

Managing municipal solid waste

— a review of achievements in 32 European countries

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Executive summary

Improved waste management is an essential element in efforts to make Europe more resource efficient. If a country is to generate greater economic returns at lower costs to the environment then it must find ways to extract more value from the resources that it takes from nature, while cutting the burden of emissions and waste. One key means of achieving that is by shifting waste management up the waste hierarchy – reducing waste disposal (for example landfilling) and instead focusing on waste prevention, reuse, recycling and recovery.

In recent years these important goals have been integrated into European environmental policy, notably the European Commission's Roadmap on a resource efficient Europe (EC, 2011) and the EU's Waste Framework Directive (EU, 2008). But national efforts to shift up the waste hierarchy have been under way for longer, in large part driven by earlier EU legislation such as the Landfill Directive (EU, 1999). Together, these instruments establish a range of waste management targets and broader goals for the years to 2020.

Effective implementation of these waste policies demands an understanding of what has been achieved so far and progress towards future targets. The present report responds to that need, reviewing national municipal solid waste management in EEA member countries (the EU-27, Iceland, Norway, Switzerland and Turkey) and Croatia for the period 2001–2010. It demonstrates that the municipal waste management landscape has changed significantly during that period.

Municipal solid waste (referred to simply as 'municipal waste' in this report) has been chosen in part because the 2008 Waste Framework Directive introduced a new 50 % recycling target for such waste. In addition, municipal waste is primarily a public sector responsibility and the current economic situation in many EU Member States demands an added focus on how to achieve policy goals most cost-effectively.

Key findings

Although only a few countries reduced their municipal waste output between 2001 and 2010, there are clear indications of a shift away from landfilling towards preferred waste management approaches. The number of countries that landfill more than 75 % of municipal waste output decreased sharply, while the numbers recycling more than a quarter of their municipal waste recorded the opposite trend. Nevertheless, the majority of countries still landfilled more than half of their municipal waste in 2010.

In general, **there have been substantial increases in the proportion of municipal waste recycled.** Twelve countries increased the percentage recycled by more than 10 percentage points between 2001 and 2010 and another ten achieved increases of 5–10 percentage points (calculated as a share of municipal waste generated). In the remaining countries, however, the average increase was negligible and in five cases it was actually negative.

Progress in enhancing recycling rates is primarily due to trends in recycling of materials, with bio-waste recycling performing less well.

Whereas 19 countries achieved fairly substantial increases in their material recycling rates, there was comparatively little change in national bio-waste recycling rates. This suggests that, despite significant achievements in increasing material recycling in some countries, there is a need for greater focus on bio-waste recycling in line with the Waste Framework Directive's waste hierarchy.

Interestingly, in most of the countries where regional recycling data were available, there was substantial variation between different regions, indicating that **regional and local policies have a significant influence on municipal waste recycling rates.** While EU targets and national targets are the overall drivers of better municipal waste management, regional and

local implementation is crucial for achieving positive results. It also suggests that regions with high recycling rates could serve as good practice examples and become knowledge-sharing platforms for other regions nationally and across Europe.

The majority of countries are making good progress in achieving EU targets on diverting waste from landfill. Among those 12 countries without derogations for the Landfill Directive's targets, all 12 achieved the 2006 target, 11 of them achieved the 2009 target, and by 2010 seven are estimated to have already achieved the 2016 target. The performance of countries with derogations for the targets has been more mixed. Just seven of the 16 are estimated to have achieved the 2010 target.

There is evidence of a clear correlation between the cost of landfilling and the share of municipal waste recycled in Member States, suggesting that **landfill taxes can play an important role in incentivising a shift up the waste hierarchy.** It is equally clear, however, that gate fees and regulatory restrictions also play an important role in shaping waste management decisions.

Reflecting on past performance provides valuable insights into the chances of achieving the Waste Framework Directive's 50 % municipal waste recycling target in 2020. Here, the outlook is certainly mixed. While five countries have already achieved the target and another six will achieve it if they continue to improve their recycling rate at the same pace as in the period 2001–2010, **the majority of countries will need to make an extraordinary effort in order to achieve the target of 50 % recycling by 2020.** Nine countries need to increase their recycling rate yearly by 2–4 percentage points until 2020, a rate that only five European countries achieved between 2001 and 2010. A further seven countries need to achieve an unprecedented increase of more than 4 percentage points annually up to 2020.

The benefits of shifting municipal waste management up the waste hierarchy are not limited to more efficient resource use and a reduced waste burden on the natural environment. **Better waste management also offers a way to cut greenhouse gas (GHG) emissions.** Methane emissions from landfilling municipal waste have declined considerably in the past decade while the benefits from increased recycling have grown even more. These benefits in GHG emissions result from the fact that recycled materials replace virgin materials and thus reduce GHG emissions from primary production.

Analysis of municipal waste management is undermined by uncertainties about the comparability of national data. Countries use varying definitions of 'municipal solid waste' and there are particular uncertainties in relation to the overlap with packaging waste. It is estimated that at least eight countries do not include any recycling of packaging waste in their reporting of municipal waste recycling or include only a minimal amount. The way countries report on municipal waste that undergoes sorting or other pre-treatment also differs widely. To facilitate future analysis, **steps are needed to harmonise national reporting methodologies, especially on the waste fractions to be included when reporting on municipal waste.**

Finally, while EU legislation of the last two decades has certainly provided the driving force for better waste management in EEA member countries, a **comparison of the landfilling and recycling rates across Europe underlines the importance of national and regional instruments.** These include measures such as landfill bans on biodegradable waste or non-pre-treated municipal waste, mandatory separate collection of municipal waste fractions, economic instruments such as landfill and incineration taxes, and waste collection fees that give incentives to recycling. In general, countries using a broad range of instruments have a higher municipal waste recycling rate than countries using very few or no instruments.

1 Introduction

1.1 Background

Implementation of environmental policies, especially waste policies, is one of the European Commission's key priorities, as confirmed by its proposal for a 7th Environment Action Programme (EC, 2012) and the Roadmap to a resource efficient Europe (EC, 2011). While the EU's Waste Framework Directive (EU, 2008) and Landfill Directive (EU, 1999) set binding targets for recycling municipal waste and diverting biodegradable municipal waste from landfill, EEA analysis indicates large differences in municipal waste management performance between countries (EEA, 2009).

In 2011, the European Commission and the EEA agreed to enhance efforts to improve knowledge on implementation of waste policies through a joint pilot project. The pilot project includes a task to review municipal solid waste (referred to simply as 'municipal waste' in this report) management in EEA member countries, using indicators, country factsheets and relevant European Commission studies.

This report presents the output of this first part of the pilot project. The main focus is an ex-post review of the progress towards better municipal waste management and policies implemented so far, with a brief assessment of prospects for meeting the targets until 2020.

1.2 Why focus on municipal waste?

While municipal waste has been the focus of considerable analysis in Europe, three factors justify this project's continued focus on the issue.

First, although the EEA has undertaken many analyses of municipal waste in European countries, these have previously not covered all EEA member countries and have included relatively few municipal waste indicators, such as municipal waste generation and management at an aggregated level.

Second, responsibility for municipal waste primarily lies with the public sector. During the current high pressure on public budgets in many EU Member States, it is very important to find the most efficient policy measures for meeting the targets imposed by EU directives.

Third, the 2008 Waste Framework Directive (EU, 2008) includes a new 50 % recycling target for waste from households, to be fulfilled by 2020. In 2011 the European Commission decided that countries can choose between four different calculation methods to report compliance with this target. One of these methods is to calculate the recycling rate of municipal waste as reported to Eurostat (EU, 2011). This method is used for all figures and scenarios in this report.

It is therefore very relevant to assess the progress achieved so far and the prospects for countries to achieve the recycling target by 2020. It is equally interesting to review national initiatives undertaken between 2001 and 2010 to improve waste management, especially those that aim to increase municipal waste recycling. The analysis in this report should improve understanding of the dynamics of moving towards better municipal waste management.

1.3 Definitions of municipal waste

The definition of 'municipal waste' used in different countries varies, reflecting diverse waste management practices. For the purposes of national yearly reporting of municipal waste to Eurostat, 'municipal waste' is defined as follows (Eurostat, 2012e):

'Municipal waste is mainly produced by households, though similar wastes from sources such as commerce, offices and public institutions are included. The amount of municipal waste generated consists of waste collected by or on behalf of municipal authorities and disposed of through the waste management system.'

In this context, municipal waste is understood as waste collected by or on behalf of municipalities. However, the definition also includes waste from the same sources and other waste similar in nature and composition that is 'collected directly by the private sector (business or private non-profit institutions) not on behalf of municipalities (mainly separate collection for recovery purposes)' (Eurostat, 2012e).

In the EU's Landfill Directive, municipal solid waste is defined as 'waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households' (EU, 1999). The 50 % recycling target in the 2008 Waste Framework Directive and the 2011 Commission Decision establishing rules and calculation methods for verifying compliance with the targets of the Waste Framework Directive (EU, 2011) refer to 'household waste and similar waste'. These two definitions of municipal waste only refer to the type of waste and not to who has collected it. Nevertheless, countries may document compliance with the 50 % recycling target by using the municipal waste data they report regularly to Eurostat.

The more complex municipal waste management systems in use today with sorting steps, pre-treatment, imports and exports, seem to have led to uncertainties and differences in municipal waste reporting. These differences generally reduce the comparability of municipal waste data and also affect the interpretation of recycling rates used in this report. Eurostat has recently published a guideline clarifying which waste types to include in municipal waste reporting, how to allocate the outputs of pre-treatment processes like sorting and mechanical-biological treatment, and how to deal with exports and imports in the reporting (EC, 2011). The quality and comparability of municipal waste data can be expected to improve substantially once countries follow these guidelines.

1.4 Conceptual framework for the analysis and indicators used

This report is a synthesis of the outcomes of a country-by-country analysis addressing 32 European countries ⁽¹⁾:

- EU-27 Member States;
- Croatia;
- Iceland;
- Norway;
- Switzerland;
- Turkey.

The conceptual framework for the country analyses is based on the following four elements:

- reviewing the historical performance in municipal waste management using indicators, with a special focus on recycling;
- assessing the extent to which differences in national performance are linked to reporting differences rather than management performance (and therefore do not reflect the true municipal waste recycling situation);
- assessing the relationship between the changes in recycling performance revealed by the indicators and the most important initiatives taken to improve municipal waste management in the country;
- assessing possible future trends and prospects for achieving the 50 % recycling target for municipal waste by 2020.

⁽¹⁾ The country papers are available at <http://www.eea.europa.eu/publications/managing-municipal-solid-waste>.

In most cases, the development and progress of municipal waste management for each of the 32 countries is illustrated using nine indicators and criteria. It was not possible, however, to include all indicators and criteria for all countries — for example if they have not reported regional data to Eurostat. Conversely, for some countries additional indicators or tables have been included.

Most of the municipal waste indicators and criteria show percentages rather than absolute amounts of municipal waste recycled, incinerated or landfilled. The reasons behind this are:

- absolute amounts are seldom comparable, even per capita values, mainly because of the contrasting definitions of municipal waste used in countries;
- percentages can better be compared to show the evolution in waste performance.

The nine indicators and criteria used in the country reports were as follows:

- generation of municipal waste per capita from 2001 to 2010;
- development of recycling rates from 2001 to 2010 for material recycling, recycling of bio-waste,

and recycling of total municipal waste, all expressed as a percentage of the total municipal waste generated;

- prospects for meeting the Waste Framework Directive's 50 % recycling target, assuming a continuation of trends in the three periods 2001–2005, 2006–2010 and 2001–2010;
- biodegradable municipal waste landfilled in the period 2006–2010, calculated as a percentage of the amount generated in 1995, to assess compliance and the distance to the Landfill Directive's landfill diversion targets;
- regional differences in municipal waste recycling rates within each country from 2001 to 2010;
- landfill tax levels and recycling, landfill and incineration rates of municipal waste;
- life-cycle GHG emissions from municipal waste management and mitigation achieved since 1990;
- uncertainties that may explain differences in national performance;
- important country-specific policy initiatives taken to improve municipal waste management, supplementing and implementing EU directives.

