Country fact sheet

Municipal waste management

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Greece

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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 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

- There has been a slow but steady increase in municipal waste (MSW) generation since 2001.
- Although the amount of MSW going to landfill has remained relatively stable since 2001, the share decreased by 10 percentage points between 2001 and 2013 due to the rise in MSW generation.
- Recycling has become more important in Greek waste management in recent years. The recycling rate more than doubled in the period 2001–2007, from 8.8 % to 20 %. However, this trend was not maintained, and the total recycling rate has stagnated at 17–19 %.
- Since 2007, Greece has not intensified its efforts on recycling, so will need to make an exceptional effort if it is to meet the 50 % recycling target of the Waste Framework Directive (WFD) in 2020.
- Amounts of biodegradable municipal waste (BMW) sent to landfill have remained significantly higher than the amounts generated in 1995, so Greece seems likely to miss the 2013 target of 50 % relative to 1995, and needs to take radical action to achieve the 2020 target of 35 %.

1 Introduction

1.1 Objective

Based on historical municipal waste (MSW) data for Greece, 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 management of MSW;
- possible future trends.

2 Greece's municipal waste management performance

Waste management has been recognised as one of Greece's most pressing problems, suffering from a low level of organisation and relying predominantly on semi-controlled landfills until the end of the last century. Nevertheless, during the last two decades the country's solid waste management has been upgraded. While it is still generally considered a major problem, significant progress has been observed and solid waste management is becoming a well-structured, organised and environmentally responsible activity with specific goals, mostly in urban areas (EIB, 2010).

The legal framework that designates the direction of waste management in Greece follows closely the development of European waste management and the corresponding Directives (EIB, 2010). Over the last decade all relevant EU Directives have been transposed to Greek law, with the most recent case being the incorporation of the WFD (2008/98/EC) in Law 4042/2012 of 2012 (YPEKA, 2012).

The major driver behind waste management in Greece in the last decade has been the Joint Ministerial Decision 50910/2727/2003 'on measures and terms for solid waste management — national and regional planning management', with the National Waste Management Plan (NWMP) annexed to it. The NWMP sets out basic principles and targets for solid waste management together with specifications for national and regional planning. Its revision is intended every five years or earlier if necessary (HSWMA, 2012); so far no revision has been made.

The Ministry of Environment is responsible for policy making, national planning, and technical matters, as well as licensing and regulating the financing of large waste treatment and disposal facilities. According to the NWMP, the operation of transfer stations and the processing and disposal of waste lie within the jurisdiction of waste management authorities, while the Ministry of Interior is responsible for establishing the authority registry. For waste streams other than MSW, management responsibility lies with producers according to the polluter-pays principle introduced in 2003 by the NWMP. The Inter-ministerial Committee for Integrated Waste Management was established in March 2008 according to Ministerial Decision 325/14.03.08 on *'Establishment of a Waste Management Inter-ministerial Committee'* and has been given strategic planning responsibilities (EIB, 2010).

The management of packaging waste came under the Hellenic Recovery Recycling Corporation (HERRCO) as a result of Law 2939/2001, which obliges relevant economic actors (producers,

importers) to organise or participate in collective (or individual) systems of alternative waste management (i.e. return, collection, transport and recovery systems), in order to achieve specific quantitative targets. It was founded in December 2001 by industrial and commercial enterprises that either supply packaged products to the Greek market or manufacture different packaging items, as well as the confederation of Greek municipalities (HERRCO, 2012).

The National Organization for Alternative Management of Packaging and other Products (NOAMPP) is responsible for monitoring the management of specific waste streams under Law 2939/2001. For organisational and legal reasons the NOAMPP systematically failed to fulfil its role and only in 2010, with Law 3854/2010 (amendment of 2839/2001), did the organisation become operational. In the meantime, Law 3854/2010 established the polluter-pays principle as state law (WWF-Greece, 2011). Finally, the NOAMPP was modified by Law 4042/2012 into the Hellenic Recycling Agency (Greece, 2012).

In 2011, 109 illegal dump sites all over Greece remained in operation despite the ruling of the European Court of Justice of 2005 (case c-502/03), which dictated that by the end of 2008 all illegal dump sites should have been closed and rehabilitated (WWF-Greece, 2011).

