European Environment Agency

Municipal waste management in Norway

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Context
The Topic Centre has prepared this working paper for the European Environment Agency (EEA) under its 2012 work programme as a contribution to the EEA's work on waste implementation.

Contents

Highlights

- The overall treatment of MSW in Norway is dominated by incineration (50 %) and recycling (42 %)
- Regional waste policies have mainly influenced recycling of organic waste
- If Norway would continue to increase MSW recycling at the same pace as in the period 2006-2010,, the country would reach 46 % recycling in 2020, which is slightly under the 50 % target set in the EU legislation. Norway will have to increase its efforts to reach the 50 % recycling since Norway has had a very low yearly increase rate of 0.4 percentage points of recycling in the period from 2006 to 2010
- The landfill ban in 2009 seems to have reduced landfilling significantly in the last years. In 2010 only 6 % of the generated MSW was landfilled.

1 Introduction

1.1 Objective

Based on historical MSW data for Norway and EU targets linked to MSW the analysis undertaken includes:

- The historical performance on MSW management based on a set of indicators;
- Uncertainties that might explain differences between the countries' performance which are more linked to differences of what the reporting includes than differences in management performance;
- Relation of the indicators to the most important initiatives taken to improve MSW management in the country; and
- Assessments of the future possible trends and achieving of the future EU targets on MSW by 2020.

2 Norway's MSW management performance

Norway is not a member of EU. However, Norway is an EFTA member and has signed the agreement on the European Economic Area. Norway has through this agreement to implement the directives in the environment area (OECD, 2011).

Norway has the greatest length of any European country with a total of 1 752 km. Norway also only has a population of 5 million, so the challenges for waste management in such a large country with a relatively small and dispersed population are high.

The first unified law concerning pollution and waste was the Pollution Control Act of 1981. It contained the basic legal framework for waste and waste management (ETC/SCP, 2009).

The Norwegian Government produces a White Paper on the environment almost every second year. A White Paper is a report on the state of the environment including a discussion on the government's future policy in this particular field. The latest White paper including waste is from 2006-2007. The White Paper outlines the national waste targets and the instruments needed to reach them. This is an analogue to a national waste management plan, apart from the fact that it does not have a legal reference (ETC/SCP, 2009).

A new regulation which came into force on 1 July 2004 changed the responsibility of the municipalities. Previously, the municipalities had the responsibility for household waste and household-like waste from the enterprises. Under the new regulation, the municipalities are responsible only for household waste (Naturvårdsverket, 2008; Avfallsforskriften, 2004).

The amount of municipal waste has been steadily increasing from 2001 to 2010. In 2010, the amount was 2 295 000 tonnes equal to an increase of 41 % from 2001. The amount peaked in 2008 with 2 324 000 tonnes.

2.1 MSW Indicators

The overall treatment of MSW in Norway is split between incineration and recycling. In 2010, incineration made up to 50 % or 1 154 000 tonnes and recycling 42 % or 967 000 tonnes. Landfilling was only 6 % or 137 000 tonnes in 2010. Landfilling has decreased in recent years whereas incineration has increased (SSB, 2012 a). Norway exports a large amount of its waste to be incinerated in Sweden (1 080 000 tonnes in 2010 (Naturvårdsverket, 2012)).

Figure 2.0 MSW generation per capita in Norway

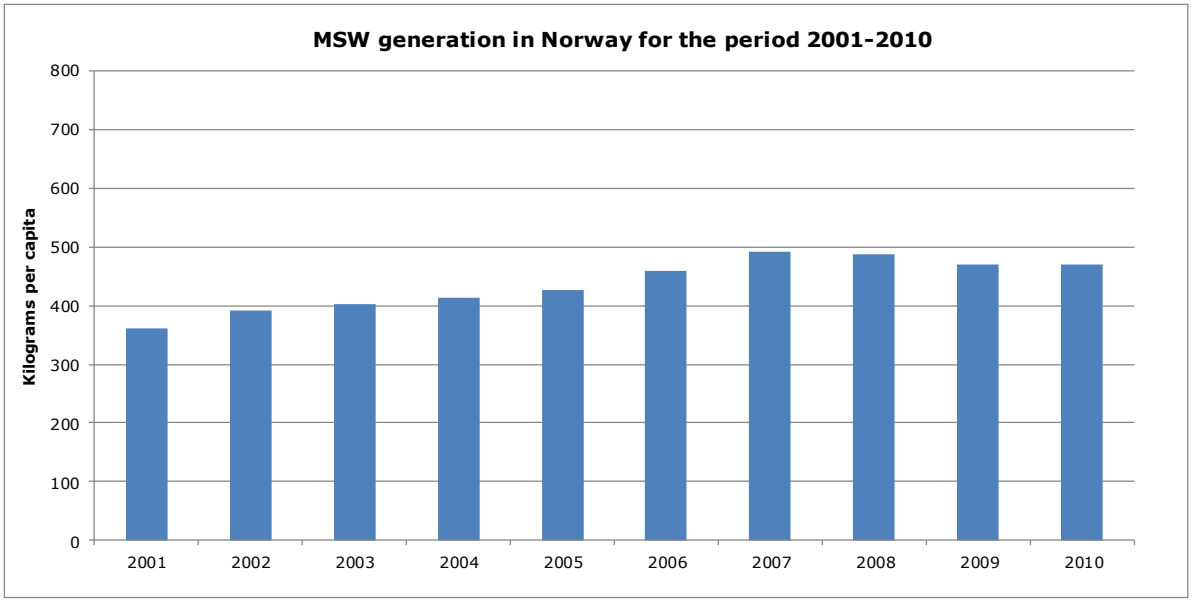


Figure 2.0 shows the development of MSW generation per capita in Norway from 2001 to 2010. There has been an increase until 2007 where the MSW per capita topped with 491 kg/capita. From 2007 to 2010 the amount has slightly decreased to 469 kg/capita in 2010.