2 Results of the cross-country analysis

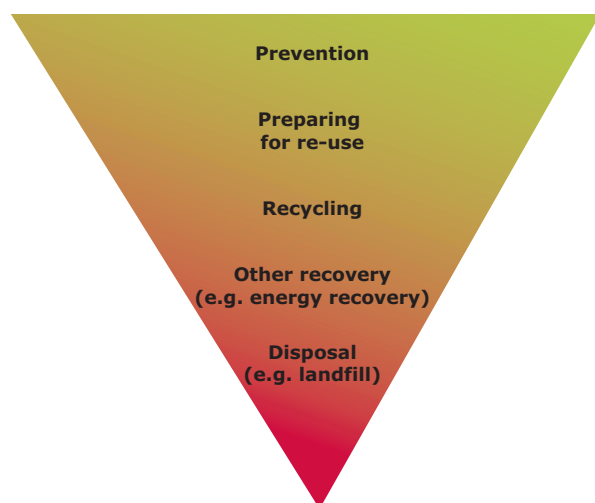
This chapter brings together the outcomes of the country-level studies. National indicators and analysis are presented and discussed in more detail in the country reports ⁽²⁾.

The nine indicators and criteria presented in this report and the country reports provide important information on the current state of municipal waste management in EEA member countries but do not present a comprehensive picture. The assessment would benefit from a more in-depth analysis of the waste framework conditions and the policies applied by the countries, which was beyond the scope of this study.

2.1 Moving municipal waste management up the waste hierarchy, 2001–2010

The development of municipal waste management in European countries reflects initiatives taken by both the EU and individual countries. The EU waste policy landscape has evolved considerably over the last 30 years. One important step was the 'Thematic strategy on prevention and recycling of waste' (EC, 2005), which resulted in a revised Waste Framework Directive in 2008 (EU, 2008). Article 4 of the directive includes for the first time a legally binding prioritisation of waste management activities. This 'waste hierarchy' (Figure 2.1) requires that waste prevention be prioritised and promoted, and that disposal (mainly landfilling) have the lowest priority and be minimised.

Figure 2.1 The EU waste hierarchy



Source: ETC/SCP.

2.1.1 Little evidence of increased waste prevention

Municipal waste prevention can be assessed by analysing trends in the amounts of municipal waste generated; if the amounts of municipal waste generated are decreasing over time, waste is prevented according to the first objective of the waste hierarchy. Calculating per capita municipal waste generation enables data to be normalised between countries and eliminates the effects of changes in national population sizes in the years 2001–2010. As noted in Box 2.1, however, there are several problems with comparing municipal waste data across countries and time periods, which mean that it should be used with caution.

Bearing in mind these uncertainties, Figure 2.2 shows the municipal waste generation per capita in 32 European countries in 2001 and 2010. Twenty-one countries generated more municipal waste per capita in 2010 than in 2001 and 11 cut per capita

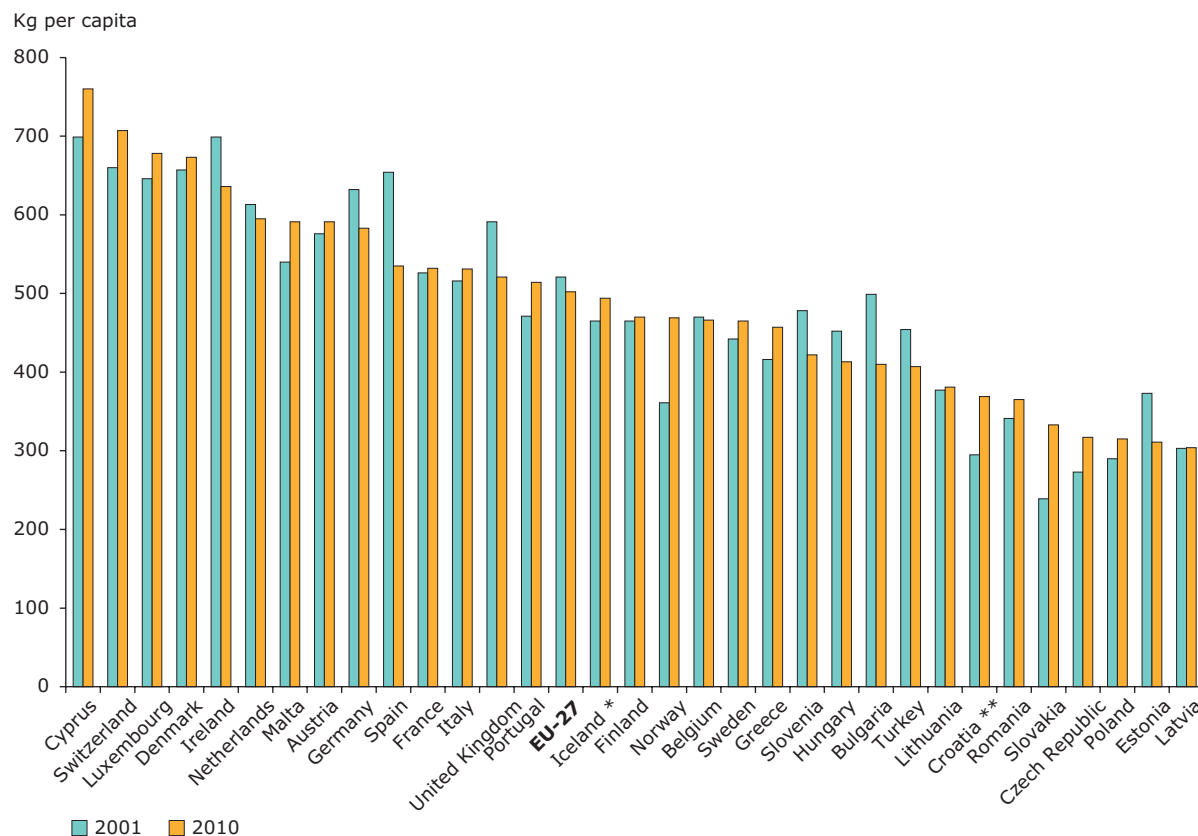
⁽²⁾ <http://www.eea.europa.eu/publications/managing-municipal-solid-waste>.

Box 2.1 Problems using municipal waste generation as a proxy to measure waste prevention

- Countries define municipal waste differently. For example, a country that includes bulky waste or garden waste in municipal waste will appear to generate more municipal waste per capita than a country that excludes these waste fractions.
- Some countries include only waste from households, whereas other countries also include similar waste types coming from other sources such as commercial activities and offices.
- Some countries include separately collected packaging waste from households, whereas other countries do not.
- During the time period, individual countries may have changed their definition of municipal waste by adding or removing waste fractions. For example, at the beginning of the period 2001–2010, some countries reported the municipal waste collected, not the amount generated.

municipal waste generation. If the figures are compared for the years 2001 and 2008, 26 countries recorded an increase and six countries a decrease. This suggests that the economic downturn that started in 2008 may have caused a reduction in

municipal waste generation per capita. Overall, however, the picture is mixed and there is no clear evidence of improved waste prevention across countries between 2001 and 2010.

Figure 2.2 Municipal waste generated per capita, 2001 and 2010

Note: (*) 2008 data used for 2010. (**) 2004 data used for 2001. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010.

Source: Eurostat, 2012c; ETC/SCP, 2013b.

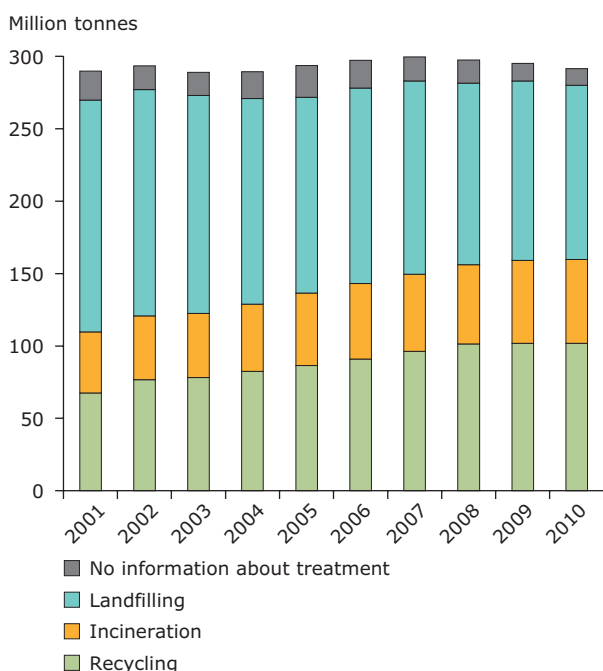
2.1.2 Clear evidence of a shift from landfilling up the waste hierarchy

Shifting the focus to how the municipal waste generated in the period 2001–2010 was managed, there is clearer evidence of a shift up the waste hierarchy. Figure 2.3 indicates that landfilling of municipal waste decreased by almost 40 million tonnes, whereas incineration increased by 15 million tonnes and recycling grew by 29 million tonnes. Looking at the EU-27 only, landfilling decreased by 41 million tonnes, incineration increased by nearly 15 million tonnes and recycling and composting increased by 28 million tonnes. As discussed in Section 2.2, however, this aggregation of 32 European countries masks large differences between the countries in terms of their waste management performance. Furthermore, Figure 2.3 shows that the total amount of municipal waste recycled has declined slightly since 2008.

Another way to illustrate the progression up the waste hierarchy is to count the number of countries achieving defined levels of municipal waste management in 2001 and 2010. Figure 2.4 shows that the number of countries that mainly rely on landfilling of municipal waste decreased between 2001 and 2010. The number of countries landfilling more than 75 % of municipal waste fell from 17 in 2001 to 11 in 2010, while those landfilling more than 50 % of municipal waste decreased from 22 to 19. In the same period, the number of countries that incinerated more than 25 % of their municipal waste rose slightly (from eight to 10) and the number recycling more than 25 % of municipal waste increased from 11 to 16.

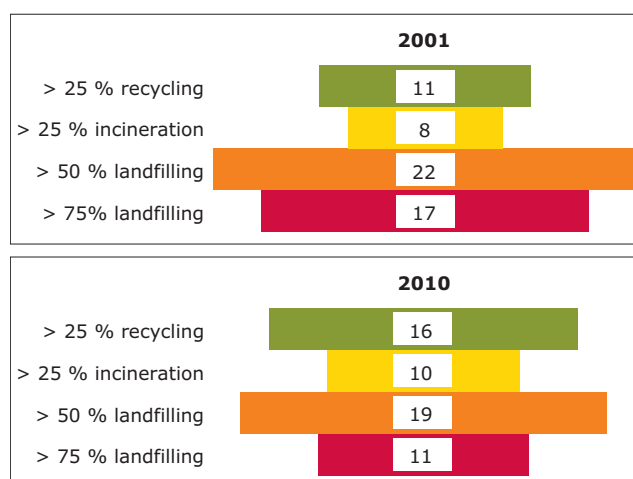
Overall, Figure 2.4 shows that European countries are climbing up the waste hierarchy for municipal waste management, thereby implementing one of the key principles of the Waste Framework Directive. It also illustrates, however, that more than half of the countries still landfill more than 50 % of their municipal waste.

Figure 2.3 Development of municipal waste management in 32 European countries, 2001–2010



Note: The figure covers the EU-27 Member States, Croatia, Iceland, Norway, Switzerland and Turkey.
Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Figure 2.4 Number of countries at different levels of the municipal waste management hierarchy, 2001 and 2010



Note: Each country can be included in several waste management categories so the total number of countries is greater than 32. The number of countries is indicated in the white boxes.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

2.2 Recycling of municipal waste, 2001–2010

2.2.1 Increases in the proportion of municipal waste recycled

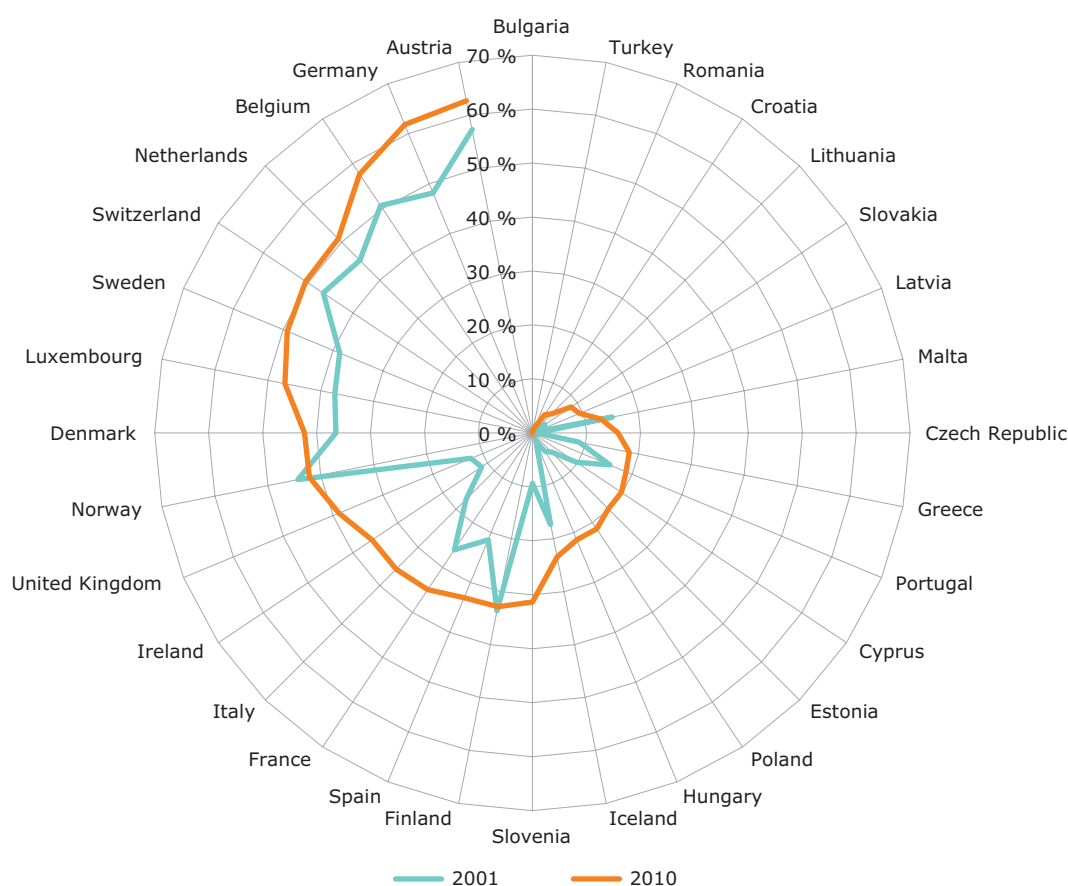
Figure 2.5 presents a comparison of the share of municipal waste recycled in EEA member countries and Croatia in 2001 and 2010. Total recycling includes material recycling as well as composting and digestion of bio-waste.

