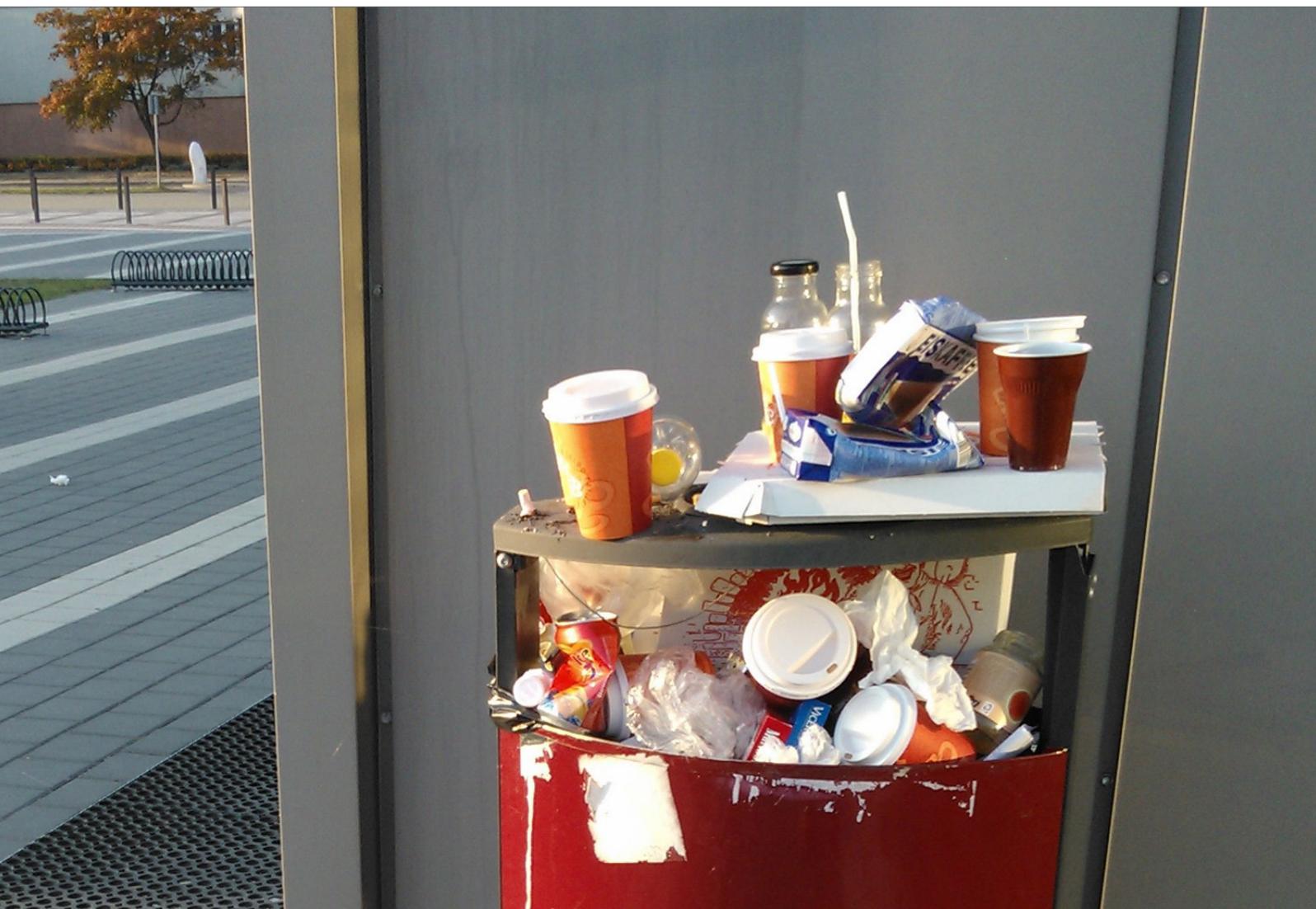


Municipal waste management



Bosnia and Herzegovina



November 2021

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Municipal waste management in Western Balkan countries — Country profile

Bosnia and Herzegovina



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Executive summary

The total amount of municipal waste generated in Bosnia and Herzegovina is 1.2 million tonnes and has stagnated in recent years. However, following a decrease in the population, waste generation per capita has increased by 6 %, compared with 2010. 74 % of the population is covered by waste management services, although the coverage varies significantly between urban areas (80-90 % coverage) and rural areas (40-45 % coverage). The population coverage has only slightly increased over the years and is mostly hindered by infrastructural and operational limitations, which would require investments or additional funds to address. The waste that is generated but not collected contributes to illegal dumpsites. There are currently more than 1 400 illegal dumpsites and they have been reported to be further increasing in number, despite the slight increase in the population covered by waste collection services and various initiatives to close down such dumpsites.

Waste collection, transport and landfill management are carried out by municipal companies operating mainly old equipment. Only a small percentage of private companies is involved in waste collection, as the financial risks are high because collecting the service fees for the collection of municipal waste from households is the responsibility of the companies collecting the waste. In addition to the extra administrative costs and the existing risk of non-payment by households, the fees are too low to cover the waste collection costs. The fees are controlled by the municipality or city assembly, which are reluctant to increase the tariffs.

Most of the waste collected is disposed of at landfills. In addition to the (non-sanitary) municipal landfills, operated by the municipalities and for which no disposal fee has to be paid, there are eight (sanitary) regional landfills in Bosnia and Herzegovina. Despite agreements, only 37 % of municipalities use the regional landfills as a result of the extra transport and disposal costs. The continued use of substandard municipal landfills, combined with illegal landfills, have led to environmental problems, such as polluted soil and groundwater and health risks for the population.

