

Municipal waste management in Finland



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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.

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 has consistently remained at a level of about 35 % of MSW generated during the whole period from 2001 to 2010;
- A significant effort would be required in order to meet the EU requirement on 50 % MSW recycling in 2020;
- The 2016 target of the EU Landfill Directive for diverting of biodegradable municipal waste sent to landfill was almost met in 2010;
- A ban on landfilling of non-pretreated MSW and an increased landfill tax have been important policy initiatives in diverting biodegradable municipal waste away from landfills; and
- The creation of inter-municipal waste organisations has improved MSW management.

1 Introduction

1.1 Objective

Based on historical MSW data for Finland 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
- Assessment of the future possible trends and achieving of the future EU targets on MSW by 2020.

2 Finland's MSW management performance

In April 2008, the Finnish Government approved 'Towards a recycling society - The National Waste Plan for 2016' (Finland, 2009).

The National Waste Plan and its background documents contain a detailed description of future measures and targets. Moreover, they include a description of the status and development of the waste sector in Finland. This is the second National Waste Plan, following on from the first plan that covered the period of 1998-2005 (EEA, 2010). The national waste plan also presents the administrative and legal, economic and informative instruments to be used in implementation. It also includes a separate national waste prevention programme (ETC/SCP, 2012).

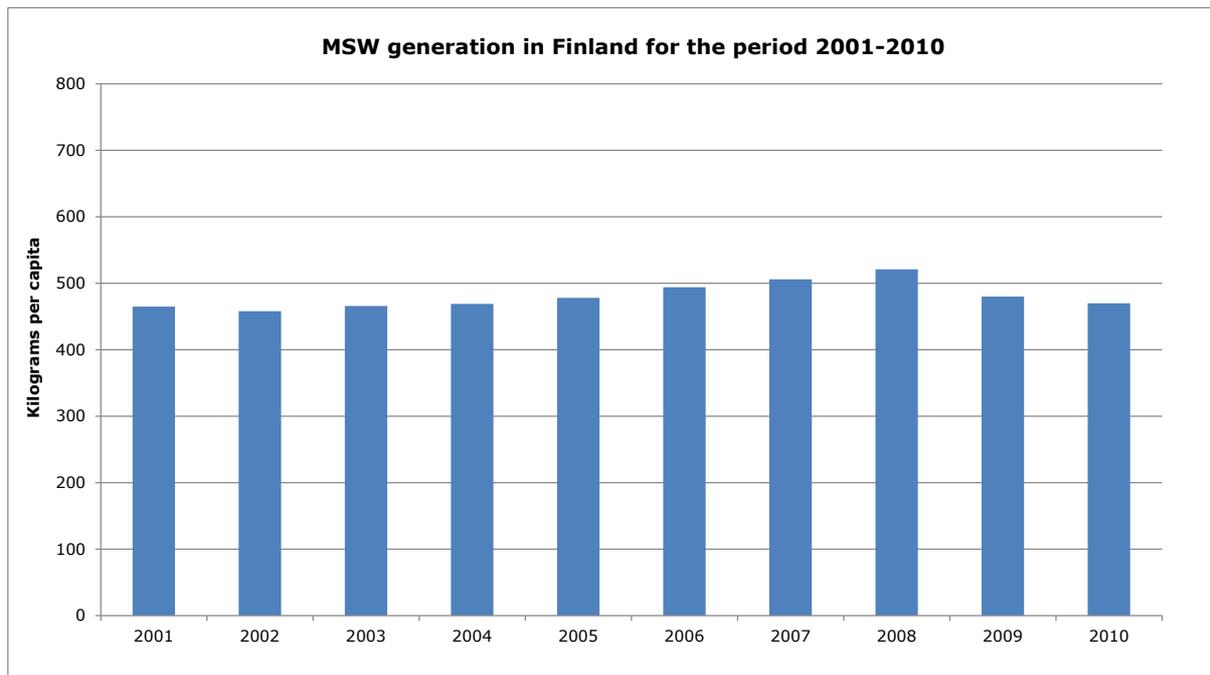
The National Waste Plan sets targets for 2016. One of the main targets is to maintain the volume of municipal solid waste at the 2000 level and then achieve a decrease by 2016. Another target is to recycle 50 % of municipal waste, generating energy from another 30 % and ensuring that no more than 20 % is disposed of in landfills (Finland, 2009 and EEA, 2010).

The Finnish generation of MSW increased from 2.4 million tonnes in 2001 to 2.8 million tonnes in 2008, but has since decreased to 2.5 million tonnes in 2010.

2.1 MSW Indicators

Figure 2.0 shows the development of MSW generation per capita in Finland from 2001 to 2010. There has been an increase from 465 kilogram per capita in 2001 to 521 kilogram in 2008. From 2008 to 2010 there has been a large decrease so that the level is now almost the same as in 2001. The decrease seems to be linked to the start of the economic crisis in 2008.

Figure 2.0 MSW generation per capita in Finland



Source: Eurostat, 2012.

