

Municipal waste management in the Netherlands



Prepared by Leonidas Miliotis
ETC/SCP

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EEA project manager Almut Reichel

Author affiliation

Leonidas Milios, Copenhagen Resource Institute, <http://www.cri.dk/>

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.

Disclaimer

This **ETC/SCP working paper** has been subjected to European Environment Agency (EEA) member country review. Please note that the contents of the working paper do not necessarily reflect the views of the EEA.

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Highlights

- Recycling is the most preferred option for MSW management in the Netherlands. Already lying at 45 % in 2001, recycling of MSW in the Netherlands reached the 50 % recycling target given in the Waste Framework Directive, by 2009, eleven years ahead of the deadline;
- A landfill ban covering 35 waste categories was already introduced in 1995;
- A landfill tax was introduced in 1995 as well, considerably reducing the amounts of municipal solid waste (MSW) landfilled. In 2002, there was a steep increase of the tax level which kept increasing marginally the following years. Finally a sharp increase in 2010 made the landfill tax in the Netherlands the highest in Europe. By 2012, the tax was repealed as the low level of landfilling rendered the tax administratively bothersome;
- The first National Waste Management Plan set the framework of future waste management in the Netherlands and introduced the control of waste policies under a national perspective.
- The second National Waste Management Plan introduced a target to increase the recycling of household waste to 60 % by 2015.

1 Introduction

1.1 Objective

Based on historical MSW data for the Netherlands 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 indicators to the most important initiatives taken to improve MSW management in the country, and;
- Assessment of the future possible trends and achieving of the future EU targets on MSW by 2020.

2 The Netherlands' MSW management performance

The Netherlands have been far ahead of EU policies in waste management and have more or less influenced the European policies that have been formulated in recent years (LAP, 2009). In the past decades, the ever increasing level of material consumption and the significant lack of physical space together with environmental deterioration of the land, forced the Dutch government to take measures early on to reduce the landfilling of waste. The Dutch waste management is influenced mainly by the so-called 'Lansnik's ladder' (named after the proposer of the motion passed unanimously by the Dutch Lower House in 1979), (NL, 2008), which was incorporated into Dutch legislation in 1994 and has been introduced in the European Waste Framework Directive as the waste hierarchy. The basic principles of the hierarchy follow the lines of avoidance of waste as much as possible, recovery of the valuable raw materials from waste, generation of energy by incinerating the residual waste and only then landfilling what is left over, but in an environmentally sound way (NL, 2008).

In 1997 there was a decision to centralise responsibility for waste management, passing the responsibility from the provincial level to the central government. This change came into force with the amendment to the Environmental Management Act in 2002.

The Environmental Management Act stipulates that the Ministry for Housing, Spatial Planning and the Environment must draw up a Waste Management Plan every six years (ETC/SCP, 2009).

The first National Waste Management Plan 2002-2012 (LAP, 2003) came into force at the beginning of 2003 and was reviewed in 2009, resulting in the second National Waste Management Plan (LAP, 2009). The plan is for the period 2009 to 2015, with a view to 2021. The overall objectives of the second National Waste Management Plan are as follows (ETC/SCP, 2009):

- To limit growth in waste generation (decoupling from the economic growth);
- To reduce the environmental impact of waste (optimising recovery and re-use);
- To minimize the environmental impacts from product chains (raw material extraction, production, use and waste management including reuse).

The government of the Netherlands has utilised a mix of measures in order to enhance MSW management in the direction of material and organic recovery. Several financial instruments have

been used such as the tax on landfilling, producer responsibility for a number of products and rate differentiation ('Pay-as-you-throw-scheme') in the collection of household waste (ETC/SCP, 2009).

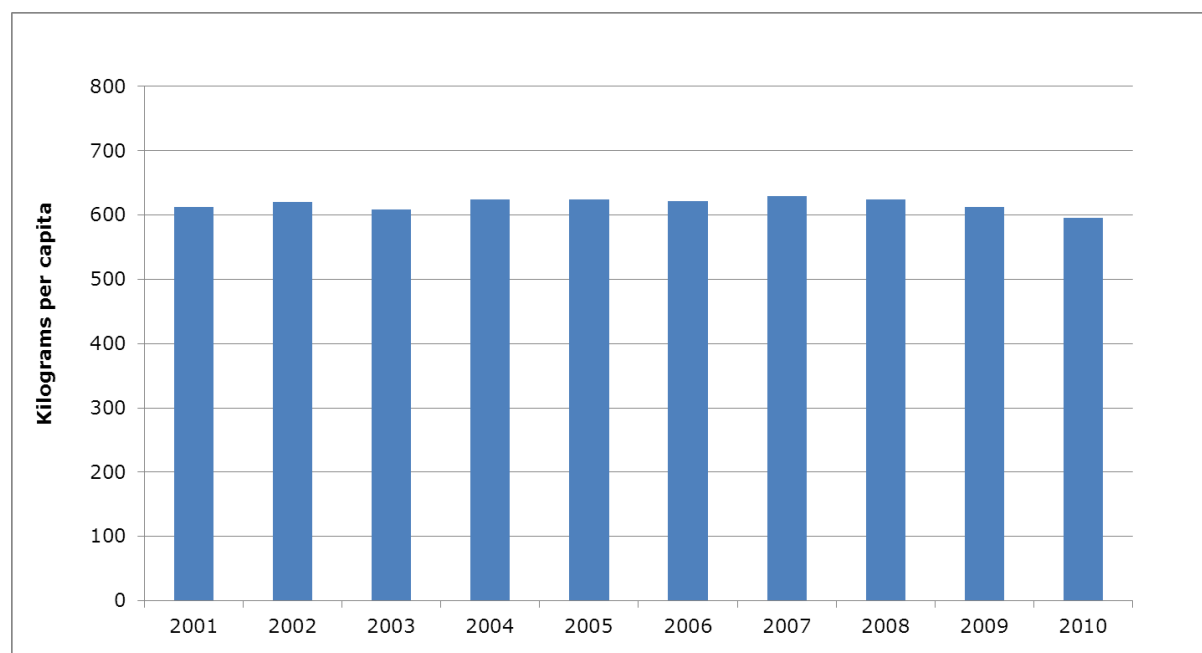
Obligations at the provincial level mostly concern the licensing and monitoring of waste treatment facilities (including incineration and landfilling), together with the regulation of waste prevention in individual licenses. The provinces are also responsible (financially, administratively and organizationally) for the environmental rehabilitation of closed landfills sites (ETC/SCP, 2009).

