Country fact sheet

Municipal waste management

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Lithuania

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European Topic Centre on Waste and
Materials in a Green Economy

Context

This country profile was prepared within the EEA's work on municipal waste, resulting in the following outcomes:

- 32 country profiles (this document) – The country profiles were originally produced by the ETC/SCP and were published by the EEA in 2013. The ETC/WMGE updated them for the EEA under its 2015 and 2016 work programme.

- An EEA briefing on Municipal waste management across European countries

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Related country profiles

Country information on waste prevention programmes can be found at:
http://www.eea.europa.eu/publications/waste-prevention-in-europe-2015

For country profiles on material resource efficiency policies, please visit:
http://www.eea.europa.eu/publications/more-from-less/

Contents

Highlights

- In 2014, Lithuania sent 59 % of its municipal solid waste (MSW), 0.7 million tonnes, to landfill, compared with 92 %, 1.2 million tonnes, in 2004.
- Since 2004, the recycling, including composting, rate of MSW has increased, reaching 31 % in 2014.
- The country did not achieve the 2010 diversion target of biodegradable municipal waste (BMW) set in the Landfill Directive – Lithuania has a derogation period of four years for the 2006, 2009 and 2016 targets of the EU Landfill Directive. However, considerable progress has been achieved since 2011 and, as a result, Lithuania reached its landfill diversion target for 2013.
- The new national waste management plan (NWMP) for the period of 2014–2020 was adopted in 2014 and the Waste Prevention Programme for the same period was adopted in 2013.
- Introduction of a landfill tax in 2016 will be an important incentive to divert waste from landfill and enhance recycling.
- Several new waste treatment and recycling facilities will be established in Lithuania in the near future.

1 Introduction

1.1 Objective

Based on historical municipal solid waste (MSW) data for Lithuania and EU targets linked to MSW in the Waste Framework Directive (WFD), the Landfill Directive and the Packaging Directive, the present analysis includes:

- historical MSW management performance based on a set of indicators;
- uncertainties that might explain differences in country performance, which may relate more to variations in reporting methodology than to management performance;
- indicators relating to the country's most important initiatives for improving management of MSW;
- possible future trends.

2 Lithuania's municipal solid waste management performance

The first Law on Waste Management, adopted in 1998 and amended several times, established the basic requirements for prevention, record keeping, collection, sorting, storage, transport, recovery and disposal of waste with a view to preventing its negative effects on the environment and human health. It also includes principles of organisation and planning for waste management systems. The Law on Waste Management, supplemented by several other legal acts, has incorporated the WFD and other EU Directives relevant to municipal waste into Lithuanian legislation (BiPRO, 2012).

An outline national waste management plan (NWMP) for the period 1997–2007 was adopted in May 1999, and the first complete NWMP – the National Strategic Waste Management Plan – was adopted in April 2002 for the period 2002–2006 (Ministry of Environment, 2012a, 2012b). This strategic document introduced the waste hierarchy prior to accession of the country to the EU in May 2004. The subsequent plan covering the period 2007–2013 was adopted in October 2007. Finally, the current NWMP for the period 2014–2020 was legally adopted in April 2014. In addition to the NWMP, ten regional as well as municipal waste management plans have been developed in order to implement the tasks defined in the NWMP (BiPRO, 2014).

The Ministry of Environment is the competent authority for drafting the NWMP and also for the coordination of management measures. The Ministry is also responsible for legislation on waste management and administration as well as coordinating the activities of other institutions. Other relevant bodies in the field include the Environmental Protection Agency (EPA) and regional waste management centres – legal entities established by several municipalities for the coordination of waste management in municipalities under their jurisdiction (BiPRO, 2012).

The 60 municipalities are the main institutions organising municipal waste management, with the main responsibility to create effective waste management systems. Local authorities are also responsible for reaching EU targets regarding recycling and recovery – with the exception of some waste streams (waste electrical and electronic equipment (WEEE), packaging waste, batteries and accumulators, internal combustion engine or fuel oil filters, car hydraulic (oil) shock absorbers, used tyres, end-of-life vehicles, and oils), which are managed by extended producer responsibility (EPR) schemes. The EPR scheme for packaging waste was adopted in 2013 (EPA and Ministry of Environment, 2015; BiPRO, 2012).

In 2013, 97 % of the total population was connected to formal waste collection systems and the remaining population was provided with other forms of waste disposal, such as civic amenity sites (EPA and Ministry of Environment, 2015).

Door-to-door waste collection is mainly limited to residual waste; recyclables from households are for the most part collected through collection point systems. The collection points (around 8 100 sites) are used to collect paper/card and glass as well as plastics and metal packaging (comingled). Furthermore, textiles are collected in five Lithuanian cities. It is estimated that around 6 % of properties additionally have door-to-door collection services for mixed recyclables (paper, card, glass, metal packaging, plastic bottles and plastic film). Commercial waste is collected through the same system as household waste. The waste collection system is complemented by 83 civic amenity sites where a variety of materials are collected – tyres, furniture, WEEE, batteries and accumulators, textiles, construction and demolition waste, household waste, waste paper, plastic, metal, glass and hazardous household waste (EPA and Ministry of Environment, 2015; Gibbs *et al.*, 2014a).

