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Municipal waste management in Luxembourg

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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 EU Waste Framework Directive's target to recycle 50% of MSW are very likely to be met before 2020, if efforts to increase MSW recycling are sustained;
- The EU Landfill Directive's targets to divert biodegradable municipal waste from landfill were met in 2006;
- Planned systematic pre-treatment of waste prior to landfilling;
- Planned not to build further landfill nor incineration capacity;
- Achieved 100 % population coverage for the separate collection of organic waste;
- Development of a container park for every 10 000 to 15 000 persons at the national level;
- Planned promotion of second-hand shops at container parks; and
- Integration of energy recovery of organic waste (bio-methanisation) in the national energy policy.

1 Introduction

1.1 Objective

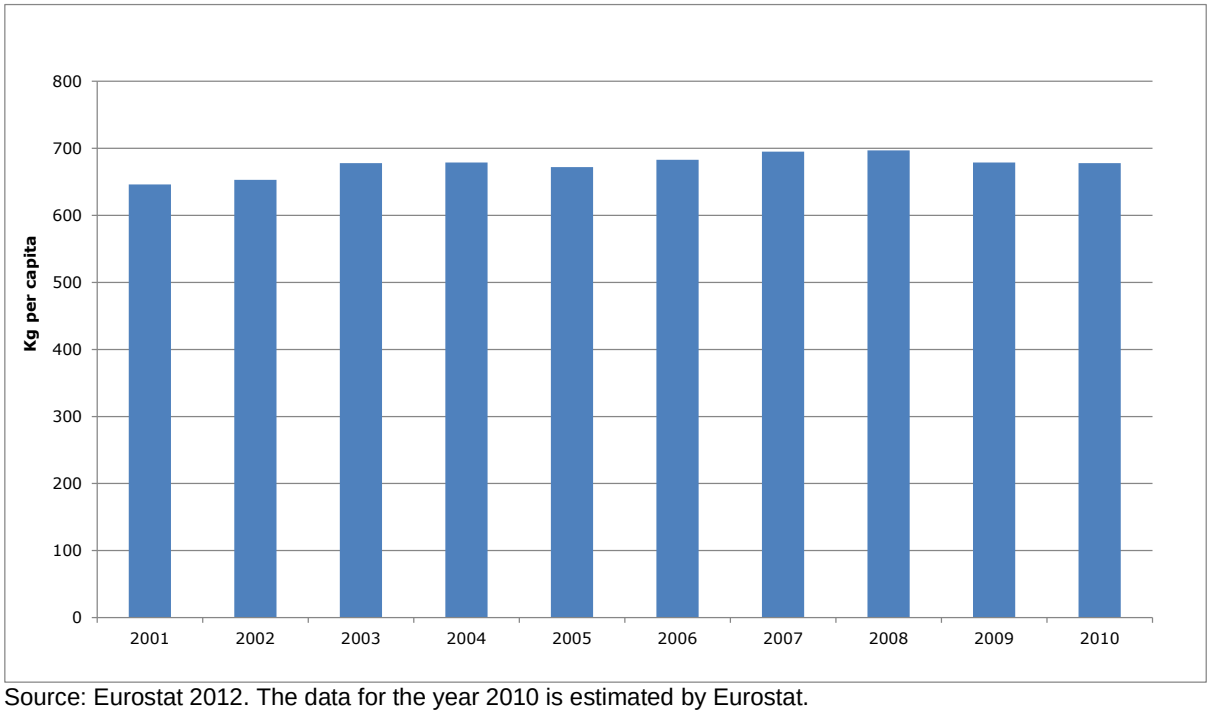
Based on historical MSW data between 2001 and 2010 for Luxembourg and EU targets linked to MSW in the Waste Framework Directive, the Landfill Directive and the Packaging Directive, the analysis undertaken includes:

- 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 Luxembourg's MSW management performance

Luxembourg is the smallest Member State in the EU after Malta. The country is generating one of the highest amounts of municipal solid waste in Europe per capita (678 kg/inhabitant in 2010) but has one of the highest rates of separately collected MSW. Figure 1 indicates a relatively stable generation of MSW per capita, with a slight reduction between 2008 and 2010.

Figure 2.0 MSW generation in Luxembourg for the period 2001-2010



Source: Eurostat 2012. The data for the year 2010 is estimated by Eurostat.

