SIXTH FRAMEWORK PROGRAMME

PRIORITY [policy-oriented research priority SSP 5A]

SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECT

FORWAST

Overall mapping of physical flows and stocks of resources to forecast waste quantities in Europe and identify life-cycle environmental stakes of waste prevention and recycling

Contract number: 044409

Deliverable n° 6-2

Title:

25-year forecasts of the cumulated physical stocks, waste generation, and environmental impacts for each scenario for EU-27 and for the case study countries.

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Contents:

1 Introduction

The overall objective of the FORWAST project is to:

1. Provide an inventory of the historically cumulated physical stock of materials in EU-27 and to forecast the expected amounts of waste generated, per material category, in the next 25 years.
2. Provide an assessment of the life-cycle wide environmental impacts from different scenarios of waste prevention, recycling and waste treatment in the EU-27.

These inventory and assessment results are provided as an output of a Leontief-type environmentally extended, quasi-dynamic, physical input-output model covering the EU-27, including raw material extraction and processing of imported materials and waste treatment of exported wastes.

The fundamental concept behind the model is that of mass balances ("what comes in must go out"), implying that the resource input (R) minus emissions (B) and stock changes (ΔS) determines the potential waste amounts ($W=R-B-\Delta S$). To determine *where* and *when* the materials in the resource inputs come out as waste, it is also necessary to trace the materials in the resource inputs through the different activities of the economy, which is done in the input-output model, and to determine the lifetime of the material stocks.

The objective of the present deliverable D6-2 is to document 25-year forecasts of the cumulated physical stocks, waste generation, and environmental impacts for each scenario for EU-27.

1.1 Methodology and data used for calculating model results

The methodology used for model calculations to obtain the results presented in this report is described in deliverable D6-4 'Documentation of the final model used for the scenario analyses'. The data collection is described in deliverable D3-1 and D4-1 which are reports describing data processing and validation for each of the EU-27 countries. The data from D3-1 and D4-1 are aggregated to an EU-27 model, a waste treatment module is implemented and the data are consolidated. This is described in deliverable D6-1 'Documentation of the data consolidation and calibration exercise, and the scenario parameterisation'. Nine future scenarios are applied to the aggregated EU-27 model. The scenarios are described in deliverables D5-2 'Description of the three chosen macroeconomic scenarios for EU-27 until 2035' and D5-3 'Report with description of three what-if scenarios of waste treatment policies and their interplay with the macro-economic scenarios'. The implementation of the scenarios in the model (scenario parameterisation) is described in deliverable D6-1 'Documentation of the data consolidation and calibration exercise, and the scenario parameterisation'. In order to calculate the current stocks and waste generation in reference year 2003 (originating from products that exceed their life time expectancy) historical time series of the EU-27 model are carried out. The method and data used for this purpose are also described in D6-1 'Documentation of the data consolidation and calibration exercise, and the scenario parameterisation'.

The reports referred to above as well as the data used for model calculations are available at: http://forwast.brgm.fr/.

It should be noted that the model results presented in this report represents data for EU-27. The data used for this are based on data collection for 20 countries, see Table 1.1. The supply-use table created from the 20 country data sets are scaled up to represent EU-27 by using the 20 countries' GDP share of EU-27 GDP.

Country code	Country	Included (x)	Data level	GDP share
AT	Austria		117x117	2%
BE	Belgium	x	57x57	3%
BG	Bulgaria	x	57x57	0.2%
CY	Cyprus	x	57x57	0.1%
CZ	Czech Republic	x	57x57	1%
DE	Germany		117x117	21%
DK	Denmark	x	117x117	2%
EE	Estonia	x	57x57	0%
ES	Spain		117x117	8%
FI	Finland	x	57x57	1%
FR	France	x	117x117	16%
GR	Greece	x	117x117	2%
HU	Hungary	x	57x57	1%
IE	Ireland		57x57	1%
IT	Italy		57x57	13%
LT	Lithuania	x	57x57	0.2%
LU	Luxembourg	x	57x57	0.3%
LV	Latvia	x	57x57	0.1%
MT	Malta	x	57x57	0.04%
NL	Netherlands	x	117x117	5%
PL	Poland	x	117x117	2%
PT	Portugal	x	57x57	1%
RO	Romania	x	57x57	1%
SE	Sweden	x	117x117	3%
SI	Slovenia		117x117	0.3%
SK	Slovakia	x	57x57	0.3%
UK	United Kingdom		117x117	16%
38% of EU27 GDP is included				**100%**

Table 1.1: Overview of the data used for the creation of the EU-27 supply-use table used in the model calculations.

1.2 Overview of scenarios

In Table 1.2 below, an overview of the nine analysed scenarios are provided.

Macro-economic scenario / **Waste treatment scenario**	**Baseline**	**High growth**	**Low growth**
Treatment	Scenario 1	Scenario 4	Scenario 7
Recycling	Scenario 2	Scenario 5	Scenario 8
Prevention	Scenario 3	Scenario 6	Scenario 9

Table 1.2: Overview of the analysed scenarios.

When interpreting the results, it is important to note, that the recycling ratio of metals is higher in the treatment scenario than in the recycling scenario. The recycling scenario only affects the recycling rate of the following two metal containing waste streams: 1) end-of-life-vehicles and 2) WEEE waste to recycling. The treatment scenario affects the recycling rate of all metal containing waste streams. This is described in deliv-

erable D5.3 ‘Report with description of three what-if scenarios of waste treatment policies and their interplay with the macro-economic scenarios’.

2 Forecasts of the cumulated physical stocks in EU-27 the next 25 years

This chapter presents results on the accumulated stocks in the EU-27 for the reference year (2003) and for future scenarios. The stock tables present the total quantity of a number of different stock, and it is specified where in the economy each of the stock categories are stored (given as percentage of the total quantity). All stocks are given in metric tonnes, dry weight.

Distinction is made between stocks in economy and stocks of waste. Stocks in economy are products, which has entered the economy (use of products) by a given activity at a given time, which have not yet exceeded their life time expectancy. Stocks of waste are materials in landfills that are not yet degraded, i.e. has not yet become emissions.

It should be noted that the applied definition of stocks implies that intermediate storage of products and wastes throughout the product chain are not included. The definition also implies that only products with life time expectancy and wastes with degradation times more than one year are included as stocks.

Most of the stocks of construction materials in residential housing and industry will appear in the construction sector. This is because the physical material input (use) of construction materials takes place in the construction sector. The physical flow of materials contained in houses and structures from the construction sector to other activities using construction products is only included as a service flow (monetary value). The same applies to transport vehicles. The reason for not including the physical flow of these 'composite' products is that this allows to operate with different life time expectancies for the different components in the 'composite' products, e.g. windows has a shorter life time than concrete and bricks. The same applies to stocks of motor vehicles which appears as stocks of the feedstock materials and components in the motor vehicles activity.