Of total municipal waste generated in 2014, 98 % was reportedly treated and 59 % of the total was deposited in landfill (Eurostat, 2016).

In 2014, 49 composting sites were in operation for the treatment of green waste and four more are planned for the near future. Additionally, there were about 15 waste treatment companies that handled composting/digestion of green waste (code 200201) in 2014. There are plans to build several new plants using EU funds (EPA and Ministry of Environment, 2015).

The first waste-to-energy plant, with a capacity of 245 000 tonnes per year, was opened in Klaipeda in 2013 and two further incineration facilities are being developed (BiPRO, 2014). Paper and cardboard recycling takes place in ten facilities with a total capacity of more than 250 000 tonnes per year, glass recycling in six facilities with a total capacity of more than 110 000 tonnes per year; plastic, polyethylene (PE) and polyethylene terephthalate (PET), recycling in 24 facilities – with a capacity of 72 000 tonnes per year; and metal recycling (aluminium melting furnace) in two facilities – 4 800 tonnes per year (EPA and Ministry of Environment, 2015).

There are 11 operational regional landfills for non-hazardous waste with a total capacity 1.25 million tonnes per year. By the end of 2015 around 807 landfills and disposal sites for non-hazardous waste will be closed (EPA and Ministry of Environment, 2015). The closure and rehabilitation of the sites is co-financed by EU funds. All operational landfills are today compliant with the Landfill Directive. Low-tech mechanical treatment for the separation of recyclables takes place at some landfill sites (BiPRO, 2014; Gibbs *et al.*, 2014a).

Collection and management of recyclables is free of charge for households and at least partly financed by EPR schemes. Municipalities are responsible for billing and collection of fees for residual waste management (Ernst and Young, 2011). In the past, residents paid a monthly fixed fee for residual waste management. As of 2015 municipalities are obliged to charge households for residual waste collection according to pay-as-you-throw schemes, based on waste volume, volume and collection frequency or weight of waste (Gibbs *et al.*, 2014a).

There is a deposit refund scheme in place for re-usable glass bottles (introduced in 2006), which covers 21 types of glass bottle, mainly for beer. According to the Ministry of Environment, the scheme was extended to metal, glass and plastic beverage containers from February 2016 (EPA and Ministry of Environment, 2015).

2.1 Municipal solid waste indicators

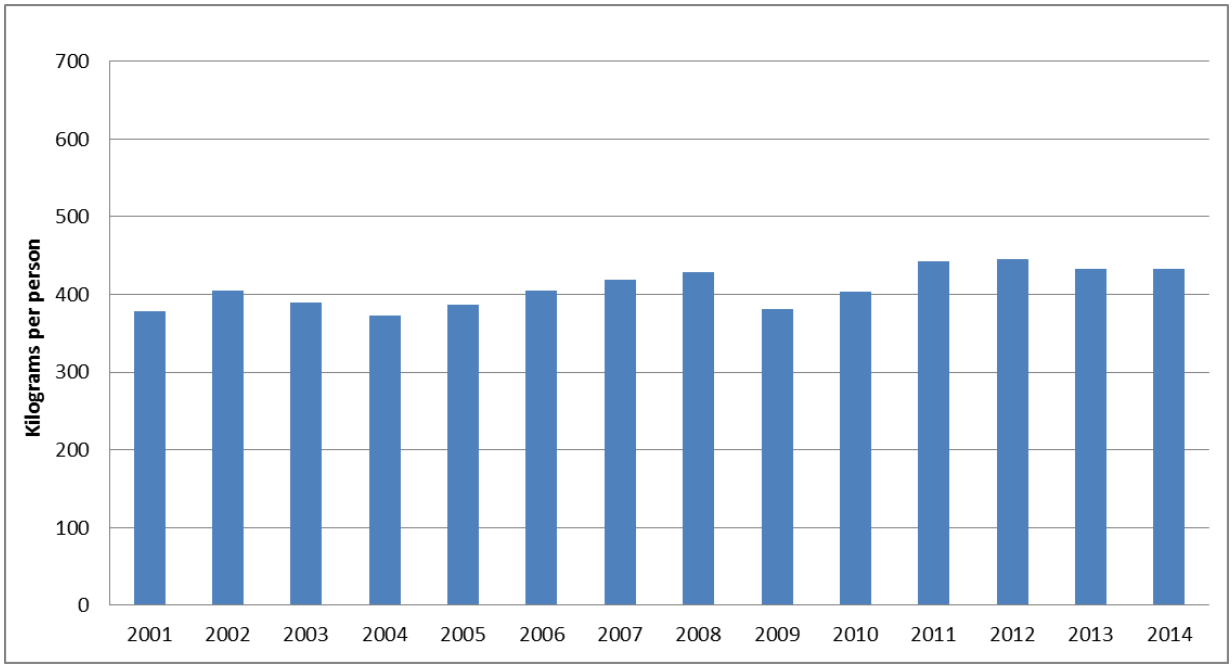
The following indicators illustrate the development of Lithuanian MSW management in the period 2001–2014. All percentage figures have been calculated as proportions of generated waste, not managed

waste. Relating the indicators to managed amounts would generally result in higher rates for all waste management paths.