Municipalities are responsible for the collection of household waste in their own territory. Authorities are obliged to collect organic household waste separately, door-to-door, though there may be deviations in specific circumstances. Local authority bylaws mainly include rules on disposal of household waste, for example, which components have to be kept separate, frequency of waste collection and the agencies carrying out collection (ETC/SCP, 2009).

2.1 MSW Indicators

Figure 2.0 shows the development of MSW generation per capita in the Netherlands from 2001 to 2010. The amount generated has remained very stable throughout the years up to 2009, despite a break in series in 2007, at around 620 kg per capita every year. For the first time in 2010 the MSW generation per capita dropped below 600 kg to the level of 595 kg per capita. This is a significant drop compared to previous years and clearly signals a decreasing trend. The lower value in 2003 is due to a hot and dry summer resulting in a smaller amount of organic waste.

Figure 2.0 MSW generation per capita in the Netherlands



Source: Eurostat, 2012

The Netherlands is a frontrunner in recycling in Europe, having managed over the last years to divert more than half of the MSW generated in 2010 to material and organic recycling. Out of the 9.8 million tonnes of MSW generated in 2010, 5 million tonnes were recycled, 3.2 million tonnes were incinerated (with or without energy recovery) and only 0.03 million tonnes ended up in the landfills. There is no certain information about the remaining 1.8 million tonnes. .

The following indicators illustrate the development of the Dutch MSW management between the years 2001-2010.

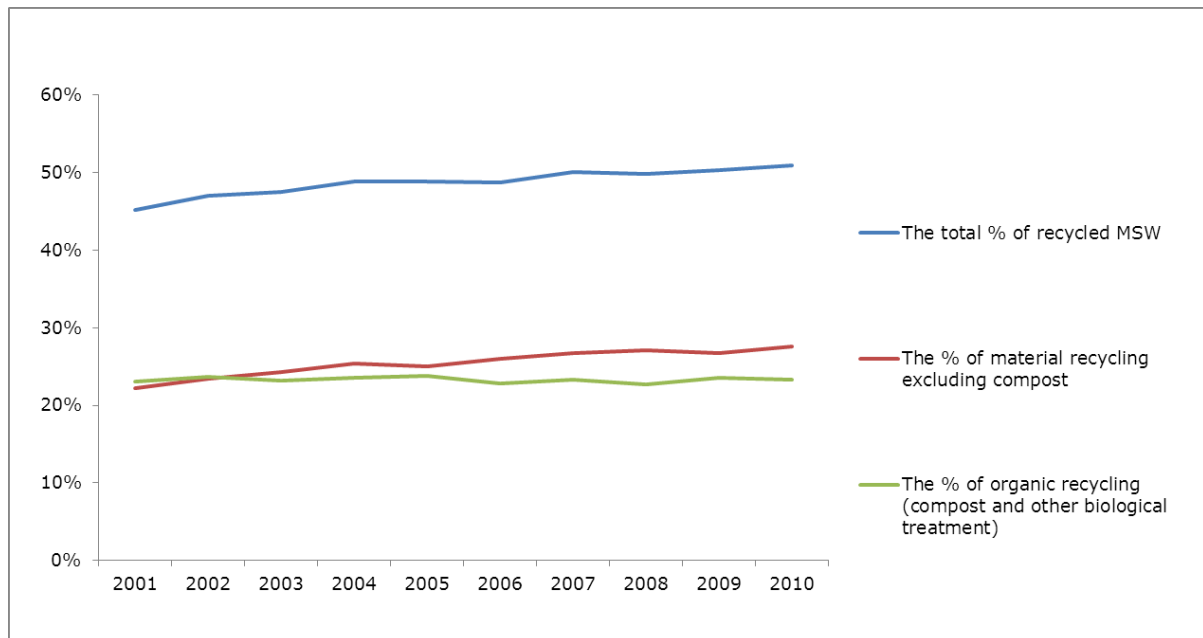
2.1.1 The recycling of MSW from 2001 to 2010

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

In Figure 2.1 it can be observed that total recycling of MSW in the Netherlands had already a very high level in 2001. Since then, the level of recycling has been increasing slowly but steadily over the period 2001-2010, reaching an overall increase of 6 percentage points, from 45 % to 51 % of the MSW generated. This increase is basically attributed to material recycling which rose more or less steadily since 2001, while organic recycling remained practically unchanged for the whole time period 2001-2010.

In general, MSW recycling has been evolving positively throughout the years in the Netherlands, making the Dutch waste management a fine example of a successful recycling practice.

