

Municipal waste management



Spain 

October 2016

Photo: © MementoImage



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](#)

Acknowledgements

The ETC/WMGE and the EEA would like to thank the Ministry of Agriculture, Food and Environment of Spain for reviewing the profile and providing valuable inputs.

Author affiliation

2016 updated version: Elina Merta, VTT Technical Research Centre of Finland (a partner in the ETC/WMGE)

2013 version: Alexandra Maria Almasi and Leonidas Milios, Copenhagen Resource Institute, Copenhagen Resource Institute (a partner in the ETC/SCP)

EEA project manager: Almut Reichel

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	3
1 Introduction.....	4
1.1 Objective	4
2 Spain's municipal waste management performance.....	4
2.1 Municipal waste indicators.....	5
2.1.1 Municipal waste recycling, 2001–2014	6
2.1.2 Landfill of biodegradable municipal waste	8
2.1.3 Regional differences in municipal waste recycling, 2001–2013.....	8
2.1.4 Recycling and landfill taxes	8
2.1.5 Environmental benefits of better municipal waste management.....	9
2.2 Uncertainties in the reporting.....	10
2.3 Important initiatives for improving municipal waste management.....	11
2.4 Possible future trends.....	12
References	14

Highlights

- Landfill rates in Spain remain high at 55 % of municipal waste (MSW) generated in 2014. Nevertheless, Spain has been successful in meeting the EU Landfill Directive's 2006 and 2009 targets for diverting biological municipal waste (BMW) from landfill.
- In recent years the total recycling rate in Spain has stagnated at around 30 % of MSW. Spain needs to speed up efforts in recycling if the country is to meet the Waste Framework Directive's (WFD) 50 % target by 2020.
- The first and second national waste management plans (NWMPs), for 2000–2006 and 2008–2015 have been instrumental in the development of MSW recycling through several initiatives including separate collection of recyclables and upgrading recycling facilities. The recently approved WMP (PEMAR) sets measures to meet the 50 % target of the WFD by 2020.
- The landfill tax adopted by some regions of Spain contributed to the diversion of MSW from landfill and the valorisation of material resources through recycling.
- Due to the high level of regional autonomy, there are significant regional differences in waste management policies and practices in Spain.

1 Introduction

1.1 Objective

Based on historical municipal waste (MSW) data for Spain, 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;
- the relevance of indicators to the country's most important initiatives for improving management of MSW;
- possible future trends.

2 Spain's municipal waste management performance

The first Spanish Waste Law was passed in 1985, forcing municipalities to approach the problem of waste and to take measures for protecting the environment. The 1997 Packaging Law (11/1997) and the 1998 second Waste Law (10/1998) aimed at establishing the responsibility and obligations of each party involved in the waste management process (this being absent from the 1985 law). Furthermore, selective collection of materials was enforced at local levels, and national recovery and overall recycling objectives were set (Justice and Environment, 2011; Barlaz *et al.*, 2002).

Spain's first national waste management plan (NWMP), the National Municipal Waste Plan 2000–2006, supported by the second Waste Law, introduced specific targets and discussed the distribution of funds for infrastructure development and the launch of information/awareness campaigns. (Barlaz *et al.*, 2002)

In December 2008, the Ministers' Council of Spain approved the second NWMP – the Integrated National Waste Plan for the period 2008–2015 (Justice and Environment, 2011). The plan provides a comprehensive analysis of the waste management situation, incorporates several waste streams not included in the previous plan, and is based on regional waste plans for all 17 autonomous regions. The plan includes many qualitative and quantitative targets for the different waste management options that were to be achieved by 2012 (Ministry of Agriculture, Food and Environment Spain, 2012b).

In July 2011, a new law (22/2011) on waste and contaminated soils came into force, incorporating the WFD (2008/98/EC) into Spanish legislation and adopting all its related targets and objectives (Ministry of Agriculture, Food and Environment, 2012a). Within the frame of this law several instruments have been approved including the 2013 national waste prevention programme, a royal decree (110/2015) on waste electrical and electronic equipment (WEEE) that incorporates new European regulations, a royal decree (180/2015) on the shipment of waste in Spain to improve the traceability of waste treatment, a royal decree (710/2015) that modifies the royal decree on batteries and accumulators (106/2008), and finally, in November 2015, the NWMP (PEMAR) for 2016–2022 (Ministry of Agriculture, Food and Environment, 2015).