2.1 Cumulated stocks in EU-27 in year 2003

In Table 2.1, the accumulated stocks in the EU-27 are presented. It appears that the total quantity of stocks in economy is 167,700 million tonne in 2003 in EU-27. The most significant part of the stocks belongs to construction materials (sand, gravel, concrete, asphalt, bricks) and wood products (also contained in construction). These stocks account for approximately 97% of the total stocks. Most of these stocks are present in the industry and construction sectors.

Other significant stocks in economy are:

- Iron products: 948 million tonnes
- Machinery and equipment nec.: 723 million tonnes
- Fabricated metal products, except machinery: 624 million tonnes
- Glass products 558 million tonnes
- Furniture, and other manufactured products: 408 million tonnes
- Electrical machinery: 335 million tonnes

Stocks of waste in landfills are mainly inert wastes (landfilled construction materials etc.). Also landfilled slag/ash is significant. All stocks of waste are stored in the waste treatment sector. In this context, diffuse littering is included as part of the waste treatment sector.

Accumulated stocks in:
Region: EU27
Year: 2003

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Resource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	116,345	1.0%	0.0%	6.3%	1.3%	19.4%	52.4%	0.1%	0.1%	11.3%	6.6%	1.5%	100%
	Concrete, asphalt	30,647	0.4%	0.0%	0.1%	1.7%	5.5%	80.4%	0.0%	0.0%	4.9%	2.2%	4.6%	100%
	Bricks	3,086	0.3%	0.0%	0.3%	0.3%	8.4%	72.6%	0.0%	0.1%	8.1%	1.7%	8.0%	100%
Textile	Textile, wearing apperel, footwear	105	0.8%	0.0%	0.1%	1.2%	23.7%	2.6%	0.0%	0.1%	13.1%	1.6%	56.7%	100%
Wood	Wood products	3,280	2.2%	0.4%	0.5%	2.3%	28.7%	40.5%	0.1%	0.6%	12.4%	2.2%	10.2%	100%
Paper products	Paper and printed/recorded media	210	0.4%	0.0%	0.1%	4.2%	15.1%	0.8%	0.2%	0.1%	45.5%	4.1%	29.5%	100%
Plastic	Plastic and rubber products	139	2.1%	0.1%	0.5%	6.6%	24.7%	19.4%	1.3%	0.1%	18.4%	2.3%	24.5%	100%
Glass	Glass products	558	2.3%	0.0%	2.1%	27.5%	22.0%	23.0%	0.4%	0.2%	11.7%	6.2%	4.9%	100%
Metal products	Iron products	948	0.2%	0.0%	0.9%	0.8%	64.3%	26.1%	0.2%	0.1%	5.5%	1.0%	0.8%	100%
	Aluminium products	39	0.1%	0.0%	0.2%	3.3%	73.8%	16.3%	0.3%	0.2%	4.1%	1.3%	0.5%	100%
	Copper products	21	0.1%	0.0%	0.0%	1.6%	86.5%	9.1%	0.2%	0.1%	1.7%	0.3%	0.5%	100%
	Metals nec products	11	0.1%	0.0%	0.2%	1.6%	69.7%	15.1%	0.3%	0.2%	10.4%	1.8%	0.8%	100%
	Fabricated metal products, except machinery	624	1.5%	0.1%	0.7%	3.9%	28.8%	27.3%	0.8%	0.3%	17.9%	12.0%	6.8%	100%
	Machinery and equipment n.e.c.	723	6.0%	0.2%	1.8%	3.8%	31.9%	8.6%	0.7%	0.3%	27.4%	5.2%	14.2%	100%
	Office machinery and computers	5	0.3%	0.0%	0.2%	0.9%	12.6%	0.8%	0.3%	0.1%	62.6%	7.3%	15.0%	100%
	Electrical machinery n.e.c.	335	0.5%	0.0%	0.4%	0.8%	26.1%	19.1%	1.2%	1.3%	29.4%	3.5%	17.7%	100%
	Radio, television and communication equipment	69	0.0%	0.0%	0.1%	0.2%	31.0%	2.4%	0.3%	0.5%	37.3%	2.0%	26.2%	100%
	Instruments, medical, precision, optical, clocks	30	0.1%	0.0%	0.0%	0.3%	16.3%	2.9%	0.2%	0.7%	48.4%	1.0%	30.2%	100%
	Furniture and other manufactured goods n.e.c.	408	0.1%	0.0%	0.0%	0.5%	9.7%	2.2%	0.1%	0.2%	24.3%	2.6%	60.3%	100%
Total		**157,583**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	5,922	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,317	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,247	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	2,249	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	186,695	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	3,954	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	223	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	2,568	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	8,665	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	32,550	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**245,388**												

Table 2.1: Cumulated stocks in the EU-27 in 2003.

2.2 Cumulated stocks in EU-27 year 2035

In Table 2.3 to Table 2.11 the cumulated stocks for scenario 1-9 are given.

In Table 2.1 below, the cumulated stocks in 2035 are compared with the cumulated stocks in 2003 for scenario 1. It appears from Table 2.1 that most stocks in the economy increases with the same rate. Only the growth of stocks of plastic are forecasted to be significant higher than for the other stocks. For stocks of waste, it appears that some categories are decreasing from 2003 to 2035, namely food waste and textiles waste. The underlying reason for this is that more waste is sent to incineration in the treatment scenario, and consequently less is sent to landfill. At the same time the stock of food waste degrades in the landfill. A consequence of the increased incineration is that more slag/ash is landfilled.

