

Municipal waste management



North Macedonia 

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Municipal waste management in Western Balkan countries — Country profile

North Macedonia



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Executive summary

Currently, 78 % of the population in North Macedonia is served by waste collection services, with a higher coverage in urban areas than in rural ones. The main system for waste collection consists of 'bring points' with containers for residual waste collection, where citizens take their waste for disposal. Where no waste collection service is provided, people often dump waste at roadsides or burn it in the open. Waste volumes in North Macedonia are increasing, corresponding to the economic growth in the country. Waste prevention measures will be needed to decouple the trend in waste generation from the trend in gross domestic product (GDP).

Today, a key barrier to improving the waste management system in North Macedonia is a lack of funds. Budget must be allocated to improving waste management, for example by closing illegal dumpsites, introducing separate collection and recycling, and increasing collection coverage. Furthermore, the structure of the tariffs today does not incentivise waste prevention or recycling. The introduction of landfill gate fees might encourage increased recycling but dumping waste at illegal landfills will remain a challenge as long as it is perceived as the cheapest alternative.

With regard to recycling, no separate collection of bio-waste or dry recyclables in North Macedonia is organised by the municipalities. There are some marginal recycling activities, with informal waste pickers collecting waste from dumpsites and bins. Bring systems for packaging waste materials are established by the producer responsibility organisations (PROs) in agreement with municipalities and other entities included in the extended producer responsibility (EPR) scheme. Currently, the recycling rates for packaging waste in North Macedonia are low, indicating that the EPR scheme for packaging is not functioning well. Awareness raising and improved collection services could improve the system and generate higher recycling rates.

The current waste management system in North Macedonia is heavily reliant on disposal to landfill and illegal dumping. There are plans to close the majority of the landfills and replace them with regional waste management centres, including a mechanical-biological treatment (MBT) facility, a sanitary landfill or an incinerator for residual waste treatment. The new infrastructure is likely to increase the waste management costs for municipalities as a result of longer transport distances and higher environmental standards than in the current situation. It is therefore important to make sure that waste fees reflect these changes and that the use of the new capacities is properly enforced.

There are national targets to increase separate collection, as set out in the national waste management plan. The national targets are expected to be attained mainly by separate collection of packaging waste, through the EPR scheme, putting the responsibility for the arrangement and financing of separate collection and management of packaging waste on the producers. The national waste management strategy (NWMS) also sets targets for the diversion of biodegradable waste from landfills, which are planned to be met mainly by building an MBT plant, complemented by encouraging home composting. The NWMS will be updated in 2021.

The currently planned improvements still focus mainly on mixed municipal waste. The additionally planned waste management capacities are important steps towards improving the situation, and planned improvements in the EPR legislation should help to make the EPR system more effective. However, the measures are unlikely to be enough to meet the national targets and even less so to meet the EU targets. More attention needs to be given to increasing recycling, for example through enabling separate collection, incentivising citizens through 'pay as you throw' fees and raising awareness. This needs to be accompanied by the political will to