Responsibilities for waste administration in Spain are shared between local, regional and national authorities. At the national level, the Ministry of Agriculture, Food and Environment is responsible for the national plans and attends to the authorisation and inspection of waste shipments to/from countries outside the EU. The autonomous regions are responsible for issuing strategic waste management plans

for each specific region, and also attend to the authorisation, inspection and sanction of waste management activities and the shipment of waste to/from EU countries. Finally, at the local level, municipal authorities are responsible for the management of municipal waste from households, commerce, offices and services, including separate collection and transport of MSW. (CIRIEC, 2010)

In 2015 the Ministry of Agriculture established subsidies to enhance separate collection of bio-waste, for the closure of landfills, including biogas capture, and to improve civic amenity sites. According to the first additional provision of Law 2/2011 on sustainable economy, the penalties imposed on Spain for the infringement of European law may be charged to the public authorities responsible for the infringement. (Ministry of Agriculture, Food and Environment, 2015)

Initiated by the waste management plans, Spain has taken measures to reduce its dependency on landfill. Since 2009 the reported amount of landfilled MSW, 55 % of generated MSW in 2014, also includes the amount of rejects from treatment plants that represents more than 50 % of this figure (Ministry of Agriculture, Food and Environment, 2015). Since 2009, absolute amounts of MSW generated have been decreasing – to 20.2 million tonnes in 2014. Of this, 12 % was incinerated and recycling amounted to 33 % in the same year, following a peak of nearly 40 % in 2008. (Eurostat, 2016)

Municipal waste collection in Spain is mainly based on a collection point system. In most Spanish regions the streams catered for at collection points include mixed waste, glass, paper and packaging other than glass. In some regions the system is complemented by separate collection of bio-waste, while in a few municipalities in other regions bio-waste is collected instead of packaging waste. The number of households served by door-to-door collection is limited, mostly in small and medium-sized municipalities in the regions of Catalonia, Basque Country and Navarra. Commercial waste is partly managed by the same system as municipal waste, and partly by private service providers. There are 1 500 fixed civic amenity sites in Spain and a number of mobile units for smaller communities. Civic amenity sites are used for collecting recyclables including plastics, metals, garden and wood waste, construction and demolition waste; waste for reuse or preparation for reuse, such as clothes, furniture, lumber, and waste electrical and electronic equipment (WEEE); and hazardous waste. Formal waste collection systems reportedly cover all households in Spain. (Gibbs *et al.*, 2014a)

Glass and paper waste separated at source are sent to sorting plants and organic waste (mainly in the region of Catalonia) to composting with pre-sorting. Rejects of the waste treatment process are sent to incineration or landfill. In 2013, there were 10 MSW incinerators and altogether 88 mechanical biological treatment (MBT) facilities for mixed waste treatment in Spain. Most MBT plants (67 plants) employ composting while 21 plants use anaerobic digestion. For separately collected bio-waste there were five anaerobic digestion facilities and 41 composting facilities. In 2013 there were 131 landfill sites in Spain, all of which complied with the EU Landfill Directive. (Ministry of Agriculture, Food and Environment, 2015)

As reported to Eurostat, all MSW generated in Spain is treated (Eurostat, 2016). The share of exported waste is very low, in line with other large EU Member States (EC, 2014b).

2.1 Municipal waste indicators

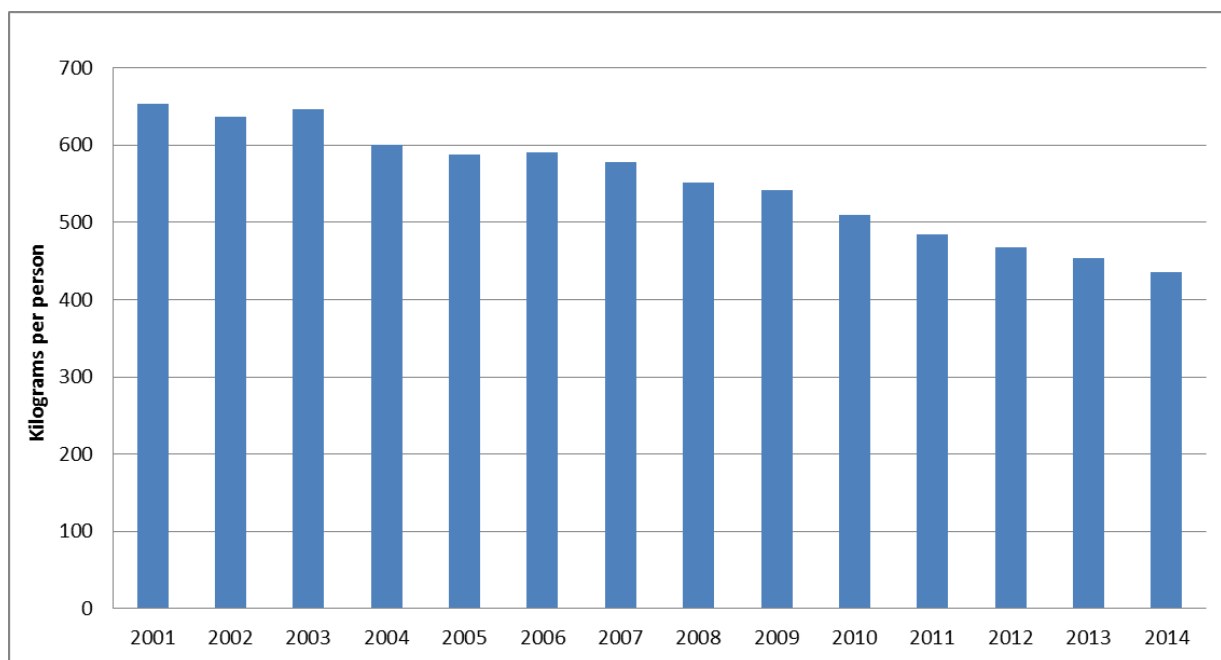
The following indicators illustrate the development of MSW management in Spain in 2001–2014. All figures have been calculated as a percentage of generated waste, not managed waste.

