

Municipal waste management



Denmark 

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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 information

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/>

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Highlights

- The overall treatment of municipal solid waste (MSW) in Denmark is characterised by low landfilling rates, 1.3 %, high incineration ones, 54 %, in 2014, and increasing recycling.
- The EU targets for diversion of biodegradable municipal waste (BMW) from landfill have been met years in advance.
- The recycling rate of MSW in Denmark increased from 31 % in 2001 to 44 % in 2014. Since 2009 the total recycling rate has stagnated at around 44 %.
- The major initiatives to improve MSW in Denmark were taken before 2001: a landfill ban, landfill and incineration taxes, and the introduction of some separate collection schemes.
- The Waste Management Plan for 2013–2018, as well as the Danish Resources Strategy adopted in 2013, focus on recycling and seeing waste as a resource.

1 Introduction

1.1 Objective

Based on historical municipal solid waste (MSW) data for Denmark, and EU targets linked to MSW in the Waste Framework Directive (WFD), the Landfill Directive and the Packaging Directive, the analysis undertaken 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 MSW management;
- possible future trends.

2 Denmark's municipal solid waste management performance

Danish waste management has progressed in leaps and bounds from its initial focus on the protection of human health, through the integration of environmental protection, to the extraction and recovery of resources in waste. This transformation has occurred as a result of a dedicated and thorough policy regime that draws in key actors and assigns clear responsibilities.

In the 1970s, landfilling and dumping of waste on sites lacking any kind of environmental protection was still the most common waste disposal practice in Denmark. Landfill was still so common in the 1980s that the landfill capacity was exhausted in the Copenhagen region.

The generation and disposal of waste in Denmark was first mapped in 1985. This showed that 39 % of all waste and 33 % of household waste ended in landfills. The percentage of household waste landfilled was reduced to 19 % by 1995 and to 4 % by 2008, while recycling and incineration have simultaneously increased; waste is now seen as a resource to be recovered. As a consequence, many landfills receive so little waste that it is no longer economically viable to keep them fully operational (ETC/SCP, 2012, Fischer *et al.*, 2013).

The first National Waste Plan was developed in 1992, covering the period 1993–97. It included targets for recycling, incineration and landfilling of all waste (Fischer *et al.*, 2013). Since then three plans covering the periods 1998–2004, 2005–2008 and 2009–2012 have been developed and implemented. The current plan, Denmark without Waste, Resource Plan for Waste Management 2013-2018 was adopted in 2014.

The waste regulation per 1 January 2010 (Statutory order on waste 2010) changed the definition of waste regarded as MSW. All enterprises became responsible for the recycling of suitable waste under the new regulation, whereas previously, the municipalities had more authority over and duties for recyclable waste from private enterprises. In addition to household waste, fractions similar to household waste from institutions, commerce and offices had also been collected by through municipal schemes (Marcher, 2005). The change in regulation also resulted in municipalities no longer having responsibility for ensuring that sufficient recycling capacity was available either at publicly or privately owned plants for waste from institutions, commerce and offices. In order to keep

the coherence of the data time series, this sorted recyclable waste has been removed from municipal waste data since 1995. A new waste data system, based on the European List of Waste, was introduced in 2011 (Eurostat, 2015).