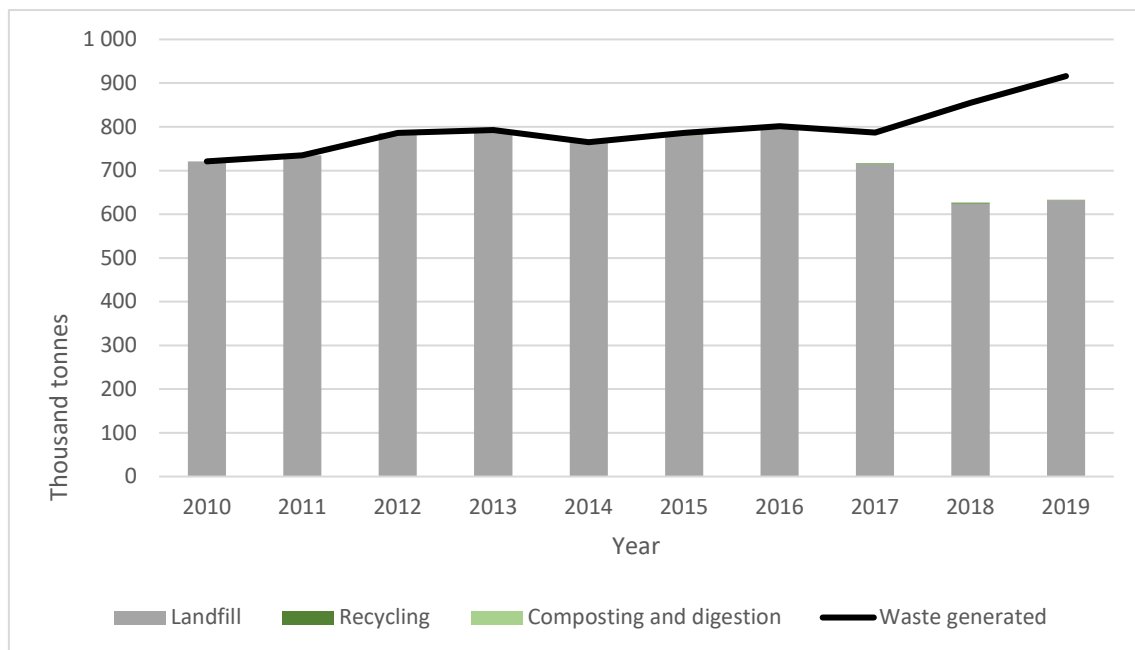
implement better waste management and enforce policies on the ground, as well as allocating financial resources to improve waste management infrastructure.

1 Municipal waste management performance

North Macedonia's waste management system today is characterised by a rather low recycling rate and a high reliance on landfilling. The main system for waste collection in North Macedonia consists of bring points with containers for residual waste collection. The arrangement of waste management is the responsibility of municipalities, but in 2019 only 78 % of the population was covered by waste collection services (Ministry of Environment and Physical Planning, 2021).

Figure 1.1 illustrates the development of municipal waste generation and management between 2010 and 2019 in North Macedonia. Waste generation in North Macedonia remained rather stable until 2016 and increased in 2018 and 2019. The waste generated was 786 000 tonnes in 2015 (corresponding to 380 kg per capita) and increased to 916 000 tonnes in 2019 (corresponding to 441 kg per capita) (Eurostat, 2021).

Figure 1.1 Municipal waste generation and treatment in thousand tonnes in North Macedonia, 2010-2019



Source: Eurostat (2021).

Waste volumes in North Macedonia are increasing, corresponding to the country's economic growth. Decoupling of the waste generation trend from the gross domestic product (GDP) trend needs to be achieved via waste prevention measures (Ministry of Environment and Physical Planning, 2021).

The dominant collection system in North Macedonia is non-separated collection. The recycling rate is very low at 0.3 %, and composting/digestion dropped from 0.4 % in 2015 to 0 % in 2019. Municipal waste is collected for recycling, mainly by informal waste pickers, who collect waste from dumpsites and bins (Ministry of Environment and Physical Planning, 2021).

The dominant waste treatment in North Macedonia is disposal at landfills that are not compliant with EU standards. The Drisla landfill is the only landfill in North Macedonia that meets national



legislative standards and it is relatively well managed. In addition, there are 57 official municipal landfills, which are not compliant with national law, and approximately 1 000 illegal waste dumpsites. Most of the illegal dumpsites have emerged as a result of the lack of an organised waste collection service, especially in rural areas (Ministry of Environment and Physical Planning, 2021).

It is estimated that less than 30 % of the landfilled waste is currently disposed of at the legal landfill in Drisla, which receives approximately 180 000 tonnes annually (Ministry of Environment and Physical Planning, 2021). The waste treatment data also include estimates of waste treatment outside the official collection system, which in principle should not be reported as receiving treatment.

The collection coverage has steadily increased from 72 % in 2008 to 76 % in 2011 and 78 % in 2019. There are differences in the coverage between urban and rural areas, with approximately 90 % of the urban population receiving waste collection services as opposed to only 15-70 % of the rural population. The national waste management strategy (NWMS) prioritises improving the collection coverage and aims for 100 % collection coverage by 2024, with an intermediate goal of 90 % coverage in 2020 (Ministry of Environment and Physical Planning, 2021).