The legal framework is guided by the laws on waste management in both Bosnia and Herzegovina entities (Federation of Bosnia and Herzegovina and Republika Srpska) and in the Brčko district. The laws on waste management promote the principles of the waste hierarchy, the 'polluter pays' and 'producer responsibility' principles. The legislation has to be further harmonised with the EU legislation. Monitoring and enforcing of the legislation is weak because the responsible organisations are understaffed. Waste management targets are laid down in the various waste management strategies of the different entities. Many of the targets, some of which are due for renewal, are very ambitious and take into account the existing situation and the achievements up until now.

Separation at source and separate collection practices in Bosnia and Herzegovina are not well developed at present and are far from reaching the objectives specified in the waste management strategies adopted by the two entities. There are no financial incentives for citizens to sort their waste and there is very low public awareness of the need for proper waste management. Both entities have extended producer responsibility (EPR) schemes in place for waste electrical and electronic equipment (WEEE) and plastic packaging, and these operate independently from each other. With regard to the EPR scheme on packaging, there are no accurate data on the amount of packaging placed on the market, and there is a significant amount of 'free riders' and lack of enforcement, limiting its effectiveness. Sorting plants all operate with financial losses because of the small amounts of (separately collected) waste and the poor quality of the collected materials, due to the extraction of saleable material from the waste containers by waste pickers. The recycling industry is not well developed, mainly because



of the limited volumes of separately collected recyclables. Most of the recyclable waste is exported abroad.

There are no reliable data on waste composition and treatment as a result of the lack of reporting and the lack of weighing equipment, hampering proper waste management planning. However, the development and implementation of a waste management information system recently became operational in the Federation of Bosnia and Herzegovina. All reporting organisations, which are those that manage waste, produce or import waste, are obliged to register and submit data to this information system. A similar initiative is planned in Republika Srpska. Although cooperation between the entities could still be improved with regard to data management, this initiative is an important step in increasing the quantity and quality of data on waste.

To conclude, the key challenges of improving the efficiency of the waste management system in Bosnia and Herzegovina are related to cross-institutional cooperation between the entities and municipalities, which could be improved, setting realistic targets and matching them with the political will to increase the tariffs in order to at least cover the costs of waste collection, cutting down illegal activities and increasing public awareness. Extra investments or supporting funds are needed to close down illegal and substandard municipal landfills and introduce separate collection on a larger scale, creating a lever for the financial viability of current and future sorting and recycling infrastructure.

1 Municipal waste management performance

Bosnia and Herzegovina is administratively divided into two entities — Federation of Bosnia and Herzegovina (FbiH) and Republika Srpska (RS) — and the Brčko district (BD). The administrative structure of FbiH is divided into 10 cantons, and the cantons are divided into municipalities. There are 79 municipalities in the FbiH. RS is administratively divided into 62 municipalities. The city of Brčko is a separate administrative unit (i.e. the district).

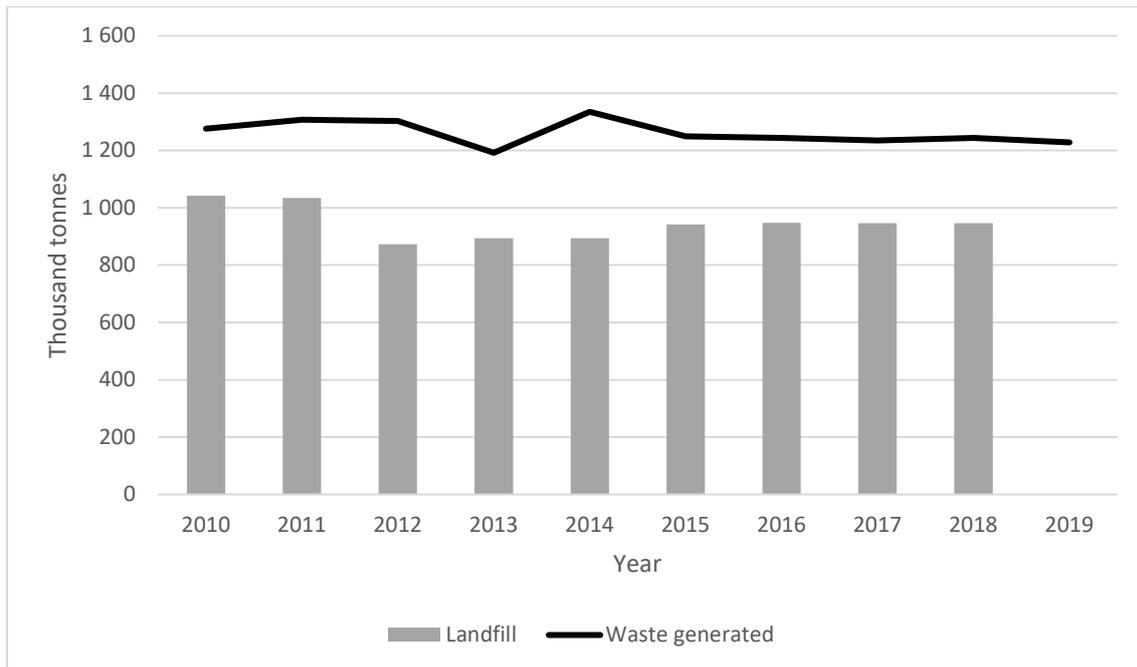
Vital statistics published by the Agency for Statistics of Bosnia and Herzegovina show that unfavourable demographic trends in Bosnia and Herzegovina continue. In 2020, the highest natural decrease in population was recorded. The decrease in the population of Bosnia and Herzegovina is caused by not only a negative natural change in population, but also a negative migration balance.

