

# Municipal waste management in Slovenia



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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

## **Main points regarding MSW management in Slovenia:**

- The majority of MSW generated in Slovenia is still landfilled;
- The total reported recycling rate of MSW has increased from 11 % in 2002 to 30 % in 2009;
- According to present trends, Slovenia is on track to fulfill the 50 % recycling target of the EU Waste Framework Directive by 2020;
- By 2010, Slovenia has decreased biodegradable municipal waste landfilled by 13 percentage points (related to the generated amount in 1995) from 2006 to 2010. Some efforts have to be undertaken to fulfill the targeted value of 35 % by 2020;
- The Slovenian landfill tax was introduced in 2001, and revenues from the tax were increasingly used to build up recycling infrastructure;
- Life-cycle GHG emissions from municipal waste have been decreasing continuously since 1994, mainly driven by reduced methane emissions from landfills and increasing avoided emissions from recycling;
- Municipalities are responsible for MSW management in their administrative territories;
- The first National Waste Management Plan is in the drafting process.

# 1 Introduction

## 1.1 Objective

Based on historical MSW data for Slovenia 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 Slovenia's MSW management performance

Quantities of waste are growing in Slovenia, and on average slightly more than 7 million tonnes of waste are generated each year, of which more than 900 000 tonnes is municipal waste – about 450 kg per inhabitant (EEA, 2010).

In previous years the majority of municipal waste was landfilled, but with changes to legislation, political instruments and the establishing of municipal waste management centres, better separate collection and treatment of mixed municipal waste before disposal, the percentage of recycled municipal waste is increasing (EEA, 2010).

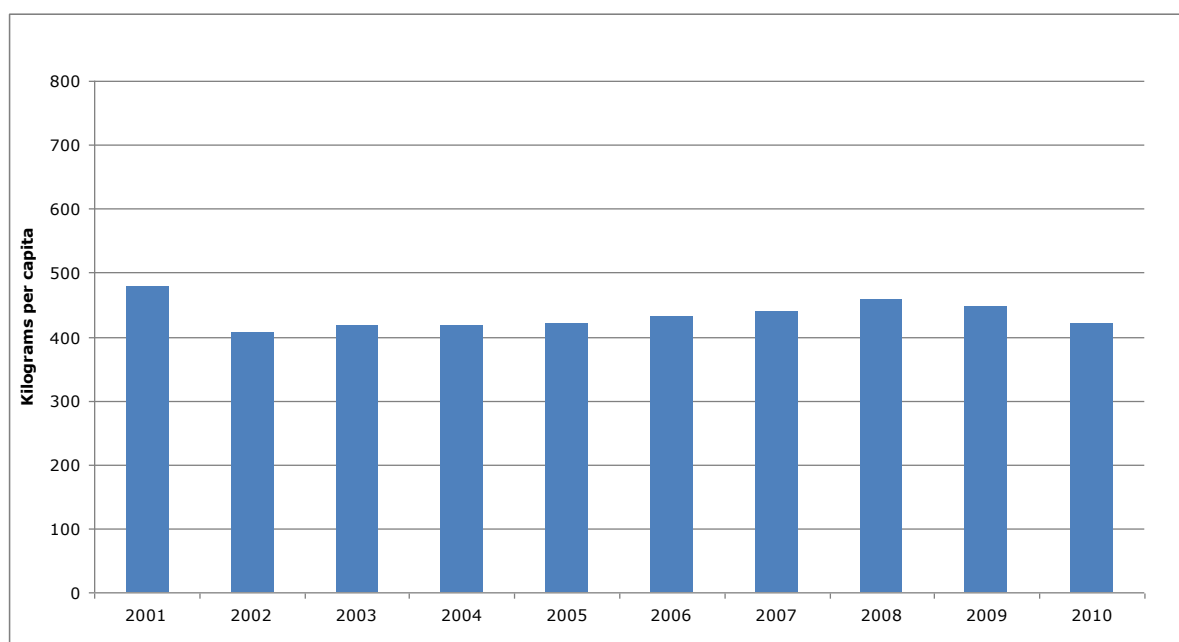
The most relevant acts related to waste management in Slovenia are the Environmental Protection Act (adopted in 2004), the Decree on the Landfilling of Waste (adopted in 2006), and the Decree on Waste (adopted in 2011). Other relevant legislation may be grouped in several clusters (EEA, 2010): legislation concerning different sorts of waste, legislation on waste management and legislation on monitoring emissions from waste treatment.

In interviews with representatives of the Slovenian Environment Agency it has been highlighted that two important documents are currently in the draft phase: the National Waste Management Plan of the Republic of Slovenia as well as the Operative Program for Municipal Waste Management. It is expected that those documents will be a basis for considerable improvements of MSW management in Slovenia in the years to come.

### 2.1 MSW Indicators

Figure 2.0 shows the development of MSW generation per capita in Slovenia from 2001 to 2010. There has been little overall change in MSW generation during the observed period but from 2008 there has been a slight decrease.

**Figure 2.0 MSW generation per capita in Slovenia**



Source: Eurostat, 2012; Break in series in 2002: There was a change in data collection methods and harmonization with EU methodology.