Stock category		Quantity 2003, dry weight (Million t)	Quantity 2035, dry weight (Million t)	2035 relative to 2003
Stocks in the economy				
Construction materials	Sand, stone, clay	116,345	184,849	159%
	Concrete, asphalt	30,647	47,338	154%
	Bricks	3,086	4,793	155%
Textile	Textile, wearing apperel, footwear	105	150	143%
Wood	Wood products	3,280	5,185	158%
Paper products	Paper and printed/recorded media	210	314	149%
Plastic	Plastic and rubber products	139	363	260%
Glass	Glass products	558	786	141%
Metal products	Iron products	948	1,350	142%
	Aluminium products	39	56	141%
	Copper products	21	29	138%
	Metals nec products	11	16	142%
	Fabricated metal products, except machinery	624	875	140%
	Machinery and equipment n.e.c.	723	1,043	144%
	Office machinery and computers	5	8	151%
	Electrical machinery n.e.c.	335	489	146%
	Radio, television and communication equipment	69	103	148%
	Instruments, medical, precision, optical, clocks	30	45	148%
	Furniture and other manufactured goods n.e.c.	408	586	144%
Total		**157,583**	**248,378**	**158%**
Stocks of waste				
Stocks in landfill	Landfill of waste: Food	5,922	4,115	69%
	Landfill of waste: Paper	1,317	1,655	126%
	Landfill of waste: Plastic	1,247	1,645	132%
	Landfill of waste: Metals	2,249	3,434	153%
	Landfill of waste: Glass/inert	186,695	346,948	186%
	Landfill of waste: Mine waste	3,954	7,246	183%
	Landfill of waste: Textiles	223	196	88%
	Landfill of waste: Wood	2,568	3,918	153%
	Landfill of waste: Oil/Hazardous waste	8,665	17,460	202%
	Landfill of waste: Slag/ash	32,550	65,120	200%
Total		**245,388**	**451,738**	**184%**

Table 2.2: Development in cumulated stocks in the EU-27 from 2003 to 2035 in scenario 1.

2.2.1 Scenario 1: Baseline scenario, treatment waste scenario, year 2035

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Treatment

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Resource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	184,849	1%	0%	6%	1%	22%	51%	0%	0%	12%	5%	2%	100%
	Concrete, asphalt	47,338	0%	0%	0%	2%	6%	80%	0%	0%	5%	2%	5%	100%
	Bricks	4,793	0%	0%	0%	0%	9%	72%	0%	0%	9%	1%	8%	100%
Textile	Textile, wearing apperel, footwear	150	1%	0%	0%	1%	22%	2%	0%	0%	14%	1%	58%	100%
Wood	Wood products	5,185	2%	0%	1%	2%	29%	39%	0%	1%	13%	2%	11%	100%
Paper products	Paper and printed/recorded media	314	0%	0%	0%	4%	15%	1%	0%	0%	47%	3%	29%	100%
Plastic	Plastic and rubber products	363	1%	0%	1%	8%	25%	21%	2%	0%	20%	2%	21%	100%
Glass	Glass products	786	2%	0%	2%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Metal products	Iron products	1,350	0%	0%	1%	1%	65%	25%	0%	0%	6%	1%	1%	100%
	Aluminium products	56	0%	0%	0%	3%	73%	16%	1%	0%	4%	1%	0%	100%
	Copper products	29	0%	0%	0%	2%	86%	9%	0%	0%	2%	0%	1%	100%
	Metals nec products	16	0%	0%	0%	2%	70%	14%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	875	1%	0%	1%	4%	30%	26%	1%	1%	19%	9%	7%	100%
	Machinery and equipment n.e.c.	1,043	5%	0%	2%	4%	33%	8%	1%	0%	28%	4%	14%	100%
	Office machinery and computers	8	0%	0%	0%	1%	13%	1%	1%	0%	64%	6%	15%	100%
	Electrical machinery n.e.c.	489	0%	0%	1%	1%	26%	18%	3%	2%	30%	3%	18%	100%
	Radio, television and communication equipment	103	0%	0%	0%	0%	31%	2%	1%	1%	38%	1%	26%	100%
	Instruments, medical, precision, optical, clocks	45	0%	0%	0%	0%	17%	3%	0%	1%	48%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	586	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**248,378**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	4,115	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,655	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,645	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,434	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	346,948	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,246	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	196	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,918	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,460	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	65,120	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**451,738**												

Table 2.3: Cumulated stocks in the EU-27 in 2035; Scenario 1.

2.2.2 Scenario 2: Baseline scenario, recycling waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Recycling

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Resource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	238,072	1%	0%	4%	1%	41%	39%	0%	0%	9%	4%	1%	100%
	Concrete, asphalt	47,140	0%	0%	0%	2%	6%	80%	0%	0%	5%	2%	5%	100%
	Bricks	4,758	0%	0%	0%	0%	9%	72%	0%	0%	9%	1%	9%	100%
Textile	Textile, wearing apperel, footwear	150	1%	0%	0%	1%	22%	2%	0%	0%	14%	1%	58%	100%
Wood	Wood products	5,177	2%	0%	0%	2%	29%	39%	0%	1%	13%	2%	11%	100%
Paper products	Paper and printed/recorded media	317	0%	0%	0%	4%	16%	1%	0%	0%	46%	3%	29%	100%
Plastic	Plastic and rubber products	364	1%	0%	0%	8%	25%	21%	2%	0%	20%	2%	21%	100%
Glass	Glass products	773	2%	0%	1%	29%	22%	22%	1%	0%	13%	5%	5%	100%
Metal products	Iron products	1,404	0%	0%	1%	1%	67%	23%	0%	0%	6%	1%	1%	100%
	Aluminium products	56	0%	0%	0%	3%	74%	15%	1%	0%	4%	1%	0%	100%
	Copper products	29	0%	0%	0%	2%	86%	9%	0%	0%	2%	0%	1%	100%
	Metals nec products	16	0%	0%	0%	2%	70%	14%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	906	1%	0%	1%	4%	33%	25%	1%	0%	18%	9%	7%	100%
	Machinery and equipment n.e.c.	1,046	5%	0%	2%	4%	34%	8%	1%	0%	28%	4%	14%	100%
	Office machinery and computers	8	0%	0%	0%	1%	13%	1%	1%	0%	64%	6%	15%	100%
	Electrical machinery n.e.c.	489	0%	0%	0%	1%	26%	18%	3%	2%	30%	3%	18%	100%
	Radio, television and communication equipment	103	0%	0%	0%	0%	31%	2%	1%	1%	38%	1%	26%	100%
	Instruments, medical, precision, optical, clocks	45	0%	0%	0%	0%	17%	3%	0%	1%	49%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	587	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**301,440**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	3,539	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,720	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,599	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,256	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	336,512	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,226	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	343	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,785	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,421	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	68,225	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**443,627**												

Table 2.4: Cumulated stocks in the EU-27 in 2035; Scenario 2.