Waste management development and the implementation of policies are the responsibility of the entities (FbiH and RS) and BD.

Figure 1.1 illustrates the development of municipal waste generation and management between 2010 and 2019 in Bosnia and Herzegovina. It shows stagnation in the total amount of municipal waste generated over this period, which fluctuates around 1.2 million tonnes per year, while during the same period the population of Bosnia and Herzegovina decreased from 3.7 million inhabitants in 2010 to 3.3 million inhabitants in 2019. This resulted in an increase in the amount of municipal waste generated per person. In 2018 this corresponded to 356 kg of municipal waste per person in Bosnia and Herzegovina, a 6 % increase compared with 2010 (Eurostat, 2021). The reported amounts of municipal waste generated include estimates for households not covered by waste collection services (OECD and Eurostat, 2019).



Figure 1.1 Municipal waste generation and treatment in thousand tonnes in Bosnia and Herzegovina, 2010-2019



Note: Data on waste treatment breakdown for 2019 are missing.

Source: Eurostat (2021).

In 2018, of the municipal waste stream 77 % came from households, 19 % came from production and service activities, and the remaining 3 % came from communal services (OECD and Eurostat, 2019). There are no reliable data on the composition of the municipal waste stream, as the data on waste generation are not based on actual measurements.

The percentage of the population of Bosnia and Herzegovina covered by public waste collection services has increased slightly over the last 10 years, from 65 % to 74 % (BHAS, 2021a). Areas not covered by the services mostly include rural areas and parts of cities or suburbs that are difficult to access, because of the higher costs of collection in such areas. The waste that is not collected contributes to the illegal dumpsites that are reported to be increasing in number, despite the slight increase in the population covered by waste collection services (BHAS, 2021a).

Most of the municipal waste in Bosnia and Herzegovina is disposed of in landfills. In 2018, 946 000 tonnes of the municipal waste collected were landfilled, representing almost 99 % of the total amount that was reported to have been treated. The type of treatment is not reported for about 23 % of the reported amount of municipal waste generated in 2018, and the type is therefore unknown. There is very limited separate collection for recycling in Bosnia and Herzegovina, and nearly no data exist on the quantities of separately collected and recycled waste. It can be assumed that a large part of the untreated waste corresponds to the uncollected waste, which ends up in illegal landfills. This unreported and unknown part of treated municipal waste has fluctuated over recent years. No data on treatment volumes in 2019 are available yet, although it is expected that these will be in line with the previous year.

Data on municipal waste are collected through statistical surveys. Although every stakeholder involved in the collection, recycling, waste treatment or import/export of waste is obliged to report, this currently does not happen. One of the reasons for this is that various small companies and multiple resellers are involved. The paper forms that have to be filled out and



sent by mail require capabilities that many of these smaller intermediate parties do not have; the forms are therefore not completed, making it difficult to monitor waste flows. In addition, because of a lack of weighing equipment at landfills, waste quantities are estimated based on truck volume and container type, creating uncertainty about how much waste is actually disposed of.

The Agency for Statistics of Bosnia and Herzegovina (BHAS) collects the relevant data on municipal waste from the entities' statistical institutes (Figure 2.1). There is currently no single waste information system for the whole of Bosnia and Herzegovina. One measure suggested by the BHAS to improve data quality is the development of a new electronic data collection system for municipal waste, replacing the currently used paper forms sent to reporting units with electronic survey forms. These reporting units are the registered organisations involved in waste collection and disposal. Although this could facilitate the submission of data, it does not necessarily address the core issues, which are the reporting of weight estimates and the fact that still not all stakeholders and businesses involved in waste processing are registered and therefore do not report at all.

In cooperation with the United Nations Development Programme (UNDP), the Environmental Protection Fund of the FBiH initiated the development and implementation of a waste management information system that became operational in the entity of FBiH in January 2021. All reporting organisations, which are those that manage, produce or import waste, are obliged to register and submit data to this information system (FbiH Environmental Protection Fund, 2021). The data collected in this system will be the basis for the development of planning and implementation documents in the field of waste management. Only registered reporting organisations that regularly submit data to this waste management information system can participate in public calls of the Environmental Protection Fund of the FBiH, which, through these calls, financially supports projects and programmes on waste management. This mechanism creates an incentive for improved reporting.

The BHAS was actively involved in the development and testing of the waste management information system by providing classifications of activities, waste types and statistical forms. Before this initiative, there was no coordination with the Environmental Protection Fund of FBiH regarding waste data collection, and both institutions conducted their activities regarding data collection independently (lonkova, 2018). This cooperation is, however, not yet established with the Environmental Protection and Energy Efficiency Fund of RS. Although the entities' statistical institutes and environmental funds are still operating in parallel without proper coordination in the collection of statistical data, overall, Bosnia and Herzegovina is taking steps to improve data quality by creating reporting mechanisms that improve the completeness of the data.

2 Legal framework, strategies and targets

The institutional architecture of municipal solid waste management in Bosnia and Herzegovina is divided over several levels. The institutional set-up is illustrated in Figure 2.1.