The new National Waste Management Plan covers the period 2014–2020. It promotes separate collection of printed paper, packaging paper, glass, metals, wood and plastics, as well as separate collection and recovery of biowaste (including home composting). The main objectives of the NWMP are to eliminate landfill, increase reuse and recycling while limiting energy recovery to non-recyclables, and to reduce waste generation per person. (Watson Farley & Williams, 2015; BiPRO, 2014).

According to Greece's reporting to Eurostat (2015), all generated waste is treated ([1]). However, it has to be noted that not all the generated MSW is in fact collected. Collection services do not cover sparsely populated rural and mountainous regions, and in total only around 85 % of total generated waste is collected (Arcadis, 2014). According to BiPRO (2014), the collection coverage is 100%.

In Greece MSW is currently collected through a collection point system, and no door-to-door system is in place. All households are covered by collection systems for mixed residual waste, waste electrical and electronic equipment (WEEE), batteries and packaging (glass and metal packaging as well as plastic bottles). Some 79 % of the population is covered by recyclables collection (paper and cardboard, glass, metal packaging, plastic bottles and plastic film); and a small part of the population is offered graphic paper collection. There is an extended producer responsibility (EPR) system for packaging (BiPRO, 2014) and a deposit-refund system for some returnable packaging (Gibbs et al., 2014a).

The generation of MSW in Greece has increased continuously, from approximately 4.6 million tonnes in 2001 to 5.6 million tonnes in 2013. Despite the economic recession and the subsequent financial crisis in Greece, the level of MSW generation has continued to rise.

([1]) Treatment rates are dependent on several factors:

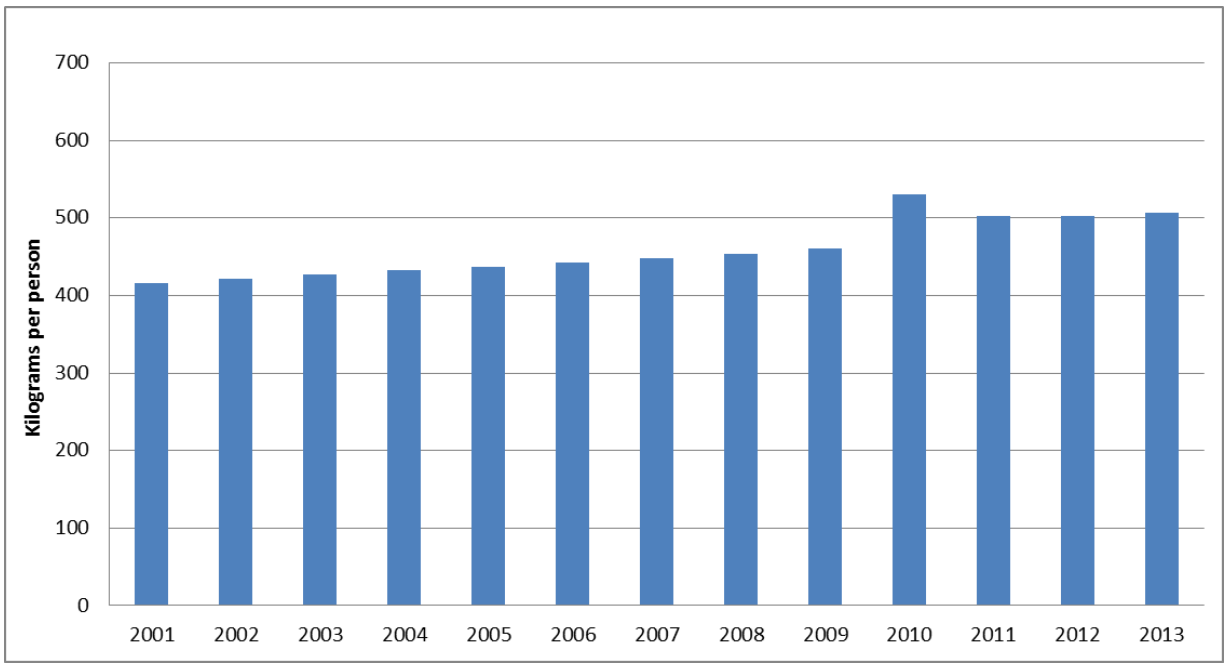
- waste undergoing MBT treatment undergoes a loss in mass, and as only final treatment amounts are to be reported to Eurostat, the waste treatment rates might be lower than the generation and collection rates;
- some countries estimate waste generation based on population (common where the collection coverage is less than 100 %), whereas treatment rates are based on actual statistics.