Since 2004, municipal waste generation figures have been computed after subtracting the amounts corresponding to (municipal) construction and demolition waste and sludges, approximately 7 % in 2004. Until 2003, these data were not subtracted from the overall figure as no information about this single variable was available. Data on treatment measures waste as it enters final treatment facilities, so that pre-treated amounts are excluded from the estimates. Since 2009, data are estimated using administrative sources as provided by the Ministry of Agriculture, Food and Environment. Figures for

composting and recycling do not account for waste discarded from their respective operations. Discarded waste amounts have been added to landfill and incineration figures respectively. (Eurostat, 2015)

Figure 2.0 shows the development of MSW generation per person in Spain for 2001–2014. There has been a gradual decrease in municipal waste generation during this period. In 2004 there was a break in the Eurostat data and a relatively abrupt drop can be observed between 2003 and 2004, from 646 to 600 kilograms per person. From 2004 to 2006 there is a marginal drop in MSW generation, while in the following period (2007–2014) the decrease is continuous and steady. Data for 2014 (435 kg per person) is estimated.

Figure 2.0 Spain, municipal waste generation per person, 2001–2014



Source: Eurostat, 2016.

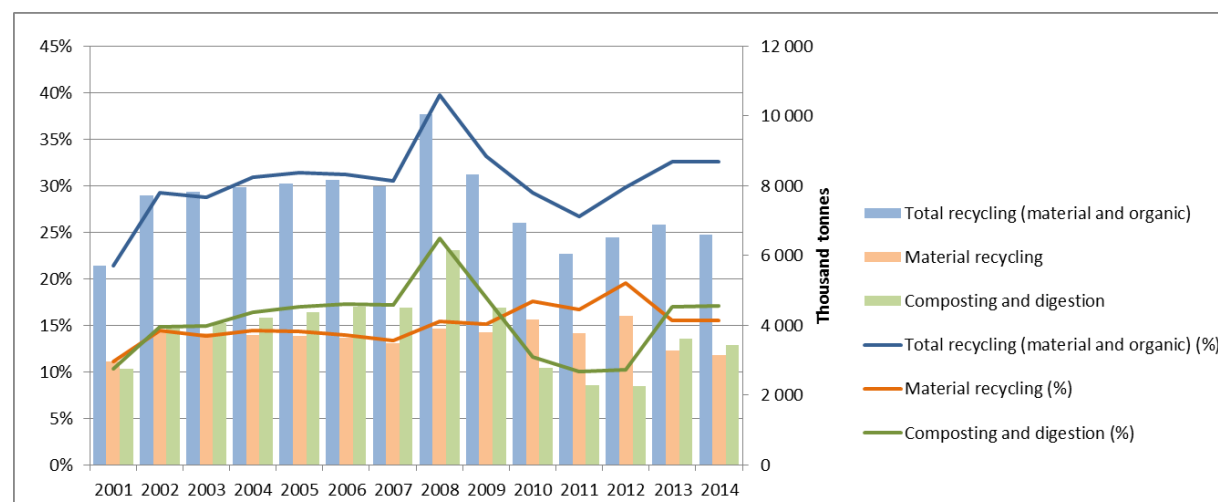
2.1.1 Municipal waste recycling, 2001–2014

Figure 2.1 shows the development of total, material and composting and other biological treatment MSW recycling in Spain. In 2001 the total recycling rate was just over 20 % of the MSW generated, reaching around 30 % in 2002 and staying at this level for the following years. The sudden increase in recycling observed between 2001 and 2002 can be attributed to implementation of the first National Urban Solid Waste Management Plan and the rapid uptake of the measures it introduced. After the first year, however, development slowed significantly and there was only a small variation in recycling rates each year thereafter.