In that period, 12 countries increased their recycling performance by more than ten percentage points, while 10 recorded an increase of between five and ten percentage points. This clearly indicates

significant improvements in recycling performance, although the numbers also show enormous differences in performance between those countries with the lowest recycling levels and those with the highest.

Figure 2.6 presents the annual growth rates of municipal waste recycling in each country during the years 2001–2005 and 2006–2010. Clearly, countries that started the decade with relatively limited recycling (e.g. Slovenia, Poland, United Kingdom, Ireland and Estonia) are more likely to have recorded substantial improvement. Contrastingly, several of the 'pioneers' of recycling in Europe recorded substantially slower growth, although in some cases successful measures

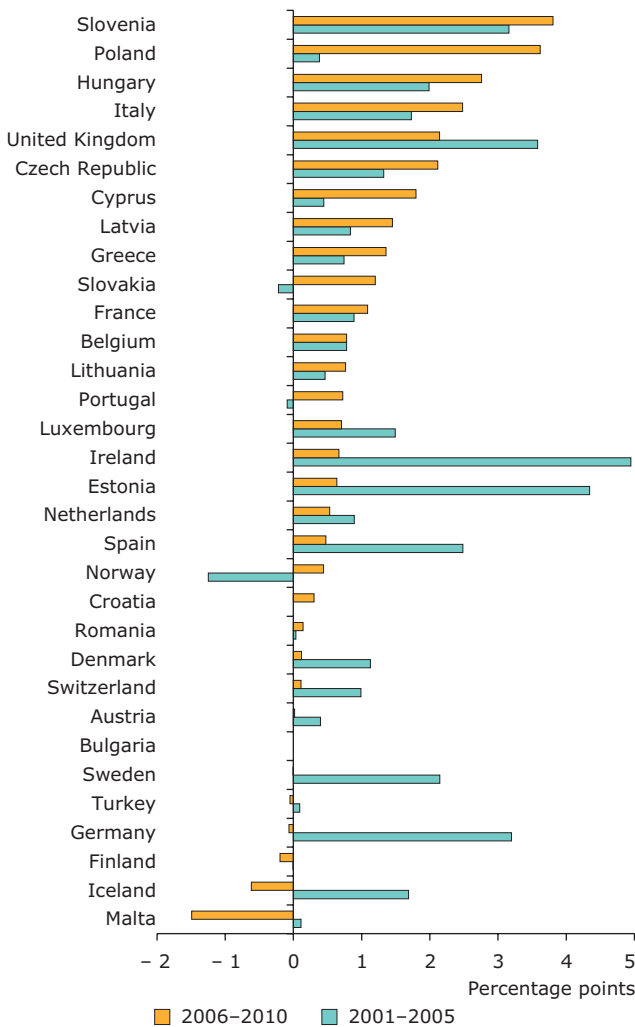
Figure 2.5 Municipal waste recycling rates in 32 European countries, 2001 and 2010



Note: The further from the centre in the radar chart, the better the waste management. The recycling rate is calculated as the percentage of municipal waste generated that is recycled. Total recycling includes material recycling as well as composting and digestion of bio-waste. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010. For Iceland, 2008 data are used for 2010. For Slovenia, 2002 data are used for 2001 and 2009 data for 2010. Croatia is not included for 2001.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Figure 2.6 Yearly average percentage point increase in total recycling of municipal waste, 2001–2005 and 2006–2010



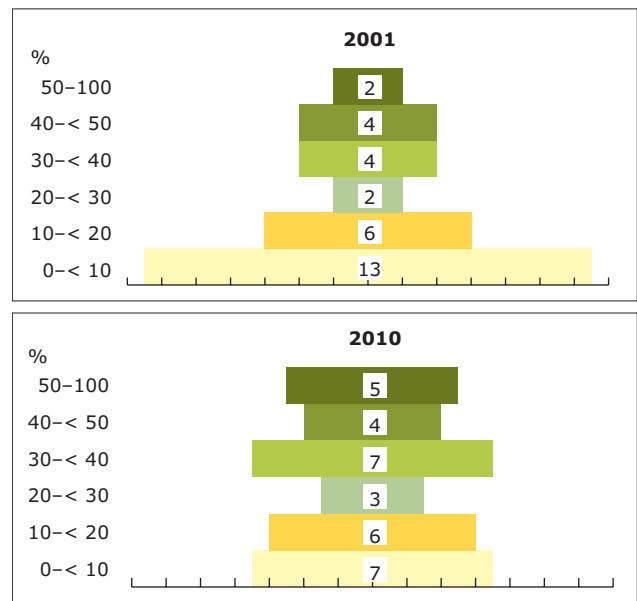
Note: The larger the bar, the greater the improvement in recycling rate. For example, Poland improved its recycling rate from 7 % in 2006 to 21 % in 2010, equivalent to a 14 percentage point improvement or 3.6 percentage points per year on average. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010. The 2001–2005 trends are therefore less reliable than the 2006–2010 trends, and in some cases, trends might rather reflect changes in data collection than change in waste management. For Iceland 2008 data are used for 2010. For Slovenia 2002 data are used for 2001 and 2009 data for 2010. Croatia is only included with data for the period from 2007 to 2010.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

markedly improved waste management performance even in countries with high initial percentages (e.g. Germany and Switzerland in the years 2001–2005).

The progress illustrated in Figure 2.6 indicates that the introduction of EU requirements to improve municipal waste management has taken effect in many but not all countries. It also indicates that it is difficult to maintain a substantial increase in the recycling rate over five years and even harder over a decade. Some of the frontrunners in municipal waste management lost momentum in the period 2006–2010 and only two countries recorded a yearly increase of more than two percentage points in both periods (2001–2005 and 2006–2010).

Figure 2.7 Progress of European countries up the recycling hierarchy (material and bio-waste recycling), 2001–2010



Note: The number of countries within each recycling interval is indicated in the white boxes. Information is not available for one country in 2001. Total recycling includes material recycling as well as composting and digestion of bio-waste.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

This can be partly explained by the fact that the frontrunners already had high recycling rates in 2001 and further improvements were likely to be much more challenging. Such challenges might include technical limits for recycling, high costs for recycling products or materials not designed for recycling, or competition with waste incineration capacity.

Another way to depict the progress in recycling during the period 2001–2010 is to analyse the number of countries within certain recycling intervals. A higher number of countries within the high recycling interval indicates a move up in the 'recycling hierarchy'.

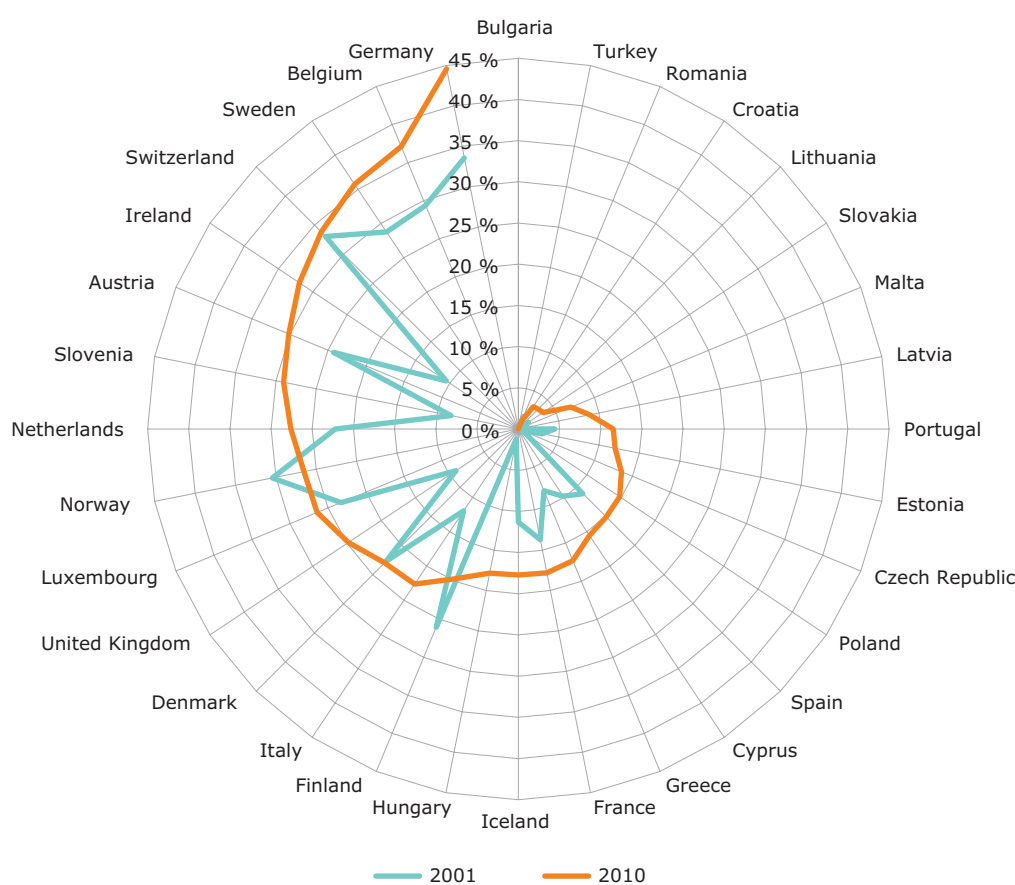
Figure 2.7 illustrates this positive transition. The number of countries recycling less than 10 % of

municipal waste dropped from 13 to seven between 2001 and 2010, and the number of countries recycling more than 30 % of generated municipal waste increased from 10 to 16.

2.2.2 Contrasting trends in recycling of materials and bio-waste

The progress made in increasing the total recycling rate is mainly due to the fact that many countries have increased recycling of materials such as glass, paper and cardboard, metals, plastic and textiles. Eight countries increased their material recycling rate by more than 10 percentage points in the period 2001–2010, and 11 countries achieved an increase of between five and ten percentage points (Figure 2.8).