The share of municipal solid waste (MSW) coming from households is estimated at 83 %, with the remainder originating from commercial activities and municipal services (OECD and Eurostat, 2019).

There are concerns regarding the quality of data, as MSW generation is not measured but estimated. This is because of the lack of weighing equipment at the landfills (except for the Drisla landfill) and the extensive use of illegal dumpsites. A significant part of the waste remains uncollected by the official system (Ministry of Environment and Physical Planning, 2021).

Data on waste generation are provided by the State Statistical Office of North Macedonia. The assessment is based on reports from the municipalities on waste collected and disposed of. The estimation refers to collected waste and is made by municipalities based on approximate number of residents. It includes estimates of waste generated by the households not covered by waste collection services. In addition, municipalities and landfills have to report annual data on transported municipal and non-hazardous waste, as well as disposed municipal, non-hazardous and inert waste, to the Ministry of Environment and Physical Planning. However, only about one third of the municipalities submitted reports in the last reporting period, despite their legal obligation. Furthermore, data on packaging waste collection and recycling by the producer responsibility organisation (PRO) are not included in the MSW data (Ministry of Environment and Physical Planning, 2021).

Efforts are under way to improve the data collection process and introduce electronic systems for reporting; for example, the EU-funded project 'Development of environmental monitoring and information system' is currently under way (Ministry of Environment and Physical Planning, 2021).

Reliable data are needed to support the organisation of separate collection, for infrastructure capacity planning and to measure performance against targets. Moreover, the lack of reliable data does not allow proper economic calculations and waste management planning. At the national level, better data would facilitate decision-making on a larger treatment infrastructure, such as incineration facilities and sanitary landfills. At the regional and local levels, better data, including waste composition data, could also facilitate investments in sorting and recycling facilities and activities.

Local waste management plans, cost calculation and tariff setting and estimations of the need for waste treatment collection infrastructure will benefit greatly from reliable data on waste composition and generation. Harmonisation of methods for data collection and the introduction



of quality control measures are key. The use of measuring equipment at landfills would improve data quality and the introduction of electronic reporting systems will facilitate reporting, but the validation of data is of equal importance.

2 Legal framework, strategies and targets

The Law on Waste Management is the key piece of legislation for waste management in North Macedonia. The legal framework in North Macedonia is not aligned with the current EU waste legislation. The Law on Waste Management has been in force since 2004 and thus pre-dates both the EU Waste Framework Directive's revisions in 2008 and 2018, and does not include the waste hierarchy nor recycling targets for municipal waste (Ministry of Environment and Physical Planning, 2021).

The Law on Waste Management is currently under revision; a draft has been submitted to the government for discussion and to the parliament for adoption. The new Law on Waste Management will enable the establishment of a functional system for regional waste management, such as regional collection, transport, sorting and recycling of waste, and the construction of new regional landfills and closing of all non-standard landfills (Ministry of Environment and Physical Planning, 2021).

The Law on Packaging and Packaging Waste was adopted in 2010 and aims to transpose the EU Packaging and Packaging Waste Directive (94/62/EC) into law. The law entered into force in 2011 and introduced extended producer responsibility (EPR) and obligations for the collection and treatment of packaging waste for the producers. The law is currently under revision; a draft has been submitted to the government for discussion. The introduction of EPR in North Macedonia has led to unfair competition; therefore, one of the main aims of the revision is to clarify the rights and obligations of the PRO, establishing the same rules and procedures for all collective and independent stakeholders (Ministry of Environment and Physical Planning, 2021).

The national waste management strategy (NWMS) 2008-2020 will be revised in 2021 and the new NWMS will cover the period 2021–2032. There is also a draft national waste management plan (NWMP) for 2020-2026, which has not yet been adopted by the government. The NWMP is currently undergoing a strategic environmental assessment and has not been adopted yet. In addition, all eight regions have regional waste management plans for a period of 10 years and 81 municipalities have municipal waste management plans.