2.1 Municipal waste indicators

The following indicators illustrate the development of Greek MSW management in the years 2001–2013. All percentage figures have been calculated as proportions of generated waste, not managed waste. Relating to the total managed amount of MSW would generally result in higher rates for all waste management paths.

Figure 2.0 shows the development of MSW generation per person in Greece from 2001 to 2013. There is a slow but gradual increase throughout the years from 2001 to 2013, but with a peak in 2010.

Figure 2.0 Greece, municipal waste generation per person, 2001–2013



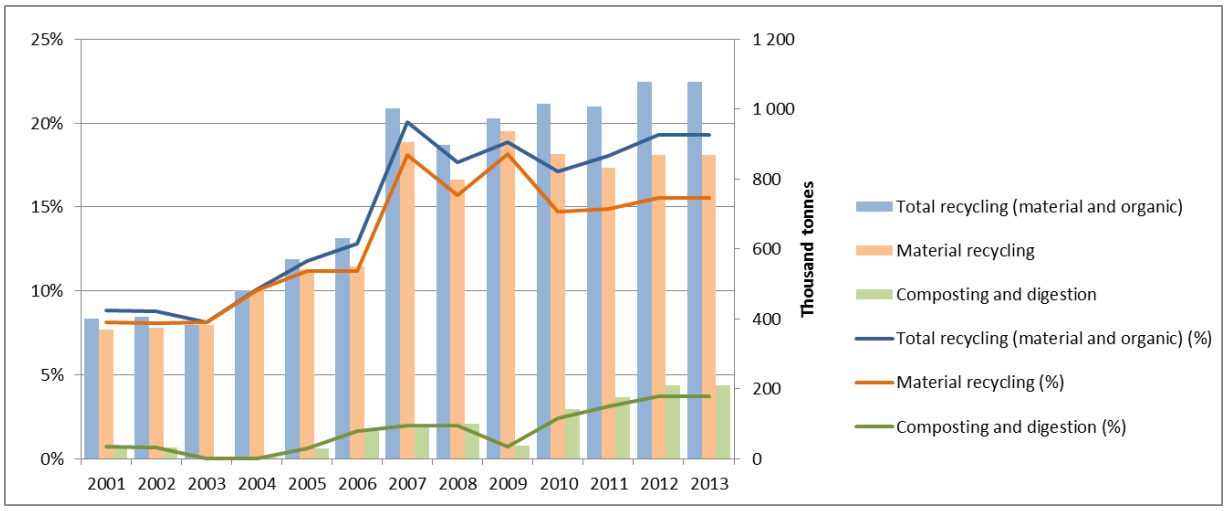
Source: Eurostat, 2015.

Greece is among the countries in the EU that still maintain high landfill rates. The amount of MSW sent to landfill in 2013 was 4.5 million tonnes, equivalent to 81 % of the total generated. Although the amount of MSW going to landfill has remained relatively stable over the last 10 years, the share of landfill decreased by 10 percentage points between 2001 and 2013. This trend can be attributed to recycling, which has been increasingly important in Greek waste management in recent years.

2.1.1 Municipal waste recycling, 2001–2013

Figure 2.1 shows the development of total, material and organic (compost and other biological treatment) MSW recycling in Greece. There was a positive trend from 2001 to 2013, though with some fluctuations. Recycling rates have stabilised and even slightly decreased since a peak in 2007. The total recycling rate was 19 % in 2013.

Figure 2.1 Greece, municipal waste recycling, 2001–2013, per cent and tonnes



Source: Eurostat, 2015.

Composting and other biological treatment seems to play a minor role in MSW treatment; the organic recycling rate was not more than 3.7 % in 2013. Recycling was boosted after the establishment and operation of two large mechanical biological (MBT) plants in two regions of Greece in 2004–2007 (Figure 2.4). It seems that the MBT output has contributed significantly in providing material recyclables, but not so much compost material.

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 ([2]). Greece has chosen calculation method 2 (Gibbs *et al.*, 2014). 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, including Greece (EC, 2015).