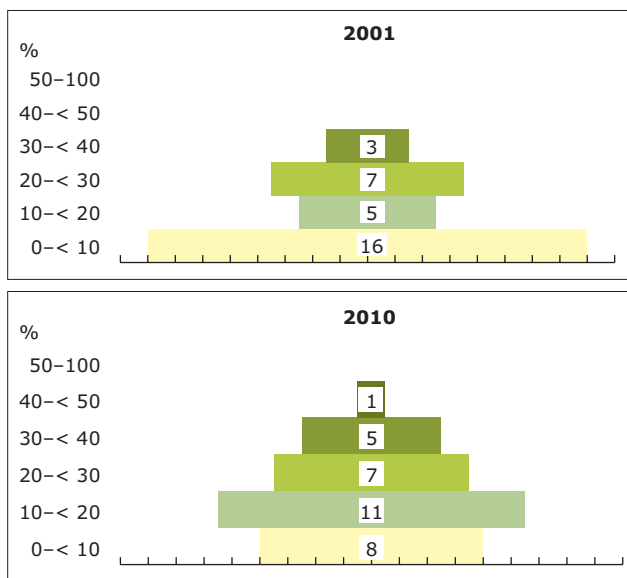
Figure 2.8 Material recycling as a percentage of municipal waste generation in 32 European countries, 2001 and 2010



Note: The material recycling rate is calculated as the percentage of materials recycled per municipal waste generated. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010. For Iceland, 2008 data are used for 2010. For Slovenia, 2002 data are used for 2001 and 2009 data for 2010. Croatia is not included for 2001.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Figure 2.9 Progress of European countries up the material recycling hierarchy, 2001–2010



Note: Number of countries within each recycling interval indicated in the white boxes. Information is not available for one country in 2001.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Figure 2.9 shows the number of countries within certain material recycling intervals in 2001 and 2010. The number of countries recycling less than 10 % declined from 16 in 2001 to eight in 2010. Contrastingly, the number recycling between 10 % and 20 % rose from five countries in 2001 to 11 countries in 2010. The number with a material recycling level higher than 30 % increased from three countries in 2001 to six in 2010.

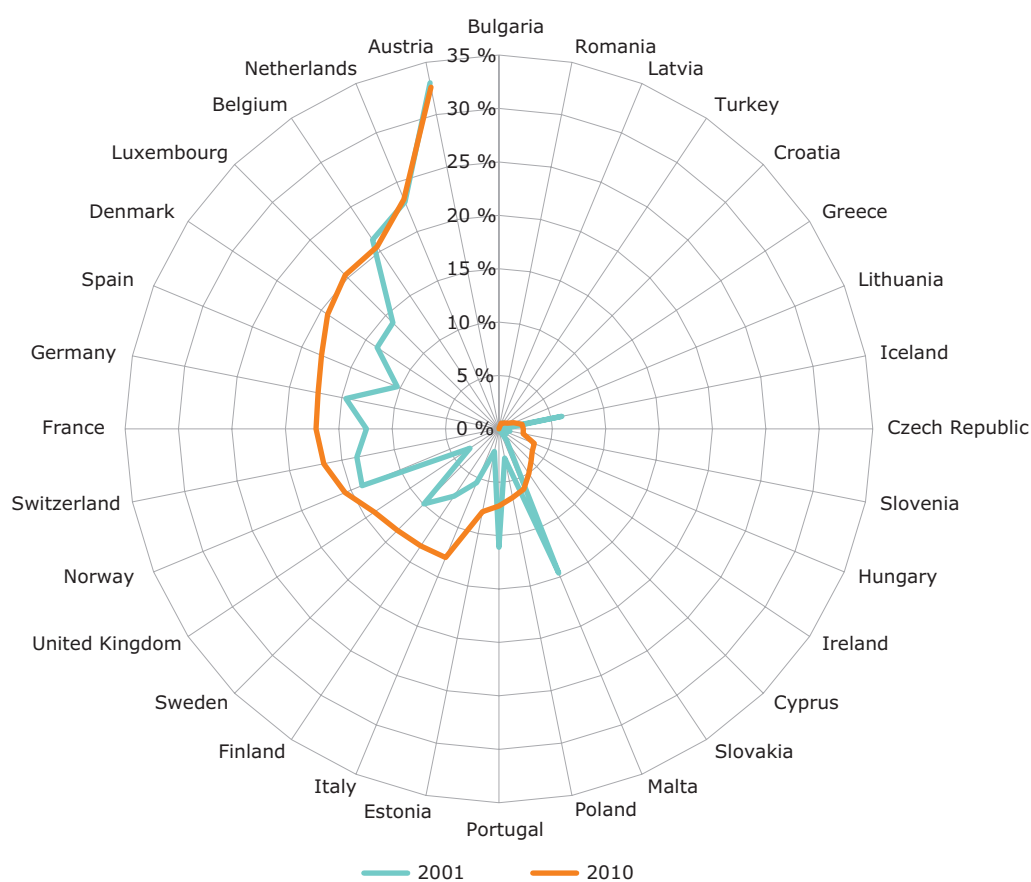
In contrast to material recycling performance, Figures 2.10 and 2.11 show that the increases in bio-waste recycling⁽³⁾ were much more modest over the same period. Only one country increased its municipal waste-derived bio-waste recycling by more than 10 percentage points between 2001 and 2010, and only six countries improved by between five and ten percentage points. Eighteen countries sustained a very low level of bio-waste recycling (0–10 % of municipal waste generated) during the whole period 2001–2010. The reasons for that trend could be:

- **The absence of an EU-wide obligation to recycle bio-waste.** Instead, EU rules only limit the amount of biodegradable waste that can be landfilled.
- **The absence of common EU quality standards or end-of-waste criteria⁽⁴⁾ for generated compost/digestate.** An important purpose of recycling of bio-waste is to produce compost or digestate but much bio-treated material is currently used as intermediate or final top soil cover on landfills. Quality standards would make it easier to clarify whether or not the compost can be used as soil improver in agriculture or in gardens. The development of common EU quality standards for compost or end-of-waste criteria is on the European Commission's agenda and is expected to be finalised in 2014.
- **The fact that material and bio-waste recycling potential depends on their respective share in total municipal waste.** In most countries bio-waste recycling potential is lower than material recycling potential because bio-waste accounts for a smaller proportion of total municipal waste. Countries with a particularly low share of bio-waste in their municipal waste, such as Lithuania, Norway and Slovenia (Table 2.1), obviously have a lower potential for bio-waste recycling than countries with a higher share.

⁽³⁾ Bio-waste is defined in the Waste Framework Directive as 'biodegradable garden and park waste, food and kitchen waste from households, restaurants, catering and retail premises and comparable waste from food processing plants' (EU, 2008). Bio-waste recycling of MSW includes the amounts reported to Eurostat as composted or digested: the EU classifies biological treatment (including composting and anaerobic digestion) as recycling when the compost (or digestate) is used on land or for the production of growing media (EU, 2011).

⁽⁴⁾ According to the Waste Framework Directive, end-of-waste criteria specify when certain waste ceases to be waste and obtains a status of a product (or a secondary raw material).

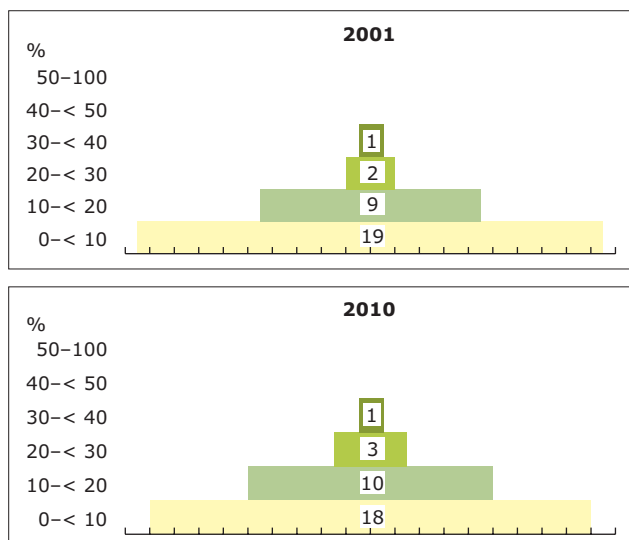
Figure 2.10 Bio-waste recycling as a percentage of municipal waste generation in 32 European countries, 2001 and 2010



Note: The bio-waste recycling rate is calculated as percentage of recycled bio-waste per municipal waste generated. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010. For Iceland, 2008 data are used for 2010. For Slovenia, 2002 data are used for 2001 and 2009 data for 2010. Croatia is not included for 2001.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Figure 2.11 Progress of European countries up the municipal bio-waste recycling hierarchy, 2001–2010



Note: Number of countries within each recycling interval indicated in the white boxes. Information is not available for one country in 2001.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

Table 2.1 Bio-waste share in municipal waste in 28 European countries in 2008–2010

% of bio-waste in total municipal waste	Countries
Less than 20 %	Lithuania, Norway and Slovenia
Between 20 % and 30 %	Bulgaria, Denmark, Ireland, Hungary, Latvia and Switzerland
Between 30 % and 40 %	Germany, France, Italy, Sweden, United Kingdom, European average
Between 40 % and 50 %	Austria, Belgium, Czech Republic, Estonia, Finland, Luxembourg, the Netherlands, Poland, Romania and Spain
Between 50 % and 60 %	Greece, Portugal, Slovakia
Between 60 % and 80 %	Malta

Source: ETC/SCP, 2011; and data provided by countries to the ETC/SCP in 2012, ETC/SCP, 2012a.

Note: Bio-waste includes food and garden waste but not wood, paper and cardboard, and textile waste. Member State data on the composition of municipal waste were for either 2008, 2009 or 2010. The European average is calculated based on the 28 countries included in the table.

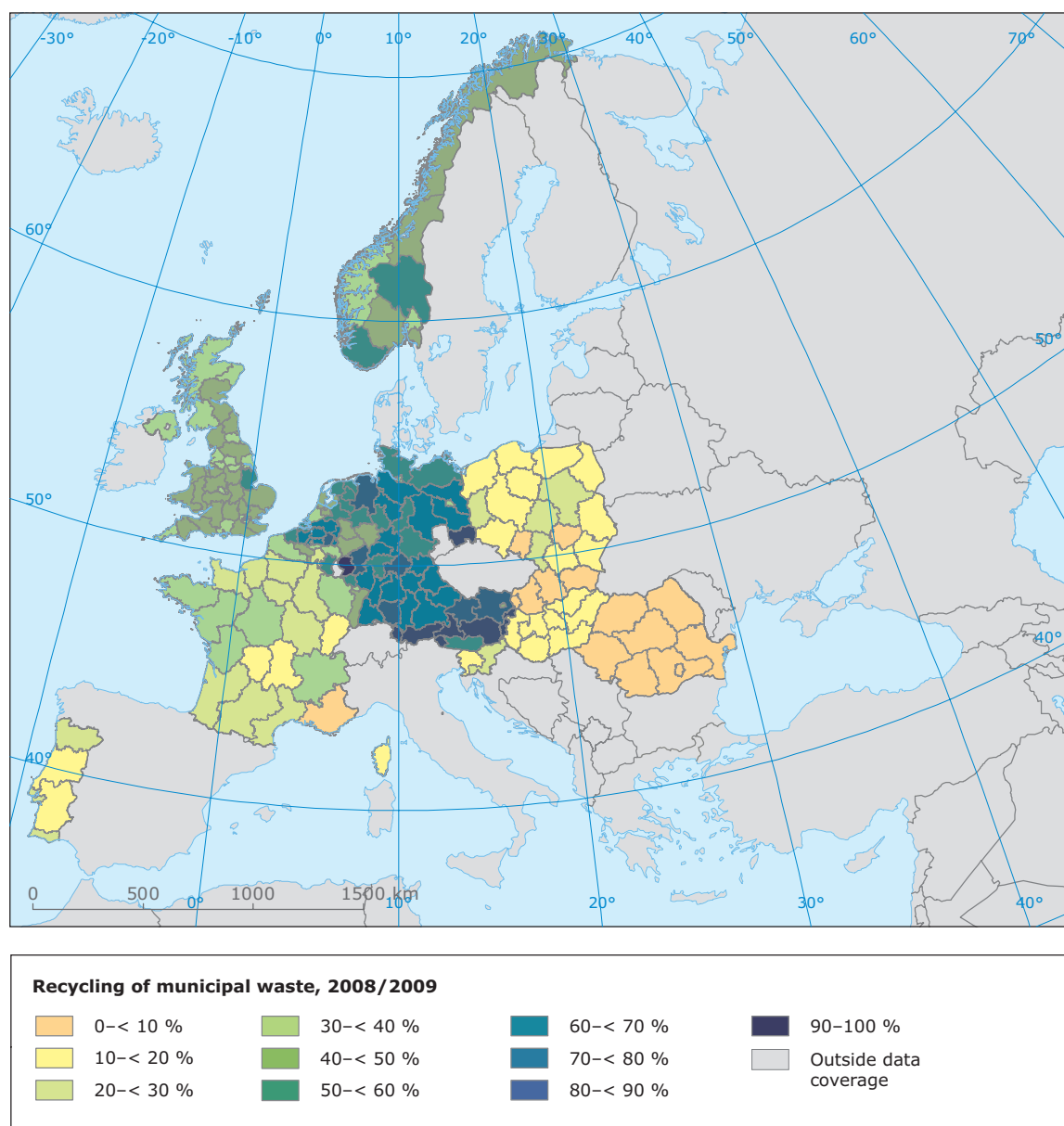
According to ETC/SCP calculations, in 2008–2010 bio-waste accounted for 37 % of the municipal waste in Europe (EU-27 excluding Cyprus, plus Norway and Switzerland). The proportion differs from country to country, however, mainly because of variations in the ways that municipal waste is defined in different countries (Box 2.1).