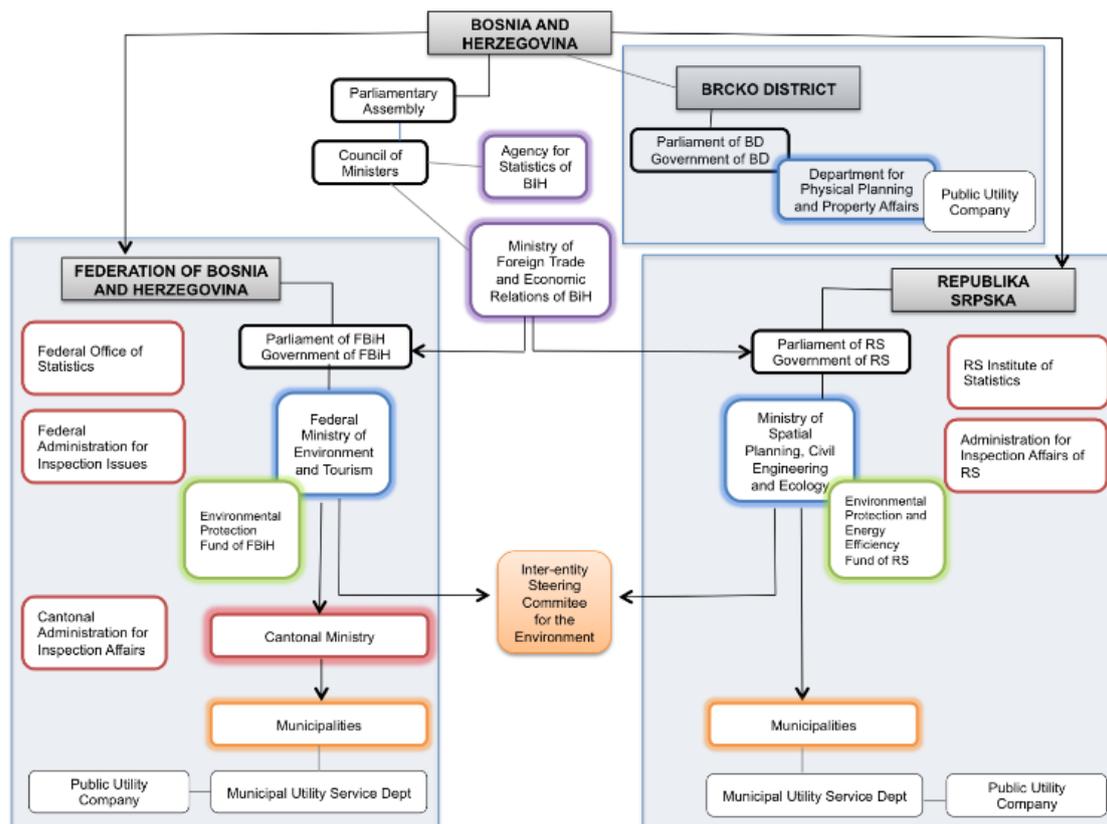
At the state level, the Ministry of Foreign Trade and Economic Relations (MoFTER) is the overall coordinator of all activities and is responsible for harmonising the plans of the entity bodies and institutions.

According to the Law on Statistics of Bosnia and Herzegovina (Official Gazette of BiH, No 26/04), the competent authority for the organisation, preparation and distribution of statistical information at the state level is the BHAS, established in accordance with the provisions of the law.

Waste management development and implementation of the policies are the responsibility of the entity bodies (FBiH and RS) and BD. Because of this, three institutions are responsible for developing and implementing waste management policy in Bosnia and Herzegovina:

- FBiH: the Ministry of Environment and Tourism of the FBiH is responsible for the development of waste management strategies, plans, laws and regulations that cover the FBiH. In addition, the ministry also issues environmental permits for waste management plants and other facilities that operate at levels above the thresholds stipulated in the Regulation on Plants and Facilities (Official Gazette of FBiH, No 19/04). These regulations require an environmental impact assessment before a facility is constructed and an environmental permit can be issued.
- RS: the Ministry of Physical Planning and Civil Engineering and Ecology of the RS has the authority to give permission to local governments for the preparation of joint waste management plans, to issue permits, approvals and other documents stipulated by the law, and to establish an authorised organisation in accordance with the law.
- BD: the Department for Physical Planning and Proprietary Affairs of the Government of Brčko District is responsible for performing professional, administrative and other tasks within its competence that apply to environmental protection and eco-permits.

Figure 2.1 Institutional set-up of Bosnia and Herzegovina



Source: Ionkova *et al.* (2018). The World Bank Group authorizes the use of this material subject to the terms and conditions on its website, [Legal](#).



The legal framework is guided by the laws on waste management in each entity:

- the Law on Waste Management in the FBiH (Official Gazette FBiH Nos 33/03 and 72/09);
- the Law on Waste Management in the RS (Official Gazette RS Nos 113/13 and 106/15);
- the Law on Waste Management in the BD (Official Gazette BD Nos 72/09, 25/04, 1/05, 19/07, 2/08 and 9/09).

The laws on waste management promote the principles of waste hierarchy, namely the 'polluter pays' and producer responsibility principles. By-laws concerning specific waste streams, such as for packaging, are currently still missing, and proper implementation and management schemes for extended producer responsibility (EPR) have yet to be developed, guided by successful EU practices.

All entities in Bosnia and Herzegovina have prepared waste management strategies up to 2018 (FBiH) and 2026 (RS and BD) that promote further harmonisation of legislation with EU directives, regionalisation of sanitary landfills (see Chapter 6), the introduction of waste separation at source and the creation of sustainable waste management systems (lonkova, 2018). The main strategic and planning documents are:

- environmental protection strategy of FBiH for the period 2008-2018;
- waste management strategy of FBiH and federal waste management plan 2012-2017 of FBiH;
- solid waste management strategy 2017-2026 in RS;
- environmental protection strategy for the period 2016-2026 in BD.

The FBiH is currently in the process of developing a new environmental protection strategy for the next planning period of 10 years and a new federal waste management plan to replace the one that expired in 2017. Furthermore, in the FBiH, the cantons (10 cantons in total, each with its own ministry) develop their own strategic documents on waste management as part of their legal obligations in accordance with the law on waste management. However, this obligation is not followed up by all municipalities and cantons.