The majority of MSW generated in Slovenia is still landfilled. According to the Slovenian Environment Agency 71 % of the municipal waste generated in 2008 was landfilled and 29 % recycled (360 000 tonnes) (SEA, 2010). However, according to Eurostat data presented in Figure 2.1, 37 % was recycled. The Statistical Office of the Republic of Slovenia has provided those data reported to Eurostat, but the methodology used also includes waste imported for recycling but excludes exported amounts, which explains different recycling rates. In the years to come a change in the methodology is foreseen, so the data will be compatible with the national data in SEA, (SEA, 2012). At the same time Slovenia has also reported regional recycling data of MSW to Eurostat from 2001 to 2009, which do not include import for recycling but include exported amounts. In the following sections the regional Eurostat data have been used in order to achieve a time series, which reflects the actual recycling level.

Landfilling of municipal waste, i.e. waste from households and other waste of similar origin and composition, falls within the competence of municipal public services and is permitted in non-hazardous waste landfills that are local public service facilities and/or public infrastructure facilities (SEA, 2010).

At the end of 2007, there were 83 waste disposal sites – 60 public infrastructure sites and 23 for industrial waste – either in operation or due for closure. During 2007, disposal was only carried out at 44 public landfills and 17 industry-operated landfills. At the other landfills only closure operations were performed (SEA, 2010).

In Slovenia, municipal waste management is the responsibility of local communities – municipalities.

Some indicators regarding the development of MSW management in Slovenia are shown below.

### **2.1.1 The recycling of MSW from 2001 to 2010**

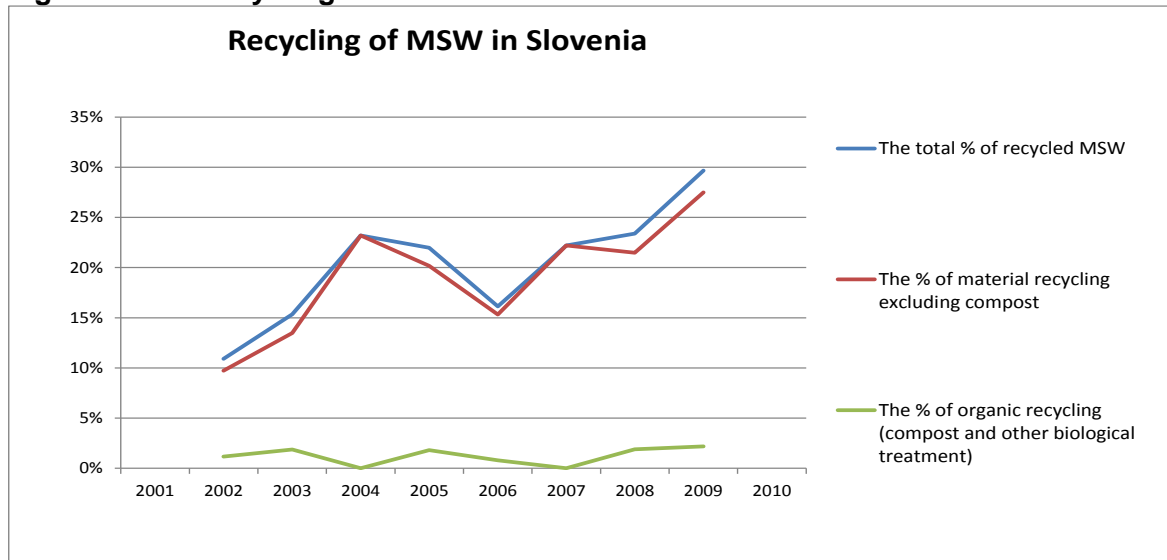
Figure 2.1 shows the development of recycling of MSW in Slovenia in terms of total recycling, material recycling and organic recycling (compost and other biological treatment). The recycling rates have changed considerably during the mentioned period. After 2001, recycling of MSW started to grow very rapidly until 2004. After a drop in 2005 and 2006, recycling of MSW increased again and

reached its peak in 2009. The total percentage of recycled MSW increased from 11 % in 2002 to 30 % in 2009. In absolute amount the increase was from 89 000 tonnes in 2001 to 271 000 tonnes in 2010.

The total increase of recycling is almost entirely linked to material recycling, which has increased from 10 % (79 000 tonnes in absolute amount) in 2002 to 27 % (251 000 tonnes) in 2010.

In the same period organic recycling has had almost negligible increase from 1 % in 2002 to 2 % in 2009. To conclude, the amount of organic recycling is very low, so there is definitely room for considerable improvement.

**Figure 2.1 Recycling of MSW in Slovenia**



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

The composition of the recycled MSW in Slovenia is shown in the Table 2.2. The data is provided by the Slovenian Environment Agency (Slovenia, 2012). Paper and cardboard are responsible for 50 % of the recycled MSW in Slovenia. In addition, according to these data, food waste was responsible for 25 % of the total recycled MSW.

**Table 2.2 Structure of recycled MSW in Slovenia (Slovenia, 2012)**

Municipal waste fractions sent to recycling in 2010		
	Quantity in 1000 tonnes	%
Paper and Cardboard	121	38 %
Plastics	33	10 %
Glass	30	9 %
Metals	15	5 %
Wood	2	0 %
Textiles	1	0 %
Food waste	79	25 %
Garden waste	0	0 %
Inerts (e.g. C&D)	20	6 %
WEEE	7	2 %
Batteries	0	0 %
Other hazardous waste	0	0 %
Others (e.g. bulky waste...)	10	3 %
Total recycled	317	100 %

Source: Slovenia, 2012. Note: According to the regional data 20 000 tonnes were composted in 2009, and according to Eurostat data for 2010, it was 20 000 tonnes in 2010, which indicates some discrepancy with the figure for food waste in the table.