Its waste management policy is driven by waste management plans. The plans provide the general policy direction for the management of all waste types generated in Luxembourg, except radioactive waste and extractive waste. The first plan was produced in 2000 and the second plan was published in 2010. The first plan (PNGD, 2000)[1] included a number of quantitative targets to be achieved by 2005, compared to 1999, including:

- Organic waste: 75 % recycling rate;
- Packaging waste: 55 % recovery rate and 45 % recycling rate;
- Household bulky waste: reduction by 30 % (per inhabitant);
- 'Final' waste: reduction by 30 % (per inhabitant); and
- 'Problematic waste': 70 % separately collected.

The publication of the second plan did not clearly indicate whether the targets of the first plan have been met in 2005, as proposed in the first plan, but progress has been made regarding the treatment share. For instance, the rate of landfilling decreased from 20 % in 2001 to 18 % in 2010, and the total incineration rate with energy recovery decreased from 42 % to 35 % during the same time period. In contrast, the recycling rate in Luxembourg has increased from 38 % in 2001 to 47 % in 2010. In 2010, the second plan was published (PGGD, 2010)2, following an intermediary assessment in 2007 (Luxembourg Government, 2007)[3]. The overall objectives of the second plan are:

- To promote prevention further;
- To reduce the quantity of residual waste sent to landfill and incineration;
- To reduce the generation of household bulky waste;
- To pre-treat all municipal residual waste collected; and
- Waste composition assessment conducted every 3 years.

The second plan does not, however, include quantitative targets, as opposed to the first plan. Due to the high level of recovery of MSW, the second plan indicates that no additional landfilling capacity should be required, except for the installation of inert landfills to accommodate all municipalities. In addition, the plan requires the expansion of the container parks network, to achieve one container park for every 10 000 to 15 000 inhabitants. The plan also indicates that there is no need for new incineration capacity and that it would be more beneficial to replace and upgrade the existing plants.

Luxembourg has achieved high material recovery due to the early installation of container parks networks, followed by an intensification of kerbside collection coverage, which meant that by 2010 almost 100 % of the population was covered by at least one separate collection system.

2.1 MSW Indicators

For this ex-post analysis, 9 MSW indicators have been chosen related to historical data from 2001 to 2010 to assess the performance of municipal waste management in Luxembourg.

[1] PNGD (2000). Plan national de gestion des déchets. [In French]. National waste management plan. Published by the Environment Ministry. Environment Ministry. Luxembourg. Luxembourg. 252 pp.
[2] PGGD (2010). Plan général de gestion des déchets. Published by the Government of Luxembourg. Ministry of sustainable development and infrastructures. Environment Administration. Luxembourg. Luxembourg. 404 pp.
[3] Luxembourg Government (2007). Rapport d'étape. Révision du plan général de gestion des déchet. [In French]. Intermediary report. Update of the general waste management plan. Luxembourg, Luxembourg. 66pp.

2.1.1 Recycling of MSW from 2001 to 2010

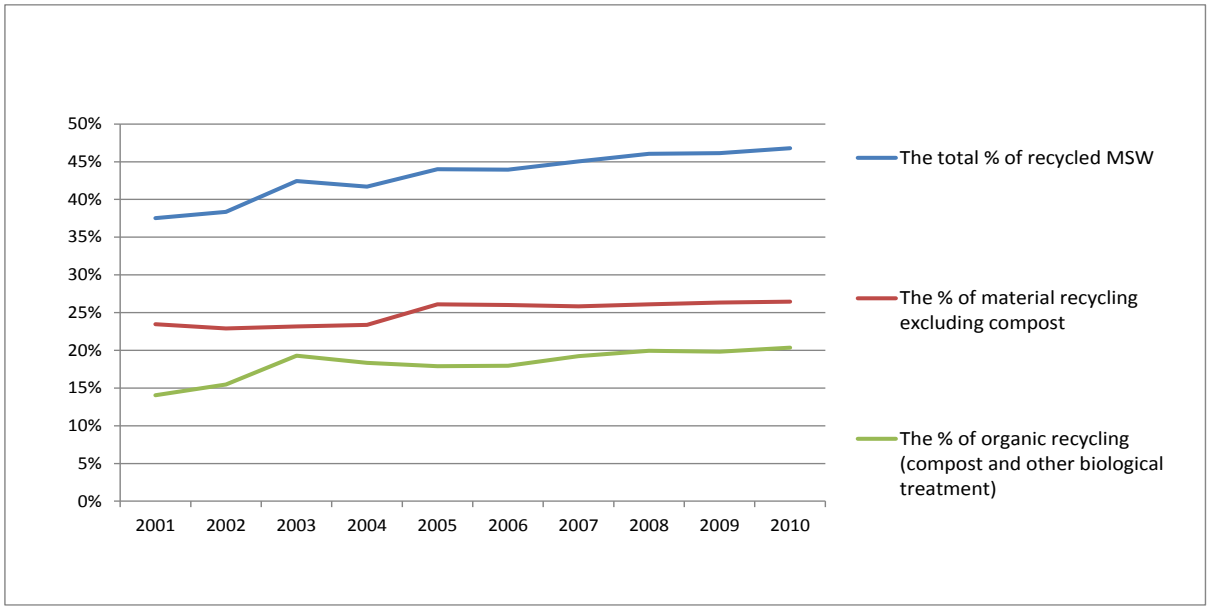
The development of total MSW recycling, organic and material recycling rates is analysed to assess whether one type of recycling has been prioritised over the other.