2.1.2 Landfill of biodegradable municipal waste

According to the EU Landfill Directive, Member States have to reduce the amount of biodegradable municipal waste (BMW) sent to landfill by a specific percentage by 2006, 2009 and 2016. However, Greece has been granted a four-year derogation period as one of the countries that sent more than

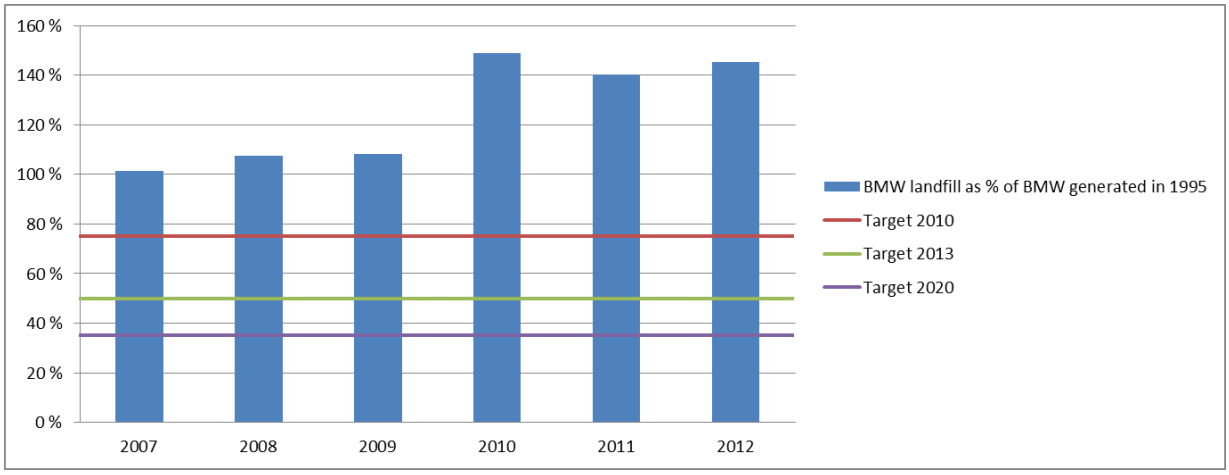
[2] Commission Decision 2011/753/EU allows countries to choose between four different calculation methods to report compliance with this target. Member States have the option of considering four alternative waste streams and fractions:

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 [This is the method used in this document].

80 % of its MSW to landfill in 1995. The targets are relative to the amount of BMW generated in 1995 (2.1 million tonnes). Greece has reported its BMW landfill quantities to the European Commission for the years 2006–2012.

Figure 2.4 shows Greece's BMW landfill levels from 2006 to 2012 relative to BMW generation in 1995, as well as the distance to the Landfill Directive target. In 2007, the landfill amount was similar to the amount generated in 1995, and by 2012 it had increased to 145 % of the 1995 value.

Figure 2.2 Landfill of biodegradable municipal waste in Greece, 2007–2012



Source: EC, 2014.
Note: The target dates take account of the 4-year derogation period.

Figure 2.2 shows that Greece missed the target for 2010 by almost 75 percentage points, which is more than 1.5 million tonnes. The landfill of BMW has stabilised at a significantly higher level than the amount generated in 1995. Thus, Greece seems likely to miss the 2013 diversion target of 50 %, and needs to take radical action to achieve the 2020 target of reducing BMW landfill to 35 % of the amount generated in 1995.

Greece has decided to tackle the issue of BMW landfill by introducing MBT technology in many parts of the country. So far, four plants are operating. The first two plants may have caused the decrease observed in 2007 in Figure 2.1 and the two other plants (with a significantly lower capacity) which opened in 2010 may have caused the decrease observed in 2011.

Additionally, six more MBT plants were expected to become operational by 2014, after which the total MBT capacity should be 467 500 tonnes. The draft NWMP covering the period up to 2020 has a planned capacity for 2020 of 764 000 tonnes for MBT and a combined anaerobic digestion and composting capacity of 334 000 tonnes (BiPRO, 2014).

2.1.3 Regional differences in municipal waste recycling, 2001–2012

There is no regional data for recycling that has been reported to Eurostat by Greece.

2.1.4 Recycling and landfill taxes

There is no landfill tax in Greece and the MSW management is covered by a municipal fee (EIB, 2010).