### 2.1.2 The yearly increase rate of recycling of MSW

In order to assess the prospects for Slovenia to meet the 50 % recycling target as set out in the Waste Framework Directive<sup>1</sup>, three scenarios have been calculated based on the reported data to Eurostat.

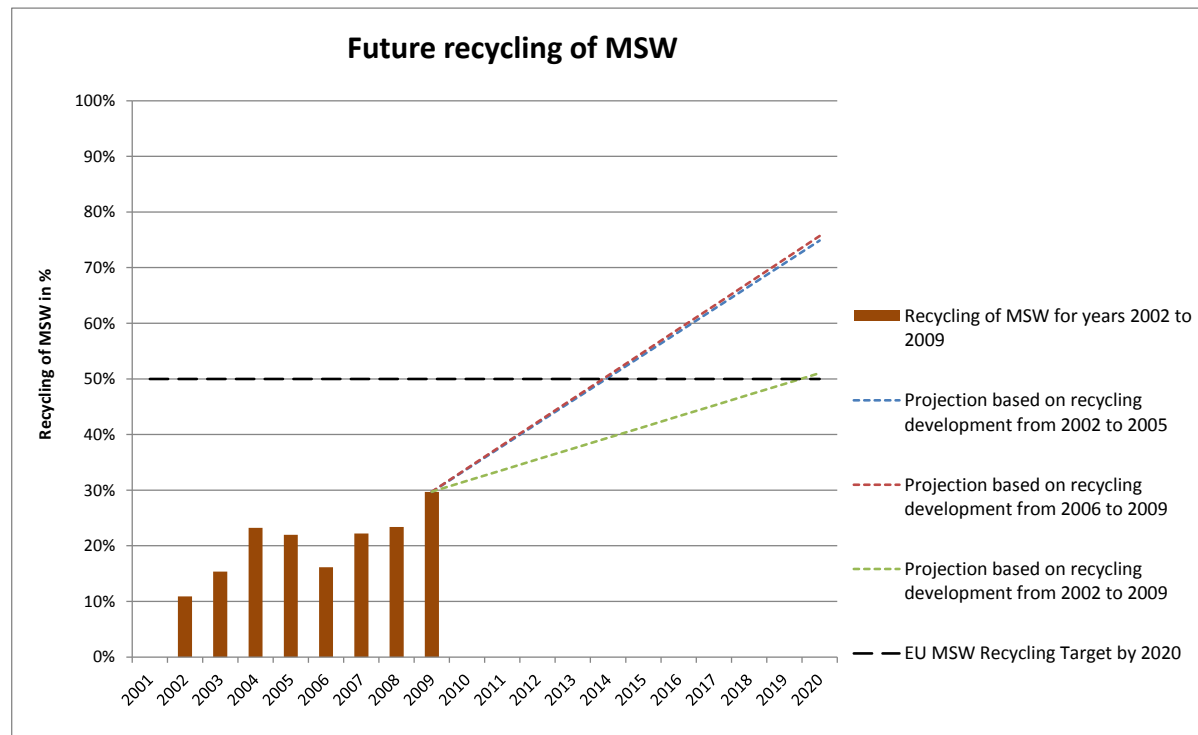
<sup>1</sup> EU's updated Waste Framework Directive from 2008 (EU, 2008) includes a new 50 % recycling target for waste from households, to be fulfilled by 2020. In 2011, the European Commission decided that countries can choose between four different calculation methods to report compliance with this target. One of these methods is to calculate the recycling rate of MSW as reported to Eurostat (EC, 2011).



These scenarios assume that recycling increases in the period 2010 to 2020 at the rate experienced in 2002-2005, 2006-2009 and 2002-2009 respectively. The projections are based on a linear regression.

Figure 2.2 shows that Slovenia will be able to fulfil the recycling target of 50 % by 2020 regardless which of the three presented trends is followed. The scenario based on 2002-2005 and the scenario based on 2006-2009 follow almost the same line, and the recycling target would for these two scenarios be reached quite far before the given deadline. The third scenario based on 2002-2009 takes into account the decrease in the years between 2004 and 2007 and will just reach the target by 2020.

**Figure 2.2 Future recycling of MSW in Slovenia**



Source: Calculation by Copenhagen Resource Institute (CRI), based on Eurostat, 2012 and Eurostat regional data, 2012. Note: The scenario based on 2002-2005 and the scenario based on 2006-2009 follow almost the same line,