Quantitative targets for separate collection and recycling are laid down in the various waste management strategies.

For the FBiH, the following goals, with target year 2018, were defined:

- establish separate waste collection systems in 95 % of all municipalities in FbiH;
- collect and recycle 30 % of total waste packaging, 55 % of paper and cardboard packaging, 40 % of glass packaging, 65 % of metals packaging and 15 % of plastics packaging;
- establish fully operational waste management regional centres in all regions;
- increase the overall percentage of waste electrical and electronic equipment (WEEE) recycled or recovered to 70 %.

It can be concluded that none of the targets above have been realised.

For the RS, the following goals, with target year 2026, were defined:

- 100 % of the population covered by organised collection of municipal waste;
- 23 % of municipal waste separately collected and recycled;
- 8 % of waste treated;
- maximum 77 % of municipal waste landfilled;
- maximum 98 % of biodegradable municipal waste landfilled;
- 50-60 % (by weight) of packaging waste separated and 25-45 % (by weight) of packing waste recycled.



Many of the targets in the various strategies are very ambitious, given the existing situation and the achievements up until now. Waste management strategies should contain realistic targets that are underpinned by implementation strategies, including planning and financing of investments and building up capacity. The proposed developments, as set out in the current waste management strategies, are often hampered by political unwillingness to increase tariffs that would cover the related costs (see Chapter 3) (lonkova, 2018).

Collection and disposal of municipal waste is the responsibility of the local government, in accordance with municipal decisions on utility services. In Bosnia and Herzegovina this local level consists of 143 municipalities, with about 25 000 inhabitants per municipality on average. Collection and disposal are managed by companies of which the municipality is the sole or majority shareholder in most cases. Municipalities are also responsible for implementing municipal waste management policies, but they lack the funds to invest, raise public awareness and build capacity to improve waste management (lonkova, 2018).

Currently, there is a lack of cooperation between the entity bodies and local levels and there is no coordinated or harmonised approach to dealing with waste management in Bosnia and Herzegovina. The legislation has to be further harmonised with the EU legislation. Monitoring and enforcing of legislation is currently weak as a result of understaffing of the responsible organisations (lonkova, 2018). A consistent country-wide strategy for waste management has yet to be developed. This needs to be reflected in both the legislative framework and its strategic approach. The new environmental protection strategy that is under development could provide for this (EC, 2020).

3 Waste fee and taxation system

The municipal companies executing the collection, sorting and landfill management are also responsible for setting the tariffs for waste management. These companies are part of the municipal departments for public utilities, which can also be responsible for other services, such as street cleaning and maintenance of public green spaces. The various services provided by these departments are financially not always strictly divided, which makes it difficult to estimate the cost of waste management services, as the revenue from the other services provided may compensate for losses from waste management. The annual cost of municipal waste management services includes collection and disposal, but again there is no clear distinction between collection and disposal costs.

Service fees represent the main revenue for waste collection, transport and disposal. As various calculation methodologies are used to determine service prices, the service fee varies between municipalities. In most cases, service fees are a fixed amount per household or are calculated based on the number of household members. In urban areas, it is common to calculate the service fee based on the amount of living space (e.g. by square metre). None of the currently used methodologies is based on the 'pay as you throw' principle, which means that there are no financial incentives for households to limit the amount of waste or to sort waste at source. The average tariff of waste management services for households in BiH is 0.4-0.6 % of their disposable income, compared with 1-1.5 % internationally (lonkova, 2018). Collecting the service fees directly from the households is the responsibility of the companies collecting the waste. In addition to creating additional administrative costs, non-payment from households, currently at 10-20 %, also creates a financial risk for the waste collection companies (lonkova, 2018). This poses a major barrier to private companies considering entering the waste collection market.



The service fees do not fully cover the costs of collection and disposal. Adaptations of the service fee are prepared and proposed by the company that performs the transport, taking into account the cost of the previous year and a cost forecast. The municipal utility service department checks these calculations and submits them to the municipal or city assembly for approval. However, in many cases the prices have not increased in years because authorities are reluctant to increase the fees. As a consequence, in several cases municipalities have to subsidise waste management services (Ionkova, 2018).

There is no (extra) disposal fee paid or collected at municipal (non-sanitary) landfills, as the landfill is usually managed by the same municipal company that considers the investment costs to be included in the price of the waste management service it provides. There is only a disposal fee for third parties disposing of non-hazardous industrial waste at municipal landfills.

Municipal companies that dispose of waste at the (controlled) regional or inter-municipal landfills do have to pay a disposal fee. This fee ranges between BAM 20 and 39 per tonne (EUR 10-20 per tonne), which includes operation and depreciation costs. This disposal fee was introduced with the development and implementation of regional landfills. Only a minority (37 %) of municipalities are currently using regional landfills, despite having signed agreements to do so. One of the reasons for not using the regional landfills is the extra cost of transport. Combined with the fact that municipal companies have their own landfills that have no disposal fee, municipal companies have no financial incentive to use regional landfills.

Both FiBH and RS have environmental protection funds. Although these funds also collect statistical information on waste generation, collection and treatment (see Chapter 1), the main role of the funds is to collect environmental fees and penalties and financially support environmental projects and programmes, including on waste management. Although the existing legislation, primarily the Criminal Code of FBiH and the Law on Waste Management in FBiH, clearly prohibits actions that are considered a crime against the environment, and sets out sanctions on individuals and organisations who illegally dispose of waste in the environment, only one sanction was imposed between 2016 and 2018. Distrust of inspection and judicial bodies and citizens' lack of information are considered to be the main reasons for not reporting violators.