2.2.3 Scenario 3: Baseline scenario, prevention waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Waste prevention

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Resource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	163,724	1%	0%	6%	2%	21%	50%	0%	0%	13%	5%	2%	100%
	Concrete, asphalt	42,392	0%	0%	0%	2%	6%	78%	0%	0%	6%	2%	5%	100%
	Bricks	4,329	0%	0%	0%	0%	9%	69%	0%	0%	9%	1%	9%	100%
Textile	Textile, wearing apperel, footwear	146	1%	0%	0%	1%	21%	2%	0%	0%	14%	1%	59%	100%
Wood	Wood products	4,832	2%	0%	1%	3%	29%	37%	0%	1%	14%	2%	11%	100%
Paper products	Paper and printed/recorded media	301	0%	0%	0%	4%	14%	1%	0%	0%	47%	3%	30%	100%
Plastic	Plastic and rubber products	341	1%	0%	1%	8%	25%	19%	2%	0%	20%	2%	22%	100%
Glass	Glass products	727	2%	0%	2%	30%	22%	19%	1%	0%	13%	5%	5%	100%
Metal products	Iron products	1,183	0%	0%	1%	1%	67%	22%	0%	0%	6%	1%	1%	100%
	Aluminium products	52	0%	0%	0%	4%	75%	13%	1%	0%	5%	1%	1%	100%
	Copper products	28	0%	0%	0%	2%	88%	7%	0%	0%	2%	0%	1%	100%
	Metals nec products	15	0%	0%	0%	2%	71%	12%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	790	1%	0%	1%	4%	31%	23%	1%	1%	21%	9%	8%	100%
	Machinery and equipment n.e.c.	984	5%	0%	2%	4%	32%	7%	1%	1%	29%	4%	15%	100%
	Office machinery and computers	7	0%	0%	0%	1%	12%	1%	1%	0%	65%	5%	15%	100%
	Electrical machinery n.e.c.	458	0%	0%	1%	1%	26%	15%	3%	2%	31%	2%	19%	100%
	Radio, television and communication equipment	98	0%	0%	0%	0%	30%	2%	1%	1%	38%	1%	27%	100%
	Instruments, medical, precision, optical, clocks	44	0%	0%	0%	0%	16%	2%	0%	1%	49%	1%	30%	100%
	Furniture and other manufactured goods n.e.c.	577	0%	0%	0%	0%	9%	2%	0%	0%	25%	2%	61%	100%
Total		**221,029**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	9,189	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,814	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,560	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,423	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	326,616	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,138	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	327	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,643	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,157	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	60,447	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**431,313**												

Table 2.5: Cumulated stocks in the EU-27 in 2035; Scenario 3.

2.2.4 Scenario 4: High growth scenario, treatment waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: high
Waste treatment scenario: Treatment

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	193,035	1%	0%	6%	1%	23%	50%	0%	0%	12%	5%	2%	100%
	Concrete, asphalt	49,043	0%	0%	0%	2%	6%	79%	0%	0%	5%	2%	5%	100%
	Bricks	4,982	0%	0%	0%	0%	9%	71%	0%	0%	9%	1%	9%	100%
Textile	Textile, wearing apperel, footwear	174	1%	0%	0%	1%	22%	2%	0%	0%	14%	1%	58%	100%
Wood	Wood products	5,461	2%	0%	1%	2%	29%	38%	0%	1%	13%	2%	11%	100%
Paper products	Paper and printed/recorded media	369	0%	0%	0%	4%	15%	1%	0%	0%	47%	3%	29%	100%
Plastic	Plastic and rubber products	402	1%	0%	1%	8%	25%	20%	2%	0%	20%	2%	21%	100%
Glass	Glass products	893	2%	0%	2%	30%	22%	21%	1%	0%	13%	5%	5%	100%
Metal products	Iron products	1,497	0%	0%	1%	1%	66%	23%	0%	0%	6%	1%	1%	100%
	Aluminium products	64	0%	0%	0%	4%	74%	15%	1%	0%	4%	1%	0%	100%
	Copper products	33	0%	0%	0%	2%	87%	8%	0%	0%	2%	0%	1%	100%
	Metals nec products	18	0%	0%	0%	2%	71%	14%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	975	1%	0%	1%	4%	31%	25%	1%	1%	20%	9%	7%	100%
	Machinery and equipment n.e.c.	1,182	5%	0%	2%	4%	33%	8%	1%	1%	29%	4%	14%	100%
	Office machinery and computers	9	0%	0%	0%	1%	13%	1%	1%	0%	65%	5%	15%	100%
	Electrical machinery n.e.c.	550	0%	0%	1%	1%	26%	17%	2%	2%	31%	2%	18%	100%
	Radio, television and communication equipment	119	0%	0%	0%	0%	31%	2%	0%	1%	38%	1%	26%	100%
	Instruments, medical, precision, optical, clocks	51	0%	0%	0%	0%	17%	2%	0%	1%	49%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	668	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**259,523**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	4,398	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,841	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,783	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,634	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	356,612	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,553	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	210	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	4,243	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,941	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	67,432	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**465,647**												

Table 2.6: Cumulated stocks in the EU-27 in 2035; Scenario 4.

2.2.5 Scenario 5: High growth scenario, recycling waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: high
Waste treatment scenario: Recycling

Stock category		Quantity, dry weight (Million t)	Sector											
			Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	250,921	1%	0%	3%	1%	42%	38%	0%	0%	9%	4%	1%	100%
	Concrete, asphalt	48,836	0%	0%	0%	2%	6%	79%	0%	0%	5%	2%	5%	100%
	Bricks	4,944	0%	0%	0%	0%	9%	71%	0%	0%	9%	1%	9%	100%
Textile	Textile, wearing apperel, footwear	174	1%	0%	0%	1%	22%	2%	0%	0%	14%	1%	58%	100%
Wood	Wood products	5,451	2%	0%	0%	2%	30%	38%	0%	1%	13%	2%	11%	100%
Paper products	Paper and printed/recorded media	371	0%	0%	0%	4%	16%	1%	0%	0%	46%	3%	29%	100%
Plastic	Plastic and rubber products	403	1%	0%	0%	8%	26%	20%	2%	0%	20%	2%	21%	100%
Glass	Glass products	879	2%	0%	1%	30%	22%	21%	1%	0%	13%	5%	5%	100%
Metal products	Iron products	1,557	0%	0%	1%	1%	68%	22%	0%	0%	6%	1%	1%	100%
	Aluminium products	64	0%	0%	0%	4%	75%	15%	1%	0%	4%	1%	0%	100%
	Copper products	33	0%	0%	0%	2%	87%	8%	0%	0%	2%	0%	1%	100%
	Metals nec products	18	0%	0%	0%	2%	71%	13%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	1,009	1%	0%	1%	4%	34%	24%	1%	0%	19%	8%	7%	100%
	Machinery and equipment n.e.c.	1,185	5%	0%	1%	4%	34%	7%	1%	0%	28%	4%	14%	100%
	Office machinery and computers	9	0%	0%	0%	1%	13%	1%	1%	0%	64%	5%	15%	100%
	Electrical machinery n.e.c.	549	0%	0%	0%	1%	27%	17%	2%	2%	31%	2%	18%	100%
	Radio, television and communication equipment	119	0%	0%	0%	0%	31%	2%	0%	1%	38%	1%	26%	100%
	Instruments, medical, precision, optical, clocks	51	0%	0%	0%	0%	17%	2%	0%	1%	49%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	668	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**317,242**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	3,781	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,877	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,732	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,439	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	345,429	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,530	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	373	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	4,090	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,903	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	70,720	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**456,874**												

Table 2.7: Cumulated stocks in the EU-27 in 2035; Scenario 5.