Note that the MSW material recycling amounts are derived from ETC/SCP, 2011 ([4]) for the years 2001 to 2005, as an error occurred in the data reported to Eurostat

The recycling rate of Luxembourg has steadily increased from 38 % in 2001 to 47 % in 2010 (Figure 2.1). The material recycling rate has been historically higher than the organic recycling rate, but organic recycling has increased more between 2001 and 2010.

According to the second waste management plan (2010), almost 100 % of the population of Luxembourg has access to at least one separate organic waste collection scheme (kerbside collection or container parks).

Figure 2.1 Recycling of MSW in Luxembourg



Source: ETC/SCP, 2011, Eurostat, 2012. Recycling rates are calculated as % of generated MSW:

The recycling rate is calculated as the percentage of MSW recycled compared to the MSW generated. The data from 2001 to 2005 for material recycling was derived from ETC/SCP, 2011 ([5]).

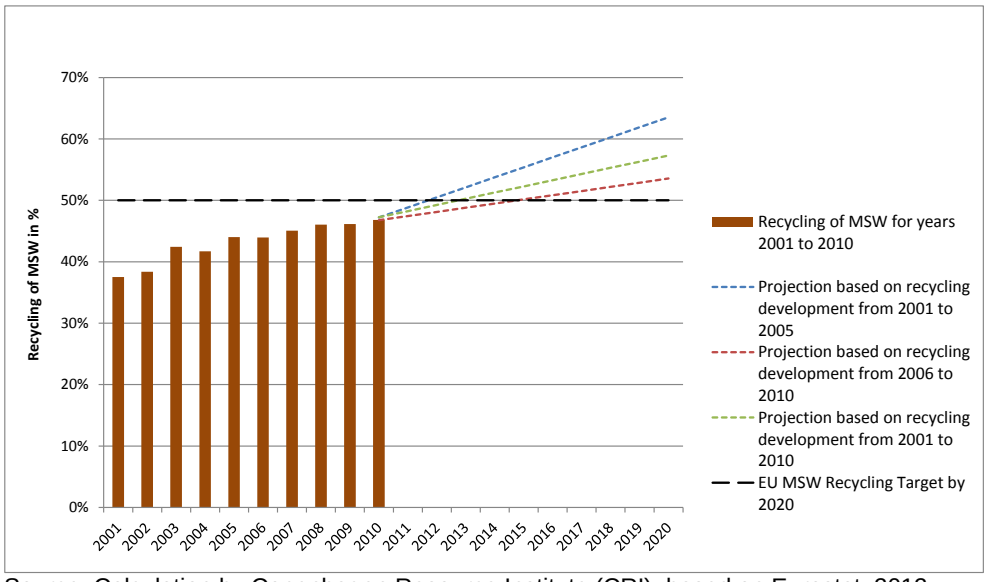
2.1.2 Yearly increase rate of recycling of MSW

In order to assess the prospects for Luxembourg to meet the 50 % recycling target as set out in the Waste Framework Directive 2008/98/EC (EC, 2008[6]) 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.