2.1.1 The recycling of MSW from 2001 to 2010

Figure 2.1 shows the development of recycling of MSW in Norway related to total recycling, material recycling and organic recycling (compost and other biological treatment).

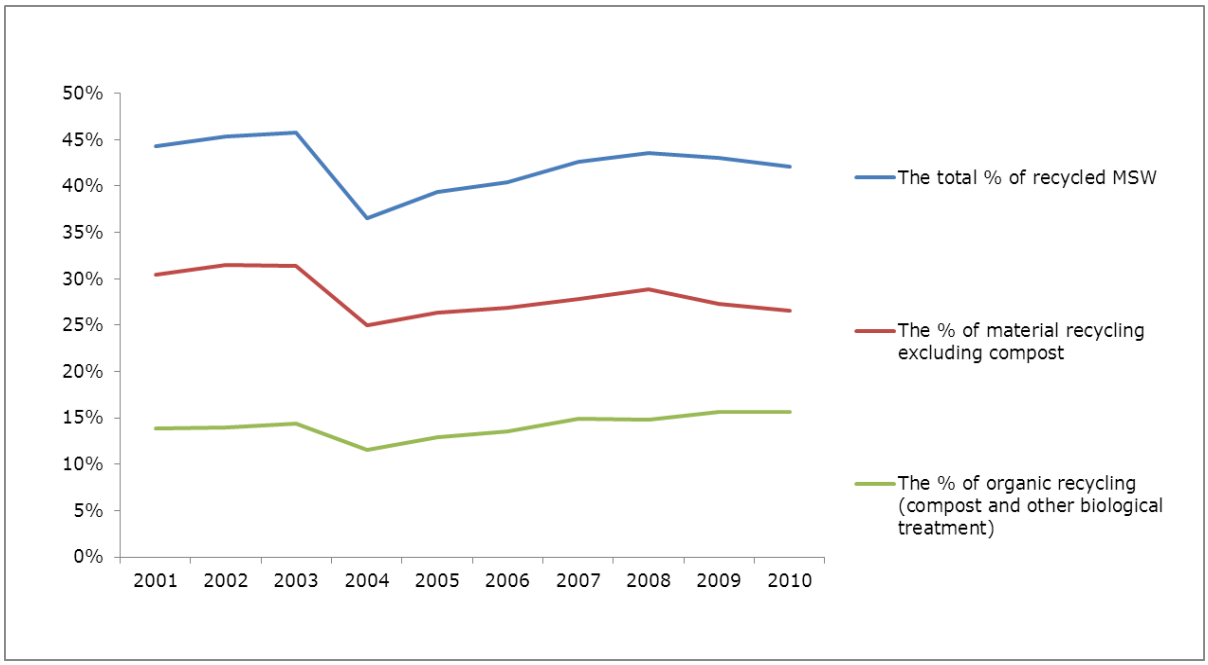
Figure 2.1 demonstrates a drop in recycling in 2004. The amount of waste recycled decreased by 145 000 tonnes from 2003 to 2004. This may be due to the new regulation of 1 July 2004 which changed the responsibility of the municipalities, as stated above (Naturvårdsverket, 2008; Avfallsforskriften, 2004). The municipalities have also had to compete with private companies for collection of household-like waste from enterprises (Naturvårdsverket 2008). This may have resulted in that the municipalities collected less recyclables from enterprises, and therefore less waste was counted as recyclable municipal waste. As a result, it is not reasonable to compare the data before 2004 with the data after 2004.

The total material recycling has increased from 37 % to 42 % between 2004 and 2010, peaking in 2008 with 44 %.

The total increase of recycling is first of all linked to organic recycling which has increased from 12 % in 2004 to 16 % in 2010, or in absolute amounts from 220 000 tonnes to 358 000 tonnes.

Material recycling has only increased from 25 % to 27 % in the same period equivalent to an increase from 475 000 tonnes to 609 000 tonnes. In other words, there is room for improving both material and organic recycling.

Figure 2.1 Recycling of MSW in Norway



Source: Eurostat, 2012. The percentages are calculated as % of generated MSW.

The amount of municipal waste consists of household waste and household-like waste collected from enterprises by the municipalities. The amount of household waste was 2 088 000 tonnes in 2010 (SSB, 2012a) that leaves 236 000 tonnes to be collected from small enterprises.