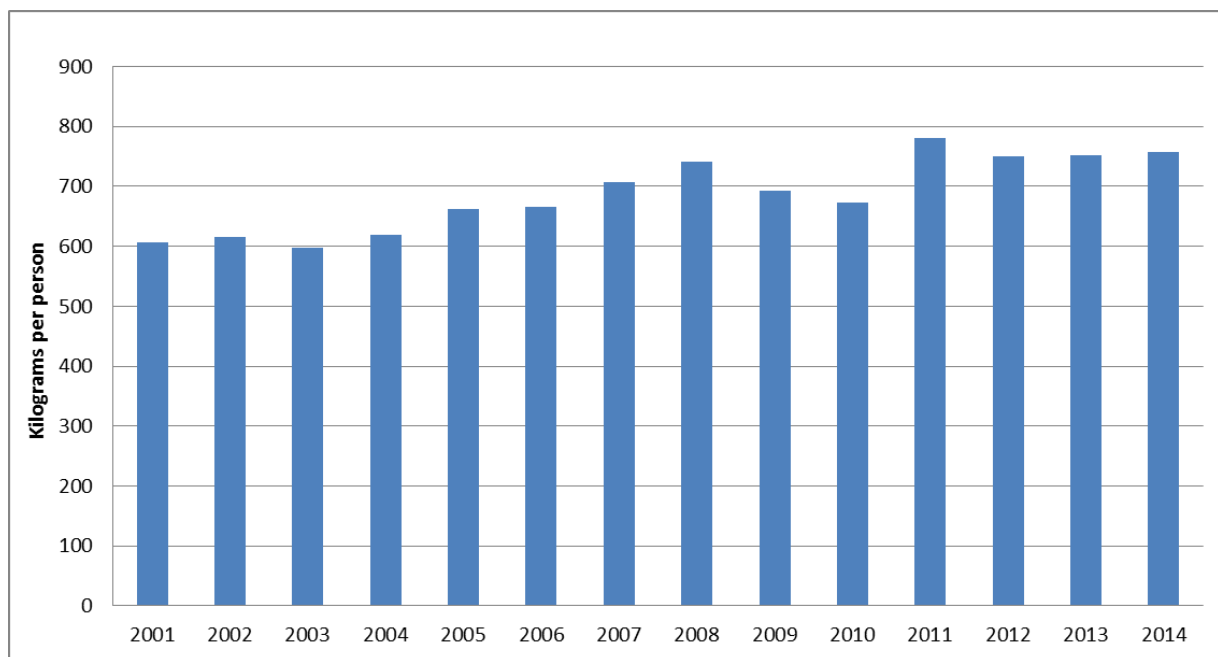
Municipalities have the responsibility for introducing collection schemes to secure meeting the targets on the national level, through whichever collection scheme they choose. Practically all households in Denmark have a door-to-door collection service for residual waste. In general, 70 % of municipalities provide a source-separated collection service for paper and glass (Gibbs *et al.*, 2014a). In addition, separate collection of further waste fractions is offered by some municipalities.

In 2014, Denmark generated 4.3 million tonnes of MSW, and all generated waste was reportedly sent to treatment operations (Eurostat, 2016).

2.1 Municipal solid waste indicators

The following indicators illustrate the development of Danish MSW generation and management in 2001–2014. All percentage figures have been calculated as proportions of generated waste, rather than managed waste.

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



Source: Eurostat, 2016.

According to Eurostat data, the generation of MSW in Denmark (Figure 2.) increased between 2001–2008, from 606 kilograms per person to 741 kilograms, and then decreased to 673 kilogram in 2010. The considerable increase to 781 kilograms per person in MSW generation that can be seen between 2010 and 2011 may be due to the introduction of a new waste data system in 2011. In 2012-2014 MSW generation stabilized at 750–760 kilogram per person.

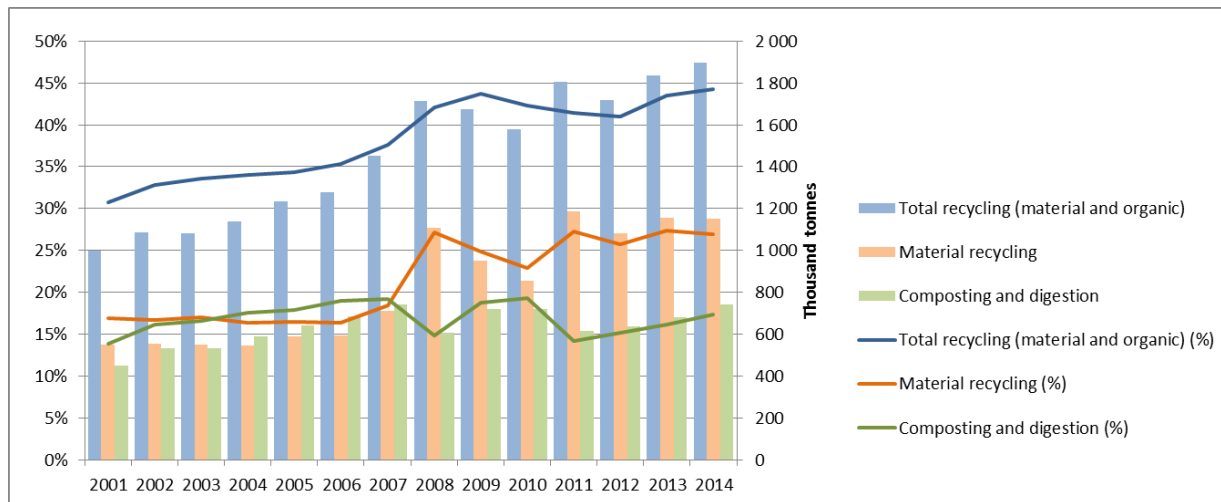
Management of MSW in Denmark is characterised by a high degree of incineration, amounting to 54 % in 2014. It is the highest percentage and the highest amount per person in EU-28 (Eurostat, 2016).