Many EEA member countries with a high share of bio-waste in their municipal waste still recycle only a limited amount of bio-waste, resulting in a relatively marginal effect of bio-waste recycling on total municipal waste recycling rates (presented in Figures 2.5 and 2.7). This is a clear indication that a stronger focus on bio-waste recycling is needed. For many countries, there is much room for improving the overall recycling rate of municipal waste through increasing bio-waste recycling.

2.2.3 Variations in recycling rates within countries

Eurostat's database includes data on recycling of municipal waste for regions in 13 countries. It is useful to assess the regional differences in recycling levels in these countries because substantial differences indicate the importance and relative success of regional policies and strategies — and the potential to improve in those countries by focusing on specific regions.

Some of the differences may, however, be influenced by differences in reporting. For example, one German region reports 100 % recycling, which presumably implies that it has reported all waste sent to sorting or mechanical biological treatment plants as recycled (although usually a part of the sorted waste is incinerated or

Map 2.1 Regional recycling rates for municipal solid waste, 2008/2009

Note: Recycling includes material recycling and composting/digestion. Recycling rates are calculated as a percentage of municipal solid waste generated. 2008 data were used for Belgium, Germany, France, Hungary, Romania and Slovenia. 2009 data were used for the rest of the countries.

Source: Eurostat, 2012a.

landfilled). Other regions have reported based on the outputs of sorting and mechanical biological treatment.

Where regional recycling data are available from Eurostat, the separate country reports present the regional differences in the development of total recycling, material recycling and bio-waste recycling for the years 2001–2009. It was not possible in this

report to include regional data available only in national databases (i.e. not compiled by Eurostat).

Map 2.1 shows the total recycling level of municipal waste in 13 European countries. Interestingly, in ten of the 13 countries there is a variation of more than 15 percentage points in recycling rates between different regions, and significant variations are also apparent in countries with low rates of total recycling.

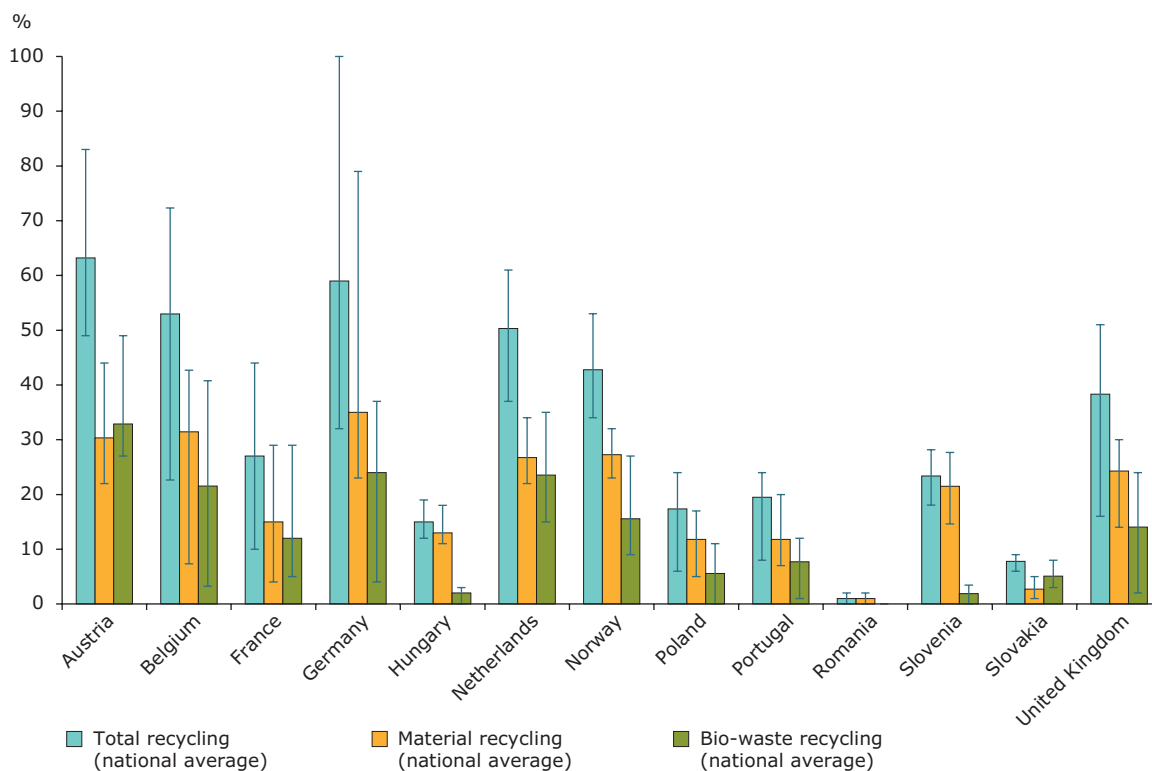
Figure 2.12 gives a more detailed overview of the extent of variation within each country, presenting the national recycling rate for municipal waste, material and bio-waste and the range between the regions in each country with the highest and lowest recycling rates. The variation in municipal waste recycling between a country's regions seems to be both due to variation in the recycling of materials and bio-waste.

The large regional differences in all countries indirectly indicate the influence of regional and

local policies on the recycling levels of municipal waste. EU targets and national targets are the overall drivers of better municipal waste management but regional and local implementation is crucial for achieving positive results.

In addition, regions with high recycling rates could serve as good practice examples and become knowledge-sharing platforms for other regions within countries, as well as for regional administrations across Europe.

Figure 2.12 Regional variation in municipal waste recycling rate in 13 countries, 2008/2009



Note: The variation bar shows the highest and lowest regional recycling level within each country. 2008 data were used for Belgium, Germany, France, Hungary, Slovenia and Romania. 2009 data were used for the rest of the countries.

Source: Eurostat, 2012a.

2.3 Diversion of municipal waste from landfill, 2001–2010

2.3.1 Landfilling of municipal waste

As illustrated in Figure 2.13, the general increase in recycling of municipal waste has led to a reduction

in the percentage of municipal waste landfilled. Most countries reduced landfilling in the period 2001–2010. Sixteen countries cut the percentage of municipal waste going to landfill by more than 10 percentage points, with five of them achieving a decrease of more than 20 percentage points.

Figure 2.13 Municipal waste landfilling rates in 32 European countries, 2001 and 2010



Note: The landfilling rate is calculated as a percentage of municipal waste landfilled per municipal waste generated. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010.

Source: Eurostat, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

2.3.2 Performance against Landfill Directive targets on biodegradable municipal waste

There is no legally binding EU limit on landfilling of municipal waste but the EU's Landfill Directive (EU, 1999) requires that all EU Member States reduce the amount of biodegradable municipal waste landfilled ⁽⁵⁾.

The directive was passed in 1999 and it includes a combination of long-term and intermediate targets for reducing the amount of biodegradable municipal waste landfilled relative to the quantity generated in 1995. Specifically, by 2006 countries must reduce to 75 % of the amount they generated in 1995, declining to 50 % by 2009 and 35 % by 2016. Twelve countries have been given a four-year derogation, however, meaning that they must meet their targets by 2010, 2013 and 2020. Furthermore, Ireland has been given a four-year derogation for the 2006 and 2009 targets, meaning that it must meet them in 2010 and 2013. Portugal has been given a four-year derogation for the 2009 and 2016 targets and must meet them in 2013 and 2020. Slovenia has a four-year derogation for the 2016 target and has to meet it by 2020. Croatia must meet the targets by 2013, 2016 and 2020.

To assess compliance with the Landfill Directive, it is necessary to analyse the available information for the years 2006, 2009 and 2010. EU Member States have reported to the European Commission the amount of biodegradable municipal waste landfilled in 2006, 2007, 2008 and 2009, although some have not yet reported for 2009. Furthermore, some countries provided data for 2009 and 2010 to the EEA for the purpose of this analysis.

The ETC/SCP has estimated the missing biodegradable municipal waste data for 2009 by subtracting the increase in the amount of municipal waste composted or digested from 2008 to 2009 from the amounts of biodegradable municipal

waste landfilled in 2008. The amount of landfilled biodegradable municipal waste for 2010 has been calculated in a similar way. This calculation methodology did not address improvements in diverting other biodegradable waste from landfill, such as paper or textiles, or diversion from landfill to incineration. As such, these data are only rough estimates.

Figure 2.14 shows the compliance status of countries without a derogation period and Figure 2.15 shows the situation in the EU Member States with a derogation period and Croatia.

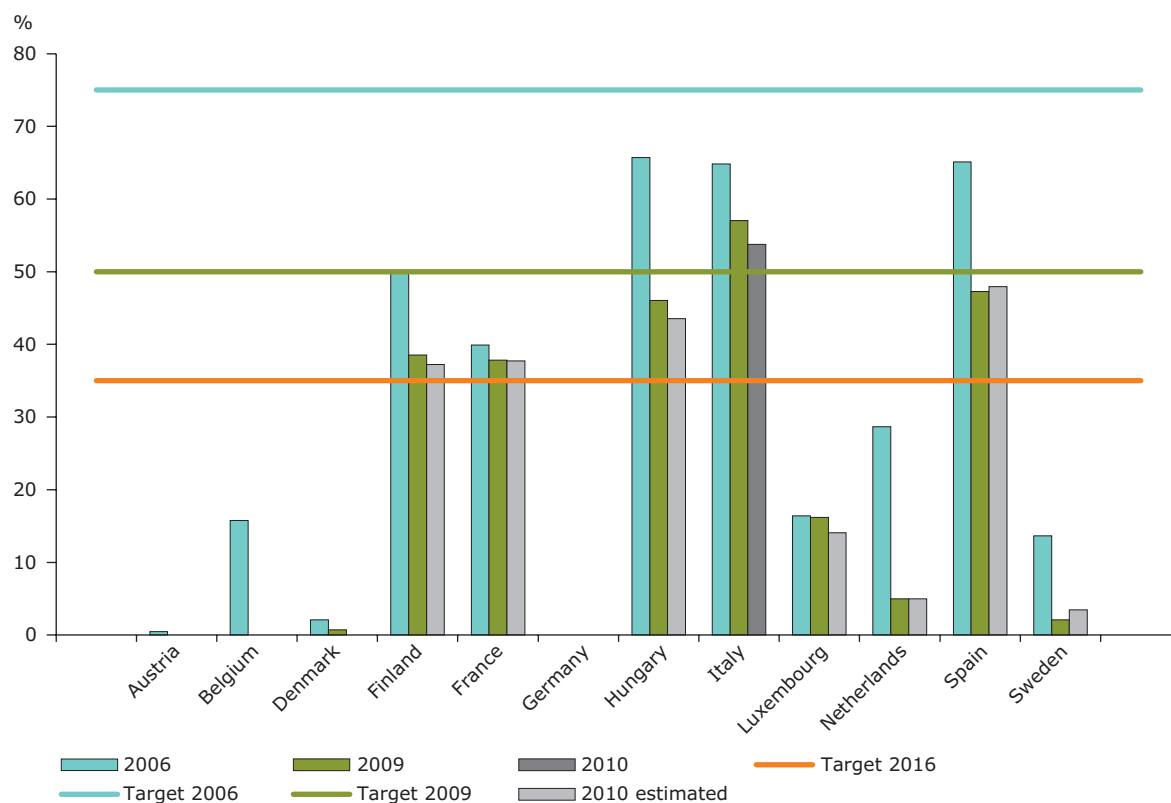
In 2006, all 12 countries without a derogation period fulfilled the target and landfilled less than 75 % of biodegradable municipal waste compared to the generated amount in 1995. In 2009, 11 countries had fulfilled the 50 % target for 2009 with one country falling short of the target (based on estimated data). Seven countries had already achieved the 2016 target of 35 % by 2010.

Seven countries with a derogation period achieved the 2010 target of cutting biodegradable municipal waste landfilling to below 75 % of the amount generated in 1995 and one almost achieved the target, based on estimated data.

The data indicate that more than half of the countries with derogations have been unable to move sufficient biodegradable waste from landfills to recycling or to develop sufficient capacity for incineration with energy recovery. Significant increases in the generation of municipal waste and consequently biodegradable municipal waste in some countries (such as Cyprus, the Czech Republic and Slovakia) are also an important factor, however, as the target relates to absolute amounts of biodegradable municipal waste generated in 1995. According to the 2009 reported data, Estonia and the United Kingdom are the only countries that have already achieved the 2013 target.