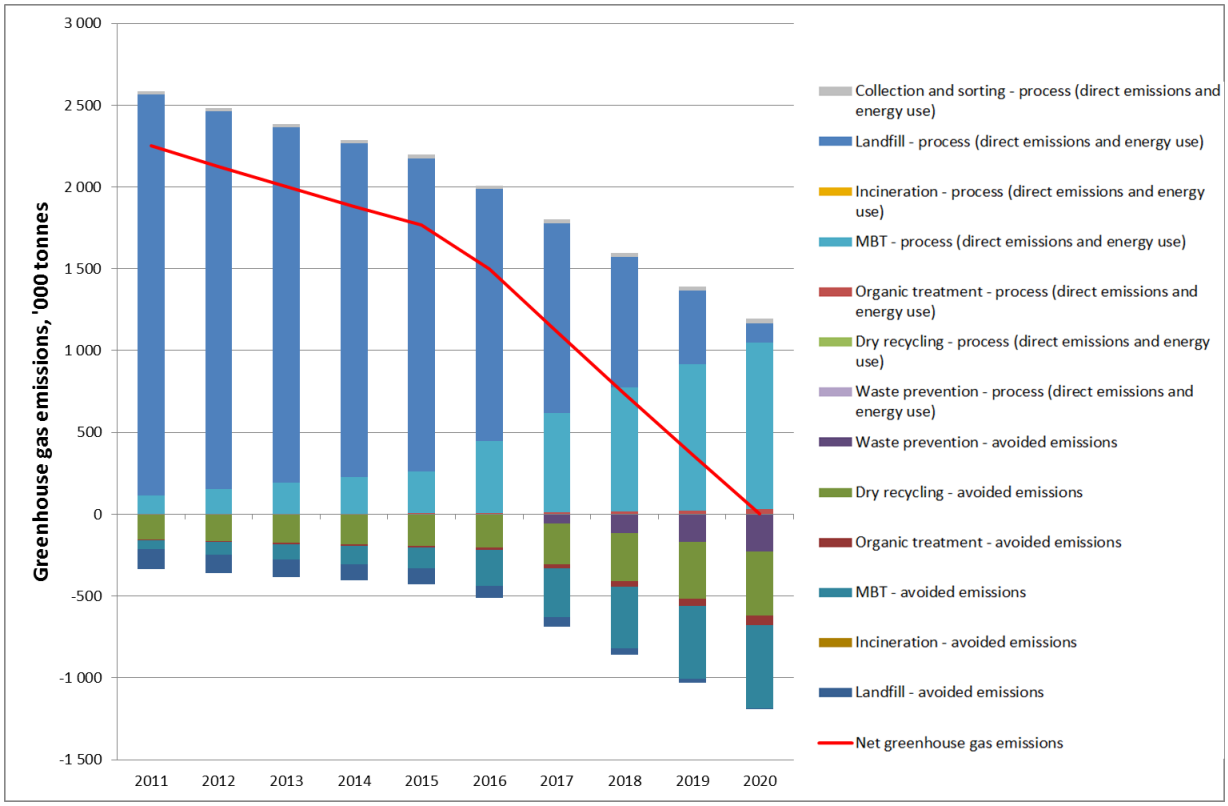
2.1.5 Environmental benefits of better municipal waste management

Figure 2.5 shows a scenario for the development of greenhouse gas emissions from MSW management in Greece. The scenario assumes a yearly decrease rate of 1.4 % for municipal waste generation for the years 2011–2015 and a 0.4 % yearly increase rate for the years 2015–2020. The scenario also assumes that EU legislation on municipal waste is fully implemented. The calculation of emissions is based on data and assumptions contained 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 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; 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 MSW. The scenario assumes full implementation of existing EU legislation on municipal waste management (Gibbs *et al.*, 2014c).

Figure 2.3 Greece, 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 Greece are expected to decrease in the period 2011–2020. In the first years of the scenario direct emissions related to municipal waste management are caused almost exclusively by landfill, while the benefits of recycling are 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 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 direct greenhouse gas emissions from waste management in Greece will increasingly originate from MBT operations.

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.

Greece has producer responsibility schemes in place for packaging waste. According to Gibbs et al. (2014a) the recycling of packaging waste is reported as included in MSW recycling; the remaining recycled amounts come from other recyclables, WEEE and battery recycling as well as MBT treatment. Paper and cardboard is by far the largest fraction of recycled MSW in Greece (Gibbs et al., 2014a).