A remarkable rise can be observed in 2008, propelling MSW recycling to 40 %. The significant increase is observed mainly for organic recycling, which increased by 37 % compared to the previous year, from 4.5 million tonnes to 6.2 million tonnes. This dynamic trend went into reverse in the following years, with organic recycling declining steeply. In 2013 and 2014 the organic recycling rate recovered to around 17 %. The sudden change from 2008 to 2009 can at least partly be attributed to the change in data collection methodology. Before 2009, the data submitted to Eurostat was obtained through surveys of waste managers, while from 2009 onwards, data come from administrative sources as provided by the Ministry of Agriculture, Food and Environment. Inconsistencies may exist between the two methodologies and therefore the data for the years before this methodological change are not fully comparable to the data from 2009 onwards (Ministry of Agriculture, Food and Environment, 2015).

For material recycling, absolute amounts have remained rather stable for the period 2002–2014. However, a decline in waste generation resulted in a rising trend in the material recycling rate for 2008–2012. In 2014 the material recycling rate was 16 %. Looking at the data for 2009–2014 only (i.e. data after the change in data collection methodology), recycling rates for both material recycling and organic recycling fluctuated but overall do not show an improving trend.

Figure 2.1 Spain, recycling of municipal waste, 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 target¹. Spain has chosen calculation method 4 (Gibbs *et al.*, 2014), which corresponds to the recycling rates shown in this paper. In 2015, the European Commission 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).

In order to meet the recycling target of the Waste Framework Directive, Spain has to increase its recycling rate with 17 percentage points by 2020, corresponding to 2.9 percentage points per year. This means that Spain needs to speed up its efforts to increase recycling.

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:

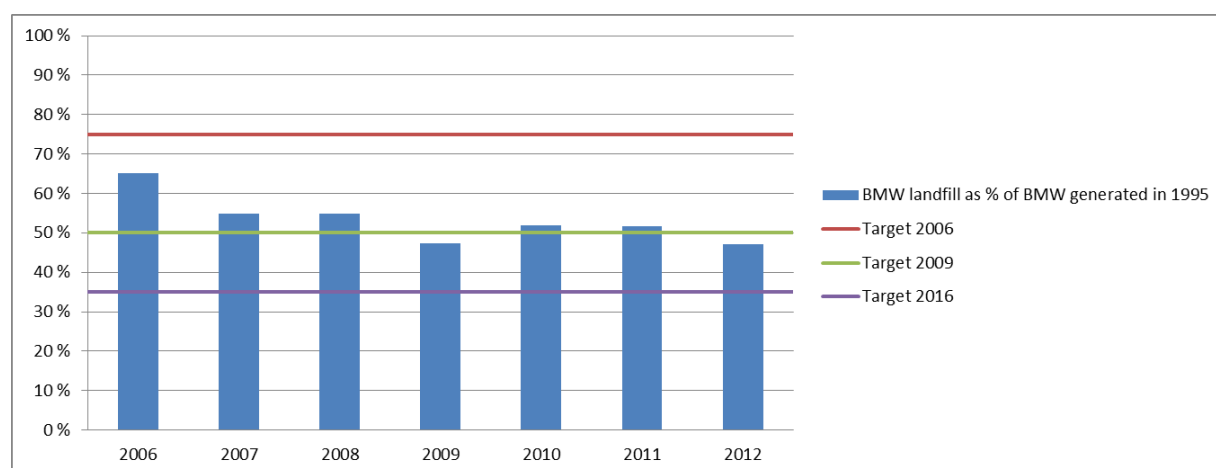
1. paper, metal, plastic and glass household waste;
2. paper, metal, plastic, glass household waste and other single types of household waste or of similar waste from other origins;
3. household waste;
4. municipal waste (the method used in this document).

2.1.2 Landfill of biodegradable municipal waste

According to the EU Landfill Directive, Member States should reduce the amount of biodegradable municipal waste (BMW) sent to landfill by specified percentages by 2006, 2009 and 2016. The targets relate to the amount of BMW generated in 1995 – 11.9 million tonnes in Spain.

Spain has reported its BMW landfill quantities to the European Commission for the years 2006–2012 (EC, forthcoming; EC, 2014a). Figure 2.2 shows that by 2006 Spain had reached the Landfill Directive target for that year, and in 2009 reached that target, with 47 % of BMW, relative to 1995, going to landfill. Data for further years are missing, which limits the possibility of estimating Spain’s prospect of reaching the 2016 target.