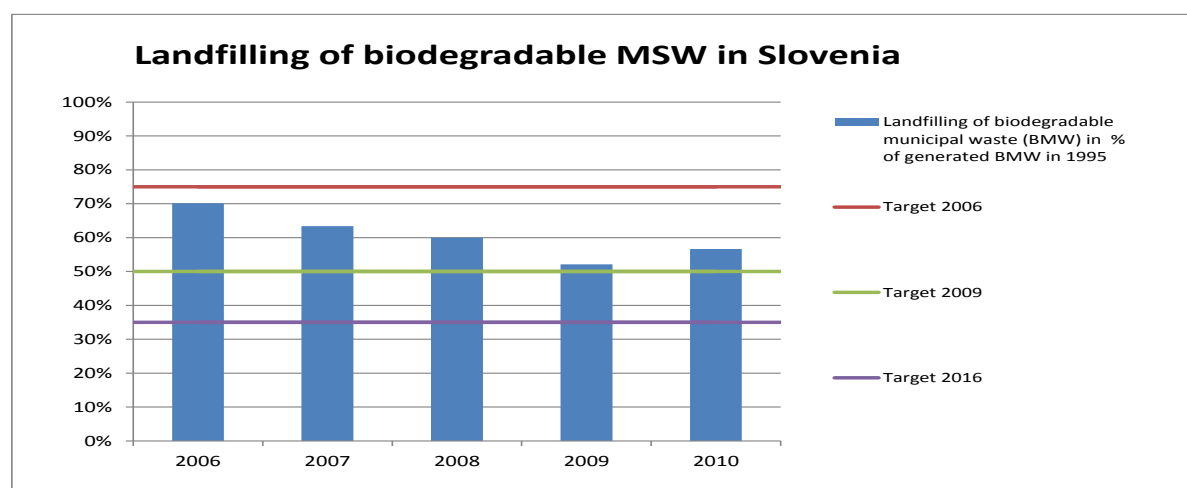
It has to be kept in mind that these three scenarios are very simplistic and do not take into account any planned policy measures. In addition, they are based on one calculation methodology for recycling of municipal waste (MSW recycled/MSW generated, using data reported to Eurostat) whereas countries 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.

### 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 (BMW) landfilled by a certain percentage by 2006, 2009 and 2016. Targets are related to the generated amount of BMW in 1995. In that year Slovenia generated 445 000 tonnes of BMW.

In 2006, the landfilled amount of BMW was 312 000 tonnes, or 70 % of the quantity generated in 1995 (Figure 2.3). Therefore, the target value for 2006 was successfully reached. In 2009, 232 000 tonnes of BMW was landfilled, i.e. 52 % of the quantity generated in 1995, which means that the target for 2009 (50 %) was not fully reached. Furthermore, in 2010 the amount of landfilled BMW increased to 252 000 tonnes, i.e. 57 % of the quantity generated in 1995 (Slovenia, 2012).

**Figure 2.3 Landfilling of biodegradable MSW in Slovenia**



Source: EC, 2012 and Slovenia, 2012.

In July 2009 Slovenia applied for the derogation period of four years (prolongation of the deadline for fulfilling the targeted value from 2016 to 2020), (SLO, SEA, 2012).

The figure indicates that Slovenia has improved, but some efforts have to be undertaken to fulfill the targeted value 35 % by 2020.

#### **2.1.4 Regional differences of MSW recycling from 2001 to 2010**

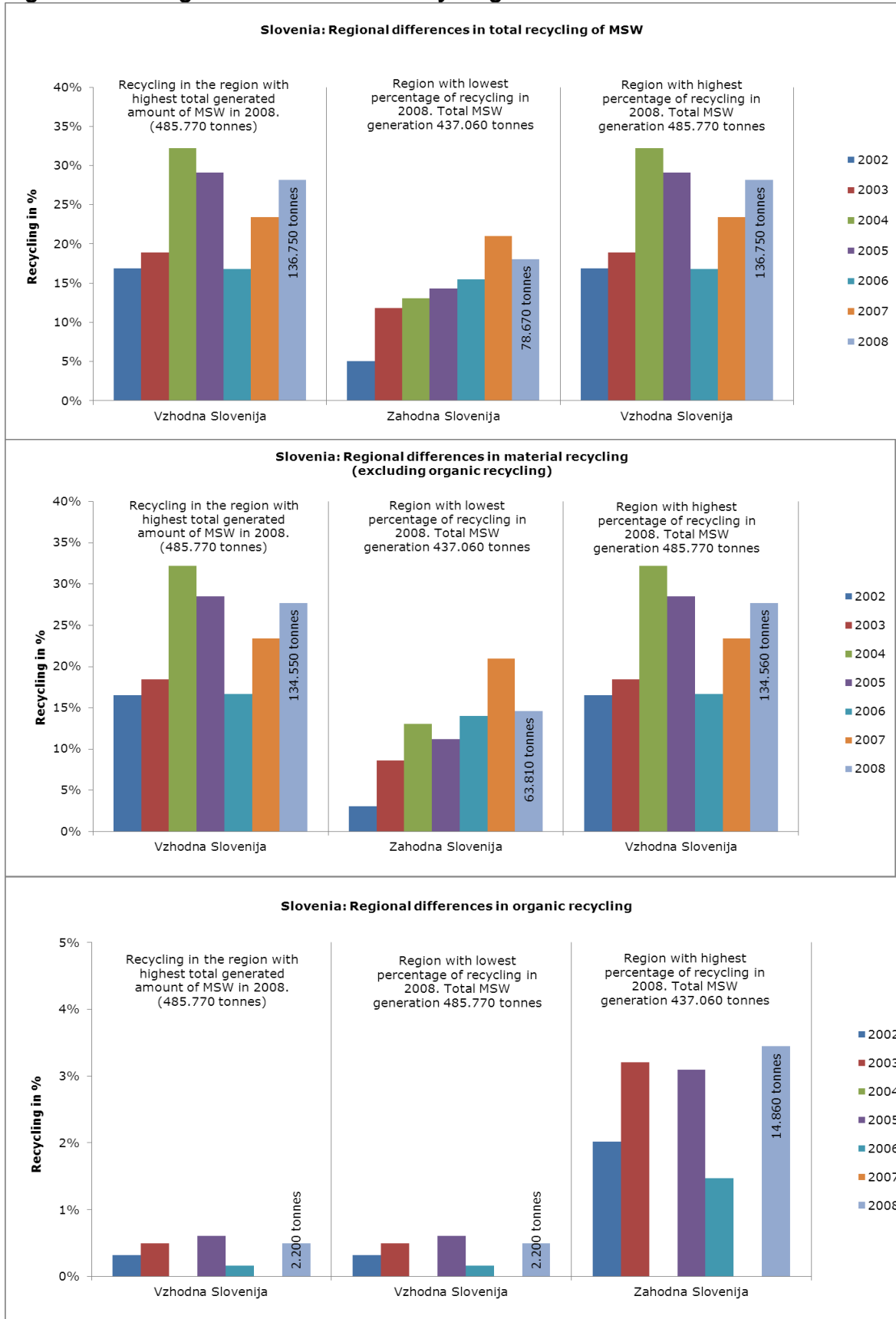
Slovenia has reported regional recycling data of MSW to Eurostat. Figure 2.4 shows regional differences in the development of MSW recycling from 2002 to 2008 related to total recycling, material recycling and organic recycling. For each type of recycling three different regions have been chosen:

