

Economic Evaluation of Emission Reductions of Methane in the Waste Sector in the EU

EXECUTIVE SUMMARY

Greenhouse gases from Waste Management Activities in the European Union were in 1990 some 155Mt of CO₂ equivalent being some almost 4% of all greenhouse gas emissions. These emissions are coming from methane and do not include the emissions from the transportation of waste. While the methane emissions are projected to remain fairly stable with current environmental policies, the waste sector offers much low cost potential to reduce emissions.

Measures to reduce methane emissions from waste can be broadly divided into three categories:

- diversion of biodegradable waste away from landfill and using alternative disposal/treatment methods such as composting or incineration;
- collection and combustion of landfill gas;
- improved oxidation of fugitive landfill gas emissions in the landfill cap.

In this study, baseline trends have been estimated assuming that waste generation per capita, the proportion of waste disposed of to landfill and the landfill gas recovery remains constant. The landfill emissions were estimated using the time dependent IPCC methodology. To provide a 'no action' baseline the effects on methane emissions of the Landfill Directive were not included. The effect of the options to reduce emissions has been calculated assuming that the measures are implemented in the order waste diversion, increased landfill gas recovery and increased oxidation in the cap. For waste diversion the implementation is split into reductions required by the Landfill Directive and those required by national policy.

Under the 'no action' baseline, landfill emissions in the EU rise slightly (by 2%) to 6672 kt methane (i.e. 140.1 Mt of CO₂ eq.) by 2010 due to the expected increase in population. The table below summarises the emissions in 1990 and the baseline emissions for 2010¹.

	Emissions	Baseline
in Mt CO ₂ eq.	1990	2010
Landfills	137,7	140,1
Wastewater handling	15,3	15,3
Waste incineration	0,5	0,5
Other (Waste)	1,5	1,5
Total	155,0	157,4

The total reduction potential taking into account interaction between options is a reduction of 3194 kt methane (67Mt CO₂ equivalent). The exact mix of measures which are likely to be implemented in Member States is difficult to define as most have yet to devise a clear strategy.

¹ The emissions for wastewater handling, waste incineration and other waste have not been estimated, and thus assumed not to change from 1990.

Table 1 below gives an estimate of the specific costs of the measures and of the reduction potential for the individual measures (assuming no interactions). These measures are likely to be very dependent on local conditions and can only be estimated very approximately in this type of European level study. There is a greater level of confidence in the overall level of reductions calculated as described above. Figure 1 shows the share in emission reduction categorised in four cost brackets.

Table 1 EU15-average costs and total potential (Mt CO₂ equivalent) for emission reduction of methane options in the waste sector (summary table).

Pollutant	Measure Name	Sector	Emission reduction	Investment	Yearly costs	Lifetime	Specific abatement costs
			Mt CO ₂ eq.	euro/tCO ₂ eq.	euro/tCO ₂ eq.	year	euro/tCO ₂ eq.
CH ₄	Landfill diversion: Paper recycling	Waste	1	391	-70	15	-35
	Landfill: Heat production	Waste	1	20	-17	20	-16
	Landfill: Electricity generation	Waste	5	31	-5	15	-2
	Landfill: Upgrade to S.N.G. (synthetic natural gas)	Waste	0	25	-2	20	0
	Subtotal : Cost range for < 0 euro /t CO₂	Waste	7				
	Landfill: Flaring	Waste	6	5	0	10	1
	Landfill: Increased oxidation	Waste	11	72	0	20	5
	Landfill diversion: Anaerobic digestion (1)	Waste	2	422	-23	15	15
	Subtotal : Cost range for 0 < 20 euro /t CO₂	Waste	19				
	Landfill diversion: Incineration (1)	Waste	23	539	-19	15	29
	Landfill diversion: Composting (1)	Waste	2	330	19	15	49
	Subtotal : Cost range for 20 < 50 euro /t CO₂	Waste	24				
	Landfill diversion: Composting (2)	Waste	1	390	28	15	63
	Landfill diversion: mechanical-biological pretreatment (MBT)	Waste	7	330	49	15	79
	Landfill diversion: Anaerobic digestion (2)	Waste	1	489	49	15	93
	Landfill diversion: Incineration (2)	Waste	10	1223	-11	15	99
	Subtotal : Cost range for > 50 euro /t CO₂	Waste	18				
	Total emission reduction potential		67				

Figure 1 Waste sector: 1990 base year direct emissions (left), 2010 frozen technology reference level and reduction potentials per cost bracket (right).