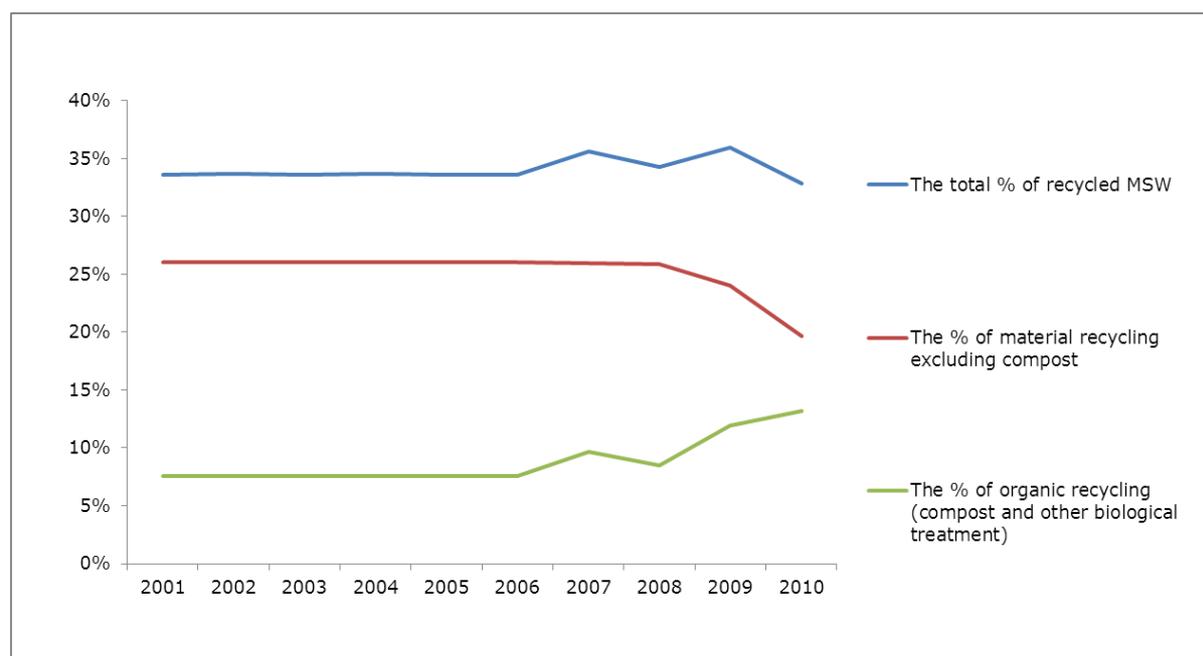
The majority of MSW in Finland is still landfilled. In 2010, the figure was 1.1 million tonnes compared to 1.5 million tonnes in 2006 and in 2001. This decrease implies a reduction of MSW landfilled from 61 % in 2001 to 45 % in 2010 (as share of the generated amount), whereas the total incinerated MSW has increased from 9 % to 22 % from 2001 to 2010. Recycling stayed almost at an unchanged level during the same period.

2.1.1 The recycling of MSW from 2001 to 2010

Figure 2.1 shows the development of recycling of MSW in Finland related to total recycling, material recycling (such as metal, glass, plastic, paper and cardboard) and organic recycling (compost and other biological treatment).

The total level of MSW recycling in Finland was almost constant at about 35 % during the whole period from 2001 to 2010. There was a slight increase from 34 % in 2006 to 36 % 2009, but in the last year it decreased to only 33 %.

Figure 2.1 Recycling of MSW in Finland



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

The stable level of total MSW recycling nevertheless hides different trends of material recycling and organic recycling. Material recycling of MSW in Finland has gone against the trend of most other EU countries, by in fact decreasing both in absolute terms and percentage. The amount was 630 000 tonnes (26 %) in 2001, then 720 000 tonnes in 2008 (26 %), and finally 420 000 tonnes (20 %) in 2010.

During the same period, organic recycling only increased from 8 % to 13 %. This is equivalent to an increase of 180 000 tonnes to 330 000 tonnes, taking place within the last four years from 2007 to 2010.

In other words, there is plenty of room for improving both material and organic recycling, but it appears that it is especially important to increase material recycling.

The composition of the recycled MSW is shown in Table 2.1.

Table 2.1 Composition of recycled municipal waste in Finland from 2003 to 2010 (in 1000 tonnes)

	2003	2004	2005	2006	2007	2008	2009	2010
Paper and cardboard	353	360	347	417	390	383	399	311
Biowaste	128	140	168	162	262	277	268	295
Glass	124	119	122	134	135	82	66	76
Metal	23	25	24	32	28	47	10	14
Wood	1	4	9	1	9	1	8	6
Plastic	6	1	1	5	10	2	8	12
WEEE	11	11	15	39	50	45	42	45
Others	43	55	53	48	69	86	119	63
Total	689	715	739	839	953	884	920	822

Source: Statistics Finland, 2012

The table indicates that there has been a highly fluctuating development for many of the recyclables. Less and less glass is recycled, whereas recycling of paper and cardboard increased until 2009 before suddenly decreasing. Metal waste recycling also increased in the beginning of this period before decreasing. WEEE recycling also increased during the period. Biowaste recycling increased most of all recyclables, more than doubling between 2003 and 2010.