Figure 2.1 Recycling of MSW in the Netherlands



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

Table 2.1 Composition of recycled municipal waste in the Netherlands 2001-2010 in 1000 tonnes

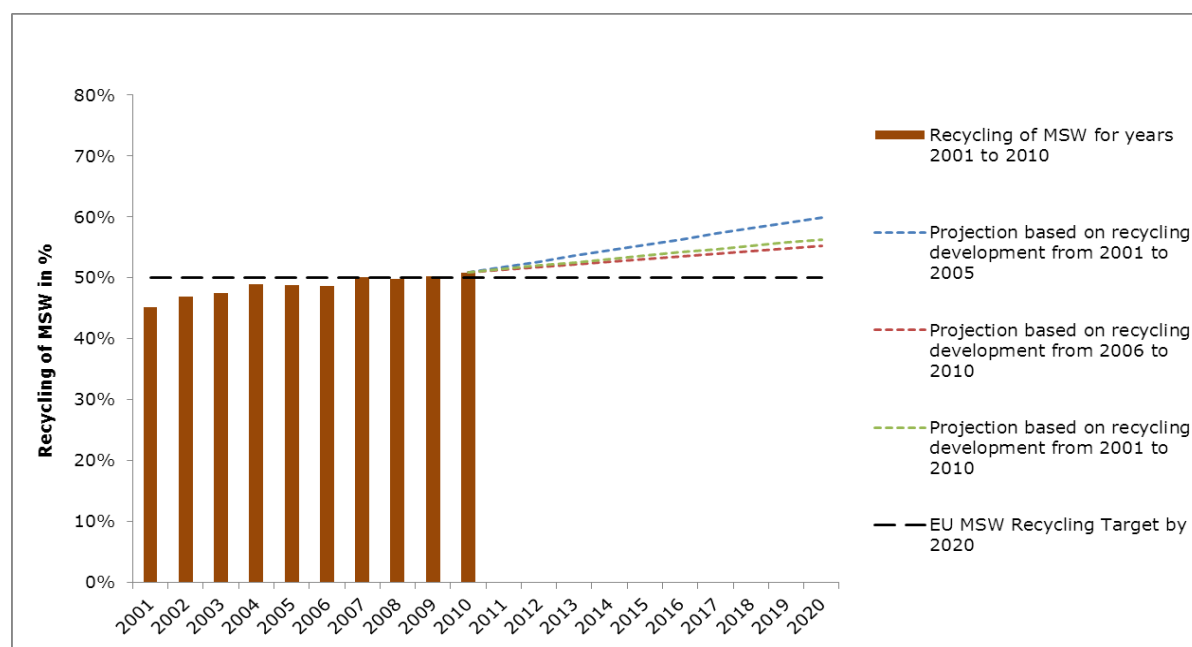
Recycling of MSW	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Paper and cardboard	1 013	1 006	982	1 027	1 045	1 081	1 106	1 124	1 077	1 063
Glass	335	342	341	342	338	341	344	349	345	351
Cartons for beverages	1	1	2	2	2	2	2	2	3	3
Metal packaging	2	2	3	3	2	2	2	2	2	2
Plastic packaging	2	3	4	5	5	6	6	8	26	82
Other plastics	:	:	:	:	:	:	4	5	6	7
WEEE	53	57	61	67	71	70	74	81	82	84
Metals from household waste	75	76	77	77	77	81	83	82	83	73
Furniture	14	24	28	38	35	40	39	38	38	38
Bulky garden waste	353	396	377	397	406	407	452	426	444	452
Wood	246	273	283	310	318	341	349	342	326	323
Organic, kitchen and garden waste	1 404	1 406	1 340	1 407	1 362	1 296	1 315	1 289	1 302	1 256

Source: Statistics Netherlands, 2012

2.1.2 The yearly increase rate of recycling of MSW

In order to assess the prospects for the Netherlands 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 with the increase rates of recycling in the periods 2001-2005, 2006-2010 and 2001-2010 (Figure 2.2)

Figure 2.2 Future recycling of MSW in the Netherlands



Source: Own calculation based on Eurostat, 2012

¹ The EU's revised 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).

Please note that these three scenarios are very simplistic and do not take into account any planned policy measures. In addition, they are 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 Framework Directive. The scenarios in Figure 2.2 should therefore be interpreted only as to give some rough indications and assessment of the risk of missing the target.

In Figure 2.2 it can be observed that the Netherlands has already fulfilled the target of 50 % by 2020. Since 2007, recycling in the Netherlands accounted for 50 % of the total MSW generated and it increased to 51 % in 2010. Although recycling levels in the Netherlands have been consistently high throughout recent years, the trend remains positive and recycling of MSW could reach 55 % to 60 % by 2020 if the increase rates of the recent years are maintained.

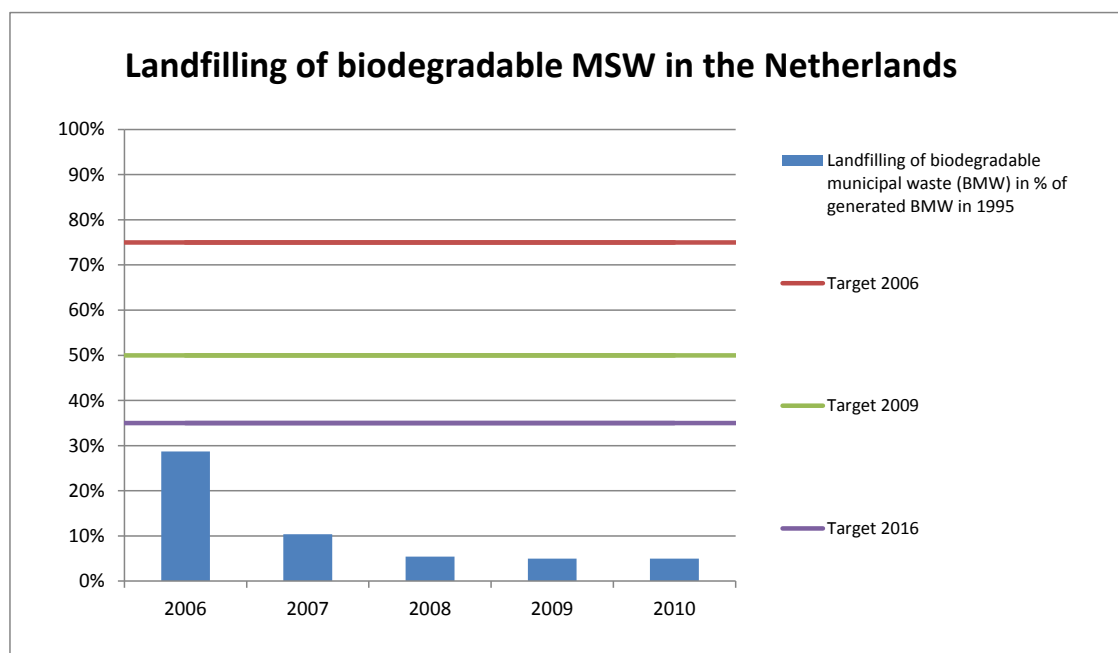
2.1.3 Landfilling of biodegradable municipal waste

According to the EU Landfill Directive Member States have to reduce the amount of biodegradable municipal waste landfilled (BMW) with a certain percentage by 2006, 2009 and 2016. The targets are related to generated amount of BMW in 1995, in which the Netherlands generated 2 406 000 tonnes of BMW.