2.2.6 Scenario 6: High growth scenario, prevention waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: High
Waste treatment scenario: Waste prevention

Stock category		Quantity, dry weight (Million t)	Sector											All sectors
			Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	
Stocks in the economy														
Construction materials	Sand, stone, clay	171,008	1%	0%	6%	2%	21%	49%	0%	0%	13%	5%	2%	100%
	Concrete, asphalt	43,939	0%	0%	0%	2%	6%	77%	0%	0%	6%	2%	6%	100%
	Bricks	4,503	0%	0%	0%	0%	9%	68%	0%	0%	10%	1%	10%	100%
Textile	Textile, wearing apperel, footwear	170	1%	0%	0%	1%	21%	2%	0%	0%	14%	1%	60%	100%
Wood	Wood products	5,092	2%	0%	1%	3%	30%	36%	0%	1%	14%	2%	11%	100%
Paper products	Paper and printed/recorded media	354	0%	0%	0%	4%	14%	1%	0%	0%	48%	3%	30%	100%
Plastic	Plastic and rubber products	379	1%	0%	1%	8%	25%	17%	2%	0%	21%	2%	23%	100%
Glass	Glass products	831	2%	0%	2%	32%	23%	18%	1%	0%	13%	4%	5%	100%
Metal products	Iron products	1,319	0%	0%	1%	1%	68%	21%	0%	0%	7%	1%	1%	100%
	Aluminium products	59	0%	0%	0%	4%	76%	13%	1%	0%	5%	1%	1%	100%
	Copper products	32	0%	0%	0%	2%	88%	7%	0%	0%	2%	0%	1%	100%
	Metals nec products	17	0%	0%	0%	2%	72%	12%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	887	1%	0%	1%	5%	32%	22%	1%	1%	21%	8%	8%	100%
	Machinery and equipment n.e.c.	1,118	5%	0%	2%	4%	33%	6%	1%	1%	30%	3%	15%	100%
	Office machinery and computers	9	0%	0%	0%	1%	12%	1%	0%	0%	65%	5%	15%	100%
	Electrical machinery n.e.c.	517	0%	0%	1%	1%	27%	14%	2%	2%	32%	2%	19%	100%
	Radio, television and communication equipment	114	0%	0%	0%	0%	30%	2%	0%	1%	39%	1%	27%	100%
	Instruments, medical, precision, optical, clocks	50	0%	0%	0%	0%	16%	2%	0%	1%	49%	1%	30%	100%
	Furniture and other manufactured goods n.e.c.	657	0%	0%	0%	0%	9%	2%	0%	0%	25%	2%	61%	100%
Total		**231,054**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	10,103	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	2,017	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,693	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,628	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	335,555	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,438	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	355	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,953	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	17,623	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	62,446	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**444,811**												

Table 2.8: Cumulated stocks in the EU-27 in 2035; Scenario 6.

2.2.7 Scenario 7: Low growth scenario, treatment waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Treatment

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	177,075	1%	0%	6%	1%	22%	50%	0%	0%	11%	5%	2%	100%
	Concrete, asphalt	45,334	0%	0%	0%	2%	6%	80%	0%	0%	5%	2%	5%	100%
	Bricks	4,588	0%	0%	0%	0%	9%	72%	0%	0%	9%	1%	8%	100%
Textile	Textile, wearing apperel, footwear	132	1%	0%	0%	1%	23%	3%	0%	0%	14%	1%	58%	100%
Wood	Wood products	4,967	2%	0%	1%	2%	29%	39%	0%	1%	13%	2%	10%	100%
Paper products	Paper and printed/recorded media	274	0%	0%	0%	4%	16%	1%	0%	0%	46%	4%	29%	100%
Plastic	Plastic and rubber products	335	1%	0%	1%	8%	25%	22%	2%	0%	19%	2%	20%	100%
Glass	Glass products	707	2%	0%	2%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Metal products	Iron products	1,230	0%	0%	1%	1%	65%	25%	0%	0%	6%	1%	1%	100%
	Aluminium products	51	0%	0%	0%	3%	74%	15%	1%	0%	4%	1%	0%	100%
	Copper products	27	0%	0%	0%	2%	87%	9%	0%	0%	2%	0%	1%	100%
	Metals nec products	15	0%	0%	0%	2%	70%	14%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	798	1%	0%	1%	4%	30%	26%	1%	1%	18%	10%	7%	100%
	Machinery and equipment n.e.c.	952	5%	0%	2%	4%	34%	8%	1%	1%	27%	4%	14%	100%
	Office machinery and computers	7	0%	0%	0%	1%	13%	1%	1%	0%	63%	6%	15%	100%
	Electrical machinery n.e.c.	441	0%	0%	1%	1%	26%	18%	3%	3%	29%	3%	17%	100%
	Radio, television and communication equipment	91	0%	0%	0%	0%	32%	2%	1%	1%	37%	2%	25%	100%
	Instruments, medical, precision, optical, clocks	40	0%	0%	0%	0%	17%	3%	0%	1%	48%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	525	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**237,590**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	3,945	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,482	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,505	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,237	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	334,028	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	7,025	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	182	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,639	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	16,906	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	62,870	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**434,819**												

Table 2.9: Cumulated stocks in the EU-27 in 2035; Scenario 7.