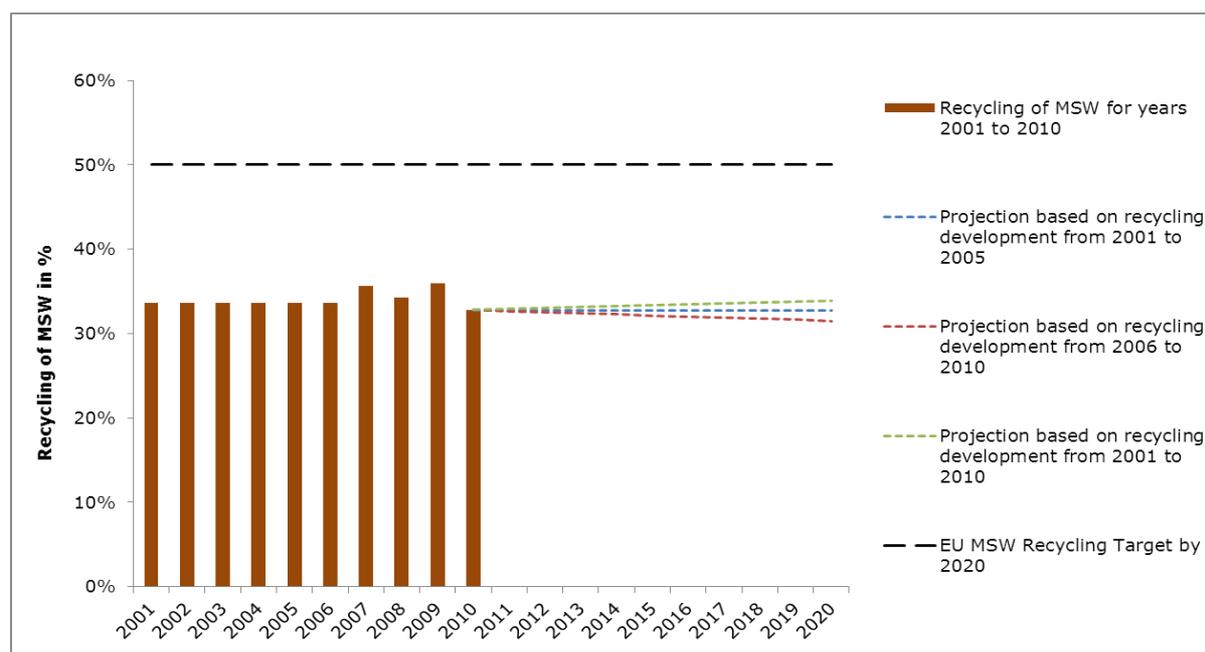
2.1.2 The yearly increase rate of recycling of MSW

In order to assess the prospects for Finland 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.

Figure 2.2 shows that it will take a significant effort from Finland to fulfil its recycling target of 50 % by 2016 and the EU target by 2020 if the respective recycling trends from the periods 2001 to 2006, 2006 to 2010 and 2001 to 2010 continue.

Moreover, it will also require a significant effort to reach a 50 % recycling level by 2020, especially since there has been no increase in the yearly recycling rate of MSW in the last ten years.

Figure 2.2 Future recycling of MSW in Finland



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

It has to be kept in mind 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.

¹ The EU's revised Waste Framework Directive in 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).

2.1.3 Landfilling of biodegradable municipal waste

It is a general requirement of the EU Landfill Directive that all Member States have to reduce the amount of biodegradable municipal waste landfilled (BMW) by a certain percentage by 2006, 2009 and 2016. The targets are related to the generated amount of BMW in 1995 (2 100 000 tonnes in Finland).