2.1.1 Municipal solid waste recycling, 2001–2014

Figure 2. shows the development of recycling of MSW in Denmark related to total recycling, material recycling and composting and other biological treatment.

Figure 2. illustrates a positive trend between 2001 and 2009. Total recycling increased from 31 % in 2001 to 44 % in 2009. Thereafter, the total recycling rate levelled at close to 44 %.

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



Source: Eurostat, 2016.

The increase in recycling rate is primarily linked to material recycling. The major increase in material recycling waste took place between 2007 and 2008. Most of this increase can be explained by increased generation and recycling of iron and other metals from households. There was, however, a problem with the reporting of metals from households, leading to unrealistically high amounts being recorded (ISAG Database 2012 and Miljøstyrelsen, 2011). According to the new waste data system (Table 2.1), the data for 2011–2013 show that the main waste fractions collected from households include paper, wood, packaging glass and iron and steel. Organic recycling only increased from 14 % to 17 % between 2001 and 2014, an increase from 449 000 tonnes to 743 000 tonnes. The main part of this is garden waste from households (Table 2.1).

Table 2.1 Denmark, main waste fractions of household waste collected, 2104, '000 tonnes

	2011	2012	2013
Domestic and similar wastes	1 440	1 382	1 354
Waste suitable for incineration	491	469	456
Organic waste	56	54	65
Paper incl. newspapers and packaging paper	189	190	178
Packaging cardboard and other cardboard	34	38	45
Packaging glass	98	95	94
Glass	13	12	17
Packaging wood	0.4	0.4	7
Wood	76	98	117
Packaging plastic	17	15	17
Plastic	6	9	10
Packaging metal	6	6	8
Iron and steel	111	98	93
WEEE	39	40	49
Refrigerators containing freon	3	5	14
Batteries	2	1	1
Garden waste	534	551	569
Tires	4	4	4
Impregnated wood	15	13	16
PVC	1	1	1
Plaster	2	2	2
Waste suitable for landfill	72	69	50
Other wastes	63	66	106
Total	3 272.4	3218.4	3 273

Source: Danish Environmental Protection Agency, 2015.

The EU's 2008 WFD includes a target for certain fractions of MSW: 'by 2020, the preparing for reuse 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 target¹. Denmark has chosen calculation method 1 (Hogg *et al.*, 2015). 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, 2015b).

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:

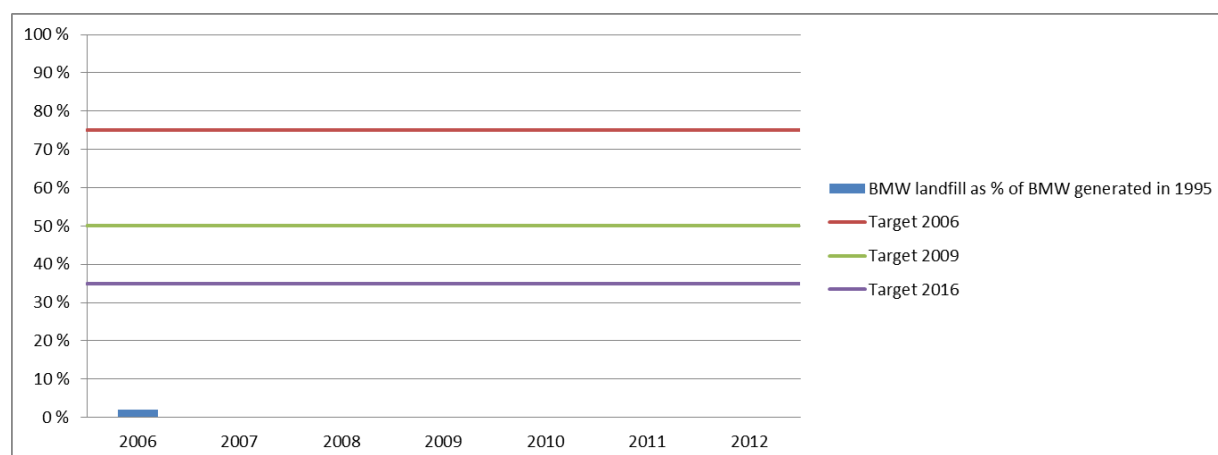
1. paper, metal, plastic and glass household waste;
2. paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins;
3. household waste;
4. municipal waste (the method used in this document).