Table 2.1 Separate collected household waste (1000 tonnes) in Norway (data source SSB 2012 and SSB 2005)

	2004	2005	2008	2010
Paper, paper packaging	271	299	335	295
Glass	41	44	49	51
Plastic	8	9	18	25
Metal	53	54	64	68
WEEE	31	39	50	42
Green kitchen waste	156	152	172	172
Wood	113	129	176	191
Garden waste	110	112	140	163
Textiles	9	11	13	14
Hazardous waste	16	23	27	32
Others	45	35	45	58
Total	854	906	1 088	1 110

Table 2.1 illustrates that the amount of separately collected waste from households increased by 23 % from 2004 to 2010. The separate collection rate was 53 % for household waste in 2010.

It has to be stressed that the amount collected separately is not equal to the amount recycled as some of the waste fractions, e.g. hazardous waste, is not collected for recycling.

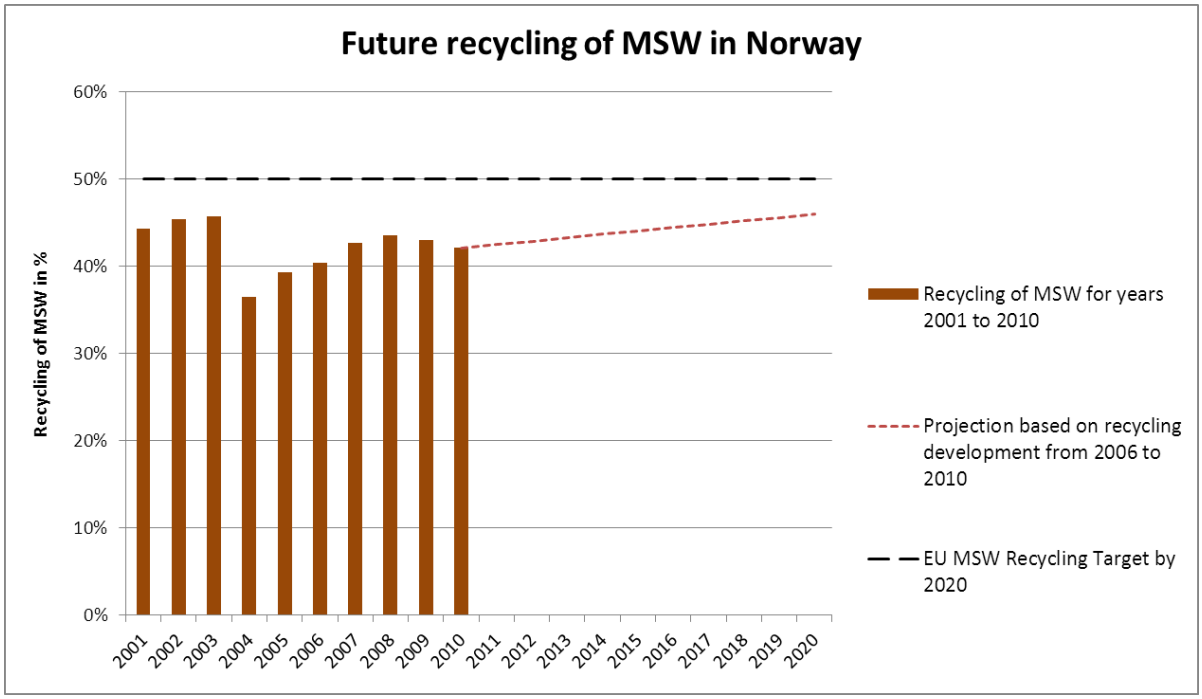
The amount of separately collected organic waste (green kitchen waste, wood and garden waste) has increased significantly from 2000 to 2010. The separate collection of plastic has increased by 500 % from 2000 to 2010, however from a very low level.

2.1.2 The yearly increase rate of recycling of MSW

In order to assess the prospects for Norway to meet the 50 % recycling target as required by the Waste Framework Directive (2008/98/EC)1, three scenarios have been calculated. The scenarios assume that recycling in the period 2010 to 2020 develops, based on a linear regression, with the increase rates of recycling in the periods 2001-2005, 2006-2010 and 2001-2010, respectively.

As explained above, the scope of municipal waste changed in 2004. Therefore, it only makes sense to assess the data from 2004 and beyond. Figure 2.2 highlights the fact that Norway would not be able to fulfil its recycling target of 50 % by 2020 if the recycling trend of 2006 to 2010 continues. Since Norway has had a very low yearly increase rate of 0.4 % in the period from 2006 to 2010, it will require a larger effort to reach the 50 % recycling level by 2020.

Figure 2.2 Future recycling of MSW in Norway



Source: Calculation done by Copenhagen Resource Institute (CRI) based on Eurostat, 2012

Please note that this scenario is very simplistic and do not take into account any planned policy measures. In addition, it is based on one calculation methodology for recycling of municipal waste (MSW recycled/MSW generated, using data reported to Eurostat) whereas countries may choose to use another methodology to calculate compliance with the 50 % recycling target of the Waste

[1] EU's updated Waste Framework Directive from 2008 (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 MSW as reported to Eurostat (EC, 2011).

Framework Directive. The scenario in Figure 2.2 should therefore be interpreted only as to give some rough indications and assessment of the risk of missing the target.

2.1.3 Landfilling of biodegradable municipal waste

Norway has implemented the EU Landfill Directive as part of the European Economic Area agreement (Affallsforskriften 2004 chapter 9). However, there is no data available for Norway on landfilling of biodegradable MSW.