The majority of municipal waste in Lithuania is still sent to landfill even though the landfill rate has decreased considerably since 2010. In 2014, 59 % of municipal waste, 0.7 million tonnes, went to landfill compared with 92 %, 1.2 million tonnes, in 2004.

Figure 2.0 shows the generation of MSW per person in Lithuania from 2001 to 2014. MSW generation per person remained relatively stable during this period, with only a slight increase over the years. In 2014, MSW generation was 433 kilograms per person whereas the EU-28 average was 474 kilograms.

Figure 2.0 Lithuania, municipal solid waste generation per person, 2001–2014



Source: Eurostat, 2016.

Until 2010 the figures refer to municipal waste collected. However, as municipal collection services did not cover the whole population, waste generation until 2010 is somewhat underestimated. From 2011 onwards the amount of generated but not collected waste is estimated and included in reported figures (Eurostat, 2015). This is reflected in the increase in MSW generation in 2011.

2.1.1 The recycling of municipal solid waste, 2001–2014

Figure 2.1 shows the development of total, material and organic (compost and other biological treatment) MSW recycling in Lithuania. From 2004 to 2006 there is a very slight increase in the recycling of MSW: both material and organic recycling stagnated at around 1 %. This can perhaps be attributed to the fact that following the accession of Lithuania to the EU in 2004, with changes in law related to waste classification and the reporting system) both the new data collection system and waste treatment companies took some time to adapt to new requirements.

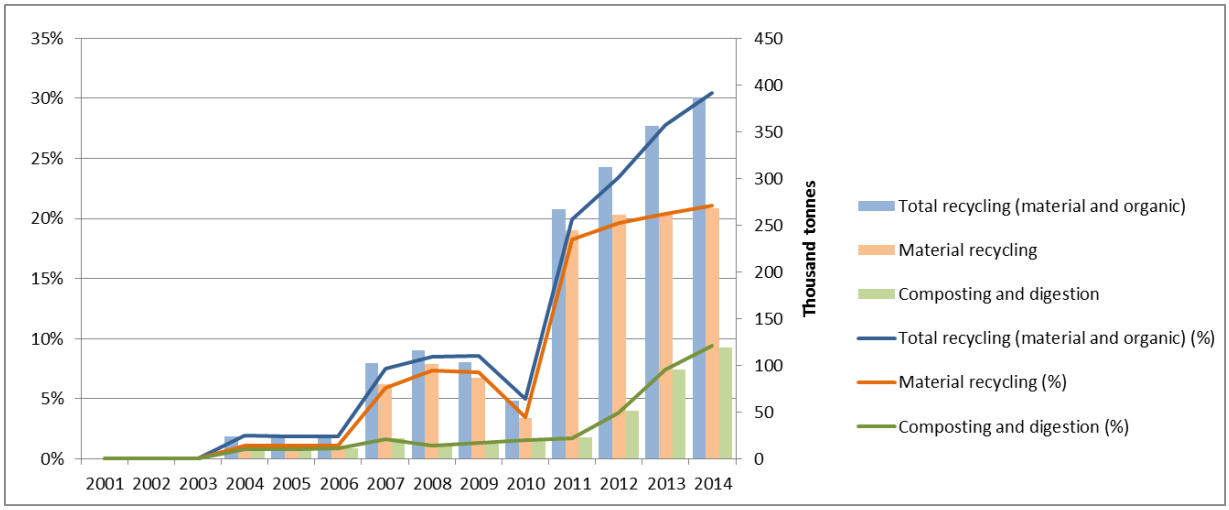
After 2007, a significant increase can be observed in total recycling, with a rate of 31 % reached in 2014 – mainly driven by material recycling. However, in 2013 organic recycling seems to have taken off: the recycling rate increased from 1.7 % in 2011 to 7.4 % in 2013 and further to 9.4 % in 2014. Since 2007, waste exported for recycling has been included in reported recycling figures (amounting to

56–69 % depending on the year) (Eurostat, 2015), explaining the abrupt increase in the recycling rate in 2007.

Although Figure 2.1 indicates a rate of zero recycling before 2004, this should be understood as a data compatibility issue; before accession to the EU, Lithuania used national classifications for waste categories and waste treatment operations that were not fully compatible with the data reported after 2004. However, this has little impact on the overall trend because the total recycling level was only 2 % in 2005.

All in all, there is room for improving both material and organic recycling, and it seems that organic recycling in particular can be increased.

Figure 2.1 Lithuania, municipal solid waste recycling, 2001–2014, per cent and tonnes



Source: Eurostat, 2016.

The EU's 2008 WFD includes a target for certain fractions of MSW: 'by 2020, the preparing for re-use and the 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 shall be increased to a minimum of overall 50 % by weight'. EU Member States may choose between four different methodologies to calculate compliance with the target[1]. Lithuania has chosen calculation method 2 (Gibbs *et al.*, 2014) and has reported a recycling rate of 43 % according to this methodology. The recycling rates shown in this paper correspond to method 4, the only method for which time series data exist. In 2015, the European Commission has proposed new targets for municipal waste of 60 % recycling and preparing for reuse by 2025 and 65 % by 2030, based on only one calculation method, and with the option of time derogations for some countries (EC, 2015a).