2.1.2 Landfilling of biodegradable municipal waste

According to the EU Landfill Directive (1999/31/EC), Member States have to reduce the amount of biodegradable municipal waste (BMW) landfilled by a specific percentage by 2006, 2009 and 2016. The targets are related to the amount of BMW generated in 1995, 1 813 000 tonnes in Denmark's case. In 1997, Denmark implemented a landfill ban on biodegradable MSW.

According to data reported to the European Commission, Denmark has not landfilled BMW for many years (EC, 2015a).

Figure 2.2 Denmark, landfill of biodegradable municipal waste, 2006–2012



Source: EC, 2015a.

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

No regional data for Denmark has been reported to Eurostat.

2.1.4 Recycling and landfill taxes

The Danish Landfill Tax was introduced on 1 January 1987, along with a tax on incineration. The aim was to create an incentive to reduce the amount of waste going to landfill and incineration and to promote recycling (ETC/SCP, 2012).

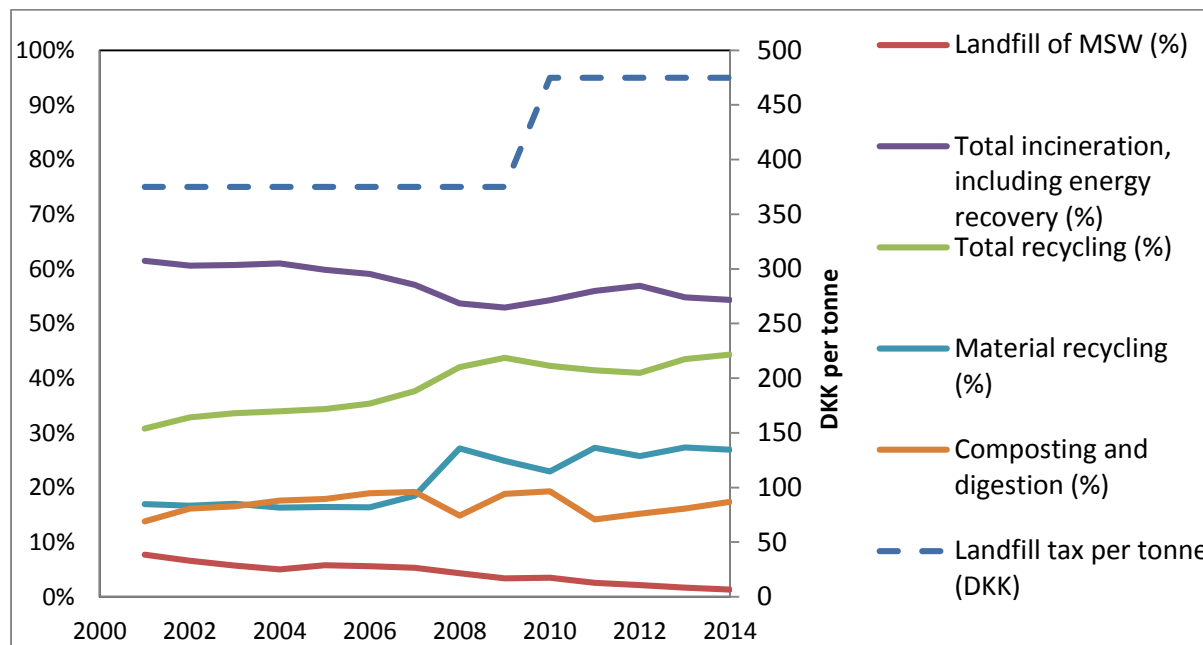
Originally, the landfill tax included only landfills receiving waste from municipal collection schemes, but in 1989 coverage was extended to all landfills, with the exception those for hazardous waste. In 1987, the tax was DKK 40 per ton of waste (~EUR 5.3).