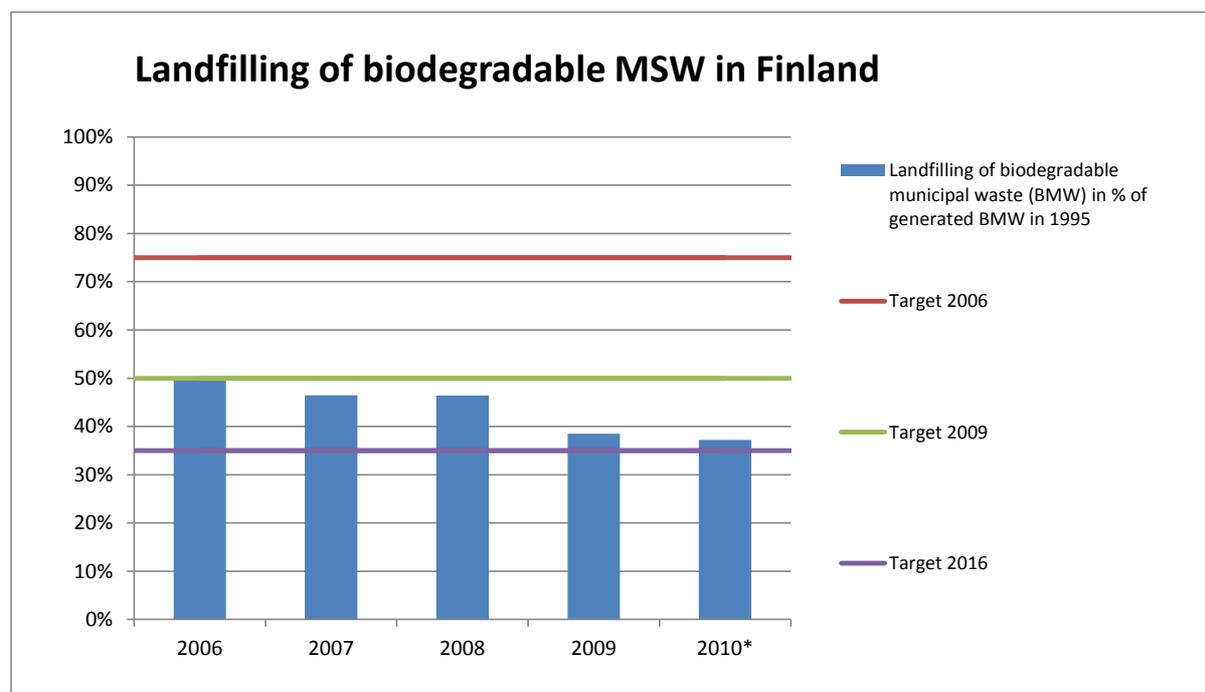
Finland reported its amount of landfilled BMW to the Commission for the years 2006, 2007, 2008 and 2009. In 2009, the landfilled amount was 809 000 tonnes (equivalent to 39 % of the generated BMW amount in 1995).

In Figure 2.3 the amount of landfilled BMW in 2010 has been estimated by subtracting the 2009-2010 increase in amount of MSW going to composting or other biological treatment (Eurostat, 2010) from the amounts of BMW being landfilled in 2009.

Figure 2.3 shows a steady reduction in the percentage of BMW landfilled in Finland from 50 % in 2006 to 39 % in 2009 (related to amounts generated in 1995). In 2010, the calculated percentage of landfilled BMW was 37 % of the generated amount in 1995. The reduction of BMW from 2006 to 2008 initially appears to be linked to the increased recycling of paper and bio-waste, cf. table 2.1. Especially from 2008 to 2009, there has been a decrease of seven percentage points, which can be explained by the fact that until late 2007 Finland had only one dedicated municipal waste incinerator and then during 2008 got two new dedicated incinerators in Riihimäki (60 km north of Helsinki) and in Kotka (140 km east of Helsinki) which have a combined capacity of about 250 000 tonnes. It is evident that these two new incinerators have succeeded in diverting biodegradable waste away from landfills.

Due to the above mentioned reduction of landfilled BMW Finland has fulfilled the 75 % requirement in 2006 and the 50 % requirement in 2009 according to the Landfill Directive. This development suggests that Finland is on track towards fulfilling the 35 % requirement by 2016.

Figure 2.3 Landfilling of biodegradable MSW in Finland



Source: EC, 2012 and CRI calculation*. The figures for 2010 are CRI estimations.

2.1.4 Regional differences of MSW recycling from 2001 to 2010

There are no regional data for recycling reported to Eurostat by Finland.

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

The Finnish tax on waste landfilling was introduced in 1996. The first Waste Tax Act was in force in the period of 1997-2010. The second Act came into force in the beginning of 2011.