The following targets have been adopted:

- Targets for the reduction of biodegradable waste going to landfill related to biodegradable municipal waste generated in 1995, as stated in the NWMS 2008-2020 (Ministry of Environment and Physical Planning, 2021), are:
 - 25 % reduction by 2017;
 - 50 % reduction by 2020;
 - 65 % reduction by 2027.
- Targets for the reduction of landfilling of biodegradable waste in comparison with the biodegradable MSW generated in 1995, as stated in the draft NWMP (Ministry of Environment and Physical Planning, 2021), are:
 - 25 % total reduction for the period 2019-2026;
 - 50 % total reduction for the period 2019-2031;
 - 65 % total reduction for the period 2019-2034.
- Targets for packaging waste, in accordance with the Law on Packaging and Packaging Waste (EEA, 2017), are:



- Until the end of 2020, a minimum of 60 % of the total weight of packaging waste needs to be processed through treatment or energy processing operations.
- Until the end of 2020, a minimum of 55 % and a maximum of 80 % of the total weight of packaging waste needs to be recycled.
- Until the end of 2020, the following amounts of materials need to be recycled: 60 % glass; 60 % paper and cardboard; 50 % metals; and 15 % wood.
- Until the end of 2018, 22.5 % of plastic needs to be recycled, considering only the recyclable materials in the plastic.

The draft NWMP further sets targets for MSW collection coverage at 90 % by 2020 and 100 % by 2024, and for MSW recycling at 25 % in 2025, 45 % in 2035 and 65 % in 2045 (including packaging waste). The targets for 2017 and 2020 set in the NWMS and NWMP were never implemented (Ministry of Environment and Physical Planning, 2021).

The NWMP defines key priorities as:

- the establishment of regional MSW management infrastructure — construction of five regional landfills with transfer stations, establishment of separate collection at the source of a wet and a dry fraction and establishment of waste treatment facilities;
- the regionalisation of municipal waste management systems, offering an approach towards gradual and institutional, organisational changes and towards establishing regional MSW management facilities, introducing landfill tax surcharges and more strict enforcement.

There is a need for more political will to improve the current situation regarding waste management and the enforcement of the regulations. Allocation of financial resources for building and improvement of infrastructures are necessary for improving waste management. Furthermore, investment is needed to improve public awareness of the importance of recycling and the separate collection of waste.

The Ministry of Environment and Physical Planning (MoEPP) is the waste management regulator and is responsible for policy development, planning, licensing, data collection and treatment, and the coordination of cooperation among all institutions involved in waste management. Public communal enterprises and private companies that deal with waste collection and transport must have a licence issued by the MoEPP. There are several departments under the MoEPP involved in waste management (Eunomia, 2017):

- The Department of Waste approves the waste management plans and programmes of municipalities and also undertakes all permitting activities related to waste management.
- The Macedonian Environmental Information Centre collects and analyses annual reports on waste management operations issued by the municipalities and reports waste statistics.
- The Department of EU Integration is involved in transposing the EU legislation, including waste-related legislation.
- The Department of Cooperation with Municipalities assists the local authorities in implementing environmental legislation.
- The Department of Integrated Pollution Prevention and Control (IPPC) is responsible for closing non-compliant landfill sites and issuing permits for compliant sites.

The MSW management system is based on a regional division; the regions must comprise at least 200 000 inhabitants. Waste management regions are responsible for the organisation of regional waste management services. North Macedonia is divided into eight statistical regions, and the municipalities in each region must establish an intermunicipal waste management board



(IMWMB) and a regional waste management centre (RWMC), which represent a link between the state and local communities (Eunomia, 2017).

MSW management is the responsibility of municipalities, which they usually fulfil through public communal companies, mostly owned by the municipalities. These waste management companies conduct waste collection services and disposal of waste. Separate waste collection is conducted by private (licensed) operators. Packaging and packaging waste management is performed by collective and individual (licensed) operators under the EPR scheme. The municipalities are also responsible for the clean-up of illegally dumped waste. In the absence of collection services, illegal dumpsites have emerged, as people need to get rid of their waste (Eunomia, 2017; UNECE, 2019). Only some municipalities have designated people in their administration to deal with waste management.