[4] ETC/SCP (2011). Europe as a Recycling Society. European Recycling Policies in relation to the actual recycling achieved. Prepared by Tojo and Fischer for the European Environment Agency.
[5] ETC/SCP (2011). Europe as a Recycling Society. European Recycling Policies in relation to the actual recycling achieved. Prepared by Tojo and Fischer for the European Environment Agency.
[6] EC (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives Text with EEA relevance. Official Journal L 312 , 22/11/2008 P. 0003 – 0030.

The historical trends of the total MSW recycling rate (including organic and material recycling) indicate that Luxembourg would meet its 50 % MSW recycling target well before 2020, if Luxembourg manages to maintain the pace of increasing its recycling rates.

Figure 2.2 Future recycling of MSW in Luxembourg



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

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.

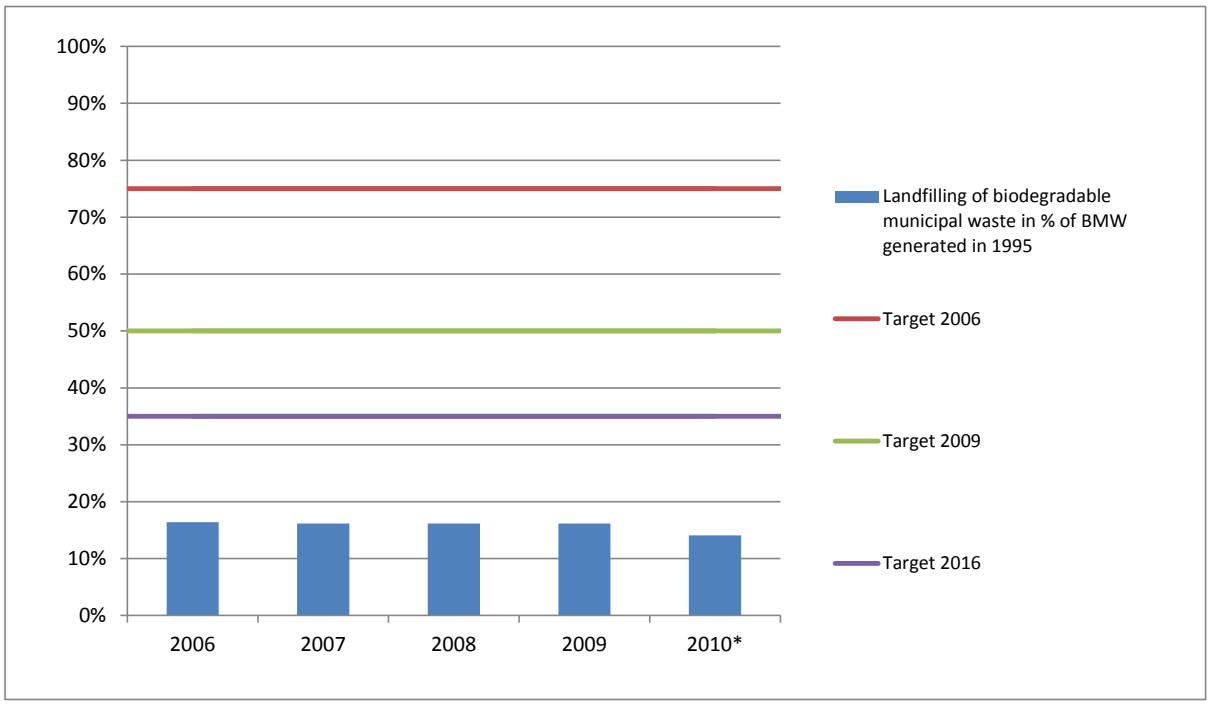
2.1.3 Landfilling of biodegradable municipal waste

The historical percentage of biodegradable municipal waste (BMW) landfilled, compared to the amounts landfilled in 1995 was calculated to assess the level of compliance with the diversion targets of the Landfill Directive 1999/31/EC (EC, 1999[7]).

According to the EU Landfill Directive, Luxembourg is required to landfill a maximum of 75 % of the total biodegradable municipal waste (BMW) generated in 1995 by 2006, 50 % by 2009 and 35 % by 2016. According to Figure 2.3, Luxembourg already reached all of its targets before 2006. Luxembourg has decided, according to the second waste management plan, published in 2010, to further reduce the BMW sent to landfill, by aiming for a reduction of the residual waste generated by households and requesting that all MSW is pre-treated prior to landfilling.