⁽⁵⁾ Biodegradable municipal waste means any waste that is capable of undergoing anaerobic or aerobic decomposition. Currently the main environmental threat from biodegradable waste is leaching and production of methane from waste decomposing in landfills. Biodegradable waste is bio-waste as defined above plus paper and cardboard, biodegradable plastic and textile waste.

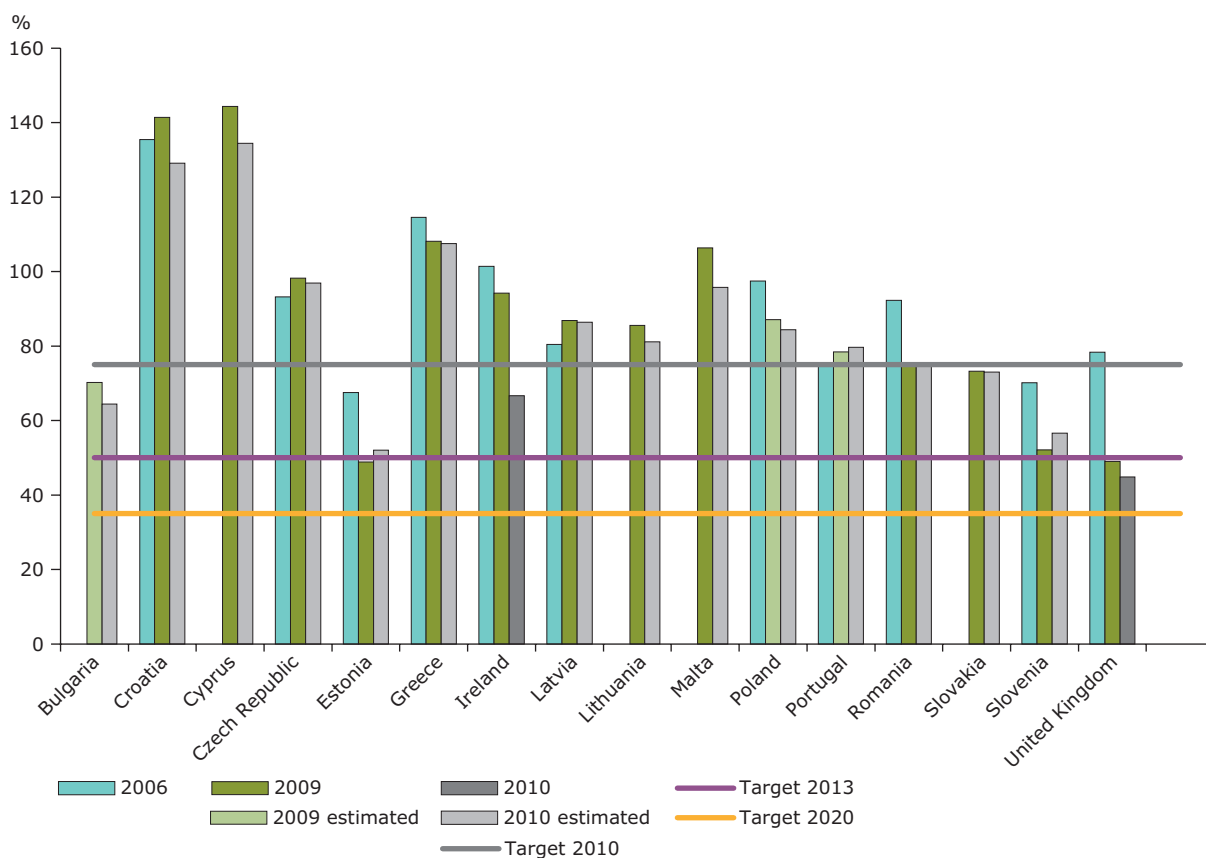
Figure 2.14 Percentage of biodegradable municipal waste landfilled in 2006, 2009 and 2010 compared with the amount generated in 1995 – countries without derogation periods



Note: 2010 data are estimated for all countries but Italy.

Source: Data provided by EU Member States to the European Commission (EC, 2012a), ETC/SCP (2013d) and ETC/SCP estimates.

Figure 2.15 Percentage of biodegradable municipal waste landfilled in 2006, 2009 and 2010 compared with the amount generated in 1995 – countries with derogation periods



Note: 2009 data are estimated for Bulgaria, Poland and Portugal. The 2010 data are estimated for all countries but Ireland and United Kingdom. Diverting derogations: Ireland: derogation only for the 2006 and 2009 targets, to be met 2010 and 2013. Portugal: derogation only for the 2009 and 2016 targets, to be met in 2013 and 2020. Slovenia: derogation only for the 2016 target, to be met by 2020. Croatia must meet the targets by 2013, 2016 and 2020.

Source: Data provided by EU Member States to the European Commission (EC, 2012a), ETC/SCP estimates (2013c, 2013g).

Overall, although eight of the countries with a derogation period seem to have problems fulfilling the 2010 target, the trend of diverting biodegradable municipal waste from landfill in the rest of the countries appears to be on track. Countries that a decade ago still heavily relied on landfilling of municipal waste, like Estonia, Hungary, Ireland, Italy, Poland, Portugal, Spain and United Kingdom, have cut the percentage of biodegradable municipal waste landfilled markedly during the last four years.

The Landfill Directive's differentiated, incremental approach to target-setting, including long-term and intermediate targets, seems to be a valuable template for future EU initiatives. It has enabled biodegradable municipal waste landfill diversion to be planned in a gradual fashion, allowing improved waste management systems to be developed (EEA, 2009).

2.3.3 The relationship between landfill tax, landfilling and recycling levels of municipal waste

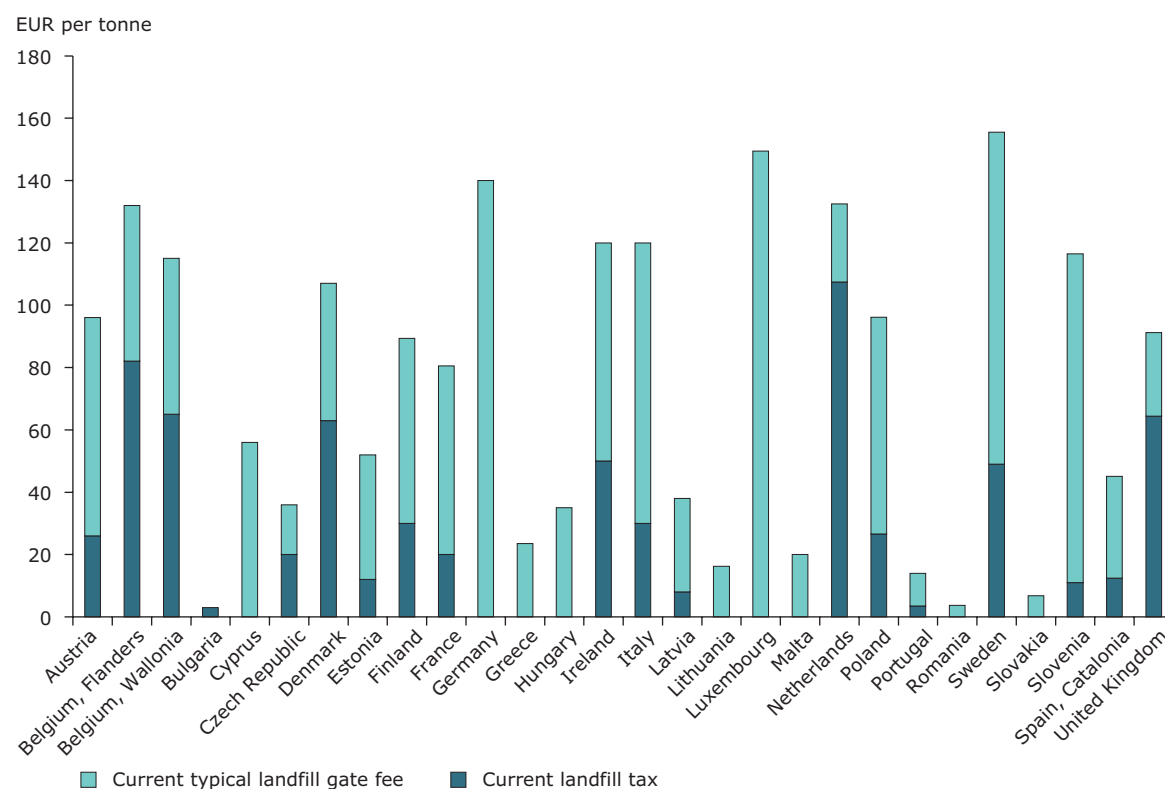
Twenty European countries (or regions within the countries) have introduced a tax on waste sent to

landfills, although, partly due to the decreasing revenue accrued, the Ministry of Finance in the Netherlands decided to eliminate its landfill tax from January 2012.

The majority of countries have a tax level for municipal waste landfilling exceeding EUR 30 per tonne of waste. Many countries are increasing the tax rate, however, so that it is already or will soon be between EUR 50 and EUR 70 per tonne (ETC/SCP, 2012b).

Analysing the relationship between the annual landfill tax increase in percentage point in the 20 countries and the amount of municipal waste going to landfill in the period 2001–2010 reveals only a very weak correlation ($R^2 = 0.37$). This should not necessarily be seen as an indication that landfill taxes are ineffective, however, because the total charge for landfilling a tonne of waste is determined not only by the landfill tax but also the gate fee. Gate fees vary enormously between Member States as demonstrated in a recent study for the European Commission (Bio Intelligence Service, 2012) (Figure 2.16).

Figure 2.16 Typical charge (gate fee and landfill tax) for legal landfilling of non-hazardous municipal waste in EU Member States and regions



Note: Taxes and fees may have changed since the publication of the report in April 2012.

Source: Bio Intelligence Service, 2012.

Other factors also play an important role in shaping waste management decisions. For example, landfill taxes often complement other policy measures such as bans on landfilling biodegradable municipal waste or non-pretreated municipal waste, mandatory separate collection schemes for recycling of municipal waste types, or economic support to build up recycling infrastructure. Germany has managed to achieve one of the highest recycling rates of municipal waste in Europe without using a landfill tax but with a combination of other instruments.

While acknowledging the difficulties disaggregating the impacts of landfill taxation from the effects of bans and other policy measures, the European Commission study does identify 'a clear correlation between the total cost of landfilling and the percentage of municipal waste recycled and composted in the Member States; the higher the cost of landfilling, the more municipal waste is pushed up the waste hierarchy towards treatment via recycling and composting'. Moreover, 'Member States appear much more likely to meet a 50 % recycling target once landfill charges (or the cost of the cheapest disposal option) approach EUR 100 per tonne. Such charges will tend to drive the economics of recycling and composting (which are dominated by the avoided costs of residual waste management)' (Bio Intelligence Service, 2012).

Landfill taxes can, therefore, in combination with other instruments, play an important role in incentivising a shift up the waste hierarchy and generate revenues for building up recycling infrastructure.

2.4 Outlook for recycling 50 % of municipal waste by 2020

How much municipal waste will European countries recycle in 2020 if today's waste management trends are sustained in the foreseeable future? This issue was specifically addressed in the 32 country-level ex-post analyses of municipal waste management that underpin the present cross-country analysis ⁽⁶⁾.

