/tonne for most waste types, except for separately sorted construction and demolition waste for which it charges 2.44 Euro/tonne and recyclables which are taken in for free.

Revenues for the company, besides gate fees, come from selling sorted recyclables, compost and surplus energy produced from biogas.

SALAJ COUNTY - AN INTEGRATED WASTE MANAGEMENT SYSTEM FINANCED BY THE EU AND IN FULL OPERATION

Salaj County established the Intercommunity Development Association called Ecodes in 2009, association which includes all 61 municipalities in the county, as well as the County Council, with the aim of implementing the Integrated Waste Management System through accessing EU funds. The IWMS included the construction of an Integrated Waste Management Centre (IWMC) and three transfer stations and closing of four non-compliant landfills[26].

Facilities in the IWMC include a sorting station, Mechanical Biological Treatment (MBT) facility, a composting station and a sanitary landfill with leachate treatment system. The financing contract was signed in November 2010 with the Ministry of Environment. Three awareness campaigns were carried out in 2012 and 2013, and in February 2015 the contract for operating the integrated waste management centre was signed with a private operator. The operator of the centre also ensures waste collection and transport services in one of the sections of the county (central section, which includes the main municipality). Bidding procedures for the collection and transport services for the remaining 3 sections of the county have not yet been initiated, services being currently carried out by several private operators.

Gate fees established through the 2015 contract between the county Council and the operator of the IWMC were approximately 12.9 euro per tonne.

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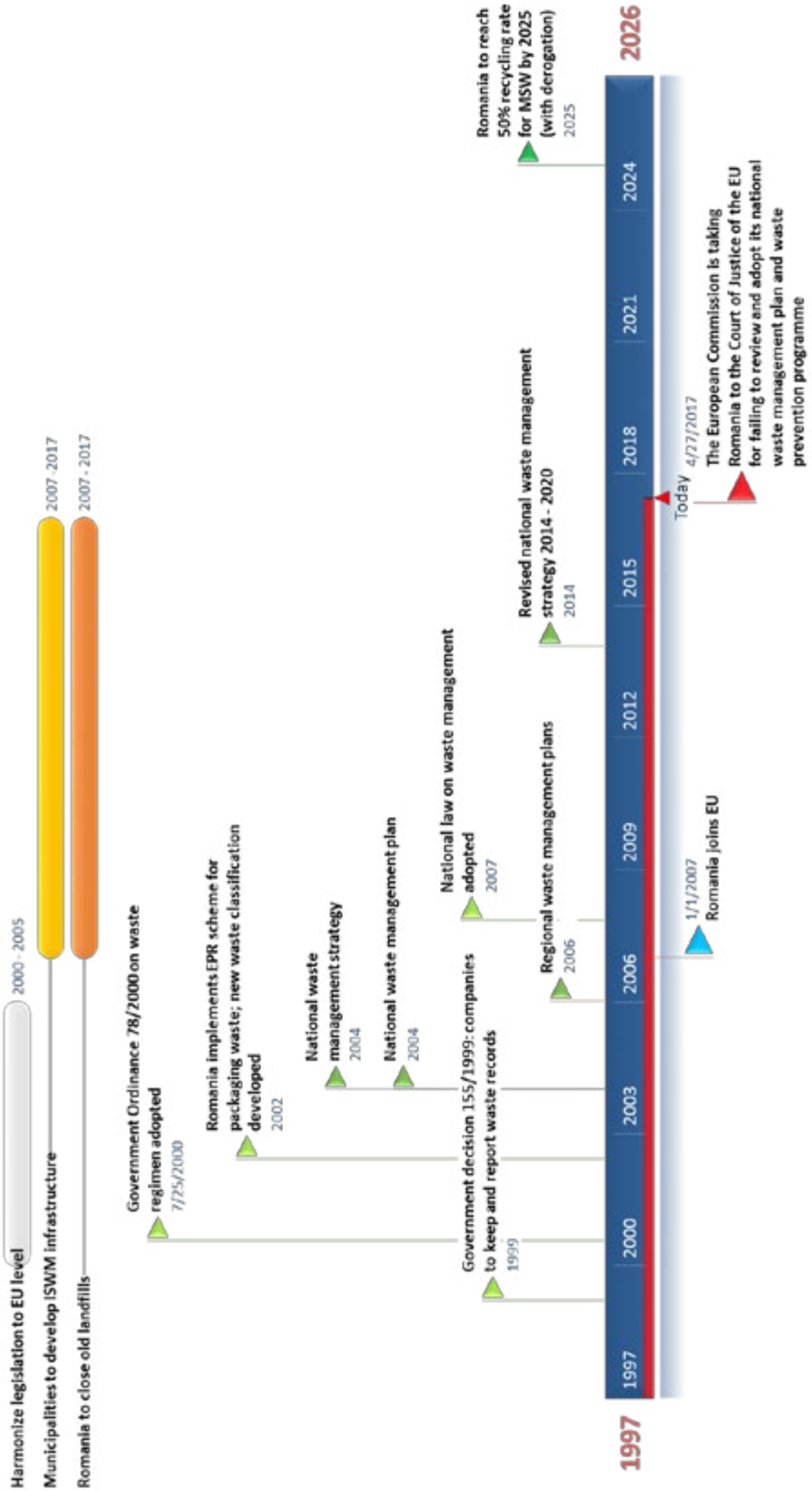
[26] Salaj County Council, Integrated Waste Management System information, http://www.cjsj.ro/index.php/proiecte-in-implementare/25-sistem-de-management-integrat-al-deseurilor-in-judetul-salaj, accessed June 2017.

A comparison between the main features of the two WMS presented above is summarized in the table below.

Parameter	EcoBihor Oradea – Private investment	Ecodes Salaj – EU financing
Time for project preparation	> 1 year	~ 2 years
Period of implementation, from contracting to operation	1 year	~ 3 years
Facilities	▪ Sorting station for recyclables ▪ Composting station ▪ Construction & demolition waste processing station ▪ Sanitary landfill with biogas extraction system and CHP production, ▪ Landfill leachate treatment station	▪ Sorting station ▪ Composting station ▪ MBT facility ▪ Sanitary landfill ▪ Leachate treatment station
Flexibility of contracts	Lock-in, municipality stuck with cash-out operations; 20 year contract	15 year Contract with 1 operator
Gate fee	17.5 Euro/tonne	12.9 Euro/tonne

8. Roadmap


Harmonize legislation to EU level
2000 - 2005
Municipalities to develop ISWM infrastructure
2007 - 2017
Romania to close old landfills
2007 - 2017
Government Ordinance 78/2000 on waste regimen adopted
7/25/2000
Romania implements EPR scheme for packaging waste; new waste classification developed
2002
National waste management strategy
2004
National waste management plan
2004
National law on waste management adopted
2007
Government decision 155/1999: companies to keep and report waste records
1999
Regional waste management plans
2006
Revised national waste management strategy 2014 - 2020
2014
Romania to reach 50% recycling rate for MSW by 2025 (with derogation)
2025
1997
2000
2003
2006
2009
2012
2015
2018
2021
2024
2026
Today
4/27/2017
The European Commission is taking Romania to the Court of Justice of the EU for failing to review and adopt its national waste management plan and waste prevention programme
1/1/2007
Romania joins EU

Tokyo
Development
Learning
Center

WORLD BANK GROUP