[7] EC (1999). Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. OJ L 182, 16.7.1999, p. 1–19.

Figure 2.3 Landfilling of biodegradable MSW in Luxembourg



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

No regional data is reported for Luxembourg.

2.1.5 Relation between landfill tax level and recycling level of MSW

The objective of this analysis is to assess whether fiscal instruments (and more specifically landfill incineration taxes) have an effect on the recycling rate.

In Luxembourg, no landfill tax has been implemented, however, according to the second waste management plan produced in 2010, a number of waste collection taxes have been introduced, including:

- Basic waste collection taxes to cover waste management administration, logistics and infrastructure;
- A pay as you throw tax (PAYT) by weight for residual waste;
- A tax related to the collection frequency for residual waste;
- A PAYT system for organic waste collection;
- A collection tax for household bulky waste;
- A collection tax for specific waste fractions; and
- A tax for the collection of specific waste fractions going to specific waste treatment plants.

However, the definition and implementation of the existing and future waste management taxes are under the responsibility of each municipality and therefore lack national harmonisation.

2.1.6 Environmental benefits of better MSW management

It is important to assess the performance of waste management by analysing the quantity of waste and their treatment share. This assessment, presented in the previous sections, provide some indication about compliance with the EU's regulatory framework on waste. This section addresses the evaluation of the greenhouse gas (GHG) emissions of the whole waste management system, using a life-cycle approach. The description of the GHG modelling performed in order to produce Figure 2.7 is out of the scope of the present analysis. However, a brief methodological summary is presented in the box below.

Assumptions concerning the production of Figure 2.7

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.

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 incinerators and life cycle modelling for the other technologies (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 average electricity mix of Luxembourg in 2002. 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 complete methodology is available from ETC/SCP (2011).

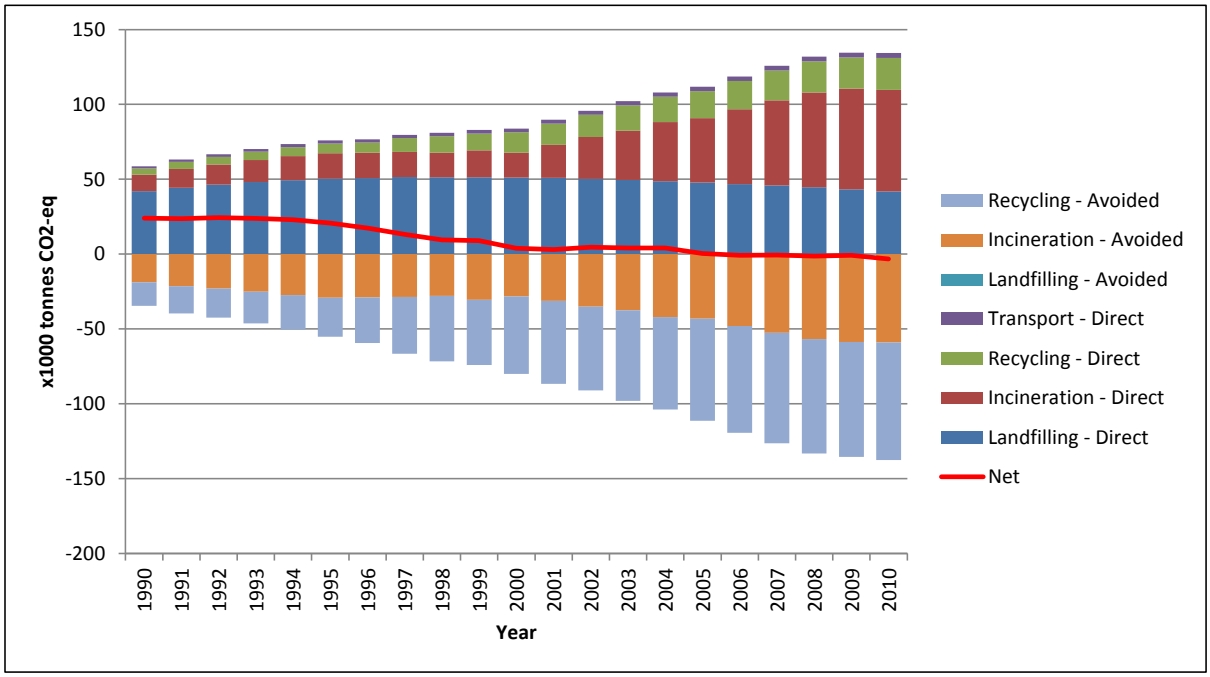
The compositions of the MSW disposed in landfills, incinerated or recycled respectively are based on (ETC/SCP, 2011). In an Eionet consultation process, initiated by the EEA in 2012, Luxembourg updated the composition of the landfilled, incinerated and recycled MSW for 2009.