There is a very low amount of MSW landfilled in Norway (6 % in 2010) (Figure 2.5), and a landfill ban was introduced in 2009 (ETC/SCP, 2009).

2.1.4 Regional differences of MSW recycling from 2001 to 2010

Norway has also reported regional recycling data of MSW to Eurostat. Figure 2.4 shows regional differences in MSW recycling in 2009 in relation to total recycling, material recycling and organic recycling. Three different regions have been chosen for each type of recycling:

1. Recycling in the region with the highest generated total amount of MSW in 2009;
2. Recycling in the region with the lowest percentage of recycling in 2009 and
3. Recycling in the region with the highest percentage of recycling in 2009.

This applies to the regions of Oslo and Akershus (which covers the capital region), the Hedmark and Oppland region (situated North of Oslo), the Trøndelag region (situated in the middle of Norway), and the Nord Norge (the Northern part of Norway).

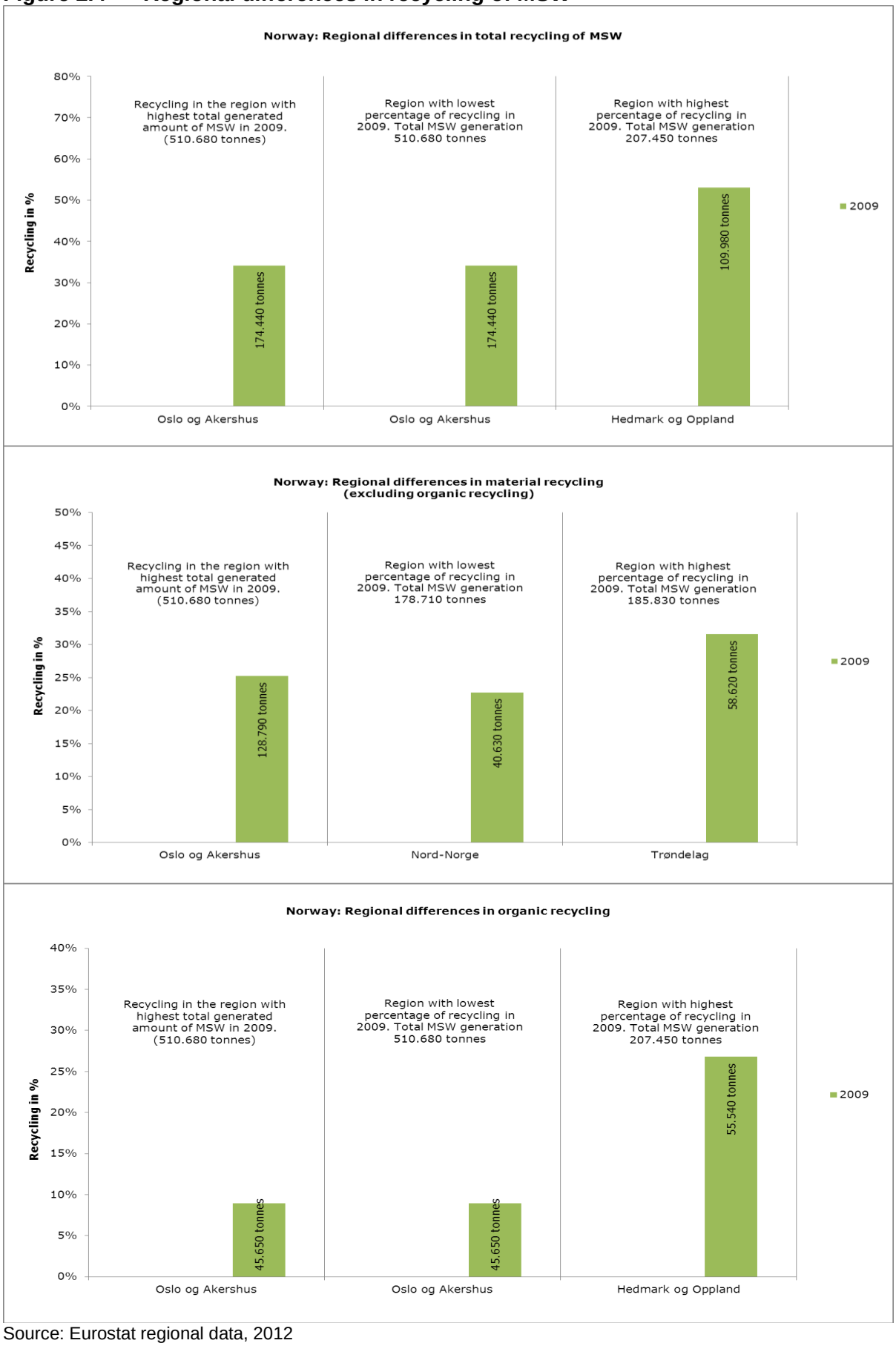
First of all, the large differences for total recycling of MSW seem to be mainly linked to differences in recycling of organic MSW. Oslo and Akershus have the lowest total recycling (34 %) and Hedmark and Oppland the highest (53 %).

The same trend applies to organic recycling which is 9 % in Oslo and Akershus and 27 % in Hedmark and Oppland. The differences might be explained by the accessibility to kerbside collection of green kitchen waste. In Oslo and Akershus only 30 % and 26 %, respectively, of citizens are offered kerbside collection. In Hedmark and Oppland the percentage covered by separate collection is 64 % and 90 % respectively (SSB, 2012c).