2.2.8 Scenario 8: Low growth scenario, recycling waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Recycling

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	226,672	1%	0%	4%	1%	41%	39%	0%	0%	9%	4%	1%	100%
	Concrete, asphalt	45,253	0%	0%	0%	2%	6%	80%	0%	0%	5%	2%	5%	100%
	Bricks	4,565	0%	0%	0%	0%	9%	72%	0%	0%	9%	1%	8%	100%
Textile	Textile, wearing apperel, footwear	132	1%	0%	0%	1%	23%	3%	0%	0%	14%	1%	57%	100%
Wood	Wood products	4,968	2%	0%	1%	2%	29%	39%	0%	1%	13%	2%	10%	100%
Paper products	Paper and printed/recorded media	276	0%	0%	0%	4%	17%	1%	0%	0%	46%	4%	29%	100%
Plastic	Plastic and rubber products	336	1%	0%	1%	8%	26%	21%	2%	0%	19%	2%	20%	100%
Glass	Glass products	696	2%	0%	1%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Metal products	Iron products	1,283	0%	0%	1%	1%	67%	24%	0%	0%	5%	1%	1%	100%
	Aluminium products	51	0%	0%	0%	3%	74%	15%	1%	0%	4%	1%	0%	100%
	Copper products	27	0%	0%	0%	2%	87%	9%	0%	0%	2%	0%	1%	100%
	Metals nec products	15	0%	0%	0%	2%	70%	14%	1%	0%	10%	1%	1%	100%
	Fabricated metal products, except machinery	826	1%	0%	1%	4%	33%	25%	1%	0%	18%	10%	7%	100%
	Machinery and equipment n.e.c.	955	5%	0%	2%	4%	35%	8%	1%	0%	27%	4%	14%	100%
	Office machinery and computers	7	0%	0%	0%	1%	13%	1%	1%	0%	63%	6%	15%	100%
	Electrical machinery n.e.c.	440	0%	0%	1%	1%	27%	18%	3%	2%	29%	3%	17%	100%
	Radio, television and communication equipment	91	0%	0%	0%	0%	32%	2%	1%	1%	37%	2%	25%	100%
	Instruments, medical, precision, optical, clocks	40	0%	0%	0%	0%	18%	3%	0%	1%	48%	1%	29%	100%
	Furniture and other manufactured goods n.e.c.	525	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	60%	100%
Total		**287,160**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	3,384	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,621	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,502	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,130	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	328,636	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	6,997	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	322	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,593	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	16,879	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	66,274	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**432,339**												

Table 2.10: Cumulated stocks in the EU-27 in 2035; Scenario 8.

2.2.9 Scenario 9: Low growth scenario, prevention waste scenario

Accumulated stocks in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Waste prevention

Stock category		Quantity, dry weight (Million t)	Sector: Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Stocks in the economy														
Construction materials	Sand, stone, clay	157,334	1%	0%	6%	1%	21%	50%	0%	0%	13%	6%	2%	100%
	Concrete, asphalt	40,685	0%	0%	0%	2%	6%	78%	0%	0%	6%	2%	5%	100%
	Bricks	4,152	0%	0%	0%	0%	9%	69%	0%	0%	9%	1%	9%	100%
Textile	Textile, wearing apperel, footwear	129	1%	0%	0%	1%	22%	2%	0%	0%	14%	1%	59%	100%
Wood	Wood products	4,635	2%	0%	1%	3%	30%	37%	0%	1%	14%	2%	11%	100%
Paper products	Paper and printed/recorded media	262	0%	0%	0%	4%	14%	1%	0%	0%	47%	3%	30%	100%
Plastic	Plastic and rubber products	314	2%	0%	1%	8%	26%	19%	2%	0%	20%	2%	22%	100%
Glass	Glass products	653	2%	0%	2%	30%	23%	19%	1%	0%	13%	5%	5%	100%
Metal products	Iron products	1,079	0%	0%	1%	1%	66%	22%	0%	0%	6%	1%	1%	100%
	Aluminium products	47	0%	0%	0%	3%	76%	13%	1%	0%	4%	1%	1%	100%
	Copper products	26	0%	0%	0%	2%	88%	7%	0%	0%	2%	0%	1%	100%
	Metals nec products	14	0%	0%	0%	2%	71%	12%	1%	0%	11%	1%	1%	100%
	Fabricated metal products, except machinery	720	1%	0%	1%	4%	32%	23%	1%	1%	20%	10%	8%	100%
	Machinery and equipment n.e.c.	897	5%	0%	2%	4%	33%	7%	1%	1%	28%	4%	15%	100%
	Office machinery and computers	6	0%	0%	0%	1%	12%	1%	1%	0%	64%	6%	15%	100%
	Electrical machinery n.e.c.	412	0%	0%	1%	1%	26%	15%	3%	3%	30%	3%	18%	100%
	Radio, television and communication equipment	87	0%	0%	0%	0%	30%	2%	1%	1%	38%	1%	27%	100%
	Instruments, medical, precision, optical, clocks	39	0%	0%	0%	0%	17%	2%	0%	1%	48%	1%	30%	100%
	Furniture and other manufactured goods n.e.c.	516	0%	0%	0%	0%	10%	2%	0%	0%	25%	2%	61%	100%
Total		**212,006**												
Stocks of waste														
Stocks in landfill	Landfill of waste: Food	8,580	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Paper	1,629	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Plastic	1,428	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Metals	3,227	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Glass/inert	315,044	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Mine waste	6,923	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Textiles	299	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Wood	3,385	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Oil/Hazardous waste	16,621	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
	Landfill of waste: Slag/ash	58,543	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%
Total		**415,680**												

Table 2.11: Cumulated stocks in the EU-27 in 2035; Scenario 9.

3 Forecasts of the waste generation in EU-27 the next 25 years

This chapter presents model results on the waste generation in the EU-27 for the reference year (2003) and for future scenarios. The model output is presented as standardised waste tables. The waste tables present the total quantity of waste generation for a number of different waste fractions, and it is specified where in the economy each of the waste fractions are generated (given as percentage of the total quantity). All waste flows are given in metric tonnes, dry weight.

The applied definition of waste is: "Output flows of a human activity that remains in the technosphere and cannot directly (i.e. without further processing or emissions) displace another product. After processing in a waste treatment (recycling) activity, the recovered residuals may displace other products" (see deliverable D6.4: 'Documentation of the final model used for the scenario analyses'). This definition implies that materials sent to recycling are included as waste. The waste flows in the model outputs originates from inputs of resources or products to activities. Some products have a long time expectancy, e.g. construction materials. The waste of these materials therefore originates from uses of the materials up to hundred years ago; time series of supply-use tables starting from year 1900 are included in the data input to the model.

The waste flows presented in the standardised waste tables are pure fractions. Thus the waste fraction 'iron waste' contains 100% iron and no impurities. The impurities that are present in real life iron scrap appears as quantities in other waste fractions. Typical real life waste fractions such as mixed municipal solid waste cannot be seen in the standardised waste tables.

The standardised waste tables specify where in economy waste generation occurs. However, some wastes will occur one stage upstream in the life cycle of the flows. These are:

- Packaging waste occur in the industries supplying the products contained in the packaging material that becomes waste
- Construction waste from demolition of buildings occur in industry that supplied the construction
- Motor vehicles waste (ELV) occur in the transport manufacturing industries that supplied the vehicles

The reason why the above mentioned three types of waste do not occur in the 'right activity' in the standardised waste tables is that the physical flow of these products (the wastes are products before they become wastes) are not included in the physical supply table. Packaging material is generally not recorded in statistical information of physical flows, e.g. the physical supply and use of beverages that can be obtained from FAOSTAT (2009) only include the weight of the beverage itself, and not the packaging. Therefore, the packaging materials will enter the beverage activity, but not leave it in the supply table. Consequently, the packaging material comes out in the beverage activity. As explained in section 3, the physical flows of constructions and motor vehicles are not included. This implies that the physical weight of these products do not appear in the activities where they are used. Instead, the feedstock materials appear as waste outputs and stock additions in the construction and motor vehicle activities.