Figure 2.7 indicates that the net greenhouse gas emissions from municipal waste management in Luxembourg have been decreasing. This is mainly due to the increasing level of material recycling and, to a lesser extent, biotreatment. In other words, avoided emissions due to material recycling and other recovery operations were higher than the direct operating emissions associated with municipal waste management activities. Avoided emissions are also due to the energy recovery from incineration and landfill gas but to a lesser extent.

We have noted earlier in this report that there are some errors concerning material recycling statistics from Eurostat (only 1 000 tonnes material reported to be recycled annually from 1995 to 2005). We have been able to update the time series from 1995 to 2010 by using data provided by Luxembourg (Environmental Administration of Luxembourg, 2012),

Luxembourg has a very low net GHG emission from MSW management. This performance is expected to improve further due to the mandatory requirement to pre-treat all waste prior to landfilling, as stated in the second waste management plan, published in 2010.

Figure 2.7 GHG emissions from MSW management in Luxembourg



Source: Eurostat (2012), Environment Administration (2012). Waste composition data used in the modelling has been updated based on questionnaire submitted by the Environment Administration of Luxembourg.

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 included in the reporting of MSW can result in different reported recycling levels. For instance, the reporting of MSW recycling may include a certain proportion of packaging waste. Some countries do not include any recycled packaging waste in their MSW reporting, even if the waste originates from a municipal source.

Figure 2.8a compares reported amounts of recycled MSW and reported amounts of recycled packaging waste.

In Luxembourg, the amount of MSW recycled is consistently higher than the amount of packaging waste recycled, indicating that the methodology for reporting recycled MSW has remained the same over the time period, and that at least a part of the recycled packaging waste is included in the reported amounts of recycled MSW. This is in line with the Commission Decision of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council.

The decrease observed for packaging waste in 2008 and 2009 is most probably a direct consequence of the economic downturn that started 2007-2008.

Figure 2.8a Interaction between MSW recycling and packaging waste recycling

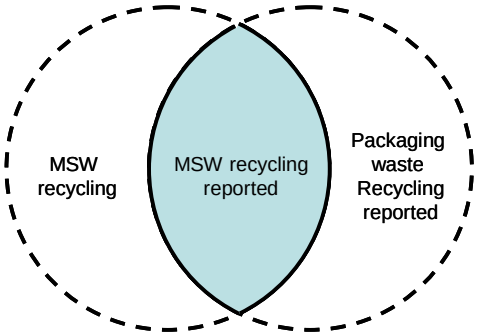
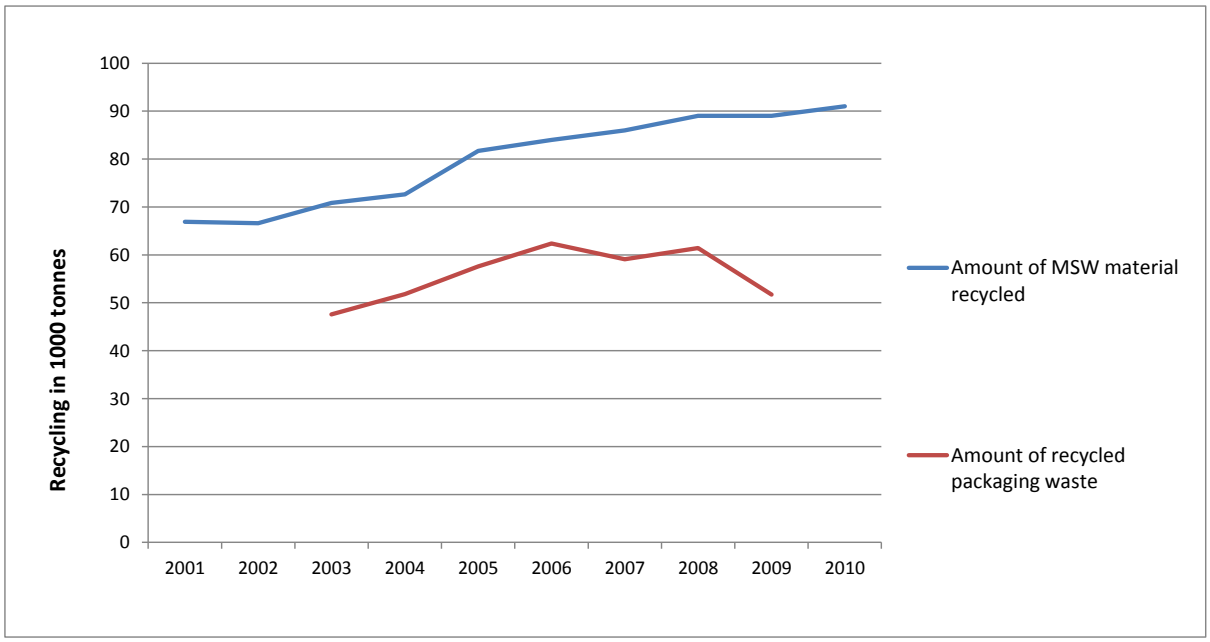