Material recycling varies from 23 % in Nord-Norge to 32 % in Trøndelag. The northern part of Norway is sparsely populated and infrastructure for recycling may be more difficult and costly in this area.

Norway is a country with a small population but it has a large geographical area with many smaller communities. It seems that the regional waste policies do not have a large effect on material recycling of MSW but first of all on organic recycling.

Figure 2.4 Regional differences in recycling of MSW



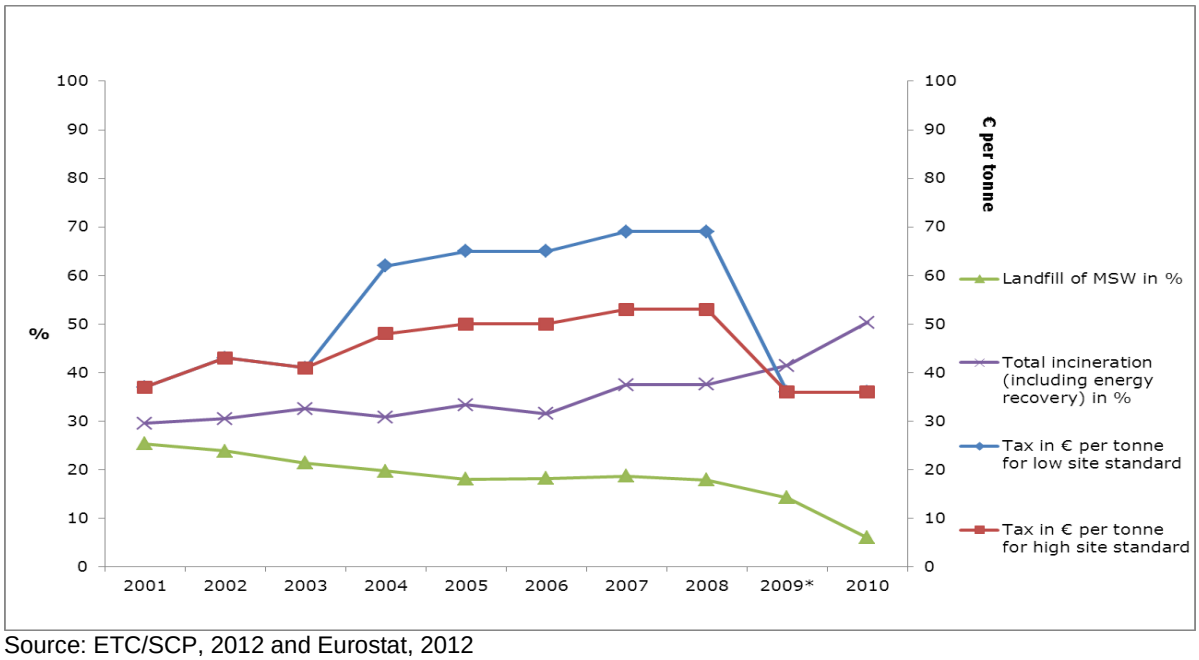
Source: Eurostat regional data, 2012

2.1.5 The relation between landfill tax level and recycling level of MSW

The landfill waste tax in Norway was introduced in 1999 in order to help reduce the amount of waste landfilled. Since July 2003, landfill tax rates have been differentiated according to the environmental standard of the landfill site to which the waste is delivered. The higher rate has been applied to sites not fulfilling the requirements with regard to site linings. Landfills that did not meet the new requirements were to close down by 16 July 2009. Since then all the landfills are classified as high standard sites. However, a few landfills have received short-term exemptions to the new requirements (ETC/SCP, 2012).

The rate of landfilling has decreased from 25 % in 2001 to 6 % in 2010 (Figure 2.5). Less waste is being landfilled, but not only due to the landfill tax (ETC/SCP 2012). The main decrease from 14 % in 2009 to 6 % in 2010 seems to be linked to the introduction of a landfill ban on biodegradable waste with total organic carbon > 10 % or organic matter >20 % (SSB, 2012 a).

Figure 2.5 Development of landfilling and incineration of MSW and landfill tax in Norway