Meeting the targets and objectives defined in relation to MSW management are the responsibility of the municipalities and the MoEPP. The municipalities are responsible for the following activities (Ministry of Environment and Physical Planning, 2021):

- organising the collection, transport and disposal of municipal wastes;
- supervising transport;
- deciding on the location of waste management facilities, establishing landfills and terminating illegal dumpsites;
- issuing local regulations on waste management;
- financing and supervising dump/landfill closures.

The main responsibility for meeting national waste targets has, however, shifted to the private sector through producer responsibility schemes (Eunomia, 2017). In theory, if a municipality fails to comply with requirements and meet targets, the MoEPP can take over the waste management activities on behalf of the municipality. There is also the option of issuing fines to municipalities failing to meet set targets, but they are rarely paid (Ministry of Environment and Physical Planning, 2021).

3 Waste fee and taxation system

The municipalities generally do not allocate separate funding for waste handling. The financing of waste operations is based on user fees collected by operating companies. The fees vary between municipalities and are set with the approval of municipal councils. The fee collection rate (the share of citizens actually paying the fees) varies from 45 % to 90 % across municipalities; the fee collection rate appears to depend on the existence of penalties and the political will to enforce payment (Eunomia, 2017). The revenues from the waste management fees are used to finance collection and disposal operations — mostly landfilling of waste (Ministry of Environment and Physical Planning, 2021).

Most of the municipalities use flat rates, i.e. the fee is based on the size of the houses, apartments and gardens (Ministry of Environment and Physical Planning, 2021). Pay as you throw (PAYT) principles are usually not applied because municipalities do not have a supporting system for measuring the quantity of waste produced.

Commercial and industrial waste is charged higher collection tariffs than household waste. If companies annually generate over 150 tonnes of waste, they are not allowed to use municipal waste collection services. Businesses use private service providers, which invoice using a PAYT-based tariff, such as one based on collection frequency or volume of collected waste, instead of linking the tariff to the size of the premises (Ministry of Environment and Physical Planning, 2021).



There are fines for illegal activities, such as illegal dumping and illegal waste collection. Issuing penalties is the responsibility of communal inspectors. In practice, the municipalities lack resources and commitment to employ a sufficient number of communal inspectors, and penalising is rare (Eunomia, 2017).

Eunomia (2017) modelled the expected changes in costs when moving to a 50 % recycling rate in 2026, indicating that a net change in the order of EUR 55 per household might be expected if the recycling rate is achieved and if all residual waste is sent to sanitary landfills. This sum could be reduced to around EUR 40 per household if the producers fully cover the waste management costs of the waste under producer responsibility.

Today, a key barrier to improving the waste management system in North Macedonia is a lack of funds. Budget must be allocated to improving waste management, such as by closing illegal dumpsites, introducing separate collection and recycling, and increasing collection coverage. Furthermore, the structure of the tariffs does not incentivise waste prevention or separate collection; fees are also low and the payment of fees is deficient. The introduction of landfill gate fees and landfill taxes should encourage recycling, but strong measures are needed to avoid people dumping their waste at illegal landfills instead.

4 Collection coverage and separate collection

The main system for waste collection in North Macedonia is bring points with containers for residual waste collection, where household and commercial waste is collected together. Construction and demolition waste (CDW) is not collected by municipalities, but is often dumped at collection points next to the containers for household waste. The waste management companies are then obliged to collect this waste as well. Still, most CDW is being dumped at illegal dumpsites, along public roads and in the environment (Ministry of Environment and Physical Planning, 2021).

The frequency of waste collection varies: in urban areas it is often once a day, in suburban areas twice per week and in rural areas once per week (Eunomia, 2017).

In urban areas, the collection of bulky waste takes place by announcing a day and location for collection. However, households often dispose of their bulky waste by placing it next to the containers for mixed household waste, as is also done with CDW (Eunomia, 2017).

Public enterprises conduct collection, transport and landfilling of MSW on behalf of municipalities, but the service level does not comply with the existing requirements. Combined collection of non-separated municipal and non-hazardous industrial waste, as well as of non-separated hazardous waste fractions, is common practice. Only a small proportion of waste collectors are private companies, typically those dealing with waste in rural areas or companies involved in the recycling of specific waste streams (Ministry of Environment and Physical Planning, 2021).