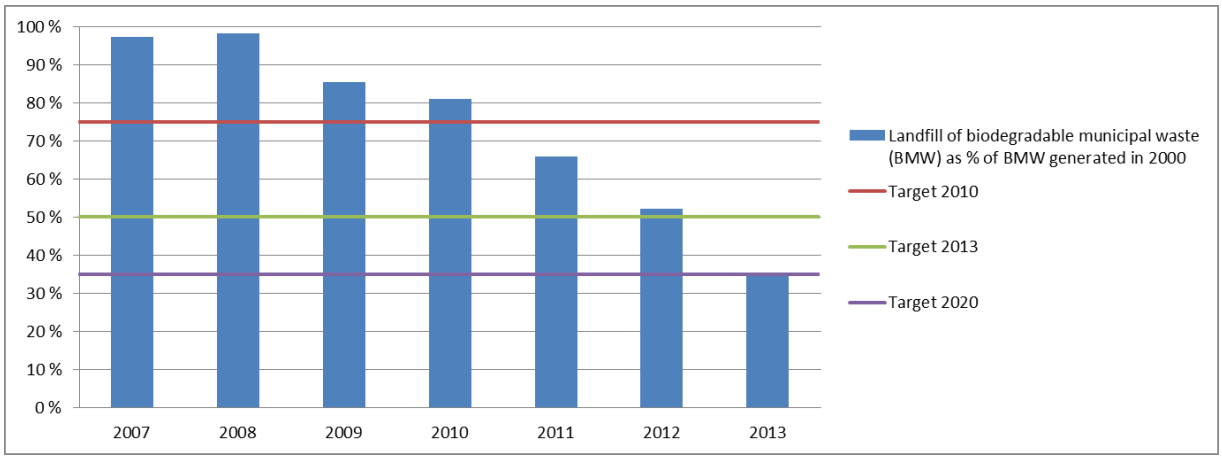
[1] Commission Decision 2011/753/EU allows countries to choose between four different calculation methods to report compliance with this target. Member States have the option of considering four alternative waste streams and fractions:

1. paper, metal, plastic and glass household waste;
2. paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins;
3. household waste;
4. municipal waste (the method used in this document).

2.1.2 Landfill of biodegradable municipal waste

The EU Landfill Directive requires all Member States to reduce the amount of biodegradable municipal waste (BMW) sent to landfill by specific percentages by 2006, 2009 and 2016. However, Lithuania has been given a four-year derogation period and thus the target years are 2010, 2013 and 2020. The targets for Lithuania relate to the amount of BMW generated in 2000, 766 000 tonnes. Lithuania has reported its BMW landfill amounts to the European Commission for the years 2007, 2008, 2009, 2010, 2011 and 2012.

Figure 2.2 Landfill of biodegradable municipal waste in Lithuania, 2007–2013



Source: EC, forthcoming; EPA and Ministry of Environment, 2015 (data for 2013); EC, 2014.
Note: the target dates take account of Lithuania's 4-year derogation period.

As shown in Figure 2.2, Lithuania was unable to reach its landfill diversion target for 2010, as BMW landfill was 81 % of BMW generated in 2000. However, considerable progress was made in 2011 and 2012, and according to the data provided by the EPA and Ministry of Environment (2015) for 2013, Lithuania reached its landfill diversion target for 2013 with a BMW landfill amount of 36 % (272 000 tonnes) of BMW generated in 2000.

2.1.3 Regional differences in municipal solid waste recycling, 2001–2013

The Eurostat database does not hold regional waste management data for Lithuania. This indicator can therefore not be applied in this report.

2.1.4 Recycling and landfill taxes

Lithuania does not currently have a landfill tax. However, the law on landfill tax has been adopted and the tax will be introduced in 2016 (EC, 2015b). The landfill gate fees are of the order of EUR 20–30 per tonne (Gibbs *et al.*, 2014a). The lack of a landfill tax and the low fees have hindered the development of recycling operations in Lithuania.