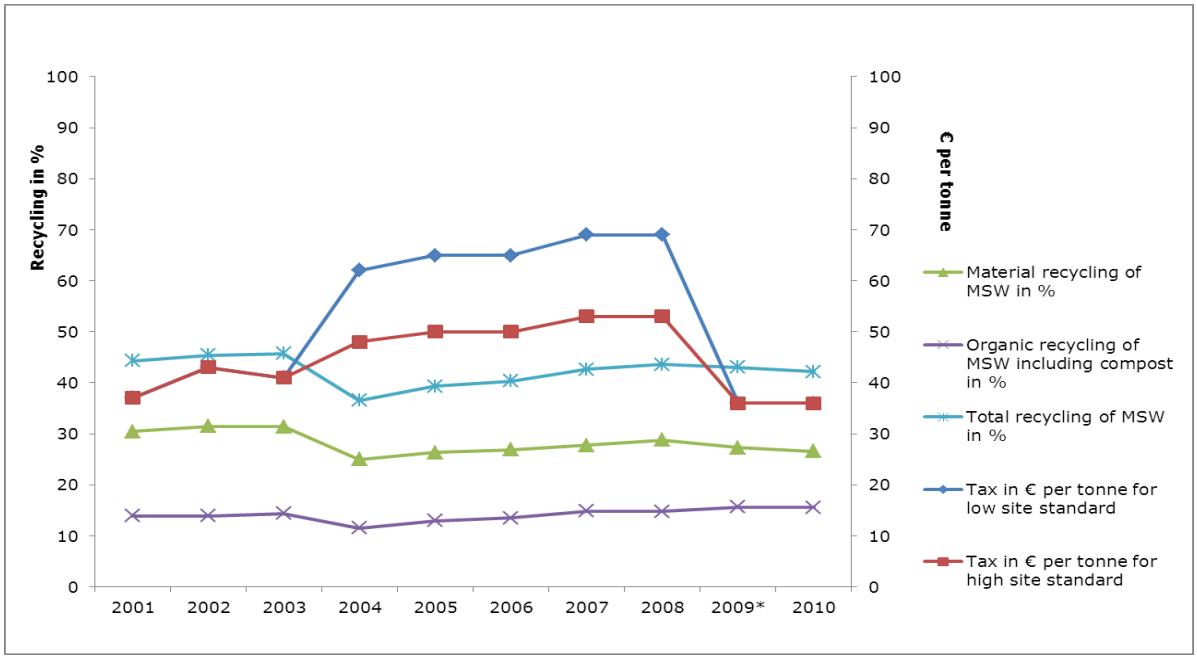
Source: ETC/SCP, 2012 and Eurostat, 2012

*2009 ban on biodegradable waste with (total organic carbon) TOC > 10 % or organic matter > 20 %

The landfill tax seems to have had some impact on the incineration of MSW. The incinerated amount of MSW increased from 30 % to 50 % from 2001 to 2010. However, it appears from Figure 2.6 that the effect of the landfill tax for MSW on recycling is quite low.

In addition to the landfill tax, Norway also has had a tax on incineration of waste. The tax was introduced in 1999 and abolished on 1 October 2010 (ETC/SCP, 2012). The reason for abolishment was mainly due to the fact that Sweden abolished its incineration tax, which created an unfair competition for the Norwegian incineration plants (Klima og Forurensningsdirektoratet, 2012). The introduction of the landfill ban in 2009 combined with no incineration tax from 2010 seems to have increased the amount of waste incinerated.

Figure 2.6 Development of MSW recycling and landfill tax in Norway



Source: ETC/SCP, 2012 and Eurostat, 2012

*2009 ban on biodegradable waste with TOC (total organic carbon) > 10 % or organic matter > 20 %

2.1.6 Environmental benefits of better MSW management

Figure 2.7 shows the development of GHG emissions from MSW management, calculated by using a life-cycle approach. The graph shows the direct emissions, the avoided emissions and the net emissions of the MSW management.

Figure 2.7 indicates a steady increase of direct emissions from landfilling up until 1997, and that emission levels have since decreased. These levels of direct emissions from landfilling will also remain significant for years to come due to the fact that recently landfilled BMW (e.g. five years ago) will continue to emit considerable amounts of greenhouse gases.

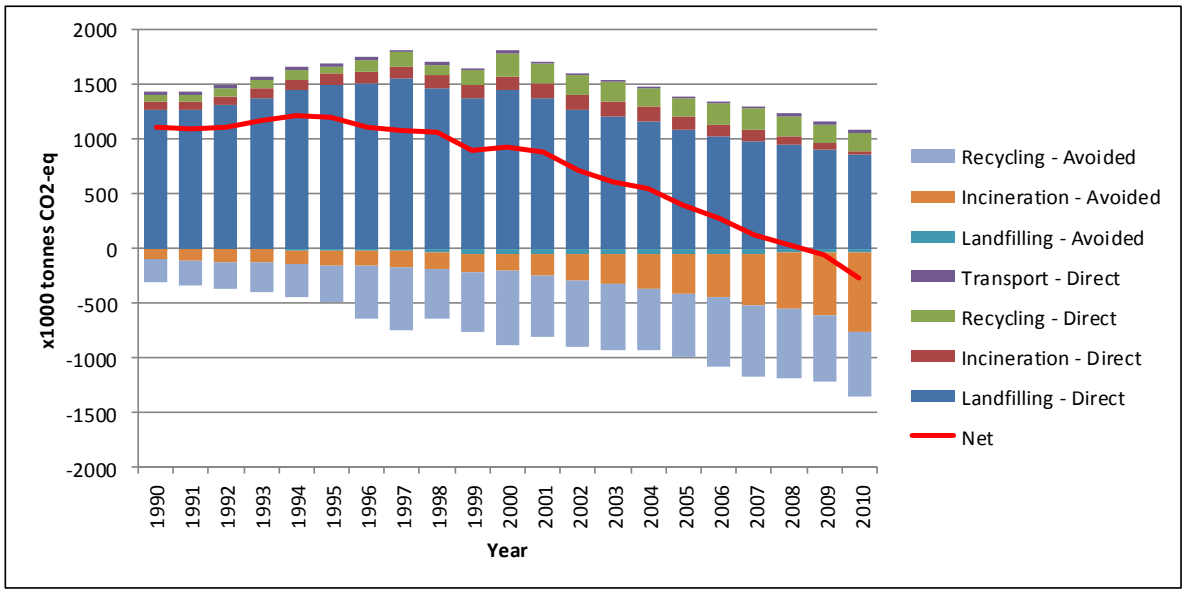
The net emissions from the MSW management have decreased from 1 114 000 tonnes CO_2-eq in 1990 to a benefit of 271 000 tonnes CO_2-eq in 2010, mainly due to the decrease of direct emissions from landfilling, an increase of avoided emissions from recycling and an increase in avoided energy production due to waste incineration. This is because products based on virgin material mostly generate more emissions than those which are based on recyclables, and because energy from waste incineration emits less CO_2 compared to conventional energy production, based on fossil fuels. This positive impact can already be recognised in Figure 2.7 in the period between 1997 and 2010.