The landfill tax was increased several times – to DKK 160 in 1993 (~EUR 21.3), DKK 335 in 1997 (~EUR 44.7), DKK 375 (~EUR 50) in 1999 and DKK 475 (~EUR 63.3) in 2010. The tax is levied on waste delivered to registered plants and a refund is granted for waste that is subsequently removed, for example, for recycling. In that way, the tax is only paid for the net amount received (ETC/SCP, 2012).

The incineration tax is lower than the landfill tax. Before 2010, the incineration tax was levied per ton of waste incinerated, since 2010 it depends on the waste's energy content (59.8 DKK/GJ), and includes also a CO₂ tax (Miljøstyrelsen, 2014).

From 1985 to 2008, the absolute amount of household waste sent to landfill declined by 0.5 million tonnes, equivalent to a reduction of 77 %. The landfill tax has probably played a role in this reduction, together with other measures such as a ban on the landfilling of combustible waste.

Figure 2.3 Denmark, landfill tax and the development of recycling, landfill and incineration of municipal solid waste, 2001–2014



Source: ETC/SCP, 2012, Eurostat, 2016, Miljøstyrelsen, 2014

The landfill tax seems to have had little impact on landfilling of MSW in the last 10 years as it was already at a low level in 2001 (Figure 2.3). Nevertheless, the landfilling rate has decreased from 7.7 % in 2001 to 1.3 % in 2014. The percentage of incineration of MSW has decreased from 61 % in 2001 to 54 % in 2014. It is likely that the incineration tax has contributed to this trend, next to the increasing policy focus on recycling.

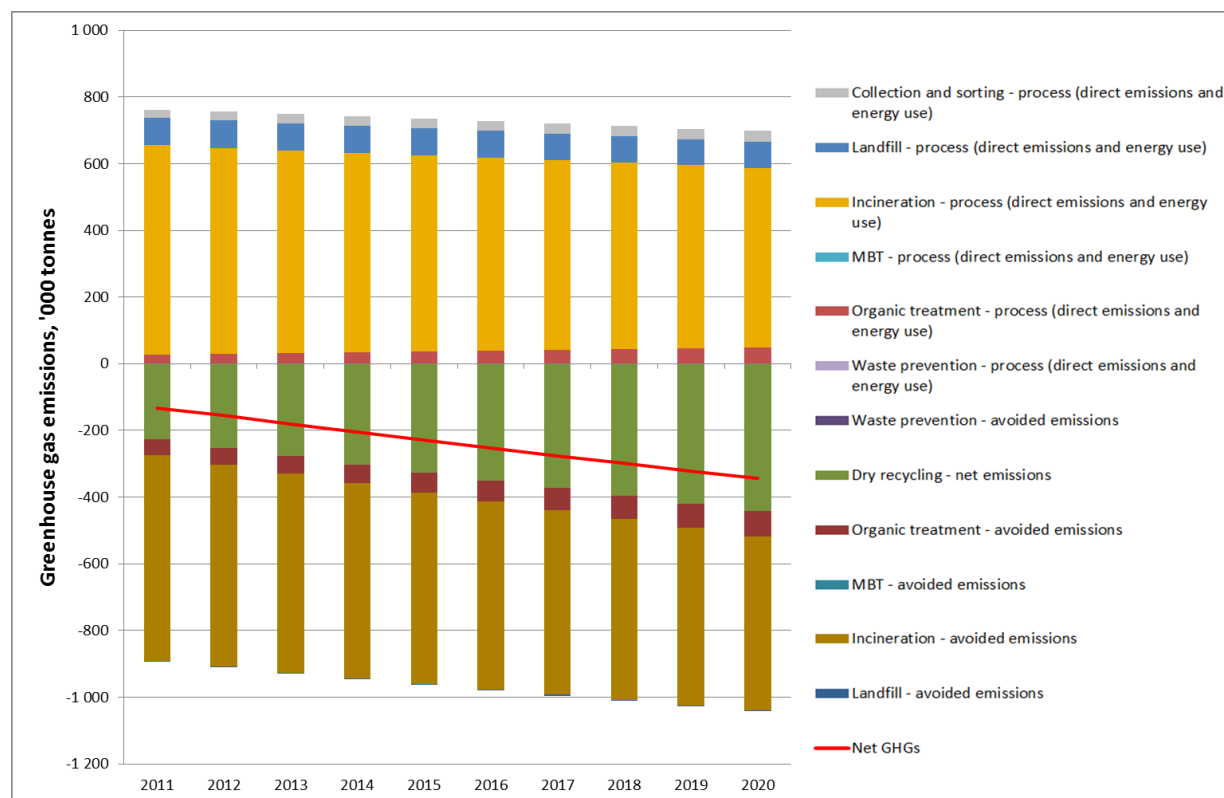
2.1.5 Environmental benefits of better municipal solid waste management