Three scenarios were calculated for each country studied. Simple linear trends were calculated

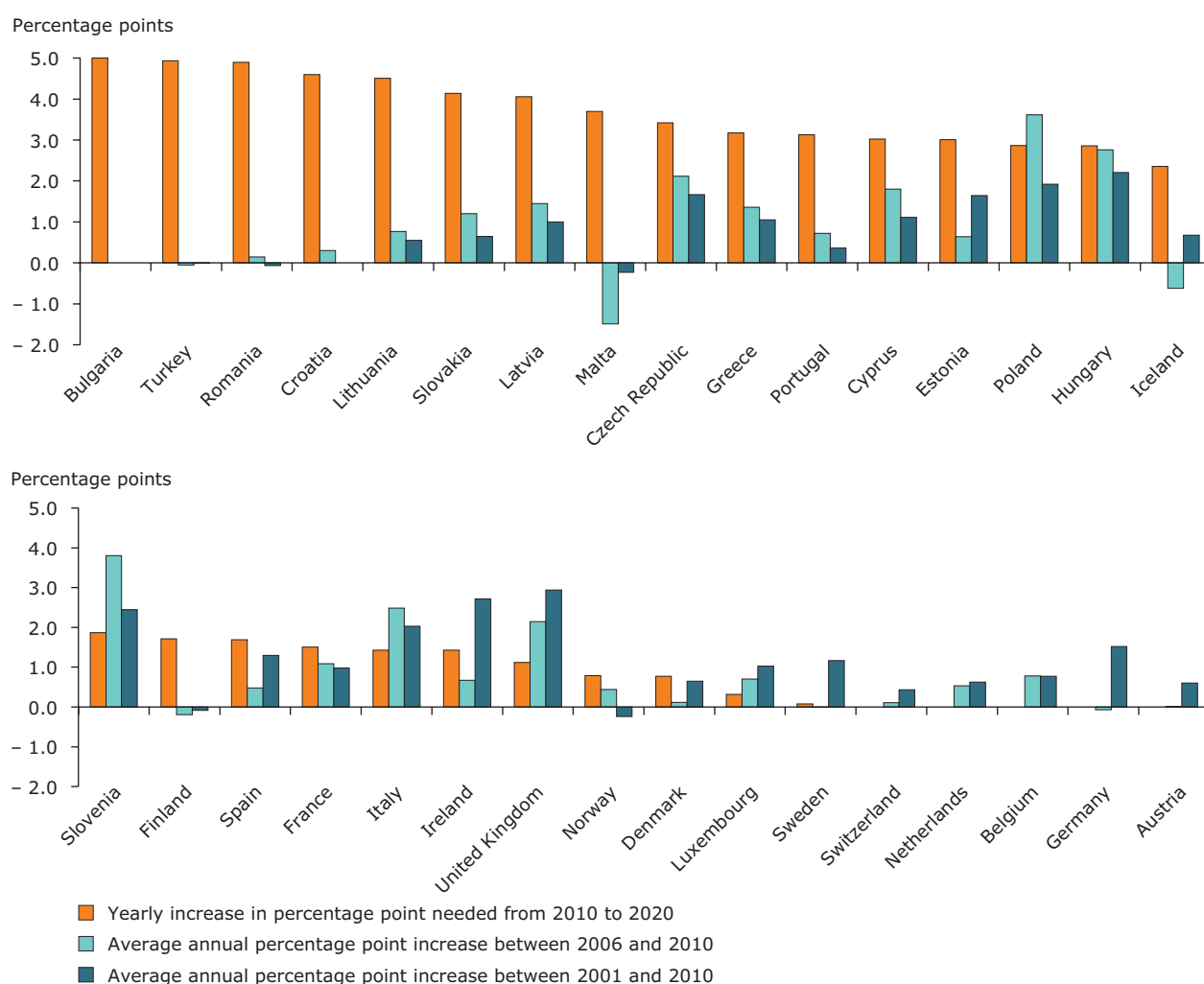
for the recycling rates from the years 2001–2006, 2006–2010 and 2001–2010, and used to project recycling rates in 2020. All projections start from the latest reported data in 2010 and the results are shown in the individual country reports. These three scenarios are very simplistic and do not take into account planned policy measures. They should therefore be interpreted extremely carefully – merely serving as an 'early warning' providing an approximate indication of the distance to the recycling targets and the risks of non-compliance.

Figure 2.17 presents the yearly average percentage point increase in recycling rates required by each country between 2010 and 2020 to reach the 50 % target, alongside the rates achieved in 2001–2006 and 2001–2010. As shown in Figure 2.17:

- Five countries (Austria, Belgium, Germany, the Netherlands and Switzerland) have already reached the 50 % recycling target.
- Six countries (Ireland, Italy, Luxembourg, Slovenia, Sweden and United Kingdom) will achieve the 50 % by 2020 if they can maintain the annual rate of increase in recycling that they recorded in 2001–2010.
- The remaining 21 countries all need to accelerate the shift to recycling because the annual rate of increase achieved in the years 2001–2010 is insufficient to achieve 50 % recycling by 2020.
- Two countries (Denmark and Norway) need to accelerate only slightly to a rate just below 1 percentage point annually.
- Three countries (Finland, France and Spain) will need to accelerate to an annual increase of between one to two percentage points.
- Nine countries (Cyprus, Czech Republic, Estonia, Greece, Hungary, Iceland, Malta, Poland and Portugal) will need an annual increase rate between two and four percentage points to achieve 50 % recycling in 2020. This annual rate of increase in recycling has historically only been achieved by five European countries in the period 2001–2010 and by six European countries in the period 2006–2010.

⁽⁶⁾ The country papers are available at <http://www.eea.europa.eu/publications/managing-municipal-solid-waste>.

Figure 2.17 Average annual percentage point increase needed in 32 European countries to reach 50 % recycling by 2020 and past rates achieved



Note: Iceland: 2008 data used for 2010. Slovenia: 2002 data used for 2001 and 2009 data used for 2010. Croatia: only data for 2007–2010 included. According to Eurostat the comparability of the data over time is high. However, some breaks in the time series are documented, which can influence the comparability between countries and within a country. Generally, the quality of the data has improved during the period 2001–2010. The 2001–2010 trends are therefore less reliable than the 2006–2010 trends, and in some cases, trends might rather reflect changes in data collection than change in waste management.

Source: Eurostat, 2012a, 2012c; ETC/SCP, 2013a, 2013b, 2013d, 2013e, 2013f.

- Six countries (Bulgaria, Croatia, Latvia, Lithuania, Romania and Slovakia) require an annual rate of increase of between four and five percentage points. Such an increase rate has not

been achieved by any European country in the periods 2001–2010 or 2006–2010. Turkey is in this group as well but has no legal obligation to meet the target.

Altogether, Figure 2.17 indicates that, despite the fact that many countries have improved their municipal waste recycling rates between 2001 and 2010, including many of the countries that entered the EU in 2004, most countries will still have to make an extraordinary effort in order to achieve the target of 50 % recycling by 2020.

For this analysis, the recycling rate for municipal waste was calculated as a percentage of municipal waste recycled and composted or digested relative to the total municipal waste generated. Countries may choose among three other methods to calculate the recycling rate in order to document compliance with the legally binding recycling target for municipal waste in the Waste Framework Directive (7). While this might alter the picture for some countries, the above indicator still clearly indicates the extent of the challenge ahead for many.

2.5 Environmental benefits of better municipal waste management

The benefits of shifting municipal waste management up the waste management hierarchy are not limited to more efficient resource use and a reduced waste burden on the natural environment. Better waste management also offers a way to cut greenhouse gas (GHG) emissions.

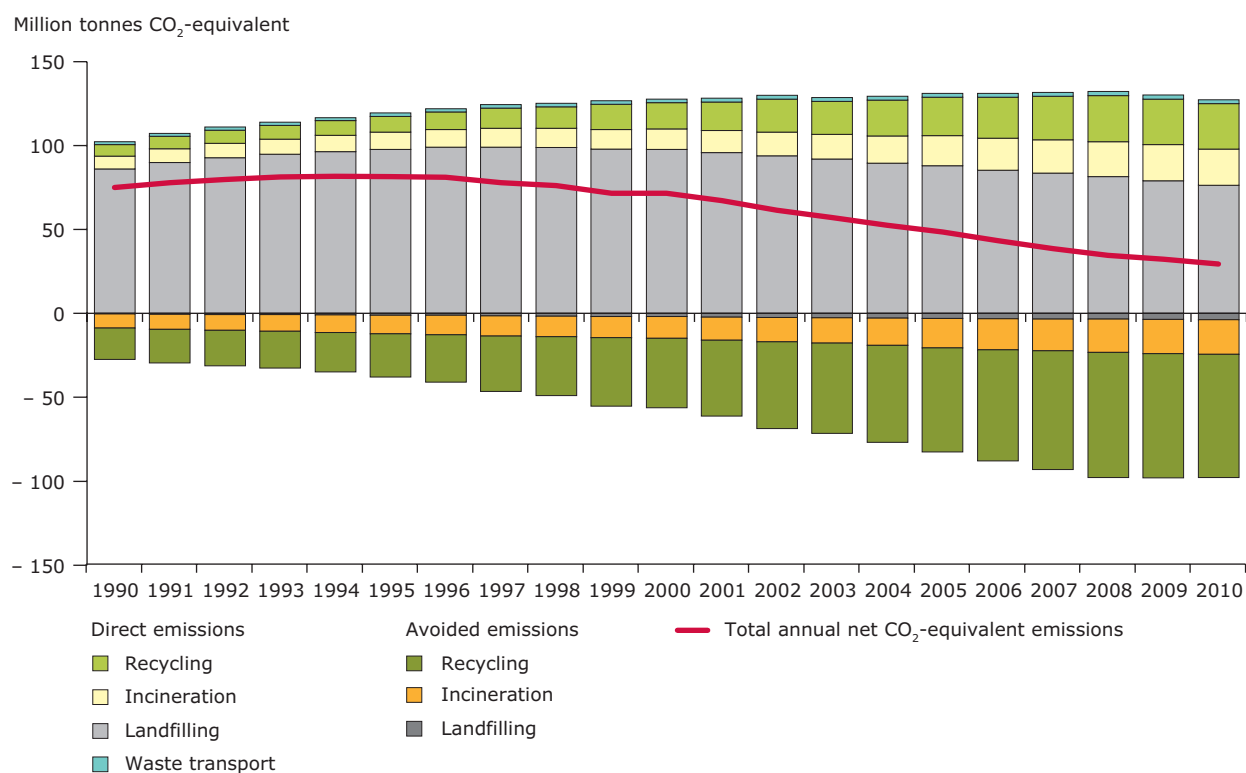
Figure 2.18 shows the direct and avoided life-cycle GHG emissions associated with municipal waste management. In order to see the overall effect of waste management, the avoided emissions (counted as negative values) are plotted with the direct emissions, giving the net greenhouse gas emissions from municipal waste management in European countries (the red line).

Direct emissions are caused by all activities directly involved in the waste management system itself. They include mainly methane emissions from landfills, energy-related GHG emissions from collection and transport of waste, and emissions from waste incineration and recycling plants. Avoided emissions from recycling result from the fact that recycled materials replace virgin materials and thus reduce GHG emissions from primary production. Avoided emissions from incineration and landfilling mean that energy from incinerating municipal waste or landfill gas replaces energy generated from other fossil fuels. Only anthropogenic emissions are included (ETC/SCP, 2011).

Figure 2.18 shows that direct emissions have decreased since 2005, triggered by better waste management. At the same time, more and more emissions were avoided, primarily through recycling and incineration. The benefit from the energy recovery in landfills is much smaller than the corresponding benefit from material recovery. The avoided emissions from recycling constitute almost 75 % of the total avoided emissions. Recycling is the main cause of the rapid decrease in net life-cycle GHG emissions from municipal waste management after the year 2000.

It is important to note that this methodology is incapable of measuring the impacts of waste prevention on full life-cycle GHG emissions of municipal waste as this would require complex modelling of the environmental impacts of the whole production chain of all products ending up as municipal waste. While acknowledging that limitation, Figure 2.18 shows that the shift of municipal waste management up the waste hierarchy cut net emissions from 67 Mt CO₂-equivalent in 2001 to 29 Mt CO₂-equivalent in 2010 — a reduction of over 56 %.

(7) For example, according to the Irish Environmental Protection Agency, Ireland has already met the target, using one of the other calculation methods.

Figure 2.18 GHG emissions from municipal waste management in the EU, Switzerland and Norway


Note: Excluding Cyprus due to lack of data. GHG emissions before 1995 are calculated based on backcasted waste data.

Source: ETC/SCP, based on ETC/SCP (2011, 2012a) and data on composition of the landfilled, incinerated and recycled municipal waste for 2008, 2009 or 2010 as provided by countries to the EEA in 2012.

2.6 Uncertainties in reporting – packaging waste in municipal waste

As noted above in Section 1.2, countries use varying definitions of 'municipal solid waste' and such differences create uncertainties when assessing waste management, especially when comparing national performance. In part, this variation in national approaches may reflect the fact that national municipal waste data were not used for reporting against legally binding waste management targets so far, which implied less attention to ensure methodological consistency across Europe. In part, it also reflects the fact that there are significant overlaps between waste categories, making disaggregation difficult. This is a particular problem when differentiating recycled municipal waste from recycled packaging waste.