3.1 Waste generation in EU-27 in year 2003

Waste generation in:
Region: EU27
Year: 2003

Waste category	Waste fraction	Quantity, dry weight (Million t)	Sector											
			Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	526	4%	0%	0%	32%	3%	0%	0%	0%	11%	1%	50%	100%
	Food waste to WWT	4	0%	0%	0%	1%	2%	0%	0%	0%	18%	0%	77%	100%
	Manure	157	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	82	1%	12%	1%	2%	25%	21%	0%	11%	9%	2%	16%	100%
Textile	Textile waste	18	1%	0%	0%	1%	16%	2%	0%	0%	11%	2%	68%	100%
Paper	Paper waste	113	0%	0%	0%	8%	27%	1%	0%	0%	39%	3%	20%	100%
Plastic	Plastic waste	167	2%	0%	0%	8%	24%	24%	1%	0%	19%	3%	19%	100%
Glass	Glass waste	60	2%	0%	2%	27%	22%	23%	0%	0%	12%	6%	5%	100%
Construction and inert	Sand, stone, clay	1,657	1%	0%	6%	1%	23%	50%	0%	0%	10%	6%	2%	100%
	Cement, concrete, asphalt	566	0%	0%	0%	2%	10%	75%	0%	0%	5%	2%	5%	100%
	Bricks waste	38	0%	0%	0%	0%	8%	73%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	762	0%	0%	1%	0%	3%	0%	1%	7%	2%	83%	2%	100%
	Metal ore waste	90	0%	0%	3%	0%	80%	2%	0%	0%	14%	1%	0%	100%
Metal	Iron waste	218	2%	0%	1%	2%	46%	19%	1%	0%	16%	5%	9%	100%
	Aluminium waste	20	2%	0%	1%	3%	44%	17%	1%	0%	17%	5%	10%	100%
	Copper waste	6	1%	0%	0%	2%	53%	12%	0%	0%	18%	3%	11%	100%
	Metals nec waste	7	2%	0%	1%	2%	38%	16%	1%	0%	21%	6%	12%	100%
	Other materials (non metal)	34	0%	0%	0%	1%	17%	7%	0%	1%	30%	3%	42%	100%
Special fractions	Special fractions	378	11%	0%	0%	1%	28%	2%	17%	0%	12%	2%	26%	100%
Total		**4,904**												

Table 3.1: Waste generation in the EU-27 in 2003.

It appears from the table, that the most significant waste flows (in terms of dry weight) are:

- Construction waste
  - Sand, stone, clay 1657 million tonne
  - Cement, concrete, asphalt 566 million tonne
- Ash and slag waste 762 million tonne
- Food waste 526 million tonne
- Iron waste 218 million tonne
- Plastic waste 167 million tonne
- Manure 157 million tonne
- Paper waste 113 million tonne

Construction waste mainly occur in the construction activity, but also in the industry and service activities construction waste occurs. This is in cases where it is these activities that buys the construction materials that become waste. Ash and slag waste primarily occur in the waste treatment activity

(waste incineration). It should be noted that this figure is related to relatively large uncertainties; according to the **J** table, relatively large shares of waste goes to waste incineration. The J table is presented in deliverable D6.1 'Documentation of data consolidation, calibration and scenario parameterisation'. Since J-data varies significantly from country to country, and since the data for creating the J table are only based on 20 out of the EU-27 countries (38% of EU-27 GDP), the J-figures are relatively uncertain. Not surprising, food waste mainly occurs in the households and in the food industry. Iron waste occurs in the industry, construction, and service activities. The high generation of iron waste in the service activities is due to the high use of metal containing products as well as iron in construction materials purchased by the service sector. Plastic waste occurs in industry, service and construction activities. Also some 8% is generated in the food industry. This mainly reflects packaging waste. Manure waste only occurs in agriculture. Paper waste occurs in the service, industry and household activities. As in the case of plastic waste some 8% of the paper waste occurs in the food industry. This is mainly packaging waste.

3.2 Waste generation in EU-27 in year 2035

Table 3.2 below summarises the total quantities of generated waste in all scenarios.

		2003	Baseline, 2035			High growth, 2035			Low growth, 2035		
Waste category	**Waste fraction**	**Reference**	**Treatment**	**Recycling**	**Prevention**	**Treatment**	**Recycling**	**Prevention**	**Treatment**	**Recycling**	**Prevention**
Organic	Food waste	526	778	779	761	928	930	908	675	676	660
	Food waste to WWT	4	6	6	6	8	8	8	6	6	6
	Manure	157	183	184	176	203	204	196	175	176	168
	Wood waste	82	160	155	155	174	167	169	155	150	150
Textile	Textile waste	18	26	26	25	30	30	28	23	23	22
Paper	Paper waste	113	169	172	157	198	201	184	148	151	138
Plastic	Plastic waste	167	77	77	72	89	89	84	68	68	63
Glass	Glass waste	60	84	82	77	93	92	87	77	75	71
Construction and inert	Sand, stone, clay	1,657	3,125	3,335	2,972	3,190	3,414	3,032	3,071	3,276	2,925
	Cement, concrete, aspha	566	1,025	1,324	933	1,065	1,400	967	985	1,253	900
	Bricks waste	38	75	75	72	76	76	73	74	74	72
	Ash and slag waste	762	1,353	1,593	1,124	1,527	1,787	1,273	1,222	1,439	1,017
	Metal ore waste	90	116	115	111	135	135	129	101	100	96
Metal	Iron waste	218	306	313	280	337	345	310	282	289	258
	Aluminium waste	20	28	28	26	31	32	29	26	26	24
	Copper waste	6	8	8	8	9	9	9	8	8	7
	Metals nec waste	7	10	10	9	11	11	10	9	9	8
	Other materials (non met	34	48	48	47	53	53	52	44	44	43
Special fractions	Special fractions	378	666	884	616	739	984	683	588	782	542
Total		4,904	8,242	9,215	7,627	8,896	9,967	8,231	7,734	8,624	7,169

Table 3.2: Waste generation in the EU-27 in the 2003 (reference year) and in 2035 for the nine scenarios. The unit is million tonne (dry weight).