Figure 2.4 shows a scenario for greenhouse gas emissions from MSW management in Denmark. The scenario assumes a yearly growth of 0.9 % for municipal waste generation for 2011–2015 and 0.6 % for 2015–2022. The scenario also assumes that EU targets for municipal waste are fully met. 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, and 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. shows direct emissions, avoided emissions and net emissions resulting from the management of MSW. All the emissions (positive values) represent 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 MSW (Gibbs et al., 2014c).

Figure 2.4 Denmark, scenario for greenhouse gas emissions from municipal solid waste management in Denmark, 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.

In countries with a low landfill share and high recycling rate, waste treatment can have an overall positive impact on greenhouse gas emissions, reducing emissions from the economy as a whole; Denmark is one of these. Based on the modelled scenario with full policy implementation, net emissions from the treatment of municipal waste in Denmark are expected to be negative and further decrease over the period 2011–2020. Throughout the modelled period, direct greenhouse gas emissions related to municipal waste management are almost exclusively from incineration.

2.2 Uncertainties in the reporting

Some uncertainties or differences in how countries report MSW recycling 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.

Denmark does not have a producer responsibility scheme for packaging, and figures for the recycling of packaging waste are included in the municipal waste data. Until 2009, a more detailed reporting system had been used, as the general waste statistic did not deliver sufficiently good data on packaging recycling. One of the aims of the new data system for waste, introduced in 2010, was to improve the data quality for the recycling of packaging.

Mechanical biological treatment plants are not used in Denmark.

2.3 Important initiatives taken to improve municipal solid waste management

The major initiatives to improve MSW management in Denmark were taken before 2001. The landfill tax and incineration tax, introduced in 1987, and the total ban on the landfilling of combustible waste, agreed in 1994 and effective from 1 January 1997, have been the main drivers of the treatment of municipal waste (Fischer *et al.*, 2013). In addition, the establishment of separate collection schemes for paper, glass packaging and garden waste has contributed significantly to the increased level of recycling.