2.1.5 Environmental benefits of better municipal solid waste management

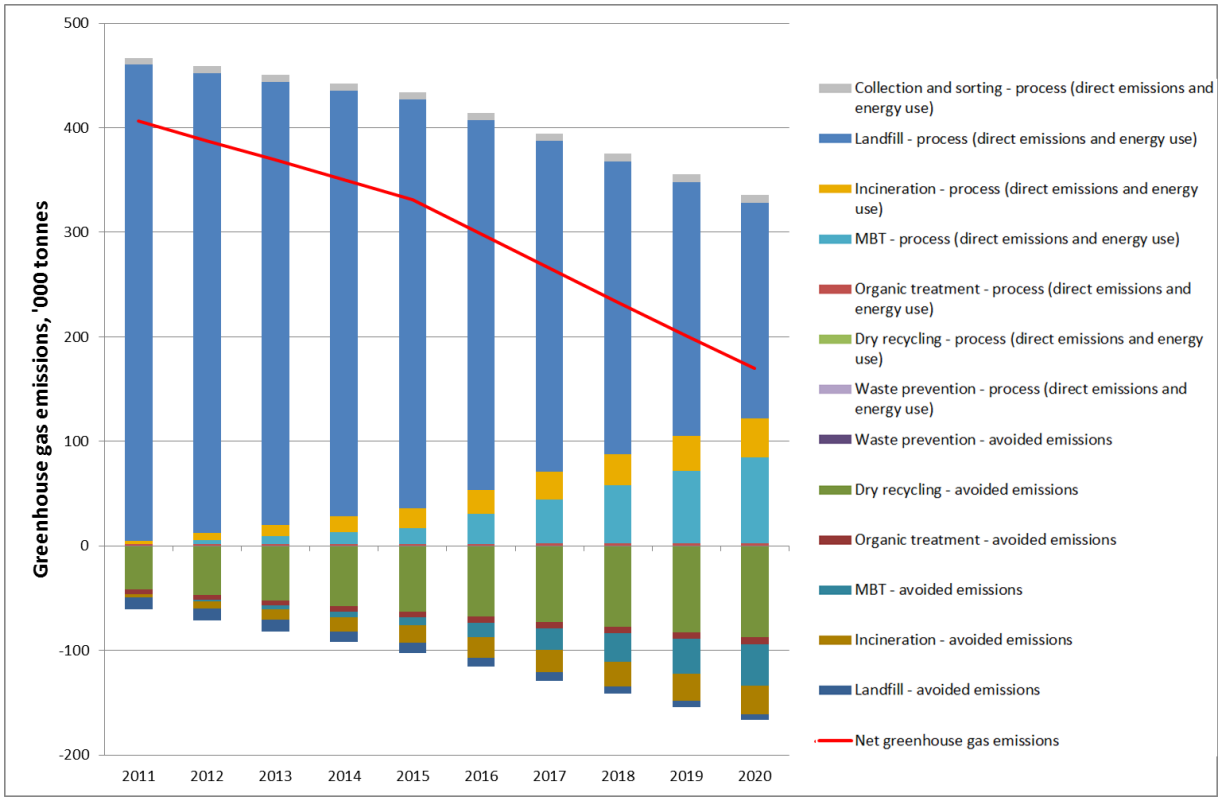
Figure 2.3 shows a scenario for the development of greenhouse gas emissions from MSW management in Lithuania. The scenario assumes a 0.0–0.43 % yearly increase in municipal waste generation in Lithuania from 2011 onwards, and that the EU legislation for municipal waste is fully implemented. The calculation of emissions is based on data and assumptions in the European Reference Model on Municipal Waste Generation and Management. The approach taken in the model is rooted in life-cycle thinking, in that it considers not only direct emissions, but also avoided emissions associated with the

recycling of materials or the generation of energy from waste management processes. The more detailed methodology is described in Gibbs *et al*. (2014b). The level of emissions depends on the amount of waste generated and the treatment it undergoes each year.

Figure 2.3 shows direct emissions, avoided emissions and net emissions resulting from the management of MSW. All emissions (positive values) represent the direct operating emissions for each waste management option. The phases of the waste management chain covered include waste prevention; material recycling; composting and anaerobic digestion; mechanical biological treatment (MBT) and related technologies; collection and sorting; incineration and landfill.

For avoided emissions (negative values), the calculations integrate the benefits associated with energy recovery and material recycling of paper, glass, metals, plastics, textiles and wood, and bio-treatment of food and garden waste from collected MSW. The modelled scenario assumes full implementation of existing EU legislation on waste management (Gibbs *et al.*, 2014c).

Figure 2.3 Lithuania, scenario for greenhouse gas emissions from municipal solid waste management, 2011–2020



Source: ETC/WMGE, calculation based on the European Reference Model on Waste.

Note: results presented in this figure should not be used for the compilation of greenhouse gas reporting for the Intergovernmental Panel on Climate Change (IPCC) national inventory report, or be compared with IPCC figures, as the methodology employed here relies on life cycle thinking and, by definition, differs substantially from the IPCC methodology. MBT means mechanical-biological treatment.

Based on the scenario with full policy implementation, net greenhouse gas emissions from the treatment of municipal waste in Lithuania are expected to decrease in the period 2011–2020. The reduction will mainly be due to greater MSW recycling, which results both in more avoided emissions as well as decreasing emissions from landfills. In the earlier years of the scenario direct greenhouse gas emissions

relating to municipal waste management are linked almost exclusively to landfill and the benefits of recycling are relatively low.

Greenhouse gas emissions from landfill are caused by the breakdown of organic wastes accumulated over past decades. In the model, which calculates landfill impacts over a 100-year period, the longer-term emissions from any given waste are attributed to the year in which that waste is deposited (Gibbs *et al.*, 2014b). Therefore, the positive effect of diverting BMW from landfill shows in the figures as an immediate reduction in greenhouse gas emissions from landfill. According to the model, towards 2020 greenhouse gas emissions from waste management will increasingly originate from MBT processing and waste incineration.