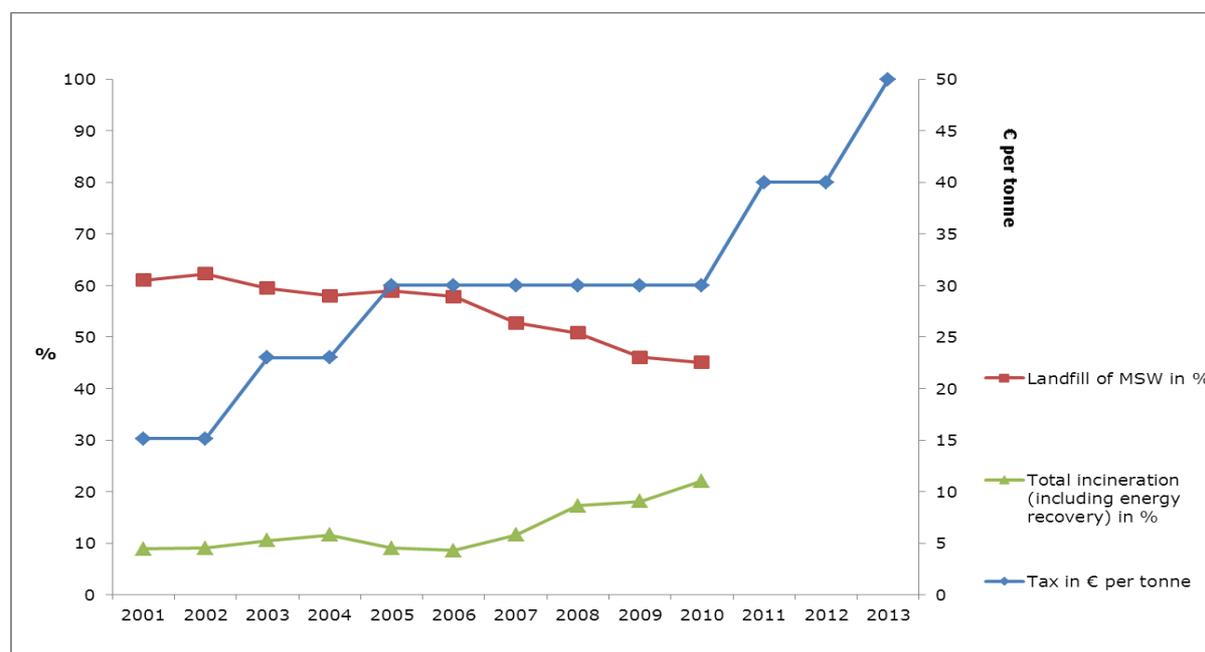
Municipal landfills and also private landfill service sites which were not disposing their own waste, were within the scope of the first waste tax. Private industrial sites were not included in that period (ETC/SCP, 2012a).

According to the new waste act which came into force at the start of 2011, the tax is now paid for landfilling of all wastes that have an alternative possibility for recovery (instead of landfill) from an environmental and technical point of view. The landfill tax per tonne of waste has increased from EUR 15.15/t in 1996 to EUR 23/t in 2003, EUR 30/t in 2005 and EUR 40/t in 2011. The new tax is planned to be EUR 50/t in 2013 (ETC/SCP, 2012a).

In general, the waste taxation is not considered to have been significantly effective towards prevention, but rather to have incentivised and increased recovery (ETC/SCP, 2012a).

Figure 2.5 illustrates the effect of the tax level raise in 2005. The amount of landfilled MSW dropped from 59 % to 53 % between 2005 and 2007 and from 53 % to 45 % between 2007 and 2010.

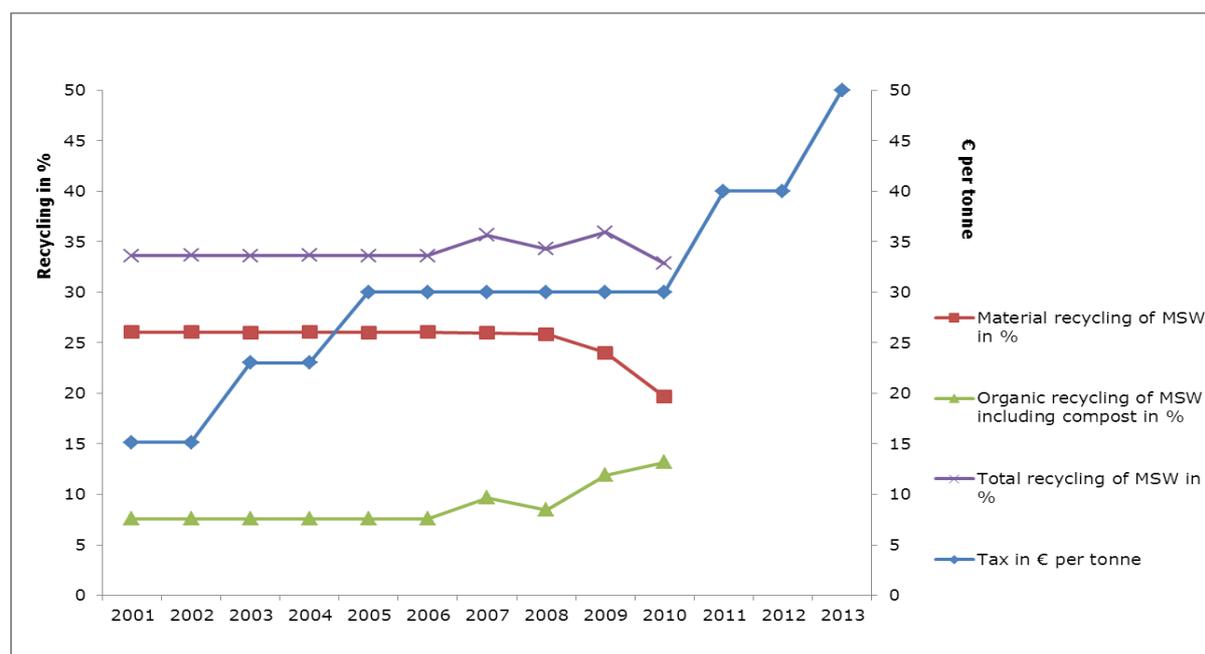
Figure 2.5 Development of landfilling and incineration of MSW and landfill in Finland



Source: ETC/SCP, 2012 and Eurostat, 2012

In general, it can be expected that the increase in the tax in 2011 and the planned increase in 2013 will offer further incentives for recycling and incineration of MSW. It depends on the effectiveness of the recently introduced new policies on recycling if Finland will manage to break the historical trend of diverting from landfill to incineration instead of to recycling – as shown in shown in Figure 2.1, Figure 2.5 and Figure 2.6.