In summary, the systems currently in place to set, control and collect the service fees for waste collection hinder the improvement of waste management services, as the fees do not fully cover the collection and disposal costs, the risk of non-payment from households lies with the company collecting the waste and there is a lack of political will to increase the waste management tariffs, thereby not creating an incentive for households to limit the amount of waste they create. Increasing the tariffs to the level where they at least cover the cost of collection and proper disposal is needed, but this will also require a different way of collecting the service fees, e.g. by the municipalities, and taking legal action on illegal disposal.

4 Collection coverage and separate collection

The overall collection coverage of waste management services has slightly increased over the past 10 years to 74 % of the population. However, the coverage varies significantly between urban areas (80-90 % coverage) and rural areas (40-45 % coverage). The uncollected waste contributes to the problem of illegal landfills (see Chapter 6). The main reasons for the lack of coverage are linked to infrastructural limitations, such as lack of (asphalted) streets, areas that are difficult to access (e.g. mountainous areas) and streets that are too narrow for waste collection trucks to pass through. In addition to these infrastructural issues, there are also operational limitations, such as insufficient capacity of the operator, who generally has to



operate old collection equipment. This second-hand equipment is mostly imported from abroad and is not fit to access higher altitude areas with steeply sloping roads in rural areas or narrow roads in cities. Both the infrastructural and operational limitations would require investments or additional funds to address them, but increasing the collection coverage will also be dependent on improving the financial viability of the collection services, as described in the previous chapter.

Most municipalities use 'bring points' with 1 100 litre containers, where citizens can dispose of their (mixed) waste. Some municipalities have door-to-door collection systems using smaller 120 or 240 litre containers. For non-hazardous industrial waste, larger skips are used. The collection frequency depends on the municipality, but varies from one to five times per week (lonkova, 2018).

The local government is responsible for the collection and disposal of municipal waste, in accordance with municipal decisions on utility services. In most cases the municipality is the sole or majority stakeholder in the waste collection companies. The private sector is practically not involved in household waste collection, with only a few exceptions. In Zenica, a city in the FiBH, 75 % of the waste collection company is owned by a private foreign company, with the municipality being the minority shareholder (25 %). The service contract in Zenica stipulates that the collection coverage should increase from 75 % to 100 % by the end of the contract and that a waste management treatment centre and separate collection should be established (EBRD, 2019). Although the involvement of private companies could have a positive impact on waste management, there is little interest from the private sector because of the high financial risk because households frequently do not pay the waste collection companies (see Chapter 3) (Terzić, 2021). In addition to the financial risk, legal difficulties are reported to be the reason for citizens not signing a contract with a private company, because of the high costs. This is reported to be the case in Živinice, a municipality in FiBH, where two small private companies operate and where citizens have to sign a contract with the company servicing their municipal zone (BHAS, 2021a).

In addition to the licensed waste collection companies, in most municipalities unlicensed waste collectors are operating and extract the valuable materials from the waste collection containers or from landfills and sell them to traders (see Chapter 7).

With a few exceptions or local initiatives, such as the relatively well-established separate collection of recyclable waste from supermarkets or other commercial outlets in large cities, there is no widespread separate collection in Bosnia and Herzegovina, especially not from households. Some municipalities have set up 'drop-off stations' or recycling centres with bins and containers for the separate collection of recyclables, such as cardboard and paper, scrap metal, plastics, glass and tyres. It is mainly private companies that collect and trade recyclable waste. Some of these companies specialise in paper or plastic collection, while others are metal scrap dealers that also collect other recyclable waste as a supporting activity. Overall, the collection focuses on materials for which the revenues cover the costs of collection and preparation, such as metals, paper and cardboard, polyethylene terephthalate (PET) bottles and large items made of rigid plastics (lonkova et al., 2018). No information is currently available about the amounts of recyclables collected in this way.

Overall, separate collection is not well established in Bosnia and Herzegovina. This is mainly because there are practically no recycling facilities (see Chapter 6). In addition to the lack of sorting and recycling facilities, there are no financial incentives for citizens to sort their waste (see Chapter 3), and there is very low public awareness of the need for proper waste management. Waste collection companies do not allocate budgets to communication or awareness campaigns. Although the lack of public awareness is recognised to be a problem, municipalities have not acted on this (lonkova, 2018).



In 2021, the UNDP in Bosnia and Herzegovina officially launched the Accelerator Lab, an initiative aimed at finding solutions to accelerate development in the 21st century. The Accelerator Lab announced an innovation challenge for clean neighbourhoods to make communities in Bosnia and Herzegovina cleaner and to help them reduce waste. Five initiatives were selected from this challenge; they focus on introducing recycling and on cleaning and composting within communities, and they also raise awareness of reducing waste and altering local lifestyles and mindsets on how waste is created and disposed of. The selected ideas are scheduled to be implemented in the course of 2021 (BHAS, 2021a).

5 Extended producer responsibility schemes

EPR is established as a principle in the legislation adopted by FBiH and RS and includes:

- product design requirements that encourage waste prevention and encourage reuse and recovery;
- restrictions on the use of certain categories of materials and dangerous substances in products above established limit values;
- responsibility for organising recovery and separate collection schemes as well as ensuring the safe recovery and/or disposal of waste generated;
- provision of information to consumers on important product and packaging characteristics regarding waste management (lonkova et al., 2018).

In both entities (FBiH and RS), there are EPR schemes in place for WEEE and plastic packaging; however, there is no specific regulation in RS governing the management of WEEE. The EPR schemes are entity dependent, which means that an EPR scheme operational in one entity is not operational in the other entity. In the Brčko district, EPR is not regulated (lonkova et al., 2018). The existence of independent EPR systems in both entities in a rather small market has resulted in high administrative costs.