Assumptions concerning the production of Figure 2.7

All the GHG emissions (positive values) represent the direct operating emissions for each waste management option. These direct operating emissions have been calculated with the use of the IPCC (IPCC, 2006) methodology for landfills and life cycle modelling for the other technologies (incineration, recycling, biotreatment and transport).

For the indirect avoided emissions (negative values), the calculations integrate the benefits associated with the recovery of energy (heat and electricity generated by incinerators, electricity generated by the combustion of landfill gas or methane from anaerobic digestion). Other avoided emissions include the benefits of recycling of food and garden waste, paper, glass, metals, plastics, textiles and wood in the municipal solid waste. Recycling is here assumed to include material recycling and biotreatment. Avoided emissions of biotreatment includes fertilizer substitution. All processes generating electricity are assumed to substitute electricity mix of Norway in 2009. Processes generating heat are assumed to substitute average heat mix for the EU-25 in 2002. The electricity mix and heat mix are assumed to remain constant throughout the whole time series. The compositions of the MSW disposed in landfills, incinerated or recycled respectively are based on ETC/SCP (2011). In an Eionet consultation process, initiated by the EEA in 2012, Norway updated the compositions of the landfilled, incinerated and recycled MSW for 2010. The complete methodology is available from ETC/SCP (2011).

Figure 2.7 GHG emissions from MSW management in Norway



Note: Results presented in this figure should not be used for the compilation of GHG reporting (national inventory report of the IPCC) or compared with IPCC figures, as the methodology employed here relies on life cycle thinking and, by definition, differs from the IPCC methodology.

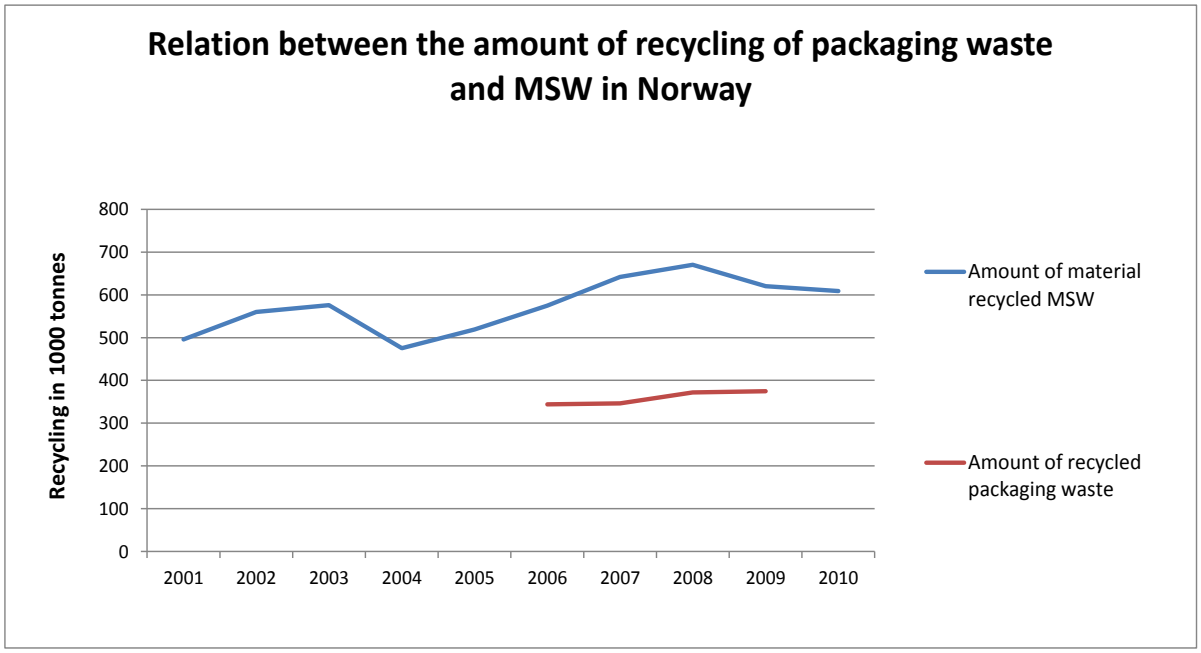
2.2 Uncertainties in the reporting

Some uncertainties or differences in the reporting of MSW can result in different levels of recycling. One example of such differences which might influence the recycling rate of MSW in Norway is to what extent packaging waste from households and similar packaging from other sources is included in

the reported recycling of MSW. Most Member States, including Norway, have producer responsibility schemes on packaging waste and therefore packaging waste is not always regarded or reported to Eurostat as MSW.