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 of the respective waste type in 2008;
3. Recycling in the region with the highest percentage of recycling of the respective waste type in 2008.

Slovenia has two regions, i.e. the Vzhodna Slovenia situated in the eastern part of the country and Zahodna Slovenia, covering western part of Slovenia.

The differences between regions in material and organic recycling rates are considerable. Differences in total recycling are considerable as well, and are linked to material recycling as organic recycling is very low.

**Figure 2.4 Regional differences in recycling of MSW**



Source: Eurostat regional data, 2012

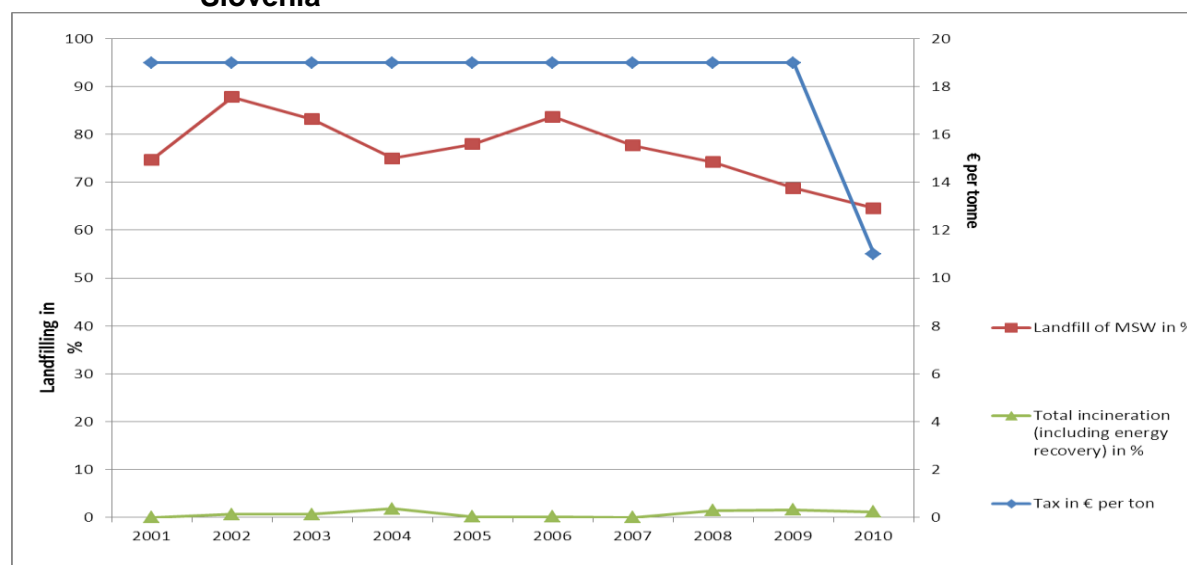
## 2.1.5 The relation between landfill tax level and recycling level of MSW

The Slovenian landfill tax was introduced in 2001, when the Decree on environmental tax for environmental pollution caused by waste disposal was adopted. All landfill operators of landfills for hazardous, non-hazardous and inert waste are obliged to pay tax for the disposal of waste (ETC/SCP, 2012).

The landfill tax is paid by the landfill operator (ETC/SCP, 2012). Until 2010, the collected tax went into the state budget; after October 2010 the landfill tax revenue from municipal landfills goes to municipalities and the revenue from industrial landfills to the state budget (ETC/SCP, 2012).

The rate of the landfill tax in the period from 2001 to 2009 was 19 EUR/t. However, this was the maximum tax rate, and the average tax paid is estimated to have been around 7-10 EUR/t<sup>2</sup>. In 2010, the rate was changed to 11 EUR/t and the calculation methodology simplified. Figure 2.5 shows that the percentage of landfilled MSW has started to decrease constantly since 2006, and the landfill tax might have contributed to this development, although the tax level is rather low compared to other countries' landfill taxes. . The consequences of the recent change in the landfill tax are still to be seen.