Figure 2.2 Spain, landfill of biodegradable municipal waste, 2007–2012



Source: EC, 2015b; EC, 2014a.

2.1.3 Regional differences in municipal waste recycling, 2001–2013

No regional data for recycling are reported to Eurostat by Spain. The NWMP for 2016–2022 includes an analysis of recycling at a regional level for 2012. Calculated related to treated amounts of MSW, the recycling rates in the different autonomous regions varied from 13 % to 54 % in 2012. (PEMAR, 2015)

2.1.4 Recycling and landfill taxes

Spain has no national landfill tax but Article 16 of the Spanish Waste Act allows waste authorities in different regions of Spain to apply economic incentives to promote waste prevention and separate collection, including the introduction of landfill and incineration taxes on municipal waste. Furthermore, according to the legislation on taxation, the autonomous communities (regions) can, under certain circumstances, impose their own taxes. Some regions have introduced taxes on landfill and incineration: Catalonia introduced a tax on the landfill of municipal waste in 2004 of EUR 12.40 per tonne or EUR 21.60 per tonne if bio-waste is not collected at source; and Castilla y Leon in 2012 of EUR 7 per tonne or EUR 20 per tonne for potentially recoverable waste. In addition, there is an incineration tax of EUR 5.6 per tonne or EUR 16.50 per tonne if bio-waste is not collected at source for municipal waste in Catalonia (Gibbs *et al.*, 2014a; EC, 2012; ETC/SCP, 2012).

Since the landfill tax for municipal waste applies in only two regions and as Spain only provides national data on MSW generation and treatment to Eurostat, it is not possible to investigate the effect of the landfill tax on Spain’s MSW recycling levels in this report.

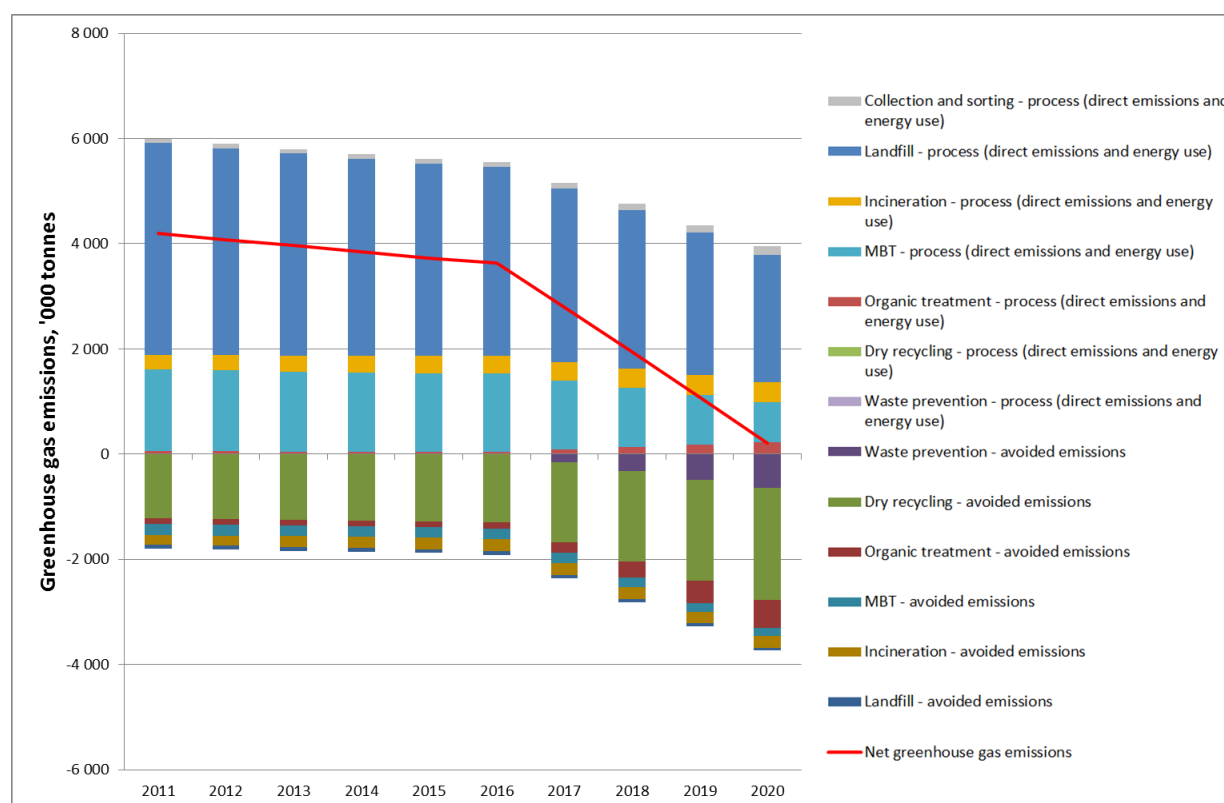
2.1.5 Environmental benefits of better municipal waste management