Figure 2.8 shows that packaging waste seems to be included in the MSW reporting of recycling in Norway. This is also confirmed by the Norwegian statistics on separately collected amounts of different waste materials (SSB, 2012b).

Figure 2.8 Comparison of packaging waste recycled and MSW recycled



Source: Eurostat, 2012. Amount of MSW recycled covers only material recycling

Another uncertainty or difference in the reporting of MSW is caused by different reporting of waste treated at MBT plants. However, MBT plants have not been established in Norway (Avfall Norge, 2010), so this uncertainty does not apply to Norway.

2.3 Important initiatives taken to improve MSW management

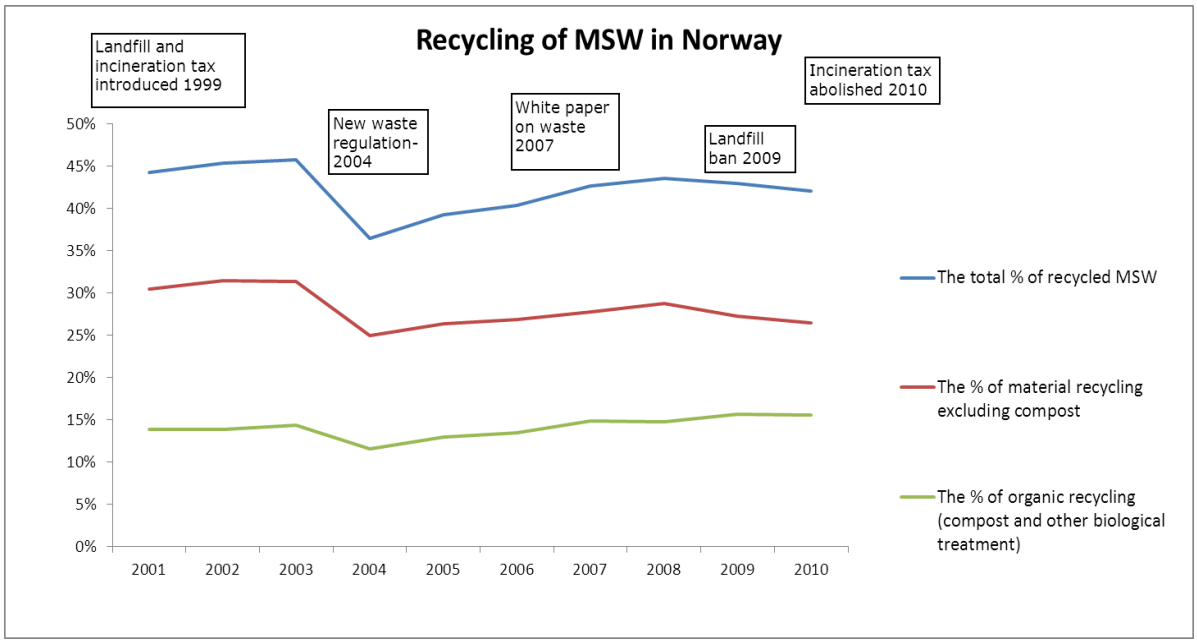
Less and less waste is being landfilled in Norway. This reduction is the result of several measures including the landfill tax which were introduced in the waste sector particularly in the 1990s (ETC/SCP, 2012).

Three major initiatives were undertaken between 2001 and 2010 which have influenced the waste management of MSW:

1. Norway's regulatory framework for waste management (Avfallsforskriften 2004) was revised and simplified in 2004. New instruments were applied to curb waste generation and stimulate waste recovery, including several taxes on landfill and incineration (OECD, 2011). The 2004 regulation changed the scope of municipal waste to include only household waste.
2. The White Paper from 2007 issued by the Norwegian Government outlines the national waste targets and the instruments needed to reach them. This is an analogue to a national waste management plan, apart from that it does not have a legal reference (ETC/SCP, 2009). The national target was to increase the percentage of total waste being recycled to 75 % in 2010 with an aspiration to increase it further to 80 % (Regjeringen, 2007).

3. Another important measure was a ban on landfill of biodegradable waste (this applies to waste that contains 10 % TOC or more). The ban was adopted by the Ministry of Environment in June 2008 and implemented on 1 July 2009. There is a period of 1-3 years where it is possible to apply for exceptions from the ban as treatment capacity for biodegradable waste in Norway is currently inadequate (ETC/SCP, 2009).

Figure 2.9 Recycling of MSW in Norway and important policy initiatives



2.4 Future possible trends

A main challenge is that MSW is increasing on a yearly basis. Until 2008, the amount of household waste has increased by 5 % per year which is more than the increase in final consumption. In the previous two years, the increase in waste has been less than the increase in consumption (SSB, 2012a).

Figure 2.2 illustrates that Norway needs to increase its recycling of municipal waste in order to reach the 50 % target in 2020 for recycling of household waste. Packaging waste recycling seems to have stagnated at a certain level (Figure 2.8), so new initiatives may be needed to increase the level of recycling.

Overall, Norway has to increase its efforts towards increasing recycling of MSW in order to fulfil the target of 50 % recycling in 2020. Norway will propose a new waste management plan and a waste prevention programme in 2013 (Regjeringen, 2012).

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