A producer responsibility organisation (PRO), also referred to as systems operator, organises the collection, sorting and temporary storage of collected packaging waste on behalf of companies who are obliged to do so. In accordance with the regulations on packaging and packaging waste management (Official Gazette of FBiH, Nos 88/11 and 28/13) and the Decree on Management of Packaging Waste (Official Gazette of RS, No 36/15), the PRO may perform these activities individually or through authorised subcontractors. The PRO must be a not-for-profit organisation. If any profits are made, these need to be invested in the infrastructure for packaging waste management, although the operator of the system cannot possess its own infrastructure for waste management (lonkova et al., 2018).

PROs have to fulfil recycling/reuse rates set out in the regulations. The regulations adopted in both entities stipulate that by 2016 35 % of packaging waste placed on the market had to be recovered or recycled. However, in the FBiH federal waste management strategy, the packaging waste placed on the market only refers to materials coming out of municipal waste, which, in theory, makes it easier to meet the target, as not all packaging actually put on the market is taken into account. According to estimates by the FBiH Environmental Protection Fund, only 15 % of packaging waste placed on the FBiH market is recovered, although there are no reliable data on how much packaging is actually put on the market or retrieved from municipal waste. The target has been suspended until 2021.

Targets for taking back and collecting WEEE are established in FBiH in the Regulation on WEEE management. The targets are defined as percentages of the quantity of equipment placed on the market and increase from 5 % for the first year following the establishment of the EPR scheme to 30 % for the fifth year of its operation (UNECE, 2018). Minimum recycling and



recovery targets are defined as percentages by weight of WEEE for the different categories of equipment. In 2019, 2.4 tonnes of WEEE were collected in FBiH, 14 % more than in 2018; however, with a population of 2.4 million inhabitants in FBiH, this corresponds to only 0.001 kg per capita, which is negligible. According to data on the website of ZEOS, a PRO responsible for WEEE in FBiH, 11 tonnes of WEEE were collected between 2013 and 2020 (ZEOS, 2021).

The Environmental Protection Fund of FBiH coordinates the system of operators and the levies or fees paid by companies that are subject to the rules on management of packaging waste or WEEE but which do not have a contract with a PRO to comply with the rules. However, it is unclear how big this share of companies is.

In theory, the fee is determined by the type, quantity, composition and purpose of the packaging, the material from which the packaging was made and its relation to the national goals (recycling and recovery targets) (Ionkova et al., 2018). In RS, the Decree on Fees for Environmental Packaging Waste Burden provides the calculation methodology of the levies (UNECE, 2018). The problems regarding the fees are clearly described in the 2018 World Bank report: 'The annual payment of the fee is difficult to be enforced compared to monthly payments, especially taking into account that no formal requirement exists the fees to be calculated in the price of goods sold. It is not clear on what basis the size of the fee coefficients for the different packaging materials were calculated and defined. The differences in maximum estimates of the fees per tonne for the different materials are not significant and do not correspond to the different separate collection costs for the different materials' (Ionkova et al., 2018).

The use of collected funds is regulated by the Law on the Environmental Protection Fund of FBiH. Based on this law, 70 % of the collected funds is transferred to the cantons and 30 % is granted by the fund to municipalities and non-governmental organisations through calls for project applications on improving waste management. However, how the 70 % of the funds that is transferred to the cantons is spent is the decision of the cantonal governments and it is therefore not necessarily spent on waste management (UNECE, 2018).

In addition to the lack of accurate data on the amount of packaging placed on the market, another issue is the significant amount of 'free riders' (Ionkova et al., 2018). These are companies that do not, but should, declare the packaging they put on the market and therefore do not contribute to the EPR system or the entity funds. The quantities of undeclared packaging in FBiH are estimated to exceed 50 %. This limits the resources that can be spent on improving waste management and distorts the market. Currently, there are no functioning enforcement mechanisms in place to reduce the number of free riders (Ionkova et al., 2018).

In summary, while the legal basis for EPR has been created, these rules are not implemented and enforced properly, and the system is not yet delivering the expected results. EPR creates opportunities to provide additional funding through the 'polluter pays' principle for the separate collection of end-of-life products and their proper management, but good governance is required to seize these opportunities.

6 Treatment infrastructure

In Bosnia and Herzegovina, most of the municipalities operate their own landfill. These official landfills are poorly operated and managed because of the lack of compaction equipment, waste layers not being covered and the lack of adherence to procedures, resulting in various types of waste being landfilled. The amount of waste landfilled is also unknown on account of the absence of weighing equipment. This poor management leads to environmental problems such as polluted soil and groundwater and health risks for the population (Ionkova et al., 2018). In



addition to these official (non-sanitary) municipal landfills, it is estimated that there are more than 1 400 illegal dumpsites (BHAS, 2021a). One of those dumpsites is on the banks of the Drina river, in which 6 000 to 8 000 cubic metres of waste is collected each year at barriers installed close to a hydroelectric dam. As the river borders Bosnia and Herzegovina, Serbia and Montenegro, the three countries mainly expect each other to take responsibility instead of taking action themselves (Gomez, 2021).

In order to get a better overview of the exact amount and location of the illegal landfills, the Environmental Protection Fund and the non-governmental organisation Centres for Civil Initiatives initiated the wild landfill mapping project and a toll-free telephone number, called the Green Alarm, for people to report and register illegal landfills. Municipalities will receive the register and use it to plan landfill remediation. Results from this initiative show that 90 % of the illegal landfills are actively used, whereas 4 % of illegal landfills are inactive (located in the environment) and 6 % are rehabilitated (BHAS, 2021a).