It is not clear how municipal waste undergoing MBT is reported in Greece. There are four MBT plants currently operating in the country: two bio-stabilisation MBT plants with outputs to landfill (Athens, Chania) with a total nominal capacity of 350 000 tonnes per year (total actual capacity in 2011: 177 512 tonnes) and two bio-drying MBT plants without plastics recycling (Heraklion, Kefalonia) with a total nominal capacity of 98 000 tonnes per year (total actual capacity in 2011: 81 218 tonnes). The MBT input in 2011 was 261 000 tonnes, and the output was 58 000 tonnes of recycled materials and 123 000 tonnes sent to landfill (Gibbs et al., 2014a).

Composting increased by 27 000 tonnes between 2004 and 2005 when a small plant began operating, and by 70 000 tonnes between 2005 and 2007. Both of these increases are far below the capacity of the composting plants. The increase in recycling from 2004 to 2005 was 60 000 tonnes, similar to the increase in packaging waste recycling, indicating that the increase in recycled MSW was mainly packaging waste. From 2005 to 2007, recycled amounts increased by 360 000 tonnes, probably mainly due to the start of operation of MBT plants.

2.3 Important initiatives for improving municipal waste management

In the last decade, several initiatives and policy measures have been employed by the Greek government to divert MSW from landfill and reduce dependency on landfill. One of the direct outcomes of Law 2939/2001 '*on packaging and recycling of packaging and other products - Establishment of the National Organization for Recycling of Packaging and other Products*' was the

establishment of the Hellenic Recovery Recycling Corporation (HERRCO) at the end of 2001, which became fully operational by 2003. Although initially covering less than 40 % of the population, mainly in urban areas, by 2011 around 75 % of the total population of Greece was covered by the HERRCO's collection mechanisms. This operation has significantly boosted the performance of recycling and material recovery, removing a share of MSW from landfill (HERRCO, 2012).

The biggest effort to coordinate waste management in Greece so far has been the Joint Ministerial Decision 50910/2727/2003 on '*measures and conditions on solid waste management - National and Regional Management Plan*' in 2003, setting specific rules and targets which must be met in waste management planning at the national and regional levels (EIB, 2010).

In 2004, a series of Decrees set the rules for the managing different waste streams, including WEEE, and batteries (YPEKA, 2012).

The waste management capacity of Greece was strongly reinforced between the years 2004 and 2006 with two new state-of-the-art MBT plants coming into operation, one in the greater Athens area and one on the island of Crete. The unit in Athens, which is one of the biggest MBT plants in Europe, treats mixed municipal waste and produces refuse-derived fuel and good-quality compost with an annual capacity reaching 450 000 tonnes. The waste treatment plant in Chania, on Crete, has an annual capacity of 70 000 tonnes. Moreover, two additional MBT plants, one in Heraklio (island of Crete) with a capacity of 75 000 tonnes and one in Kefalonia, one of the Ionian islands, with a capacity of 25 000 tonnes began operating in 2010 (EIB, 2010), while six more MBT plants were expected to become operational by 2014. Furthermore, two incineration plants are at the planning stage on the island of Rhodes, and in Thebes (EIB, 2010).