**Figure 2.5 Development of landfilling and incineration of MSW and landfill tax in Slovenia**

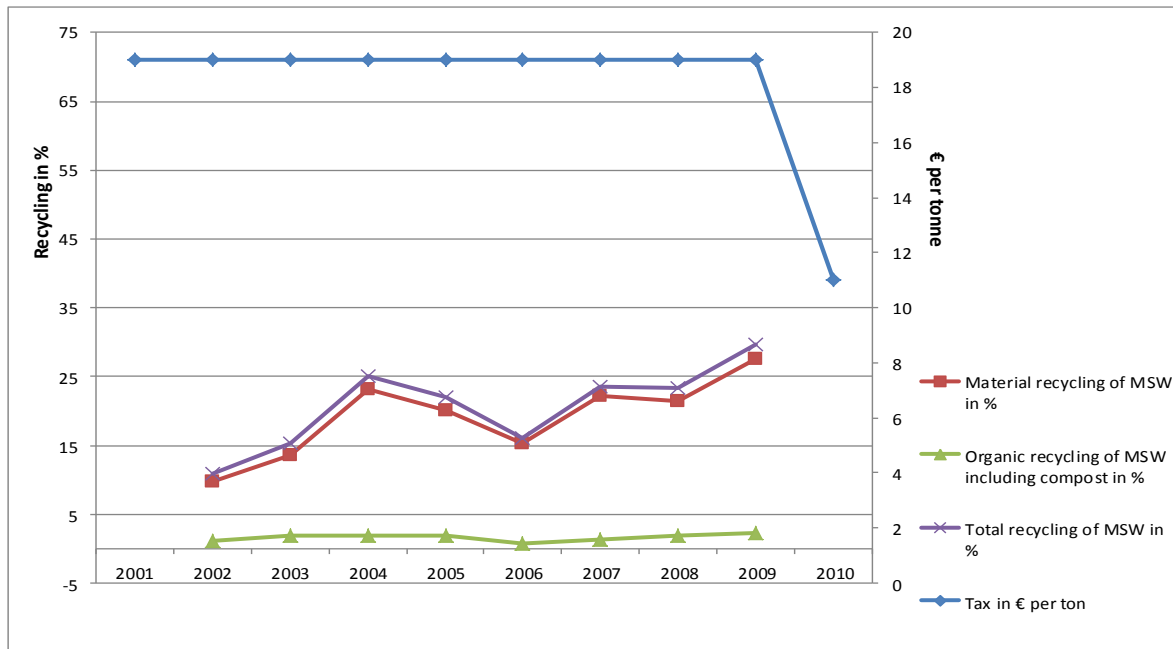


Source: ETC/SCP, 2012 and Eurostat, 2012

Figure 2.6 shows an increase of recycling since the landfill tax was introduced in 2001. The revenues from the landfill tax are mainly earmarked for investments in waste management centres. Since 2001, the investments in public infrastructure have increased. From 2001 to 2004, the largest share was spent on landfills for municipal and hazardous waste in order to bring them into compliance with the requirements of the EU Landfill Directive, but significant investments were also made into collection and recycling schemes (ETC/SCP, 2012). It should also be stressed that the increase of total recycling of MSW is mostly due to material recycling of MSW and to a lower extent to organic recycling.

**Figure 2.6 Development of MSW recycling and landfill tax in Slovenia**

<sup>2</sup> 19 EUR/t was the highest tax for landfilling of MSW to be paid if there was no documentation on the percentage of biodegradable waste in the waste sent to a landfill. If such an analysis was done and/or if there was a pretreatment of MSW to decrease the amount of the biodegradable part of the waste, or the landfill gases were collected, then the tax was lower (and indeed the average tax paid for municipal waste was about 7-10 EUR/t). From October 2010 a more simple calculation for the tax was implemented and it is now around 11 EUR/t. (SEA, 2012)



Source: ETC/SCP, 2012 and Eurostat, 2012

### 2.1.6 Environmental benefits of better MSW management

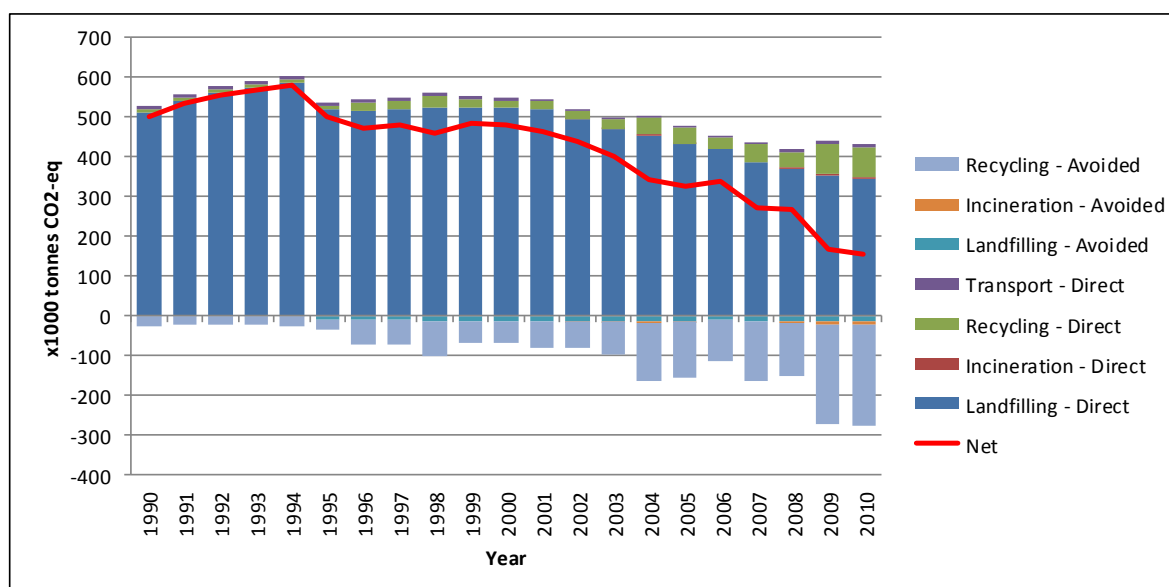
Figure 2.7 shows the environmental benefits and costs of MSW management indicated by greenhouse gas (GHG) emissions from 1990 to 2010. The graph shows the direct emissions, the avoided emissions and the net emissions of the MSW management.