Figure 2.5 shows a scenario for the development of greenhouse gas emissions from MSW management in Spain. It assumes a yearly increase of 0.3 % for municipal waste generation for the years 2011–2020, and it also assumes that 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 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 2.3 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; MBT and related technologies; collection and sorting; and 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 scenario assumes full implementation of existing EU legislation on municipal waste management (Gibbs *et al.*, 2014c).

Figure 2.3 Spain, scenario for greenhouse gas emissions from municipal 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 Spain are expected to decrease in 2011–2020 and to be close to zero by 2020 – in other words the benefits of improved waste management are expected to almost equal the direct emissions from collection and treatment operations. In the earlier years of the scenario most of the direct greenhouse gas emissions relating to municipal waste management were caused by landfill, while the benefits of recycling were relatively low.

Greenhouse gas emissions from landfill are caused by the breakdown of organic wastes accumulated over the 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 was 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.

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, for example the inclusion or exclusion of home composting;

- the methodology used to report the inputs and outputs of MBT and sorting plants.

Spain includes domestic packaging waste collected by municipalities in the reporting of MSW to Eurostat (NSI, 2014).

In Spain, municipal waste is mainly treated in MBT plants – up to 10 million tonnes in 2013. Only the actual amount of waste recycled after MBT is included in the reporting as recycled MSW, with reject amounts allocated to landfill or incineration depending on the fate of the secondary waste (Ministry of Agriculture, Food and Environment, 2012a). There is therefore no uncertainty in the reporting of MSW sent to MBT. According to Gibbs *et al.* (2014a), however, there seem to be some erroneous reporting procedures for recycling that deviate from Eurostat’s guidelines: reporting of organic waste separated at source is allocated to material recycling, though it should be in organic recycling; and organic MBT output sold as compost and water losses have been allocated to composting although water losses should be excluded (Eurostat, 2012). From 2013 reporting of source separate organic waste will be allocated to composting according to Eurostat guidelines (Ministry of Agriculture, Food and Environment, 2015).

2.3 Important initiatives for improving municipal waste management

Spain’s most important initiative, which legally binds all waste management activities, is the National Waste Law (10/1998) that came into force in 1998. As a legislative framework, the law introduced the separate collection of MSW in all municipalities with more than 5 000 inhabitants and, most importantly, it banned the disposal of recyclable materials (ETC/SCP, 2006).

For the effective and timely implementation of the National Waste Law, the first NWMP (2000–2006) was formulated and set targets for Spain’s waste management. It introduced streamlining of treatment and disposal of MSW while aiming to control the amount generated. Special attention was given to the valorisation of BMW, especially through composting (ETC/SCP, 2006).

From 2004, in some of the autonomous communities (regions) of Spain, a landfill tax was introduced in an effort to divert as much waste as possible from landfill, but it is only in Catalonia and Castilla y Leon that the tax applies to MSW (ETC/SCP, 2012). At the same time, additional investment in waste infrastructure and separate collection schemes reinforced the taxation schemes (ETC/SCP, 2006).

In December 2008, the second NWMP (2008–2015) was approved, reintroducing some of the concepts of the previous plan and setting ambitious targets for the seven-year period. Specifically, it set the three Rs (reduce, reuse, recycle) framework as the main driver of Spanish waste management and set out guidelines and main measures to be implemented. These are developed in 13 specific plans for each type of waste and included information on the different autonomous regions. A National Waste Prevention Plan was approved in 2013 for the period 2014–2020, the main objective of which is to reduce the amount of waste produced in 2020 by 10 % relative to 2010 (in tonnes) and also to contribute to reducing marine litter from terrestrial sources (Arcadis, 2014; BiPRO, 2014; Gibbs *et al.*, 2014a; CIRIEC, 2010). In July 2011 a new national waste law (22/2011) was approved to incorporate the WFD in Spanish law (Ministry of Agriculture, Food and Environment, 2015).

The competent authority for preparing the NWMP is the Spanish Ministry of Agriculture, Food and Environment. In accordance with the national plans, autonomous regions prepare their own WMPs that contain specific measures to implement the waste policy in their territory.