In 1995, the Dutch government issued a waste decree that introduced a landfill ban for 35 waste categories (ETC/SCP, 2009) including all combustible and biodegradable waste. As a result, no BMW would under those circumstances go to landfill. Nevertheless, the decree enables the provincial authorities to grant an exemption from the landfill ban to operators of landfills (for example, if there is a temporary shortage of incineration capacity). However, the provincial authority is only allowed to do so if it has obtained a statement from the national environmental authorities indicating that at that time in the Netherlands no other processing option other than landfill is available for that particular waste (EEA, 2002).

The Netherlands have reported the landfilled amount of BMW to the European Commission for the years 2007, 2008 and 2009 (EC, 2012). The 2010 data has been kindly provided to the ETC/SCP (Netherlands, 2012a) for the purpose of this assessment. Figure 2.3 shows that in 2006 the Netherlands had already reached the targets of the Landfill Directive for 2006, 2009 and 2016 and that no further effort is required. However, Figure 2.3 also shows that the landfilling of BMW has continued to decrease sharply year by year after 2006, being reduced by 60 % (related to the generated amounts in 1995) between the years 2006-2007 and an additional 50 % between the years 2007-2008. However, between the years 2008-2010 the amount of BWM landfilled remained practically the same.

Figure 2.3 Landfilling of biodegradable MSW in the Netherlands



Source: EC, 2012 and the Netherlands, 2012a.

2.1.4 Regional differences of MSW recycling from 2001 to 2010

The Netherlands have reported regional recycling data of MSW to Eurostat.

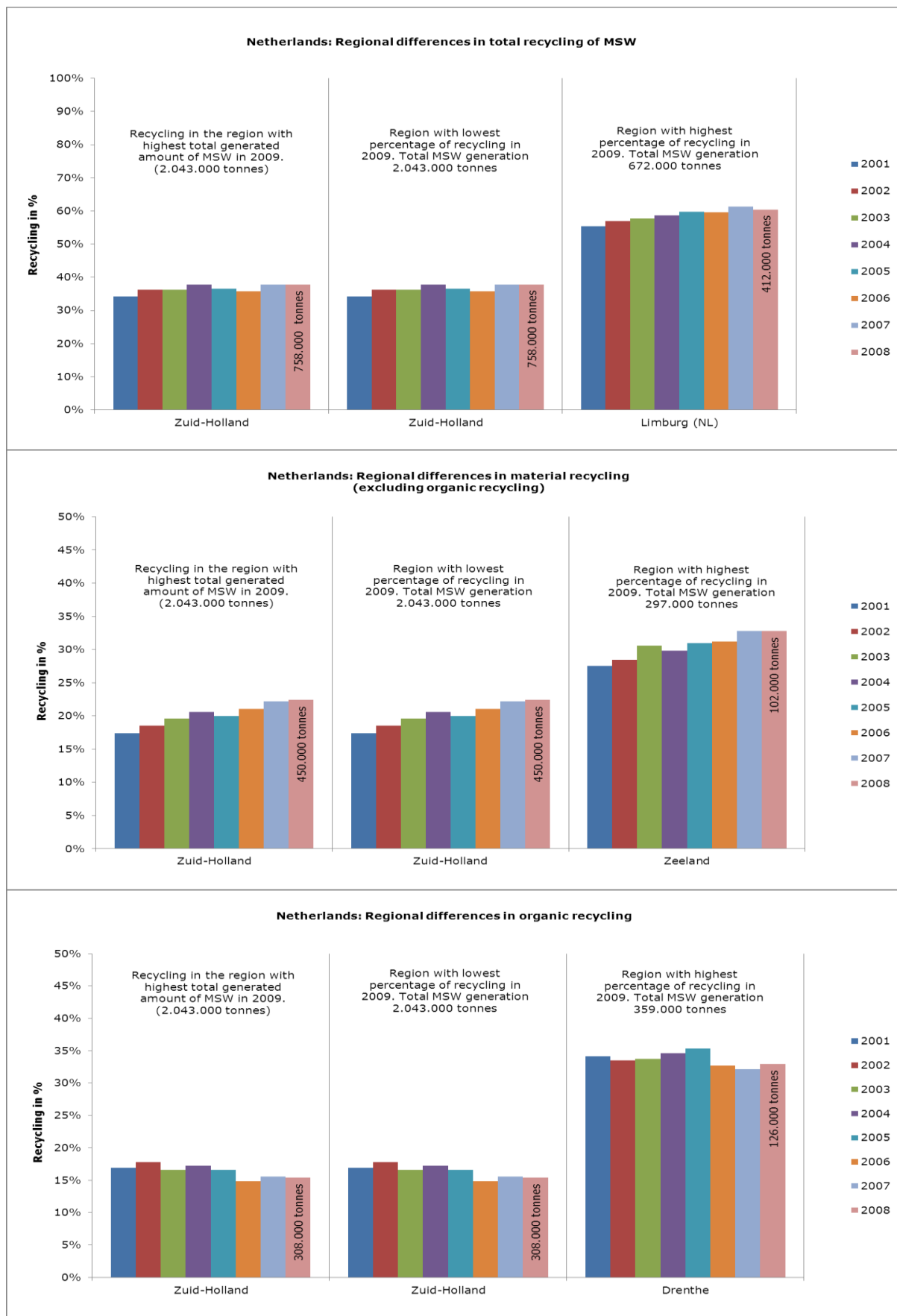
Figure 2.4 shows regional differences in the development of MSW recycling from 2001 to 2008 related to total recycling, material recycling and organic recycling. Three different regions are presented for each type of recycling: 1) Recycling in the region with the highest total generated amount of MSW in 2008; 2) Recycling in the region with the lowest percentage of recycling in 2008 and 3) Recycling in the region with the highest percentage of recycling in 2008. The region with the highest amount of generated MSW is South Holland (Zuid Holland), including major cities such as the Hague and Rotterdam, which is also one of the biggest ports in whole of Europe.