2.2 Uncertainties in the reporting

Some uncertainties or differences in how countries report recycling of MSW can result in different recycling levels. This applies, for example, to the following issues:

- the extent of packaging waste from households and similar packaging from other sources included or not included in the MSW recycling reported;
- the definition of municipal waste used by the country, such as the inclusion or exclusion of home composting;
- the methodology used to report the inputs and outputs of MBT and sorting plants.

Since 2011, Lithuania includes packaging waste generated in households, public areas, retail trade, restaurants and other small enterprises in the MSW data reported to Eurostat. In 2013, about 9 % of generated MSW was packaging waste collected from the above-mentioned sources (EPA and Ministry of Environment, 2015).

Municipal waste is defined in the Lithuanian Waste Management Law as household waste and other waste which, because of its nature or composition, is similar to household waste (Republic of Lithuania, 1998). Thus, the definition is similar to the one given in the WFD.

Lithuania excludes rejects from sorting plants when reporting recycling figures to Eurostat (Gibbs *et al*., 2014a). Waste MBT will start in 2016 (EPA and Ministry of Environment, 2015).

2.3 Important initiatives for improving municipal solid waste management

The waste policy in Lithuania was poorly developed in the early 1990s – many household waste streams simply did not exist, the reuse rate of packaging and organic waste was high and what was left over was dumped in hundreds of uncontrolled sites that fell short of environmental standards (Veidemane *et al.*, 2004).

As Lithuania moved towards a market-based economy, a legislative framework for waste handling was built up, institutions were created and their responsibilities were defined, waste management strategies were developed with targets set for individual waste streams and, at the same time, measures were introduced for the continuous improvement of the system.

In Lithuania, local authorities have relatively strong control over waste flows and general influence over the waste management sector. Municipal waste management is conducted according to the municipal waste management rules approved by the Municipal Council. These rules regulate the rights and duties of actors in the system and set the conditions of municipal waste services. The Municipal Councils approve municipal waste management service fees (ECAT, 2012).

Lithuania has been developing a regional municipal waste management system since 2002. The 60 municipalities are divided into ten regions and each of them has a Regional Waste Management Centre (RWMC) (EPA and Ministry of Environment, 2015). RWMCs were established as legal entities with the main purpose of implementing waste management tasks effectively and creating the waste management system. Waste collection and sorting and utilisation systems were developed. Furthermore, non-compliant landfill sites have been closed and redeemed, new and modern waste disposal facilities have been constructed, and green waste composting and bulky waste acceptance sites have been installed. A substantial part of the EU structural funds for 2007–2013 was channelled into the development of municipal biodegradable waste management infrastructure.

Since 2003 there is a ban on landfill of biodegradable waste from gardens, parks and greeneries as well as batteries and accumulators (BiPRO, 2012).

EPR schemes have been established for the following waste streams: WEEE, packaging waste, batteries and accumulators, internal combustion engine or fuel oil filters, car hydraulic (oil) shock absorbers, used tyres, end-of-life vehicles, and oils (EPA and Ministry of Environment, 2015). The tax on environmental pollution is used as a means of enforcing legislation, levied on producers/importers that fail to meet the Lithuanian target for packaging reuse or packaging waste management (BiPRO, 2012).

The updated Lithuanian NWMP and a separate National Waste Prevention Programme for the period 2014–2020 were legally adopted in 2014. The NWMP defines a range of targets for municipal waste management. There is a target to introduce separate collection of at least paper, metal, plastic and glass by 2015 and to prepare at least 50 % of the aforementioned waste streams from households for reuse and recovery by 2020. Some key measures to fulfil these targets will be the improvement of collection infrastructure to make it more accessible for households, financial incentives for recycling facilities and extension of the deposit refund system to single-use packaging and also for metal, glass and plastic beverage containers. The 2016 recycling targets for packaging waste are defined as a minimum of 60 % of glass and paper/cardboard, 50 % of metals, 22.5 % of plastics and 15 % of wood (BiPRO, 2014).

The target of the previous NWMP to cease landfill of untreated waste by 2013 was not met and during the validity period of the new NWMP this challenge will be further tackled by building one mechanical treatment plant and nine MBT plants by the end of 2015. These plants will begin operating in 2016 and will be able to sort bio-waste and secondary waste resources (paper, plastic, glass, metal waste and packaging waste) from mixed municipal waste. The NWMP defines biodegradable waste in municipal waste as a priority waste stream requiring specific measures. These include promotion of better infrastructure, pilot projects for collection, introduction of a landfill tax and charges for bio-waste going to landfill as well as promotion of community composting. Landfill of sewage sludge has been banned since 1 January 2015. A separate collection system for biodegradable waste is planned for establishment by 2019 and collection of biodegradable waste from the production and manufacturing sector is to be improved (EPA and Ministry of Environment, 2015; BiPRO, 2014).