In the FBiH waste management strategy 2008-2018, targets were set to remediate and close 100 % of the non-sanitary municipal landfills and remove 95 % of the illegal dumpsites by 2018. However, both targets were not achieved and the number of illegal dumpsites is reported to have not decreased. Data collected from 35 local self-governments in 2019 indicated that, of the 163 rehabilitated illegal landfills, 82 had become active again (BHAS, 2021a). Although various funded projects on landfill rehabilitation have taken place, there does not seem to be a structural improvement. The BHAS further states that 'The main causes of illegal landfills are low environmental awareness of citizens, insufficient collection coverage in rural areas, insufficient capacity for sorting municipal waste at the place of origin, lack of implementing regulations for special categories of waste and lack of sanctions for violators' (BHAS, 2021a).

Following a strategy study conducted in 2000, the concept of regional sanitary landfills was adopted in the waste management strategy. Since then, eight regional landfills have been established: four in FBiH (Sarajevo, Livno, Mostar and Zenica) and four in RS (Bijeljina, Banja Luka, Prijedor and Zvornik). Regional landfills are usually managed by a newly established company founded by the municipality in which the landfill is located. Funds for the establishment of regional landfills are secured from credit financing without equity participation (BHAS, 2021a). Although municipalities signed an association agreement to bring their waste to the regional landfill, only 53 municipalities out of 143 municipalities are currently disposing of their waste at regional landfills. The main reasons are the high transport costs and the gate fees that regional landfills operate. As a result, these regional landfills have difficulties in attracting the revenue needed to repay their loans. There is no enforcement of using the regional landfills despite the signed agreement. Improved cooperation between municipalities and the implementation of waste transfer facilities could be a way to reduce transport costs (Ionkova et al., 2018).

There is a limited number of sorting/separation plants in Bosnia and Herzegovina. At the regional landfill in Mostar and at the municipal landfill in Tuzla there are municipal waste sorting plants, of which the sorting plant in Mostar has a capacity of 15 tonnes of waste per hour. In this sorting plant, 790 tonnes of waste (2.7 % of the input) was sorted into dry recyclables in 2016. In the sorting plant in Tuzla this was 360 tonnes of waste (2.4 % of the input) in 2016. Newly set up sorting plants treating pre-separated dry recyclables in Konjic and Sarajevo have a sorting capacity of 5 tonnes of waste per hour. While the mixed waste sorting lines have an efficiency of 2-3 % of the input, the sorting lines for pre-separated waste have an efficiency of 50 % of the input. The results achieved by sorting plants are below expectation, and all sorting lines operate with financial losses as a result of the small amounts of (separately collected) waste and its poor quality due to the extraction of saleable material from the waste containers by the informal sector (Ionkova et al., 2018; BHAS, 2021a).



The production of refuse-derived fuel and solid-recovered fuel for co-incineration in cement plants are being investigated as other treatment options to reduce the quantities to be landfilled and to reduce the amount of fossil fuels used in cement production. In 2018, a feasibility study for the construction of such a plant at the regional landfill in Zenica was completed. The operators of the Mostar regional landfill are also interested in investigating these options. A feasibility study for mechanical-biological treatment and waste-to-energy plants has been initiated in Sarajevo (Ionkova et al., 2018).

No plans currently exist for investing in the separate collection of bio-waste and composting or anaerobic digestion plants.

The recycling industry is not well developed, mainly because of the limited volumes of recyclables. After limited processing, the (mainly private) companies collecting and trading recyclable waste export the waste abroad (Ionkova et al., 2018).

7 Social aspects of waste management

According to a 2021 report by the BHAS (BHAS, 2021b), 209 waste management companies were operating in Bosnia and Herzegovina in 2020. This comprises companies registered as active in waste collection, treatment and disposal activities. Most of these companies (54 %) are categorised as micro enterprises, with fewer than nine employees. 34 % are small enterprises (10-49 employees), while medium-sized enterprises (50-249 employees) represent 11 % of companies. Only 1 % of all waste collection companies are large enterprises (over 250 employees). The total number of waste management companies has not really changed over the past 5 years, fluctuating around 200 (BHAS, 2021b). This means that less than 1 % of the active population of Bosnia and Herzegovina is employed in the official waste management sector.

There are no official data on the number of informal waste collectors and traders in Bosnia and Herzegovina, but their existence is undeniable. Informal waste collectors or waste pickers are reported to collect materials from local landfills, road containers and directly door to door from households. They mainly focus on scrap metal, such as copper and aluminium, and to a lesser extent on paper, which is then sold to traders (Eunomia et al., 2017). There are no official data on the amount of waste that collectors or waste pickers extract from the recyclable municipal waste stream, although a study by the International Finance Corporation from 2008 suggests that this could be 40 % (Popovska, 2008). It is considered that the participation of this sector in the waste management system is not significant, because waste collectors from the informal sector are mostly the result of unfavourable social and economic situations in municipalities, and are not competition for public companies. Yet, waste management organisations insist on introducing a ban on the sale of these materials from individuals to traders, claiming that most of the materials have been stolen from containers for selective waste collection.



Abbreviations

Abbreviation	Name
BAM	Convertible Mark
BiH	Bosnia and Herzegovina
BD	Brčko district
BHAS	Agency for Statistics of Bosnia and Herzegovina
EPR	Extended producer responsibility
FBiH	Federation of Bosnia and Herzegovina
MoFTER	Ministry of Foreign Trade and Economic Relations
PRO	Producer responsibility organisation
RS	Republika Srpska
UNDP	United Nations Development Programme
WEEE	Waste electrical and electronic equipment



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