There is very little variation in the levels of total recycling throughout the years. It is remarkable that Limburg has reached recycling levels as high as 60 % of MSW, recycling 412 000 tonnes in 2008. Although in South Holland the amount of MSW recycled was almost the double of that in Limburg, still the recycling rate is low compared to other Dutch regions, reaching only 38 % in 2008.

Material recycling is increasing steadily in the Dutch regions as it can be seen in Figure 2.4. Zeeland has the highest material recycling rates in the Netherlands at 33 % while South Holland has achieved a recycling rate of 23 %.

In organic recycling, there is a big difference (20 %) between Drenthe which has the best performance in the country, and South Holland which is the worst performer that also produces the highest amount of MSW. This could be partly explained by the fact that Drenthe is mainly a rural area where more organic waste is expected to arise and therefore organic waste management systems are likely to have been put in place to enable the recovery of organic matter.

Figure 2.4 Regional differences in recycling of MSW

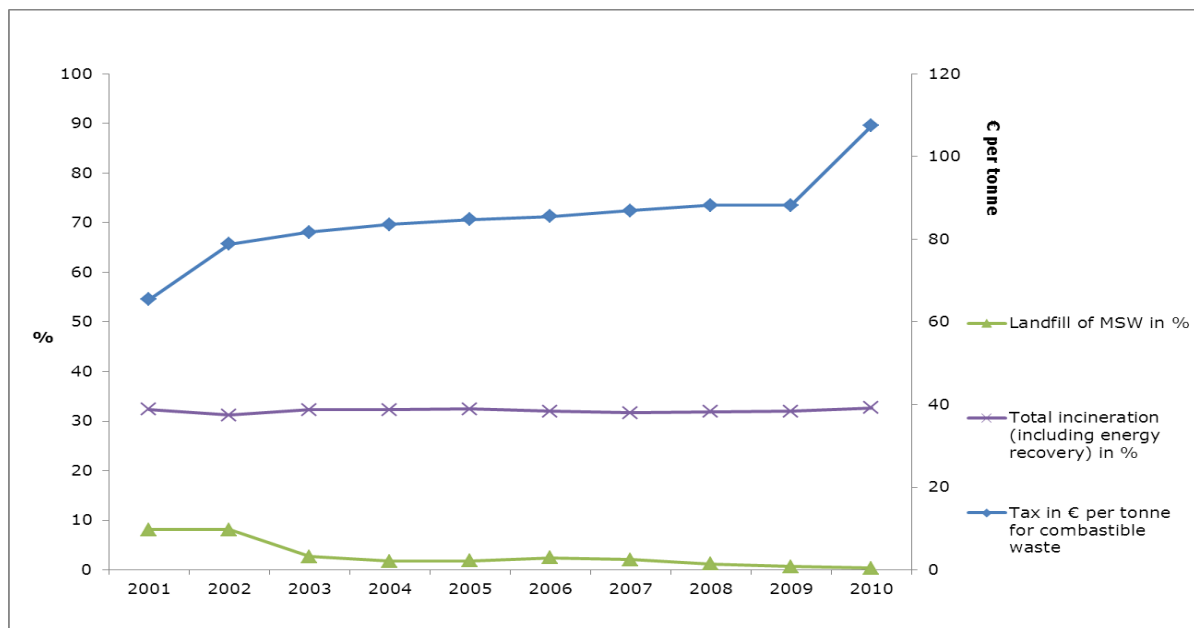


Source: Eurostat regional data, 2012

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

The Netherlands introduced a landfill tax in 1995 in an effort to reduce waste generation by making waste disposal more expensive and at the same time promoting recycling and incineration as more attractive waste management options. In 2000, two different levels of taxes were introduced. Combustible MSW is always charged with a high tax, while waste that is assumed to be non-combustible with no other favourable recovery alternative is charged with a low tax (ETC/SCP 2012). Figures 2.5 and 2.6 show the development of the high landfill tax together with different waste management options of MSW. The low landfill tax has steadily remained between EUR 13-16/tonne, with only minor fluctuations over the years (ETC/SCP, 2012).

Figure 2.5 Development of landfilling and incineration of MSW and landfill tax in the Netherlands