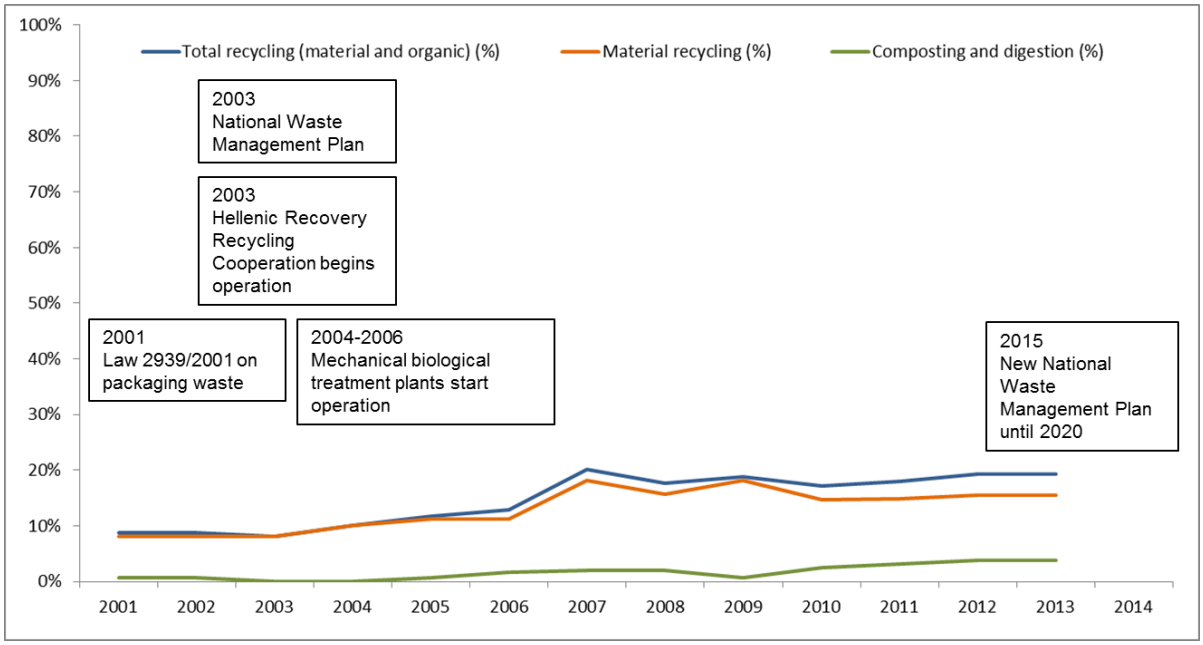
Construction of the planned MBT plants might contribute to an increase in recycling, depending on the ability of the plants to generate recyclable waste. The draft NWMP covering the period to 2020 has a planned capacity for 2020 of 764 000 tonnes for MBT and a combined anaerobic digestion and composting capacity of 334 000 tonnes (BiPRO, 2014).

Extended producer responsibility (EPR) is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. In practice, EPR implies that producers take over the responsibility for collecting or taking back used goods and for sorting and treating them for eventual recycling. The responsibility can be either voluntary or through a statutory EPR scheme set up by one or several producers. Greece has EPR systems (for MSW) for batteries, WEEE and packaging.

- There is one producer responsibility organisation for collection of batteries called AFIS S.A.
- There are two producer responsibility organisations for collection of WEEE — ANAKYKLOSI S.A. and FOTOKYKLOSI S.A.
- There are three collective producer organisations for packaging (S.S.E.D.-RECYCLE of HE.R.R.Co, K.E.PE.D SA, and Rewarding Recycling) and there is one individual (AB Vassilopoulos S.A.) packaging collection scheme.

A recent initiative concerns a pay-as-you throw scheme piloted in Elefsina municipality in 2010–2011 within a European LIFE Environment Project HEC PAYT. The pilot was realised by implementing a separate household waste (green bins) and packaging waste (blue bins) collection in an area housing 5 500 inhabitants. The collected waste was weighed and the fee was calculated according to waste bags used by each household. According to the project results, the pilot scheme did not much change citizen's behaviour in the pilot area, proved by the negligible amount of material transferred to the blue bins. A number of problems associated with technical functionality as well as citizen mistrust were also experienced during the pilot (Municipality of Elefsina, 2011).

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



2.4 Possible future trends

According to current trends, Greece is likely to miss the targets of both the Landfill Directive and the WFD if it does not considerably intensify efforts towards recycling and diversion of waste from landfill.

Regarding the Landfill Directive, the level of BMW landfill is extremely high. Besides missing the target for 2010 and, presumably, 2013, Greece is likely to experience great difficulties in meeting the target for 2020.

Greece will need to make an exceptional effort to fulfil the WFD 50 % recycling target by 2020.

Construction of the planned MBT plants during the next few years can be expected to reduce the amounts of BMW going to landfill and might contribute to an increase in recycling, depending on the ability of the MBT plants to generate recyclable waste. The new NWMP covering the period 2014–2020 has a planned MBT capacity of 764 000 tonnes in 2020 and a combined anaerobic digestion and composting capacity of 334 000 tonnes. The new focus in the NWMP on improving separate collection systems – including door-to-door collection in some areas – for different recyclables and biowaste can be expected to increase recycling rates. (BiPRO, 2014).

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