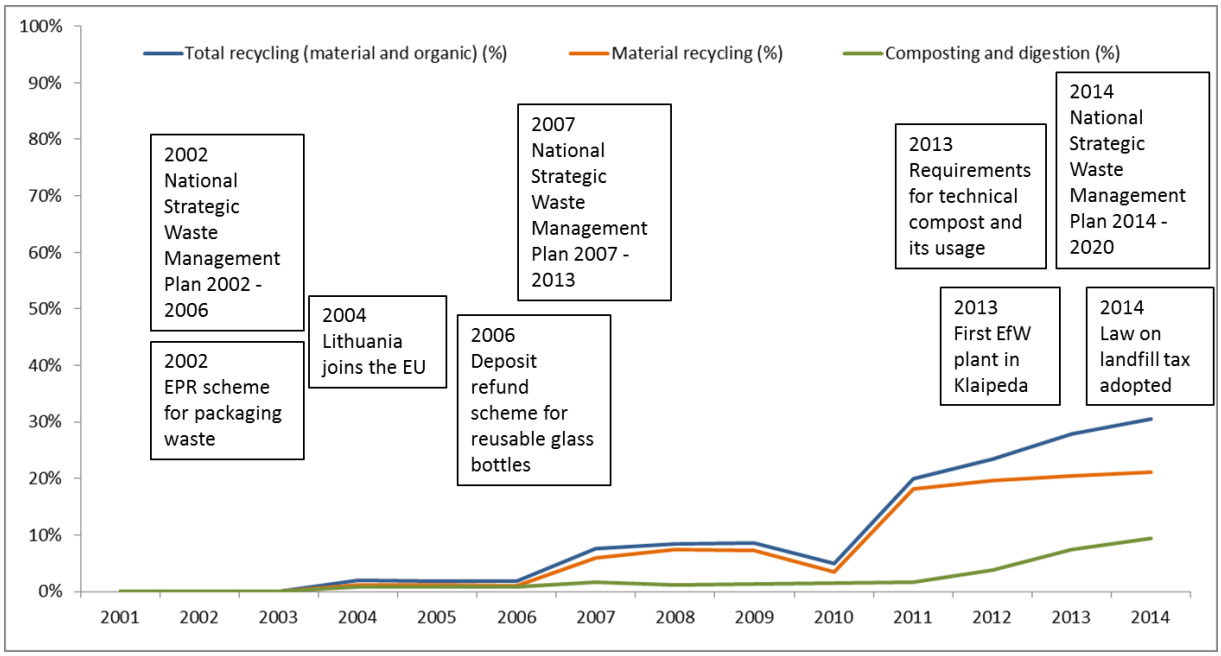
The NWMP for 2007–2013 included provisions for the preparation of draft legislation to promote recycling and the use of different recycled materials, and for the elaboration of a recycling development programme for 2009–2013. The programme for the use of technical compost was adopted in 2010 (validated until January 2013), with the requirements for technical compost and its use adopted in 2012 and entering into force in January 2013.

There are 49 composting sites in various municipalities where garden and park waste is brought by residents free of charge. Since 2012 bio-waste composting in individual households has been promoted by giving special containers for bio-waste collection and composting. In the period 2012–2014, some 157 900 such containers were given to households (EPA and Ministry of Environment, 2015).

There are 11 operational regional landfills for non-hazardous waste, all of which comply with the Landfill Directive. Disposal of waste in old, non-compliant landfills has been banned since 16 July

2009. In all, 807 old landfill and disposal sites had been closed by mid-2015 (EPA and Ministry of Environment, 2015; BiPRO, 2014; Gibbs *et al.*, 2014a; BiPRO, 2012).

Figure 2.4 Lithuania, recycling of municipal solid waste and important policy initiatives, 2001–2014



2.4 Possible future trends

Lithuania will need to increase its efforts in order to fulfil the 50 % recycling target by 2020. Rapid establishment of recycling facilities, combined with the introduction of effective economic incentives and robust information measures, will be essential for fulfilling the target.

The long-term objectives of Lithuanian waste policy, among others, are to encourage waste prevention, reuse and recycling (especially secondary raw materials including packaging), to minimise disposal of municipal waste, to ensure the accessibility and high quality of public municipal waste management services, and to ensure municipal biodegradable waste collection and treatment.

Lithuania introduced a landfill tax in 2016. The tax level is EUR 21.72 per tonne with a progressive increase to EUR 44.89 per tonne in 2020 (EC, 2015b).

In order to increase recycling levels in the country, the introduction of a certification system of products and materials obtained from recycled waste is planned as well as the organisation of public information campaigns on waste separation. As indicated in the NWMP, separate collection of kitchen (food) waste is to be introduced in a few years and there are also plans to extend the collection of recyclables to include packaging waste, metal, WEEE, batteries and accumulators. The planned establishment of new civic amenity sites is another means to enhance waste separation and recycling (Gibbs *et al.*, 2014a).

Energy production from mixed municipal waste unsuitable for recycling and recovery started in 2013. Nine MBT plants and one mechanical treatment facility; one material recycling facility; four anaerobic digestion facilities in Alytus, Panevėžys, Telšiai and Utena regions; four composting facilities in Kaunas, Marijampolė, Šiauliai and Tauragė regions; and one bio-drying facility in the Vilnius region

for pre-treatment for incineration are under construction or in the planning phase for establishment in the near future (EPA and Ministry of Environment, 2015; Gibbs *et al.*, 2014a).