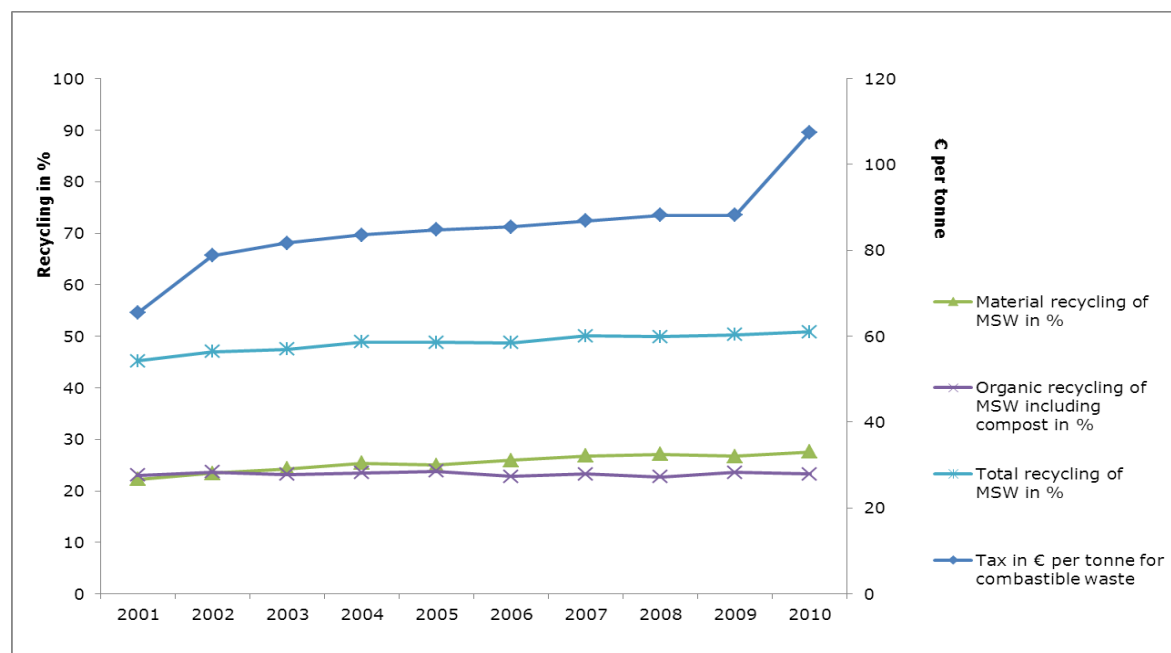
Source: ETC/SCP, 2012 and Eurostat, 2012

In Figure 2.5 a relative good correlation of landfill tax and MSW landfilled can be observed.

In 2001, landfilling accounted for 8 % of MSW. In 2000 there was a sharp increase of the landfill tax from EUR 13 to 65/tonne and therefore a significant incentive of reducing landfilling had already been created, but it is not reflected in Figure 2.5 because the figure only covers the years after 2000. In 2002, the landfill tax was further increased to EUR 79/tonne, and the following year the percentage of MSW landfilled dropped significantly to 2.7 % of MSW generated that year. This decrease can also be partially explained by the new regulation presented in the first National Waste Management Plan 2002-2012 (LAP, 2003), which bans direct disposal of mixed municipal waste to landfill. In the following years, 2004-2007, the landfill tax was increased marginally whereas landfilling levels stayed low at around 2 % of MSW generation. From 2008, landfilling starts to decrease again at a fast pace, almost halving its percentages every year, starting from 2.1 % in 2007 and reaching only 0.3 % in 2010. Significant change in taxation happened only in 2010 when the landfill tax skyrocketed to EUR 107.5/tonne, being the highest rate in Europe.

The landfill tax together with additional measures, have acted as strong drivers to divert MSW from landfill. As of 1 January 2012 the landfill tax has been eliminated. In recent years revenues from the tax on landfill have dramatically reduced in line with the reduction of waste landfilled and therefore its existence has become only an administrative burden and does not induce further benefits (ETC/SCP, 2012).

Figure 2.6 Development of MSW recycling and landfill tax in the Netherlands



Source: ETC/SCP, 2012 and Eurostat, 2012

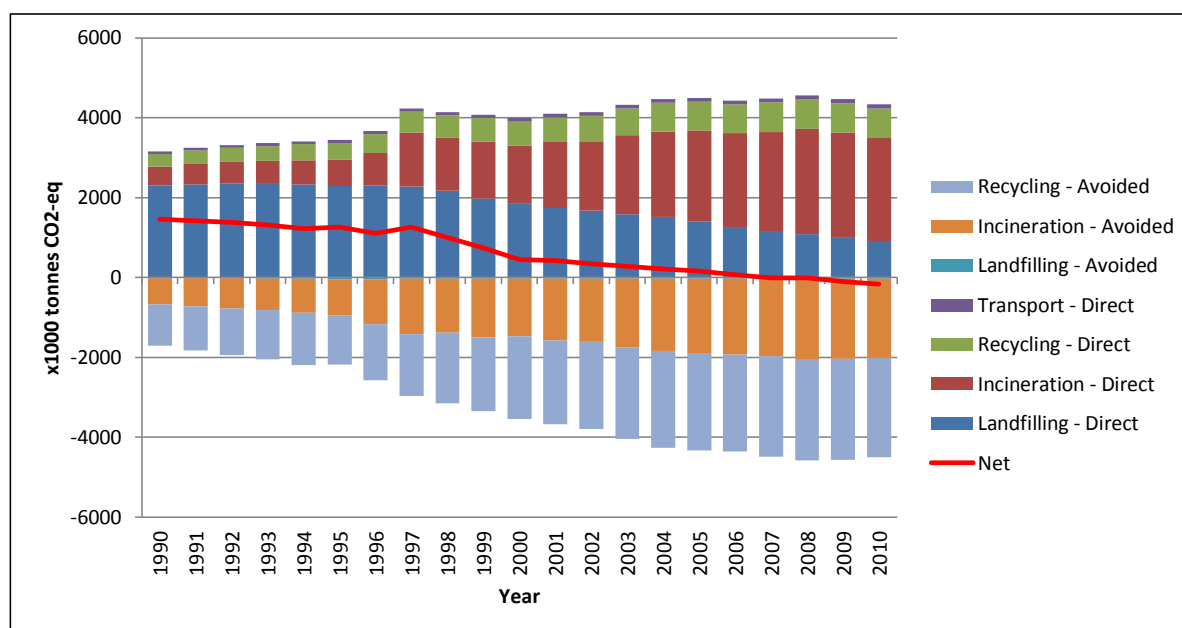
In Figure 2.6, the development of recycling is presented alongside the development of the landfill tax. There is no simple correlation between the landfill tax increase and the total recycling of MSW. There is a steady positive development of recycling, while the landfill tax also increases, meaning more MSW is diverted from landfilling to either recycling or incineration. Taking into account that incineration of MSW has remained practically stable throughout the years 2001-2010 (Figure 2.5) and the fact that recycling showed a steady slow increase (Figure 2.6), it could be concluded that the landfill tax has benefitted recycling much more than incineration.