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.

Figure 2.7 indicates little change of net emissions up until 1999. From that point net emissions have been decreasing constantly. It is reasonable to assume that direct emissions from landfilling will continue to decrease in the coming years but for several years ahead considerable amounts of GHGs will continue to be emitted from landfills because BMW landfilled in the previous period continues to generate methane for several years.

Next to a decrease in direct emissions from landfill, more and more emissions were avoided due to better MSW management, most prominently due to MSW recycling. This is because products based on virgin material generate more emissions than those which are based on recyclables. Avoided emissions from recycling increased most notably after 2003. Avoided emissions from energy recovery of landfill gas and from waste incineration are very low.

**Figure 2.7 GHG emissions from MSW management in Slovenia<sup>3</sup>**



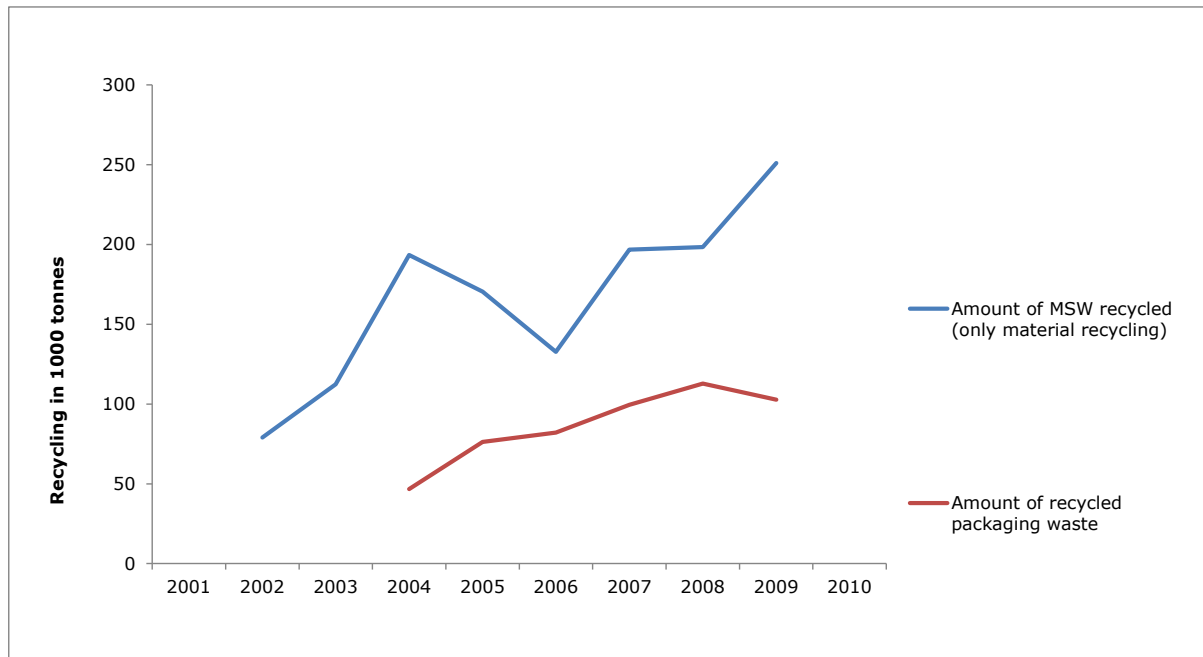
## 2.2 Uncertainties in the reporting

Some uncertainties or differences in the reporting of MSW can result in different levels of recycling. One example of such differences which may influence the recycling rate of MSW in Slovenia 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 Slovenia, 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 Slovenia was significantly higher than the amount of recycled packaging waste. This indicates that Slovenia has included recycled packaging waste from households in its reported amounts of recycled municipal waste.

<sup>3</sup> 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 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 bio-treatment. Avoided emissions of bio-treatment include fertilizer substitution. All processes generating electricity are assumed to substitute electricity mix of Slovenia 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 Bakas et al., ETC/SCP, 2011. In an Eionet consultation process, initiated by the EEA in 2012, Slovenia updated the compositions of the landfilled and incinerated MSW for 2010. The complete methodology is available from Bakas et al, ETC/SCP, 2011).

**Figure 2.8 Comparison of packaging waste recycled and material MSW recycled**



Source: Eurostat, 2012

Another potential source of uncertainty is that some countries allocate the total amount of MSW sent to Mechanical Biological Treatment (MBT) to recycling. In other countries, only the actual amount of recycled material recovered in the MBT is included, and not the waste material that is subsequently sent to landfill or incineration. In Slovenia there are only few MBT plants, so most of MSW recycled, including packaging waste, goes directly for recycling, which means that the reported amount reflects the amount actually recycled (SEA, 2012).