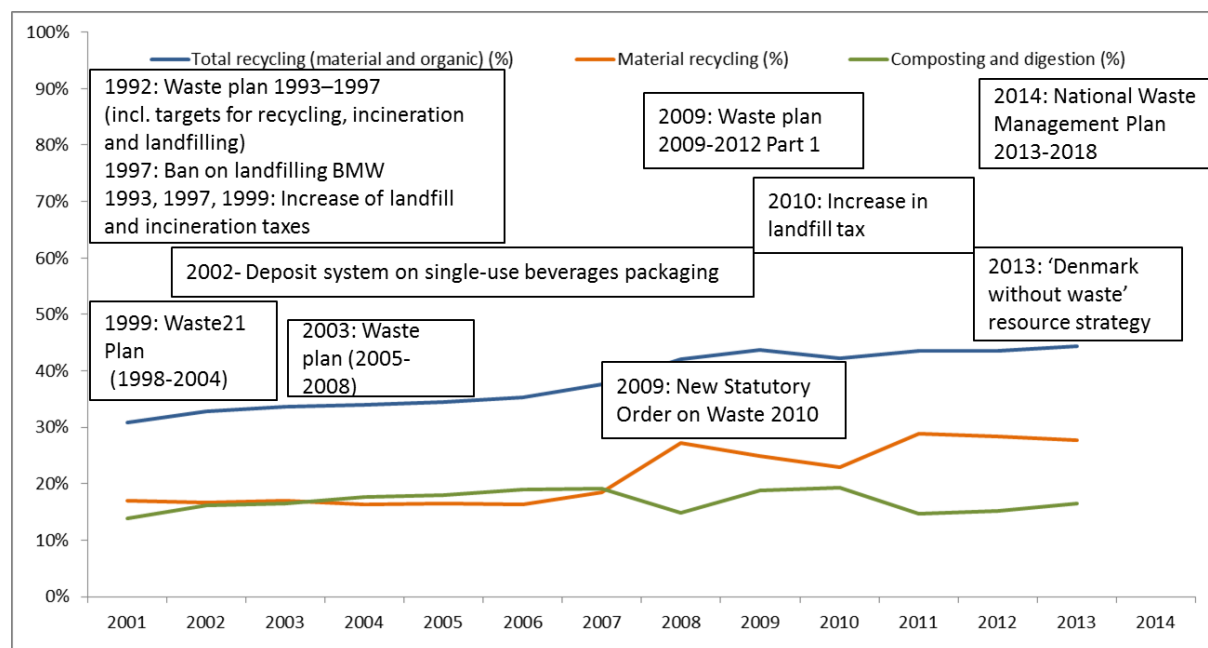
Minor initiatives were taken to improve MSW management between 2001 and 2010. The second Danish Waste Plan 1998–2004 (Waste 21) set a target of 60 % recycling for paper and cardboard waste from households and municipalities with low rates of separate collection of paper were obliged to introduce separate containers in each household for paper waste (Regeringen, 1999). The potential in tonnes was huge. The data, however, shows little change in the volume of paper collected from households between 2000 and 2009 (Miljøstyrelsen, 2011). During the last decade the recycling centres for household waste run by the municipalities have been expanded and more waste types can be delivered to the recycling centres.

The third Danish Waste Plan 2005–2008 implemented the targets in the EU Directive for packaging and packaging waste that had to be fulfilled in 2008. Some initiatives focused on municipal waste. The municipalities had to implement collection schemes for metal packaging and certain types of plastic packaging (Regeringen, 2003). The introduction of a deposit system for single-use beverage packaging in 2002 increased the amount of separately collected plastic and metal packaging waste and the amount of recycling. However, the potential in tonnes for these schemes were quite small and it did not influence the total recycling of municipal waste.

The fourth Danish Waste Plan 2009–2012 did not focus on new initiatives for the recycling of municipal waste other than setting a target for the collection of batteries (Regeringen, 2009).

The most recent initiatives were introduced in the National Waste Management Plan (NWMP) for 201–2018, released in 2014 (Miljøstyrelsen, 2014). The initiatives presented in it are focused on meeting the recycling targets for household waste. The Danish national target is that 50 % of organic, including wood, paper, cardboard, glass, plastic, and metal waste from households is collected for recycling or material recovery by 2022, and the strategy for achieving this is based on ensuring the development of new separate collection schemes in municipalities. This will allow citizens better access to sorting and secure an increase in the recycling of waste, including organic, plastic and metal fractions. In addition, establishing partnerships between different actors, including municipalities, companies, designers and anthropologists, could help the development of simple and easily accessible waste systems (BiPRO and CRI, 2015). In 2013, Denmark also adopted the Denmark without Waste (*Danmark uden affald*) strategy and a number of follow-up projects have been started or finalised (Miljøstyrelsen, 2016).

Figure 2.5 Denmark, recycling of municipal solid waste in Denmark and important policy initiatives, 2001–2014



Source: Eurostat, 2016.—

2.4 Possible future trends

According to the data presented in Figure 2., the recycling rate has increased very slowly since 2009. The 2013 Denmark without Waste strategy (Regeringen, 2013) and the NWMP 2013–2018 (Miljøstyrelsen, 2014) aim to increase the share of recycling, particularly through increased separate collection. These initiatives have only just started and it remains to be seen how effective they will be.

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