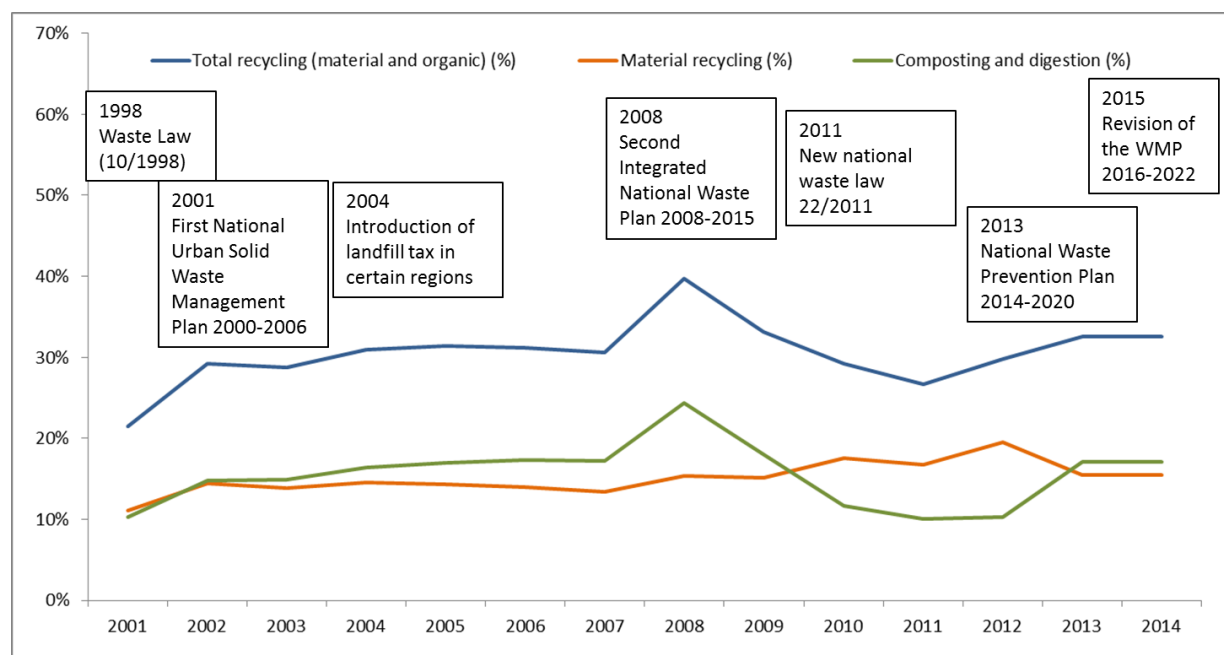
A new NWMP (PEMAR 2016–2022) that includes targets on the separate collection of certain waste materials, in particular bio-waste, was approved in November 2015. It proposes a country-wide landfill tax complemented by an incineration tax. Improvements in waste collection methods and harmonised waste taxation are seen as essential measures for the country to reach the WFD’s 50 % recycling target by 2020. The plan also calls for increased capacity for the composting of separately collected bio-waste. (Ministry of Agriculture, Food and Environment, 2015)

There is a producer responsibility scheme in place in Spain for packaging waste under which producer fees range from EUR 21 per tonne for wood to EUR 472 per tonne for plastic packaging (EC, 2012). However, the system has not worked in an optimal way and has been criticised for low transparency and low engagement with municipalities. The goal of national authorities is to improve the producer responsibility system in the future. (Gibbs *et al.*, 2014a)

Funding for the overall waste management system is gathered through fees by municipalities. In some communities there is a separate fee earmarked for waste management whereas in others the fee is of a general nature covering other municipal services. The basis for calculating the fee varies across regions, one example being square metres of dwelling (Gibbs *et al.*, 2014a). In such cases, there are no incentives for households to prevent waste or to sort it at source.

Pay-as-you-throw schemes have been studied and implemented by some local authorities, mainly in Catalonia. The waste management fee in these cases has consisted of a fixed annual fee and an additional fee per bag of packaging or mixed waste. (EC, 2012) In the Basque Country some municipalities have introduced this kind of scheme associated to door-to-door collection. In Valencia, some municipalities have established discounts on the waste tax linked to the use of civic amenity sites by citizens (Ministry of Agriculture, Food and Environment, 2015).

Figure 2.4 Spain, recycling of municipal waste and important policy initiatives, 2001–2015



Source: Eurostat, 2016

2.4 Possible future trends

The decline in MSW generation after the economic crisis starting in 2007 indicates that MSW generation in Spain is heavily influenced by economic circumstances. Nevertheless, the preventive measures implemented under the NWMPs for 2008–2015 and 2016–2022, the national waste law 22/2011 and national waste prevention plan for 2014–2020 can be expected to reduce waste generation, increase recycling rates and lower landfill. Waste generation has already shown a downward trend since 2007 and this is expected to continue as the economic crisis persists.