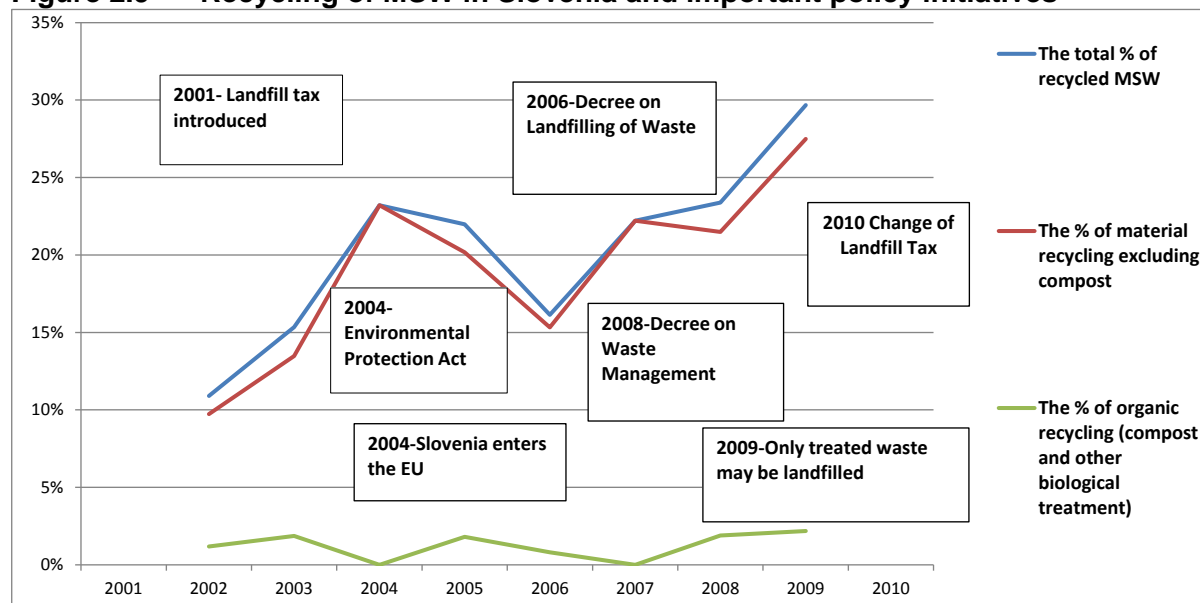
### **2.3 Important initiatives taken to improve MSW management**

In spite of growing quantities of generated municipal waste, Slovenia still remains rather below the European average, since the EU-27 average of generated waste amounted to 522 kg per capita in 2010. However, the methodologies for collecting data are not fully comparable (SEA, 2010).

The quantities of municipal waste in Slovenia are increasing. Schemes for collecting and treatment of individual types of waste streams along with financing of activities that ensure proper management of such waste have been established (EEA, 2010).

In order to implement EU legislation, several changes in waste management were introduced in recent years. Alongside introducing producer responsibility, schemes have been established for collection and treatment of individual types of waste, along with companies that ensure the proper management of such waste. Since June 2009, only treated waste may be landfilled, and landfill site operators are obliged to provide financial guarantees to the local authority. Waste incineration is conducted at three sites, two of which generate energy. A small plant for heat treatment of municipal waste is undergoing trial operation – and there are plans for two further facilities. Electronic reporting is being introduced, and this should allow easier tracing of waste (EEA, 2010).

**Figure 2.9 Recycling of MSW in Slovenia and important policy initiatives**



In previous years around 70 % of municipal waste was disposed of in municipal waste landfills. Through changes to legislation, the establishment of municipal waste management centres, taxes and financial guarantees for landfill operators, the quantities of municipal waste landfilled should diminish (EEA, 2010).

As it has been mentioned before, two important documents are in the drafting phase at the moment: the National Waste Management Plan of the Republic of Slovenia as well as the Operative Program for Municipal Waste Management. It is expected that those documents will be a basis for considerable improvements of MSW in Slovenia in years to come.

## 2.4 Future possible trends

As it is indicated in Figure 2.2, based on the official reported data to Eurostat, Slovenia has a good chance of fulfilling the recycling target of 50 % by 2020 if it can maintain the increase in recycling rates of any of the periods 2002-2005, 2006-2009 or 2002-2009.

In view of the amendments in the legislation, the establishment of regional waste management centres, taxes and financial guarantees provided for landfill operators, landfilled quantities of waste are expected to decrease (SEA, 2012).

Slovenia expects to further reduce GHG emissions from the waste sector (according to IPCC methodology). This is expected to be achieved primarily by reducing the quantities of biodegradable waste going to landfill, through more active separation of waste at the source, heat treatment and capture of landfill gas (EEA, 2010).

Environmental targets for waste management are have been aligned with the EU targets. Besides the new targets that are set by the Directive 2008/98/EC on waste and the target of reducing the amount of biodegradable compounds in municipal waste landfilled, objectives are also set for collecting and/or recovery of individual waste streams. In its accession negotiations Slovenia received a derogation period for achieving recovery targets for packaging waste. The targets applicable to the countries of EU-15 for 2001 had to be met by Slovenia by 2007, and the 2008 targets for EU-15 will have to be met by 2012. The 2008 EU Waste Framework Directive demands the establishment of a



system for separate collection by 2015 for at least paper, metal, plastic and glass. Slovenia already has such a system in place, but the results of separate collection are still far from those desired.

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