There is no separate collection of dry recyclables from households. Bring systems for packaging waste are established by the PROs in agreement with municipalities and other entities included in the EPR scheme. In 2019, 35 302 tonnes of packaging waste were collected and 34 230 tonnes were reported as recycled (Ministry of Environment and Physical Planning, 2021); however, these amounts are not included in municipal waste statistics. Bio-waste is not collected separately, but there have been some pilot projects for home composting in rural areas (Ministry of Environment and Physical Planning, 2021).

Approximately 2-3 % of municipal waste is collected for recycling, mainly by informal waste pickers, who collect waste from dumpsites and bins and then sell it to the recycling industry. The



waste pickers are mostly ill-equipped and work under unsafe conditions and are often exposed to hazardous materials (Ministry of Environment and Physical Planning, 2021).

There are national targets to increase separate collection, which are set out in the NWMP (see Chapter 2). The national targets are expected to be attained mainly through the collection of packaging waste; EPR puts the responsibility for the arrangement and financing of separate collection and management for packaging waste on the producers.

A number of initiatives have been undertaken to raise awareness of separate collection and recycling. The city of Skopje has conducted a campaign for the proper disposal of bulky waste during 'Black Friday'. The PRO Pakomak set up a campaign on the importance of separate collection of packaging waste, emphasising consumers' responsibility and the benefits of recycling. The non-governmental organisation Zero Waste is active in raising public awareness regarding the importance of waste reduction and recycling and the impacts of improper waste treatment on health and the environment. They have arranged, for example, collection campaigns for discarded home electronics and set up educational campaigns for schools (Ministry of Environment and Physical Planning, 2021).

5 Extended producer responsibility schemes

North Macedonia has EPR schemes in place for waste electrical and electronic equipment (WEEE), batteries and packaging (including all main packaging materials). It is organised either by the producers/importers independently or collectively through an agreement with a PRO, which takes over the responsibility of managing the packaging waste on behalf of the producer. The PRO is also obliged to ensure that the collection points are accessible and is responsible for informing consumers of the end-of-life treatment and benefits of recycling of the waste. The PROs report annually to the MoEPP, and the reports are monitored by the Department of Waste (Ministry of Environment and Physical Planning, 2021).

Material recycling in North Macedonia is mostly recycling of packaging waste, which is collected through bring points. For 2019, the PROs reported that 85 719 tonnes of packaging were placed on the market and that 34 230 tonnes were recycled. The municipalities must, in cooperation with the producers and PROs, arrange the collection points and transport of the separately collected waste. The responsibility of the producers is to cover the expenses and to ensure that waste is collected, sorted, recovered and recycled according to targets set in the waste legislation (Ministry of Environment and Physical Planning, 2021).

6 Treatment infrastructure

The MSW management system in North Macedonia is organised according to a regional division. Waste management regions, which must comprise at least 200 000 inhabitants, are responsible for the organisation of regional waste management services (Ministry of Environment and Physical Planning, 2021).

The dominant waste treatment in North Macedonia is disposal at landfills that are not compliant with EU standards. Current disposal practices do not comply with any technical and/or environmental standards, and the landfills in North Macedonia thus represent a risk to the environment. Waste registration and weighing at landfills is only done at the Drisla landfill. At the municipal landfills and the illegal dumpsites, waste is simply dumped by communal



enterprises with minor operational costs. Compaction and covering with soil is done at only a few bigger landfills (Ministry of Environment and Physical Planning, 2021).

- The Drisla landfill, serving the Skopje region, with approximately 590 000 inhabitants, is the only landfill in North Macedonia that is compliant with national legislation and it is relatively well managed.
- There are 57 'official' municipal landfills; although they are legal, they are not compliant with the national law and are scheduled to be closed and reclaimed.
- It is estimated that there are approximately 1 000 illegal waste dumpsites, in particular in rural municipalities. Most illegal dumpsites have emerged as a result of the lack of organised waste collection services, especially in rural areas.