Figure 2.8b Comparison of packaging waste recycled and MSW recycled



Source: Eurostat, 2012

2.3 Important initiatives taken to improve MSW management

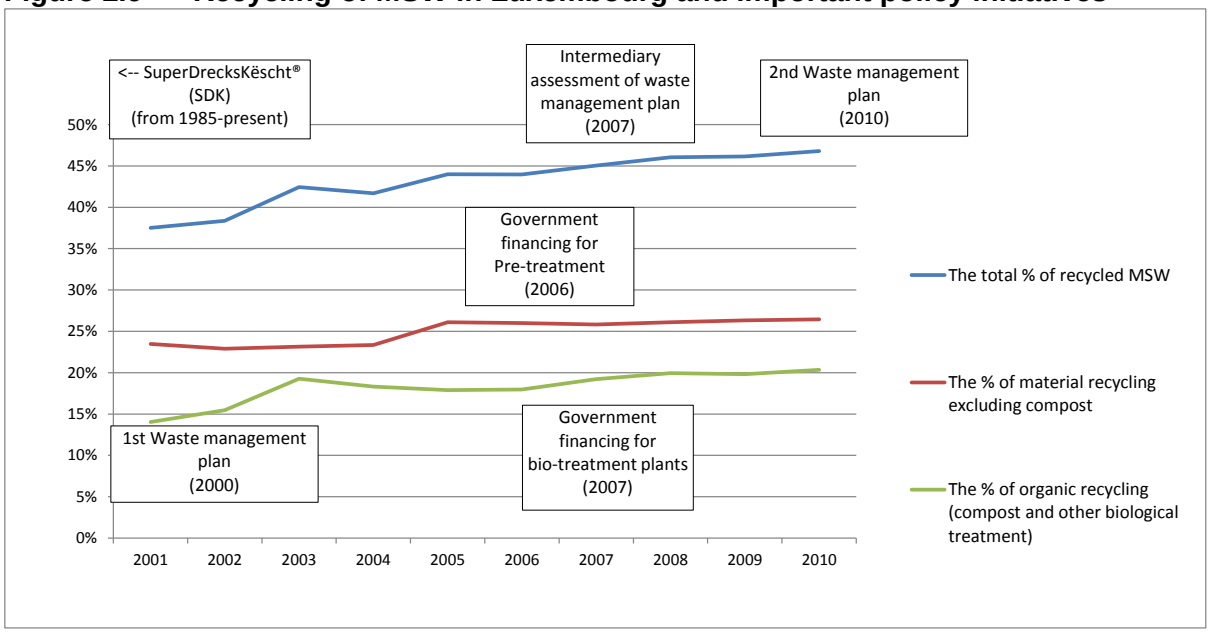
The most important initiatives taken in Luxembourg are the first national waste management plan in 2000 and a second plan published in 2010. During the period from 2001 to 2010, Luxembourg has increased the number of container parks, has agreed on the financing of pre-treatment facilities for the existing landfills (2006), and the financing of biotreatment facilities (2007), which have contributed to the reduction of untreated waste disposed to landfill and the further recovery of recyclable materials (Figure 2.9).