Figure 2.6 Development of MSW recycling and landfill tax in Finland



Source: ETC/SCP, 2012 and Eurostat, 2012

2.1.6 Environmental benefits of better MSW management

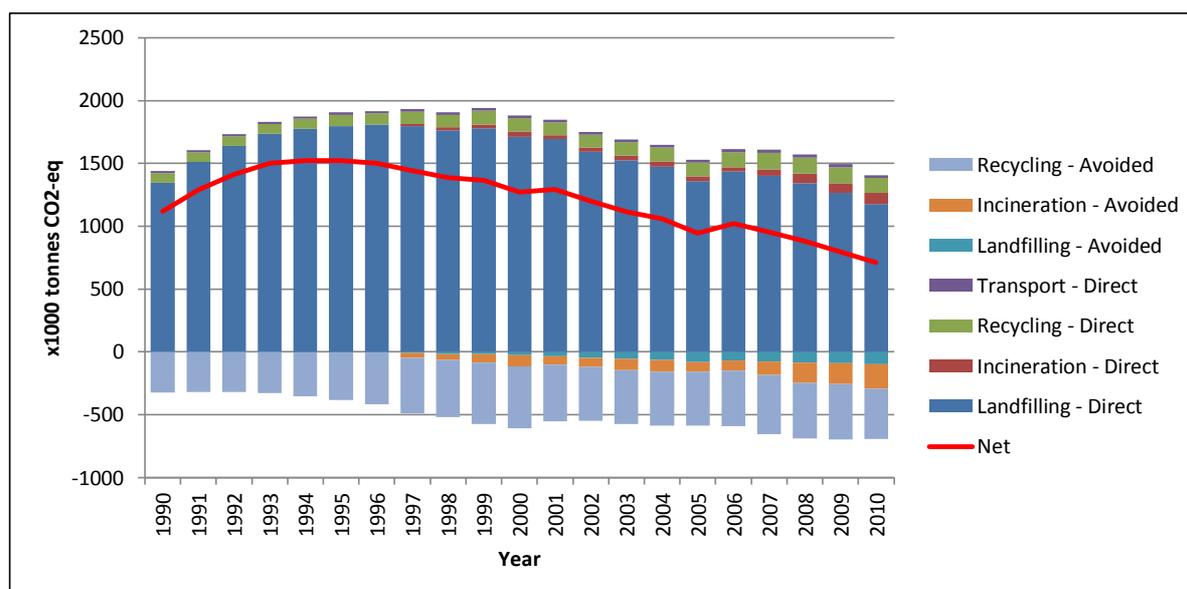
Figure 2.7 shows the development of GHG emissions from MSW management, calculated by using a life-cycle approach. The graph shows the direct emissions, the avoided emissions and the net emissions of the MSW management.

Figure 2.7 indicates a steady increase of direct emissions from landfilling until 1996, where it stabilized until 2000. The direct emission levels have reduced since then due to less landfilling of BMW. These rather high levels of direct emissions from landfilling will also remain for years to come due to the fact that recently landfilled BMW (e.g. five to ten years ago) will continue to emit considerable amounts of greenhouse gases. Due to more incineration in the last couple of years, the direct GHG emissions from incineration have increased, whereas the level of GHG emissions from recycling is almost constant due to a very limited increase of the total recycling.

The recent increase in incineration of MSW has resulted in reduced greenhouse gas emissions. This is due to the fact that incineration of non-fossil based MSW can generate energy which can replace fossil fuel based energy. This positive impact can be recognised in Figure 2.7 in the period between 2007 and 2010.

The net greenhouse gas emissions shown by the red line indicates that better management of MSW since 1996 has resulted in a reduction of net greenhouse gas emissions from MSW management from 1.5 million tonnes CO₂-equivalent in 1996 to about 710 000 tonnes in 2010.