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 shows a steady decrease of the net GHG emissions of municipal waste management in the Netherlands. Although a landfill ban had already been introduced in the Netherlands in 1995, landfilling remained the main source of direct GHG emissions of the Dutch waste management until 1998. From 2007, waste management activities showed a net benefit (higher avoided emissions than direct emissions). Since then the direct emissions from landfills have decreased steadily while the avoided emissions saved by recycling have increased considerably. However, the accumulated amounts of BMW landfilled will continue to emit substantial quantities of greenhouse gases for the following years despite the landfill ban and the reduction in number of active landfill sites.

In 2010, direct emissions from landfills had less of an impact on the environment compared with direct emissions from incineration. Nevertheless, much of the direct emissions of incineration are balanced out by the avoided emissions, which are saved in the form of heat and energy produced from waste, replacing the energy mix.

Figure 2.7 GHG emissions from MSW management in the Netherlands



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.

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 methodology for landfills and incineration and life cycle modelling for the other technologies (recycling, bio-treatment 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 bio-treatment. Avoided emissions of bio-treatment include fertilizer substitution. All processes generating electricity are assumed to substitute electricity mix of the Netherlands in 2009. Processes generating heat are assumed to substitute average heat mix for the EU25 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, the Netherlands updated the compositions of the incinerated and recycled MSW for 2008. The complete methodology is available from ETC/SCP (2011).

2.2 Uncertainties in the reporting

Some uncertainties or differences included in the reporting of MSW can result in different recycling levels. One example of such differences which might influence the recycling rate of MSW could be

the extent of packaging waste from households and similar packaging from other sources which is included in the reported recycling of MSW. Most Member Countries have producer responsibility schemes on packaging waste and the packaging waste is therefore not always reported to Eurostat as MSW.

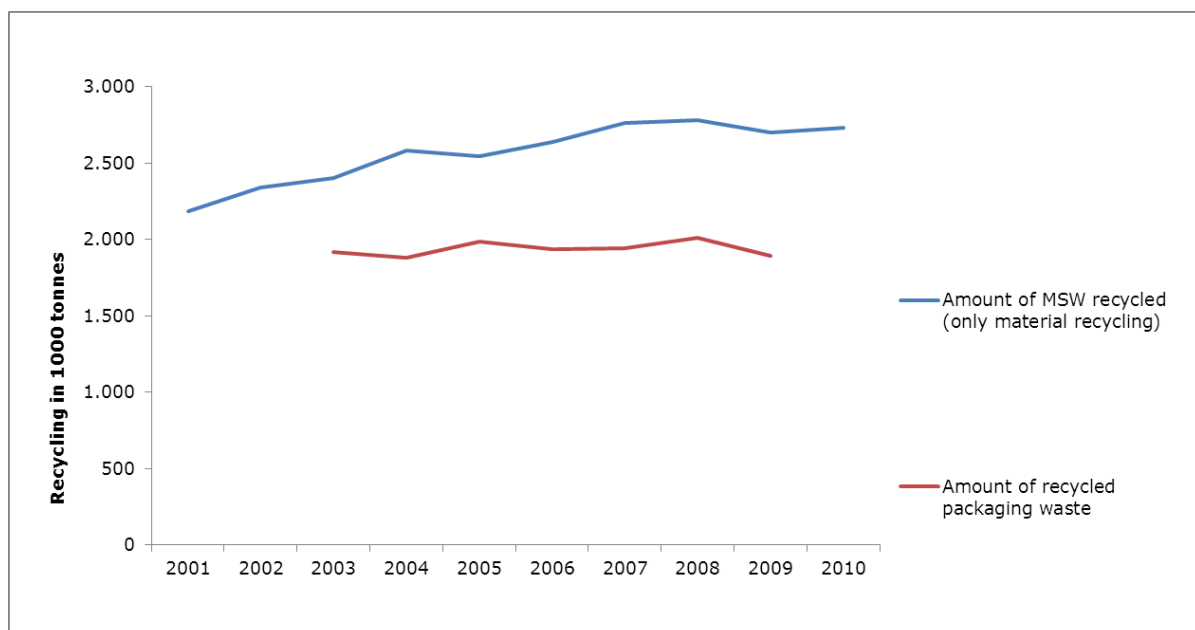
In the case of the Netherlands, it can be concluded from Figure 2.8 that there is little uncertainty about the inclusion of packaging waste in MSW material recycling amounts reported to Eurostat. It seems the recycling of packaging waste remains more or less stable at around 2 million tonnes, and does not affect in any way the development of material recycling throughout the years 2003-2008. A general decrease is observed both in MSW material recycling and the recycling of packaging waste in 2009, with the decrease between 2008 and 2009 being the only common trend.

Therefore it can be concluded that other waste streams have more of an effect on the recycling rates of MSW than the packaging waste. On the whole, no uncertainty related inclusion of packaging waste can be identified for recycling of MSW in the Netherlands.

Another factor for uncertainty could be MSW sent to Mechanical Biological Treatment (MBT), where the whole amount received at the MBT plant in some countries is allocated to recycling. In other countries it is in fact only the actual amount recycled after the MBT which is included and not the amount afterwards sent to landfilling or incineration. The Dutch reporting is based on the final treatment of the MBT or sorting outputs (incineration, recycling, landfill) (Statistics Netherlands, 2012).

There are considerable amounts of waste traded through the Netherlands either for recycling or incineration and some uncertainty could arise concerning the origin of waste and its final purpose. The reported treated amounts of MSW are lower than the generated amounts of MSW in the Netherlands but it is unknown if this difference is due to exports. The loss of water and organic material during MBT treatment could play a role as well.