Non-compliant landfills that represent a high risk to the environment need to be closed down and remediated, as the MoEPP assesses that upgrading these to EU standards is not feasible. In addition, open burning of some types of waste, including plant residues and municipal waste, creates air pollution and subsequently pollution of the soil (Ministry of Environment and Physical Planning, 2021).

There are plans to close and remediate non-compliant landfills and replace all non-compliant landfills with regional waste management centres, including a sanitary landfill or incinerator. Two regions have already been granted funds by the government for the closure of non-compliant landfills and dumpsites. In the next planning period, the government has set aside budget for the remaining six regions to do so as well. Deposited material will be excavated and relocated to the new regional or temporary landfills. The remediation of landfills is a priority in cases of direct impact on drinking water sources. There are also plans to remediate landfills that pose a medium or low risk to the environment. The risk assessment is based on the hydrogeological conditions. Remediation of these landfills allows them to temporarily continue operations with acceptable environmental impacts (Ministry of Environment and Physical Planning, 2021).

In order to reduce the landfilling of biodegradable waste, one mechanical-biological treatment (MBT) facility is planned. Furthermore, encouraging home composting is aimed at reducing the amount of bio-waste in the residual MSW. New planned capacity for residual waste treatment covers the following (Ministry of Environment and Physical Planning, 2021):

- Two regional MSW management centres will each collect and dispose of approximately 80 000 tonnes of MSW/year. A first investment phase will focus on improving existing and building new landfill infrastructure and on establishing some basic sorting activities.
- Six transfer stations are planned to be built in the same two regions by the end of 2022.
- One MBT installation will serve the same two regions by the end of 2022.
- Several similar plans for waste management facilities have been developed for the other regions.
- The main landfill, Drisla, will be upgraded to EU standards;
- The construction of a waste-to-energy combined heat and power combustion plant in the region of Skopje is planned, which will have a capacity of approximately 70 000 tonnes, corresponding to around 30 MW of heating power. This plant will use secondary fuels prepared from the MSW light fraction or from residues of the biomass treatment.

The new infrastructure is likely to increase the waste management costs for municipalities as a result of longer transport distances and higher environmental standards than in the current situation. It is therefore important to make sure that waste fees reflect these changes and that the use of the new capacities is properly enforced. Good communication of the benefits in terms of reducing environmental costs and health risks due to poor waste management could help create support for and acceptance of the measures.



The planned new treatment capacities, if used well, will move North Macedonia closer to the targets for diverting biodegradable municipal waste from landfill, but more is needed to meet these targets. In addition, these capacities will contribute little towards increasing recycling.

Meeting the landfill targets will be feasible only if MBT diverts residual waste away from landfills or if separate collection and recycling of bio-waste and other biodegradable wastes, such as paper and cardboard, is introduced. Assuming that biodegradable waste makes up 80 % of the total MSW, the current annual generation of biodegradable waste would be 733 000 tonnes. Currently almost all biodegradable waste is landfilled. The planned MBT facility would divert the residual waste from landfilling in two regions. If these are assumed to generate 25 % of the total waste and all this residual waste is treated by MBT, this would divert 25 % of biodegradable waste from landfill in line with the target for 2017. To achieve the targets of diverting 50 % and 65 % biodegradable waste away from landfills, additional actions will be needed. It is unlikely that home composting of bio-waste will be enough to close this gap.

The recycling sector is split between the informal and formal sectors. The informal sector is active in the collection of metals, paper, plastics, car batteries and accumulators, waste oils, etc., from waste bins and dumpsites. Informal sector recycling is done in scrap yards, which have potential impacts on the environment and public health. There are no sorting plants in North Macedonia, with the exception of a plant for the manual sorting and baling of packaging waste (mainly polyethylene terephthalate (PET)) at the Drisla landfill (Ministry of Environment and Physical Planning, 2021). The formal sector constitutes of private companies, which have licences for waste management activities. The PRO arranges door-to-door collection of recyclables for commercial enterprises (Eunomia, 2017).