References

BiPRO, 2012, *Country Factsheet for Lithuania: Support to Member States in improving waste management based on assessment of Member States' performance*, report made by BiPRO on behalf of the European Commission under contract ENV.C.2/SER/2011/0034.

BiPRO, 2014, *Detailed evaluation report for assessing the waste management plan of Lithuania – National*, Final Draft – 2 July 2014, ENV.C.2/FRA/2013/0023.

EC, 2011, 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 the Council.

EC, 2014, Member States' reporting to the Commission according to the Landfill Directive (1999/31/EC), email from Bartosz Zambrzycki (European Commission) to Almut Reichel (EEA), 16 January 2014.

EC, 2015a, Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste (COM(2015) 595 final of 2 December 2015).

EC, 2015b, *Country Report Lithuania 2015*, Commission Staff Working Document, Brussels, 26.2.2015 SWD (2015) 34 final, COM(2015) 85 final (http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_lithuania_en.pdf), accessed 21 August 2016.

EC, forthcoming, *Final Implementation Report for the Directive 1999/31/EC on the Landfill of Waste*, prepared by Eunomia Research and Consulting Ltd, ENT Environment and Management, EPEM S.A., Ekokonsultacijos and the Environmental Research Institute (ORZ) for the European Commission, DG Environment under Study Contract DG ENV.C.2/FRA/2013/0023. Draft report, forthcoming.

ECAT, 2012, *Waste management system in Lithuania – history, trends, main actors and future scenarios*, Environmental Centre for Administration and Technology. (www.vartotojai.lt/get.php?f.1311), accessed 21 August 2016.

EPA, 2012, Information received during the Eionet consultation of the paper, email of 17 October 2012 from Kęstutis Minderis, Lithuania Environmental Protection Agency.

EPA and Ministry of Environment, 2015, Information received during the Eionet consultation of the paper, email of 11 November 2015 from Kamilė Petrauskienė, Environmental Protection Agency.

Ernst and Young, 2011, *Key issues in municipal waste management in EU-11 countries*. (http://webapp01.ey.com.pl/EYP/WEB/eycom_download.nsf/resources/Municipal-waste-management-EU11.pdf/$FILE/Municipal-waste-management-EU11.pdf) accessed 18 October 2016.

Eurostat, 2015, *Country specific notes on municipal waste data*, (last update December 2015), European Commission/Eurostat, Directorate E: Sectoral and regional statistics, Unit E-2: Environmental Statistics and Accounts; Sustainable Development (http://ec.europa.eu/eurostat/cache/metadata/Annexes/env_wasmun_esms_an1.pdf) accessed 18 October 2016.

Eurostat, 2016, *Waste database, municipal waste*. (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasmun&lang=en), accessed 13 June 2016.

Gibbs, A., Elliott, T., Vergunst, T., Ballinger, A., Hogg, D., Gentil, E., Fischer, C., Bakas, I. and Ryberg, M., 2014a, *Development of a modelling tool on waste generation and management – Appendix 1: Baseline report*, Final report for the European Commission DG Environment under Framework Contract No ENV.C.2/FRA/2011/0020.

Gibbs, A., Elliott, T., Ballinger, A., Hogg, D., Gentil, E., Fischer, C. and Bakas, I., 2014b, *Development of a modelling tool on waste generation and management – Appendix 6: Environmental modelling*, Final report for the European Commission DG Environment under Framework Contract No ENV.C.2/FRA/2011/0020.

Gibbs, A., Elliott, T., Vergunst, T., Ballinger, A., Hogg, D., Gentil, E., Fischer, C. and Bakas, I., 2014c, *Development of a modelling tool on waste generation and management – Headline project report*, Final report for the European Commission DG Environment under Framework Contract No ENV.C.2/FRA/2011/0020.

Government of the Republic of Lithuania, 2007, *Strategic Plan for Waste Management of the Government of the Republic of Lithuania*, November 2007, amended December 2010, (http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=388766&p_query=&p_tr2=2&p_hil=&p_sess=&p_no=1), accessed 21 August 2016.

Lithuania, 2012, The Lithuanian answer of 11th July 2012 to the Eionet review of assumptions in the EEA and ETC/SCP model on municipal waste, submitted to member countries on 27 April 2012.

Ministry of Environment, 2012a, emails from Neringa Pundytė, Ministry of Environment of the Republic of Lithuania, Waste Management Strategy Division, 30 July, 24 August and 3 September 2012.

Ministry of Environment, 2012b, Information received during the Eionet consultation of the paper, email of 5 November 2012 from Neringa Pundytė, Ministry of Environment of the Republic of Lithuania.

Republic of Lithuania, 1998, *Waste Management Law No.VIII-787*. (http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=470296&p_tr2=2), accessed 21 August 2016.

Veidemane, K., Valiukaite, V., Morkvenas, Z. and Dudutyte, Z., 2004, *Waste Management in the Baltic States*.