Figure 2.8 A comparison of material recycling of MSW and packaging waste recycling in the Netherlands for 2001-2010



Source: Eurostat, 2012

2.3 Important initiatives taken to improve MSW management

The pressing situation of the increasing amounts of waste and the disposal of waste during the 1960s and 1970s had already sparked the interest in the Dutch government to introduce new policy initiatives with the aim of reducing waste.

The Landfill ban and landfills Decree of 1994 introduced the ban of landfilling of certain waste streams, which were characterised in 35 different waste categories. One year later, the Environmental Taxes Act of 1995 introduced the tax on the landfill of waste. Both measures contributed drastically to the reduction of waste being landfilled since their full application by 1996 (ETC/SCP, 2009).

Around the same period of time, in 1996, there was a decision to centralise responsibility for waste management which promoted a shift of responsibilities from the provincial authorities to the central government authorities. This led to the amendment of the Environmental Management Act in order to reflect the change in the waste management occurring in the Netherlands which came into force on 8 May 2002. With that shift came the responsibility of waste management to the Ministry of Environment. In order to meet that responsibility, the Ministry issued the National Waste Management Plan 2002-2012, which covered almost all hazardous and non-hazardous waste and was applicable to the whole waste management chain (LAP, 2009).

The National Waste Management Plan 2002-2012 came into force in 2003 and three subsequent revisions measuring the progress of its implementation followed in 2004, 2005 and 2006 (LAP, 2009). Among other measures, the Plan introduced stricter rules on disposal of MSW (LAP, 2003).

On 1 January 2002, the tax on landfilling was further reinforced by a steep increase of EUR 11 per tonne. The purpose of this increase was to make landfilling more expensive than alternatives to landfill and in this way to put an end to the landfill of combustible waste. As a result, the separation or sorting of waste streams into sub streams suitable for recovery became financially more attractive (ETC/SCP, 2009).

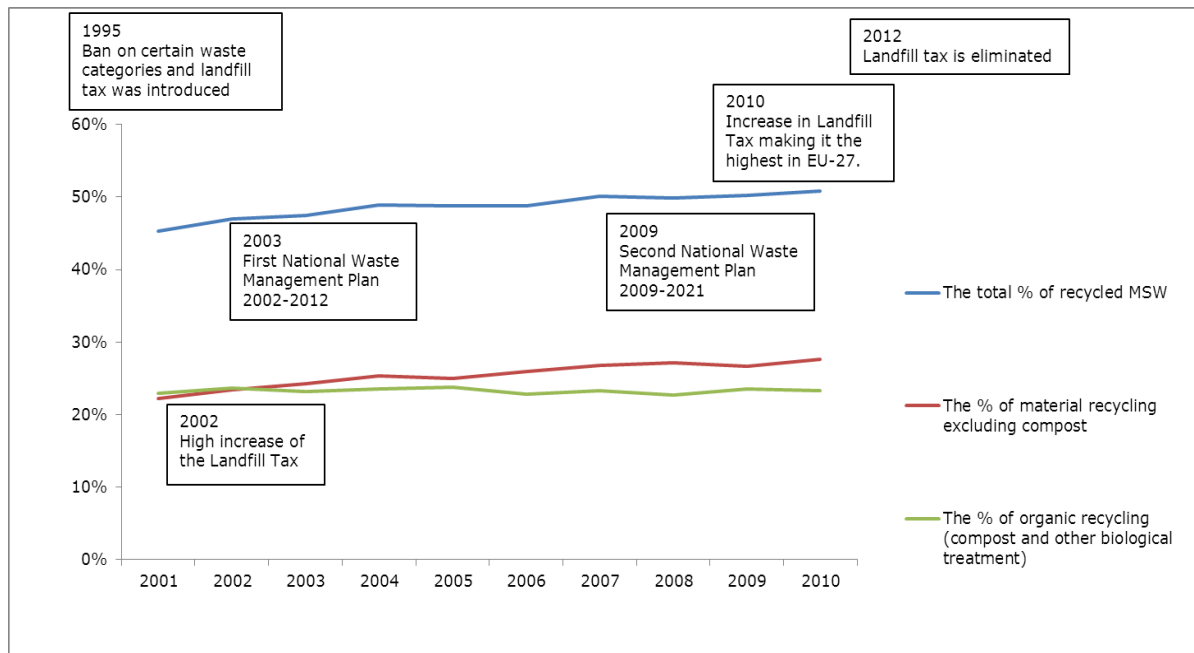
The Decree on Packaging and paper/cardboard came into effect in 2005 (ETC/SCP, 2009) further boosting producer responsibility in an effort to increase recovery rates of recyclables as much as possible.

In 2009, the second National Waste Management Plan came into force covering the period 2009-2015 and expanding its vision to 2021. The second Plan was based on the revision of the first and set some specific qualitative targets to be achieved in a medium to short term perspective. A well formulated target refers to the increase of recycling of household waste to 60 % by 2015 (LAP, 2009).

Following the same line of thought as in 2002, another steep increase of EUR 19 per tonne in the landfill tax was applied in 2010. The continuous increase of the landfill tax has mostly rendered incineration cheaper than landfilling (ETC/SCP, 2012).

As of 2011, the Ministry of Finance has decided to eliminate the tax on landfill as part of a simplification of the taxes. In recent years, revenues from the tax on landfill have been reduced substantially following the reduction of waste going to landfill (ETC/SCP, 2012).

Figure 2.9 Recycling of MSW in the Netherlands and important policy initiatives



2.4 Future possible trends

In Figure 2.2 it can be seen that the Netherlands have already met the 50 % recycling target for MSW, to be achieved by 2020.

In fact, MSW recycling had already reached the level of 51 % in 2010. The MSW recycling rate has increased slowly but steadily in the decade 2001-2010, and recycling of MSW could possibly reach 55 % to 60 % by 2020 if the increase rates for recycling can be maintained.

The second National Waste Management Plan has set a target of 60% for the recycling of household waste by 2015. In order to fulfil this target, the Netherlands will have to intensify its efforts.

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