Figure 2.7 GHG emissions from MSW management in Finland²



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

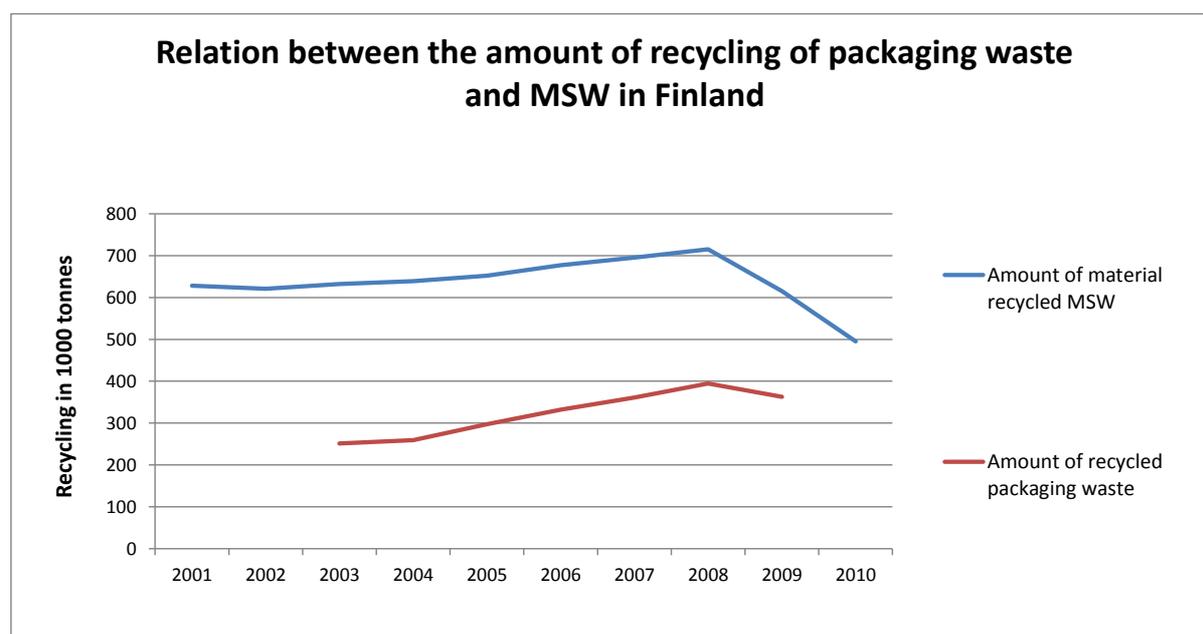
Some uncertainties or inconsistencies in the reporting of MSW can result in different levels of recycling being presented. One example of such differences which can influence the recycling rate of MSW in Finland is to what extent packaging waste from households and similar packaging from other sources is included in the reported recycling of MSW. Most Member States including Finland 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 the amount of recycled MSW in Finland was significantly higher than the amount of recycled packaging waste in the whole period from 2001 to 2009.

² 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 include fertilizer substitution. All processes generating electricity are assumed to substitute the electricity mix of Finland in 2009. Processes generating heat are assumed to substitute average heat mix for the EU-25 in 2002. The electricity mix and the 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, Finland updated the composition of the recycled MSW for 2010. The complete methodology is available from ETC/SCP (2011).

Figure 2.8 A comparison of packaging waste recycled and material MSW



Source: Eurostat, 2012

In other words, the figures indicate that Finland has included a reasonable amount of packaging waste from households and similar packaging from other sources in its reporting of recycling of MSW.

Another factor for uncertainty could be that in some countries the whole amount of MSW sent for Mechanical Biological Treatment (MBT) is allocated to recycling at the MBT plant. 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 Finnish municipal waste strategy is based on the source separation of wastes. Therefore, most of the organic waste is composted or anaerobically digested and MBT is not applied as such. Therefore, this uncertainty about MBT is not relevant to Finland.

2.3 Important initiatives taken to improve MSW management

As in many other countries, the Finnish municipalities are responsible for collection and treatment of the generated municipal waste from households. Finland has many municipalities including many small ones, and therefore it is an advantage that many municipalities have organised the management of waste through 39 inter-municipal associations. This has improved the municipal waste infrastructure during the last 15-20 years (ETC/RWM, 2008).

Finland has achieved very good results in those instances, such as tyres and paper, where waste streams have clear targets and division of responsibilities. Another example of clearly formulated targets and responsibilities is the fulfilment of the technical requirements for landfills; Finnish landfills met the requirements of the Landfill Directive by the end of 2007 – two years before the deadline (ETC/RWM, 2008).

Finland introduced a landfill tax and a partial landfill ban on BMW in the late 1990s. Later, in 2003, the tax was raised to EUR 23/t and to EUR 30/t in 2007.

In 2005, a landfill ban on non-pre-treated BMW was introduced (ETC/RWM, 2008 and ETC/SCP, 2012). Although these initiatives have contributed to achieving the targets by 2006 and 2009 regarding reduction of BMW according to the Landfill Directive, the total amount and percentage of