Luxembourg has also developed the concept of SDK (SuperDrecksKëscht®), initiated in 1985, and considered as best practice by the European Commission. Its role and public financing was clarified in the law of the 25 March 2005([8]). The objective of this, reportedly very successful model, was initially to manage 'problematic' household waste, to assist the public and companies, to provide marketing and advertising efforts for better waste management at households and companies. More specifically, this action includes 6 pillars:

- Awareness raising, information, training and education (children, adults and employees);
- Ecological waste management in companies (support for the ISO 14024 certification);
- Intelligent and sustainable consumption (actions in supermarkets, ecolabels for selected products…);
- Association with business partners (industry and crafts, commerce);
- Association with local and social authorities; and
- Follow the principle of ecological waste management for climate and resource protection (kitchen oil recovery, intelligent logistics….).

SDK has also become a brand (reportedly considered fourth best known brand in Luxembourg) and the model has also been exported to Switzerland, Sweden, Hungary, Cyprus, Greece, Lithuania and Ukraine.

Figure 2.9 Recycling of MSW in Luxembourg and important policy initiatives



This initiative is imbedded in the first and second waste management plans of Luxembourg, and therefore considered as an inherent part of the waste management policy portfolio of the country. It is difficult to assess the effect of this action on the recycling rates observed but it is clear that the creation of a brand, with the active involvement of the staff of this organisation, has had a positive contribution towards the recycling effort of the country.

[8] *Loi du 25 mars 2005* relative au fonctionnement et au financement de l'action SuperDrecksKëscht (Mém. A-N° 39, p. 696). [In French]. Law in relation to the management and financing of the SuperDrecksKëscht model.

2.4 Future possible trends

Luxembourg is very likely to reach the 50 % recycling target for household waste in the Waste Framework Directive well ahead of the target year 2020, if the country manages to continue increasing its recycling rates at the same pace as in the past decade. The waste management plan, published in 2010, provides additional policy measures and directions, which are expected to further improve the waste management performance of the country and move further towards the top of the waste hierarchy. The policy includes institutional, infrastructural and waste specific aspects that will improve future trends in material recycling.

Institutional aspects

Regarding monitoring of progress to meet waste management policies' objectives, some initiatives include the development of more systematic waste analyses and national waste statistics, performed at the national level on a 3 year basis. It is expected that this approach will provide a better understanding of the waste management infrastructure requirements in order to optimise waste management.

The 2010 waste management plan also indicates the requirement of a national waste management stakeholders' meeting every two years. This indicates that, while the general direction of waste management policy (waste management plans) is only updated every ten years, new organisational infrastructure will be implemented to introduce a continuous active debate, in order to monitor progress and eventually change the direction of the agreed plan.

Infrastructural aspects

The levels of waste separately collected for recycling are already rather high in Luxembourg. There is a strong confidence and expectation, that this trend is expected to increase further with time. As a consequence of this expected trend, Luxembourg is proposing not to increase further landfill nor incineration capacity, except for landfills for inert waste. This gives a strong message that the overall objective of the waste management policy in Luxembourg is to collect and recover as much material as possible, including material and organic recovery. The policy focus on recycling also includes the requirements to increase the standards of existing biotreatment plants and to develop further the bio-methanisation plants network.

The current waste policy also suggests that efforts will be undertaken to increase further the network of container parks (both stationary and mobile), as it is believed that this will lead to a further increase of recycling rates and a reduction of residual waste disposal. The objective is to systematically develop a container park for every 10 000 to 15 000 inhabitants over the whole territory.

The specific policy concerning household bulky waste includes the reduction of quantities sent to landfilling or incineration, promotion of second hand shops inside container parks, with obligatory quality control of items before being sold (especially for electrical appliances).

Other policy incentives towards higher level of recycling

It is interesting to note that the waste management plan, published in 2010, includes some specific measures which should favour the collection of waste into separate fractions and enhance both recycling quantity and quality. For instance, the plan indicates that architectural standards will be revised to include separate collection specifications in newly built houses.

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PNGD (2000). Plan national de gestion des déchets. [In French]. National waste management plan. Published by the Environment Ministry. Environment Ministry. Luxembourg. Luxembourg. 252 pp.