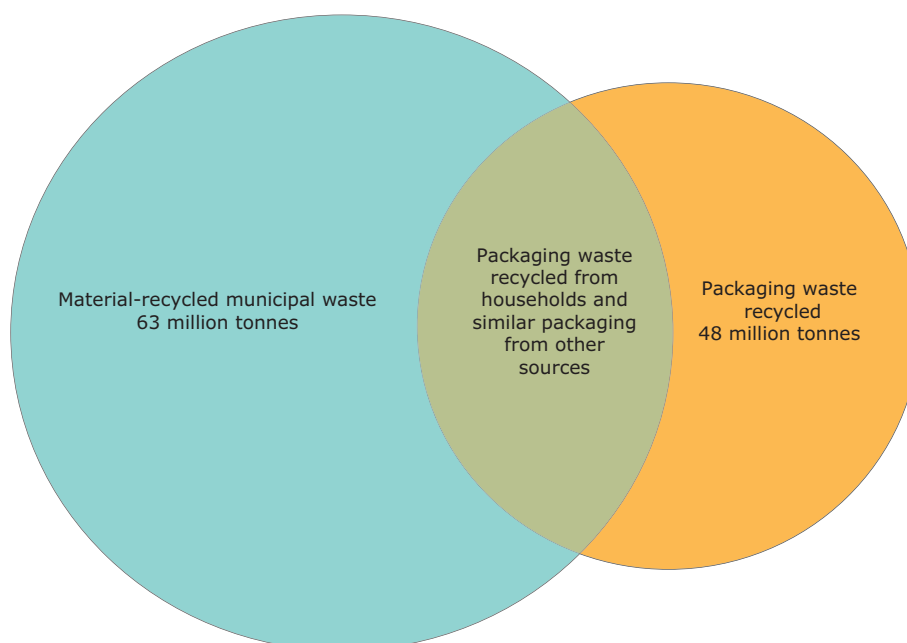
As Figure 2.19 illustrates, the 27 EU Member States reported recycling 63 million tonnes of material derived from municipal waste (glass, paper, metal, plastic, textile, etc.) and 48 million tonnes of packaging waste in 2009. Packaging waste makes up a substantial portion of the total municipal waste that is material recycled, although the precise amount is not known. There are indications that some countries do not include recycled packaging waste from households when reporting on municipal waste.

In order to shed some light on the extent of the differences in national practice in including or excluding packaging waste in reported municipal waste, Figure 2.20 shows the ratio of recycled packaging waste and material-recycled municipal waste in each country. Unless a very large amount of recycled packaging waste is from industrial activities, the amount of material-recycled municipal waste will normally be larger than the total recycled packaging waste because material recycled municipal waste includes all types of wastes, not merely packaging waste.

Figure 2.20 shows that, in 2009, 11 countries reported recycling more packaging waste than material recycling of municipal waste, indicating that these countries may partially or wholly exclude recycled packaging waste from households and similar sources when reporting recycled municipal waste. Eight of those countries reported recycling more than 50 % more packaging waste than material-recycled municipal waste, indicating that they include no or only very small amounts of packaging waste in the reported municipal waste. The majority of these countries are EU Member States that joined the EU in the period 2004–2007.

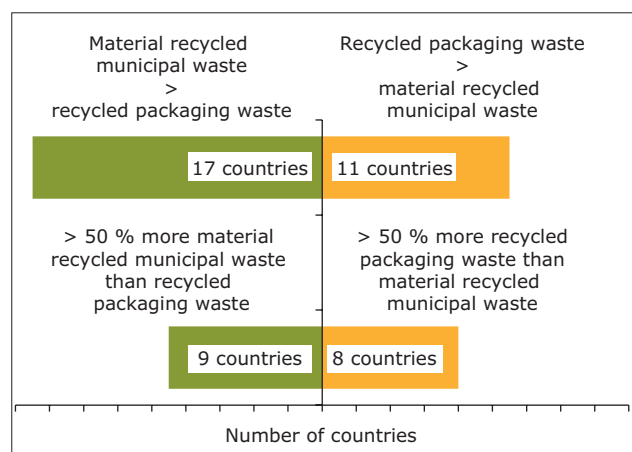
One factor influencing the categorisation of waste can be the presence of producer responsibility

Figure 2.19 Overlap between municipal waste recycling and packaging waste recycling, 2009



Source: Eurostat, 2012c, 2012d; ETC/SCP, 2013d, 2013f.

Figure 2.20 National reporting of the relative level of material-recycled municipal waste and recycled packaging waste (EU-27 and Norway), 2009



Source: Eurostat, 2012a, 2012c, 2012d; ETC/SCP, 2013d, 2013f.

schemes. These can contribute to distortion in reporting of municipal waste in cases where the private operators of the schemes do not report on the respective shares of packaging waste from the different sources.

Excluding packaging waste from households from reporting on municipal waste has significant consequences for the comparability of data on municipal waste generation and recycling rates across Europe. Recycling rates might in fact be higher for some countries than indicated in this report if packaging waste from households were included in the reported municipal waste. For example, Slovakia reported 8 % municipal waste recycling in 2009, excluding packaging waste. If it is assumed that half of the recycled packaging waste in Slovakia is from households then the municipal waste recycling rate increases to 14 %.

In addition to uncertainties resulting from the definition of municipal waste and from including or excluding packaging waste in municipal waste reporting, further differences in national reporting

hamper the comparability across countries, for example:

- allocation of waste streams undergoing waste sorting or mechanical biological treatment (MBT) to the statistical waste management categories is done in different ways;
- several countries have conflicting datasets on municipal waste (for example maintained by statistical offices and by environment ministries);
- data reported at the regional level does not always match nationally reported data.

Taken together, these findings underline the need to harmonise national methodologies on which waste fractions should be included when reporting on municipal waste. Eurostat (2012b) has recommended that packaging waste from households should be covered by municipal waste statistics.

2.7 Important national initiatives to improve municipal waste management

Over the last 20 years, the EU has introduced a large body of waste legislation, including minimum requirements for managing certain waste types. Three targets in particular should have led to a convergence of municipal waste recycling levels across Europe: the Landfill Directive's landfill diversion target for biodegradable municipal waste; the Packaging and Packaging Waste Directive's recycling targets; and the Waste Framework Directive's recycling target for household and similar wastes.

Despite these measures, recycling levels for municipal waste differ enormously between countries. In large part, these differences can be explained by the varying initial municipal waste recycling rates in different countries; the fact that many countries joined the EU (and became subject to its waste management provisions) in 2004 or later; the existence of derogation periods for some countries; and the fact that some frontrunner countries started increasing municipal waste recycling before the introduction of EU policies or went beyond the minimum requirements.

It is also important to stress that formal transposition of EU law into national legislation is seldom sufficient to achieve the minimum target levels required by the different EU directives. In practice, additional national and regional instruments are necessary to achieve targets.

Table 2.2 gives a non-exhaustive overview of policy instruments used in the individual countries in the period 2001–2010. Introduction of producer responsibility has not been included in the overview because it is required under the EU's WEEE Directive and Batteries Directive, and almost all countries have voluntarily introduced producer responsibility for packaging waste.

The same policy instrument can be designed and implemented in many different ways, influencing its effectiveness. Table 2.2 therefore lists some realistic policy options for all countries but also reflects how the instruments are used. For example, only countries that have developed two or more national waste management plans are identified with an 'X', because if only one waste management plan has been developed over a ten year period then it suggests that the instrument is not used very actively. For landfill taxes, both the absolute tax level in 2010 and the increase in landfill tax are used as criteria, with the latter showing a dynamic use of the instrument.

In general, Table 2.2 shows the following:

- Countries using many of the instruments listed in the table have a higher municipal waste recycling rate than countries using very few or no instruments. Among the sixteen countries with the highest municipal waste recycling rates, twelve have used between four and seven of the selected instruments, and four have used between two and three. The ten countries with the lowest municipal waste recycling rates have all used only two or fewer of the selected instruments.
- Countries that have only regional waste management plans generally achieved good municipal waste recycling results.
- Many countries have developed more than two national waste management plans during the

last ten years but the recycling performance differs greatly. This indicates that plans need to be complemented with additional initiatives to establish better recycling infrastructure or divert waste away from landfills.

- In general, countries that have increased their landfill tax by more than 50 % during the last ten years and have introduced a landfill ban on organic waste or non-pre-treated municipal waste have achieved good results. The same applies for countries with a landfill tax at or above EUR 30 per tonne of municipal waste landfilled.
- Countries that have introduced mandatory separate collection of certain municipal waste fractions, e.g. waste paper, in addition to packaging waste, or mandatory separate collection of bio-waste, have high municipal waste recycling levels. This indicates that once countries have set up separate collection schemes for at least paper, metal, plastic and glass by 2015, as required by Article 11 of the 2008 Waste Framework Directive, the recycling rates can be expected to grow significantly in many countries.
- Finally, countries using some economic incentives for households to recycle their waste (for example 'pay-as-you-throw schemes', requiring the payment of fees based on the weight of the residual (not separately collected) waste, the size of the residual waste bin or the frequency of collection) have mostly performed better than countries where waste collection fees are just based on the property value, size of the property, household size or similar.

It would be naïve to claim that if a certain policy instrument results in success in one country, then it can be implemented with similar success in all other countries. The way in which policy instruments are combined may be more relevant than the total number of instruments. However, if no specific instruments or a limited number of specific instruments are used in a country, then there appears to be a substantial risk that the policy landscape will not deliver high municipal waste recycling levels.

Table 2.2 Municipal solid waste (MSW) management and selected policy instruments in European countries, 2001–2010

Country	Percentage of MSW recycled per MSW generated, 2010	Two or more national waste management plans developed between 2001 and 2010	Only regional waste management plans	Landfill tax increased more than 50 % from 2001 to 2010	Landfill tax at least 30 EUR/tonne MSW, 2010	Incineration tax	Landfill ban on organic waste or non-pretreated MSW	Mandatory separate collection of non-packaging waste	Mandatory separate collection of bio-waste fractions	Economic incentives for recycling of MSW (PAYT etc.) (*)	Selected innovative policies
Austria	63 %	X		X	X	X	X	X	X	X	Separate collection of waste paper
Germany	62 %		X				X			X	Introduction of a 'recycling bin' for plastics and metals
Belgium	58 %		X	X	X	X	X	X		X	High household fines for non-compliance in source separation, maximum generation of residual MSW per capita, recycling quality standards
Netherlands	51 %	X		X (abandoned in 2012)	X	X (but zero)	X		X	X	
Switzerland	51 %		X		X	X	X	X		X	
Sweden	49 %			X	X	Until 2010	X	X		X	Separate collection of waste paper
Luxembourg	47 %	X					X		X	X	Design standards for separate collection in new households, one container park per 10 000 inhabitants, 100 % of population covered by separate collection
Denmark	42 %	X			X	X	X	X		X	Separate collection of waste paper
Norway	42 %				X	Until 2010	X	X		X	
United Kingdom	39 %		X	X	X						Landfill allowance trading schemes, where allowances were allocated to each waste disposal authority. To be scrapped in 2013 in England
Ireland	36 %		X	X	X	X			X (retailers, restaurants)	X	
Italy	36 %		X					X	X	X	Maximum generation of residual MSW per capita
France	35 %			X		X	X			X	National extended producer responsibility introduced, e.g. on non-packaging paper, textile and furniture

Table 2.2 Municipal solid waste (MSW) management and selected policy instruments in European countries, 2001–2010 (cont.)

Country	Percentage of MSW recycled per MSW generated, 2010	Two or more national waste management plans developed between 2001 and 2010	Only regional waste management plans	Landfill tax increased more than 50 % from 2001 to 2010	Landfill tax at least 30 EUR/tonne MSW, 2010	Incineration tax	Landfill ban on organic waste or non-pretreated MSW	Mandatory separate collection of non-packaging waste	Mandatory separate collection of bio-waste fractions	Economic incentives for recycling of MSW (PAYT etc.) ^(a)	Selected innovative policies
Spain	33 %	X							X in Catalonia		
Finland	33 %	X		X	X		X	X		X	Separate collection of waste paper
Slovenia	31 %						X			X	
Iceland	26 %										
Hungary	21 %						X			X	
Poland	21 %	X		X			X ^(b)		X ^(c)	X	Government fund co-financing recycling activities
Estonia	20 %	X		X			X			X	
Cyprus	20 %										
Portugal	19 %	X		X		X					
Greece	18 %										
Czech Republic	16 %			X						X	Quality standards on composted bio-waste
Malta	13 %	X									
Latvia	9 %	X		X							
Slovakia	9 %	X								X	
Lithuania	5 %	X								X	
Croatia	4 %										Government fund co-financing recycling activities
Romania	1 %										
Turkey	1 %										
Bulgaria	0 %	X									

Note: ^(a) Considers economic incentives for households to recycle their waste (for example Pay-as-you throw schemes such as fees after weight, size, collection frequency other than just paying collection fee on the basis of property value, area of the property, household size or similar).

^(b) Into force on 1 January 2013 and covers bio-waste collected separately.

^(c) Into force on 1 January 2012.

Source: Country reports (<http://www.eea.europa.eu/publications/managing-municipal-solid-waste>).

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