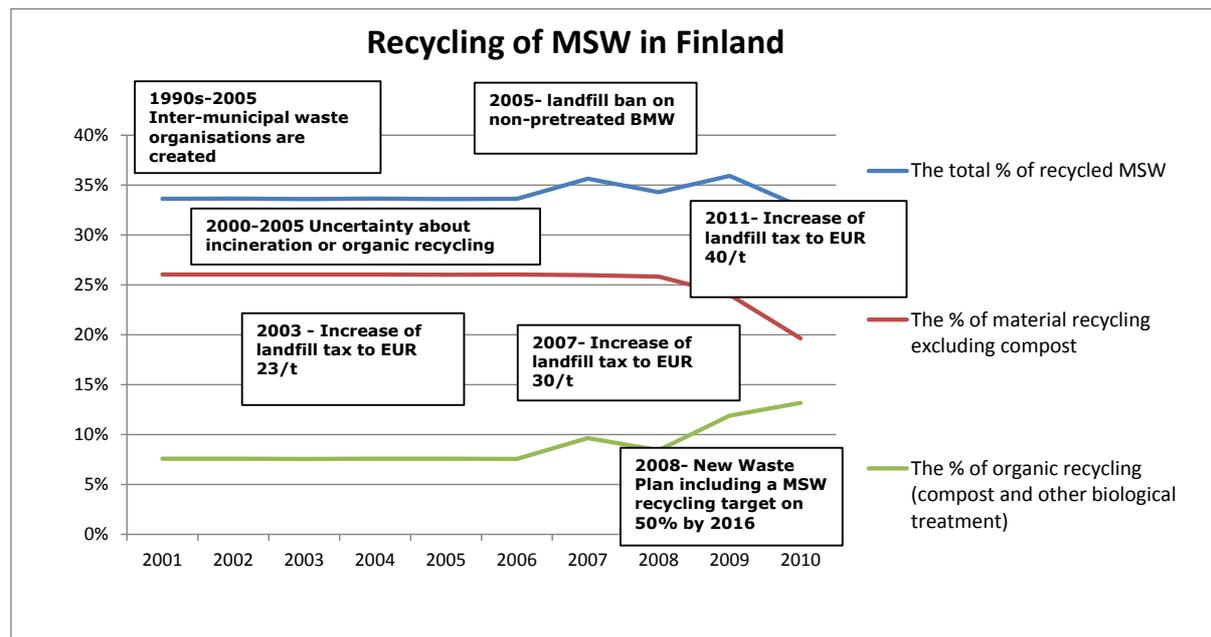
landfilled MSW has only decreased very little before 2006, where it was still 59 % (ETC/RWM, 2008). A new landfill ban on placing organic waste at landfills will come into force in 2016. The ban concerns wastes that contain more than 10 % of organic substances (Finland, 2012).

Several new economic instruments to support an-aerobic digestion have been adopted. These incentives have increased the number of new biogas facilities (about 40 facility projects under way) during the years 2010 and 2011 (Finland, 2012). The Finnish policy seems to favour MSW incineration, for example is there no tax on incineration of MSW. It implies that the increasing of the landfill tax in 2011 to EUR 40/t and to EUR 50/t in 2013 might support more incineration rather than recycling.

Already by 2008, the Government had approved the new national waste plan until 2016 ‘Towards a recycling society’ including a 50 % recycling target for MSW, 30 % used for energy recovery and a maximum of 20 % landfilling (Finland, 2009). The 50 % recycling target of MSW is detailed into a target for material recycling of 30 %, composting at source 6 % and composting or anaerobic digestion (in biogas plants) 14 % (Finland, 2009). This nationwide strategic plan includes the principles and objectives of waste management and waste prevention. For each goal and objective of the plan, the required policy instruments have been proposed and the responsible body for implementation has been identified (ETC/SCP, 2012).

However, until 2010 these initiatives have not resulted in any significant progress regarding the level of recycling of MSW.

Figure 2.9 Recycling of MSW in Finland and important policy initiatives



2.4 Future possible trends

Finland does not fulfil the criteria stated in Article 11 (3) of the EU Waste Framework Directive to get a derogation period for fulfilling the 2020 target of 50 % recycling of MSW. Therefore, as indicated in Figure 2.2, if Finland is to fulfil the 50 % EU recycling target by 2020, it is necessary to make a significant effort to achieve a very high yearly increase of recycling from 2010 to 2020. The increase has to be at least 1.7 percentage points per year on average.

If Finland is to fulfil its own target of 50 % recycling by 2016 as stated in the national waste management plan (Finland, 2009), it will require a recycling increase per year of at least 2.9 percentage points. It seems especially that the increase of recycling has to be undertaken for material recycling, which has decreased in the latest years. In 2010, the recycling of materials covered only 20 % of the total MSW generated and the Finnish target here is 30 %.

In the last two years the recycling rate of BMW has increased with five percentage points and it has reached a level of 13 %. The target is to reach 20 % by 2016.

The Finnish waste plan estimates that 700 000-750 000 tonnes of incineration capacity for MSW are needed by 2016 (Finland, 2009). Over 550 000 tonnes of MSW was incinerated in 2010. However, additional incineration capacity of 600 000 tonnes is approved to be built during 2012-2014 (Ecoprog/Fraunhofer, 2010). It seems Finland is at risk to build overcapacities for incineration that might be an obstacle for increasing the recycling rate. In order to meet the 50 % recycling target, incentives to increase recycling have to be considered.

Under all circumstances, the necessary increase in recycling will require a significant effort from the Finnish government, the local authorities and a good co-operation between the public and private sector in order to secure 50 % recycling of MSW.

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