There are no national projections on future municipal waste generation as forecasts are developed on a regional level. However, overall residual waste generation will likely continue to decrease. (BiPRO, 2014; Gibbs *et al.*, 2014a)

In recent years recycling rates have remained steady at around 30 %. Further measures are needed to enhance recycling and the recently approved NWMP (PEMAR 2016-2022) includes measures to improve recycling levels (Ministry of Agriculture, Food and Environment, 2015).

Waste collection systems will also vary between regions and municipalities in the future. There is a need to reduce waste collection costs. Due to the economic recession, low-cost waste treatment solutions will be emphasised in the future, such as small-scale composting plants close to bio-waste generators and compost users. The use of existing infrastructure will be optimised and possibly upgraded; no new large-scale treatment facilities are anticipated in the near future. In sorting and treatment facilities, manual sorting is expected to be replaced by mechanical sorting. (Gibbs *et al.*, 2014a)

References

Arcadis, 2014, *Screening of ex ante conditionality regarding the consistency of national Waste Management Plans, with the requirements of the Waste Framework Directive 2008/98*, under framework contract No ENV.A.2/FRA/2012/0032 – Lot 2. European Commission DG Environment Project number BE0013000458 | Draft final report version 2 | 13-02-2014.

Barlaz, M., Loughlin, D. and Williams, J., 2002, *Strengthening Markets for Recyclables, A Worldwide Perspective: Spain*, Department of Civil Engineering, North Carolina State University.

BiPRO, 2014, *Detailed evaluation report for assessing the waste management plan of Spain – National*, ENV.C.2/FRA/2013/0023, Final Draft, 21 July 2014.

CIRIEC, 2010, *The Spanish Waste Sector: Waste Collection, Transport and Treatment*, Working paper No. 2010/03 (http://www.ciriec.ulg.ac.be/fr/telechargements/WORKING_PAPERS/WP10-03.pdf).

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, 2012, *Use of economic instruments and waste management performances*, final Report, 10 April 2012, European Commission – DG Environment, Contract ENV.G.4/FRA/2008/0112.

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

EC, 2014b, *Ex-post evaluation of certain waste stream directives*, final report, European Commission – DG Environment, 18 April 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, *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.

ETC/SCP, 2006, *Country fact sheets on waste policies, Spain*, European Topic Centre on Sustainable Consumption and Production (http://scp.eionet.europa.eu/facts/factsheets_waste/2006_edition/Spain), accessed 21 August 2016.

ETC/SCP, 2012, *Overview of the use of landfill taxes in Europe*, ETC/SCP Working paper 1, 2012 European Topic Centre on Sustainable Consumption and Production (http://scp.eionet.europa.eu/publications/WP2012_1), accessed 21 August 2016.

Eurostat, 2012, *Guidance on municipal waste data collection*, November 2012, Eurostat – Unit E3 – Environment and Forestry (<http://ec.europa.eu/eurostat/documents/342366/351811/Municipal-waste-statistics-guidance.pdf>), accessed 21 August 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.

Eurostat, 2015. *Municipal waste (env_wasmun), Reference Metadata in Euro SDMX Metadata Structure (ESMS), country specific notes on municipal waste generation and treatment*. (http://ec.europa.eu/eurostat/cache/metadata/en/env_wasmun_esms.htm), accessed 21 August 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.

Justice and Environment, 2011, *Waste Management Planning: Spain – Legal Analysis* (<http://www.justiceandenvironment.org/files/file/2011%20waste%20plan%20ES.pdf>), accessed 21 August 2016.

Ministry of Agriculture, Food and Environment, 2012a, Information received during the Eionet consultation of the paper, email of 31 October 2012 from Carmen Tapia Carrasco.

Ministry of Agriculture, Food and Environment 2012b, *Plans and Programmes*, (in Spanish) (<http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/prevencion-y-gestion-residuos/normativa-y-planificacion/planes-y-programas/>), accessed 21 August 2016.

Ministry of Agriculture, Food and Environment, 2015, Information received during the Eionet consultation of the paper. E-mail of 3 December 2015 from Carmen Tapia Carrasco.

NSI, 2014, *Municipal waste reporting: Data quality/Methodology report for the year 2012*, 12 November 2014, National Statistical Institute of Spain.

PEMAR, 2015, *Plan Estatal Marco de Gestión de Residuos (PEMAR) 2016–2022*. Ministerio de Agricultura, Alimentación y Medio Ambiente. (http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/planes-y-estrategias/pemaraprobado6noviembrecondae_tcm7-401704.pdf), accessed 21 August 2016.