There are more than 150 registered entities for the collection, storage and treatment of non-hazardous waste paper, plastic and scrap metal. With regard to the treatment of separated waste streams, collected by informal waste pickers from dumpsites and bins, the waste is sold to the recycling industry, where the following processes take place (Ministry of Environment and Physical Planning, 2021):

- Because of their value, scrap metals represent the biggest part of the recyclable materials collected. The collection of metals (ferrous metals and aluminium) is undertaken by the informal sector and by the PRO, and there is a strong and stable market for recovered scrap metals. Scrap metals are processed in the existing ironworks or are exported. Copper, aluminium and non-recyclable ferrous metals are exported, mostly to Greece, Turkey and Bulgaria.
- The paper and cardboard market is divided into two parts. The paper factory located in North Macedonia organises the collection of one part (around 20 %) and the other part is mainly collected by the informal sector.
- Regarding glass waste, there are very limited recovery and recycling activities.
- Three companies are registered for the management and processing of PET waste and one for polyolefins. The plastic waste is pre-treated in North Macedonia and exported to Turkey for recycling.
- The collection of recyclable non-packaging waste plastic is undertaken by the informal sector, with a focus on 'hard plastics', such as high-density polyethylene (HDPE), polyvinyl chloride (PVC), polypropylene and polystyrene, originating from crashed car batteries, pipes and containers.
- There are very limited recovery and recycling activities for textile waste.
- There is very limited bio-waste collection and treatment in North Macedonia. Although there are some existing facilities, most are not in operation.

The market for recovered paper is not capable of taking up all recycled paper that could be produced from the waste paper currently collected separately. Thus, the paper factory cannot



use all separately collected paper, and the remaining waste paper is exported to Serbia and Croatia. Still, it is the aim of the Government of North Macedonia to increase separate collection and recycling of paper and cardboard (Ministry of Environment and Physical Planning, 2021). Attention is therefore needed to develop demand for recyclables from a circular economy perspective in North Macedonia or through regional cooperation.

7 Social aspects of waste management

There are more than 150 registered private waste management companies in North Macedonia, employing 4 385 people in 2019. The companies are involved in waste collection, treatment and disposal activities, materials recovery, remediation activities and other waste management services (Ministry of Environment and Physical Planning, 2021).

The involvement of the informal sector in collection of recyclables is significant, supplying at least 40 % of the waste materials for recycling (Eunomia, 2017). Unofficial data provided by North Macedonia indicate that there are 5 000 informal collectors active in the waste management sector. The informal sector is very active in dealing with the collection and recycling of potentially recyclable materials, such as metals, paper, plastics, car batteries and accumulators and waste oils. The informal sector operates in scrap yards, which have potential impacts on the environment and public health (Ministry of Environment and Physical Planning, 2021).

The informal sector is mainly represented by members of the Roma community, who collect recyclable waste from the municipal waste containers. They are also active at the municipal landfills and dumpsites, collecting recyclables there as well. These families are subordinated to middlemen, who coordinate with scrap dealers. The scrap dealers sell the recyclable materials to recycling plants in the country or they export them (Ministry of Environment and Physical Planning, 2021).

In addition to the organised informal sector, people on low incomes also recover valuable waste materials from containers for personal use. Valuable materials include bread or other foodstuffs (people put leftovers of bread in plastic bags to preserve them from coming into contact with other waste) and clothes (Eunomia, 2017).

The introduction of EPR legislation and separate collection of WEEE, batteries and packaging has significantly improved the formal collection and recycling system. This has also led to the shrinking of the informal recycling sector (Ministry of Environment and Physical Planning, 2021).

At the Drisla landfill, the waste pickers that used to collect polyethylene terephthalate (PET) bottles from the waste delivered to the Drisla landfill are now formally employed by the landfill operator to sort and bale PET at the landfill (Eunomia, 2017).



Abbreviations

Abbreviation	Name
CDW	Construction and demolition waste
EPR	Extended production responsibility
GDP	Gross domestic product
IMWMB	Intermunicipal waste management board
MBT	Mechanical-biological treatment
MoEPP	Ministry of Environment and Physical Planning
MSW	Municipal solid waste
NWMP	National waste management plan
NWMS	National waste management strategy
PAYT	Pay-as-you-throw
PRO	Producer responsibility organisation
RWMC	Regional waste management centre
WEEE	Waste electrical and electronic equipment



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