3.2.1 Scenario 1: Baseline scenario, treatment waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Treatment

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	778	3%	0%	0%	32%	3%	0%	0%	1%	11%	0%	50%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	183	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	160	1%	11%	1%	2%	23%	21%	0%	19%	8%	1%	14%	100%
Textile	Textile waste	26	0%	0%	0%	1%	15%	2%	0%	0%	11%	1%	69%	100%
Paper	Paper waste	169	0%	0%	0%	8%	27%	1%	0%	0%	40%	3%	20%	100%
Plastic	Plastic waste	77	2%	0%	1%	6%	25%	15%	2%	0%	19%	2%	28%	100%
Glass	Glass waste	84	2%	0%	2%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,125	1%	0%	6%	1%	23%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	1,025	0%	0%	0%	2%	11%	75%	0%	0%	5%	2%	5%	100%
	Bricks waste	75	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,353	0%	0%	1%	0%	2%	0%	3%	14%	1%	76%	2%	100%
	Metal ore waste	116	0%	0%	2%	0%	77%	2%	0%	0%	17%	1%	0%	100%
Metal	Iron waste	306	2%	0%	1%	2%	46%	18%	1%	0%	17%	4%	9%	100%
	Aluminium waste	28	2%	0%	1%	4%	44%	16%	1%	1%	18%	4%	10%	100%
	Copper waste	8	1%	0%	0%	2%	52%	11%	1%	1%	18%	2%	11%	100%
	Metals nec waste	10	2%	0%	1%	2%	39%	15%	1%	1%	22%	5%	12%	100%
	Other materials (non metal)	48	0%	0%	0%	1%	17%	7%	1%	1%	30%	2%	41%	100%
Special fractions	Special fractions	666	7%	0%	0%	1%	25%	1%	31%	1%	10%	1%	22%	100%
Total		**8,242**												

Table 3.3: Waste generation in the EU-27 in 2035, scenario 1: Baseline, treatment.

3.2.2 Scenario 2: Baseline scenario, recycling waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Recycling

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	779	3%	0%	0%	32%	3%	0%	0%	0%	11%	0%	50%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	184	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	155	1%	10%	1%	2%	24%	21%	0%	17%	9%	1%	14%	100%
Textile	Textile waste	26	0%	0%	0%	1%	15%	2%	0%	0%	11%	1%	69%	100%
Paper	Paper waste	172	0%	0%	0%	8%	28%	1%	0%	0%	39%	3%	20%	100%
Plastic	Plastic waste	77	2%	0%	1%	6%	26%	15%	2%	0%	19%	2%	28%	100%
Glass	Glass waste	82	2%	0%	1%	29%	22%	22%	1%	0%	13%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,335	1%	0%	5%	1%	28%	47%	0%	0%	10%	5%	1%	100%
	Cement, concrete, asphalt	1,324	0%	0%	0%	2%	31%	58%	0%	0%	4%	1%	4%	100%
	Bricks waste	75	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,593	0%	0%	1%	0%	2%	0%	3%	10%	1%	82%	1%	100%
	Metal ore waste	115	0%	0%	2%	0%	77%	2%	0%	0%	17%	1%	0%	100%
Metal	Iron waste	313	2%	0%	1%	2%	48%	17%	1%	0%	16%	4%	9%	100%
	Aluminium waste	28	2%	0%	1%	4%	45%	16%	1%	1%	17%	4%	10%	100%
	Copper waste	8	1%	0%	0%	2%	53%	11%	1%	1%	18%	2%	11%	100%
	Metals nec waste	10	2%	0%	1%	2%	40%	15%	1%	1%	22%	5%	12%	100%
	Other materials (non metal)	48	0%	0%	0%	1%	17%	7%	1%	1%	30%	2%	41%	100%
Special fractions	Special fractions	884	6%	0%	0%	1%	44%	1%	23%	0%	8%	1%	17%	100%
Total		**9,215**												

Table 3.4: Waste generation in the EU-27 in 2035, scenario 2: Baseline, recycling.

3.2.3 Scenario 3: Baseline scenario, prevention waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: baseline
Waste treatment scenario: Waste prevention

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	761	3%	0%	0%	31%	3%	0%	0%	1%	11%	0%	51%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	176	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	155	1%	11%	1%	2%	22%	20%	0%	19%	9%	1%	14%	100%
Textile	Textile waste	25	0%	0%	0%	1%	15%	1%	0%	0%	12%	1%	69%	100%
Paper	Paper waste	157	0%	0%	0%	8%	24%	1%	0%	0%	42%	2%	22%	100%
Plastic	Plastic waste	72	2%	0%	1%	6%	25%	13%	2%	0%	20%	2%	30%	100%
Glass	Glass waste	77	2%	0%	2%	30%	22%	19%	1%	0%	13%	5%	5%	100%
Construction and inert	Sand, stone, clay	2,972	1%	0%	6%	1%	22%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	933	0%	0%	0%	3%	9%	75%	0%	0%	5%	2%	6%	100%
	Bricks waste	72	0%	0%	0%	0%	9%	72%	0%	0%	9%	2%	8%	100%
	Ash and slag waste	1,124	0%	0%	2%	0%	2%	0%	4%	16%	2%	72%	2%	100%
	Metal ore waste	111	0%	0%	3%	0%	78%	2%	0%	0%	17%	0%	0%	100%
Metal	Iron waste	280	2%	0%	1%	2%	47%	16%	1%	1%	18%	4%	10%	100%
	Aluminium waste	26	2%	0%	1%	4%	45%	14%	1%	1%	19%	4%	11%	100%
	Copper waste	8	1%	0%	0%	2%	53%	9%	1%	1%	19%	2%	12%	100%
	Metals nec waste	9	2%	0%	1%	3%	39%	13%	1%	1%	23%	4%	13%	100%
	Other materials (non metal)	47	0%	0%	0%	1%	16%	5%	1%	1%	31%	2%	43%	100%
Special fractions	Special fractions	616	8%	0%	0%	1%	22%	1%	31%	1%	11%	1%	24%	100%
Total		**7,627**												

Table 3.5: Waste generation in the EU-27 in 2035, scenario 3: Baseline, prevention.

3.2.4 Scenario 4: High growth scenario, treatment waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: high
Waste treatment scenario: Treatment

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	928	3%	0%	0%	33%	3%	0%	0%	0%	11%	0%	49%	100%
	Food waste to WWT	8	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	203	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	174	1%	11%	1%	2%	23%	19%	0%	20%	8%	1%	14%	100%
Textile	Textile waste	30	0%	0%	0%	1%	14%	2%	0%	0%	11%	1%	70%	100%
Paper	Paper waste	198	0%	0%	0%	8%	27%	1%	0%	0%	40%	2%	20%	100%
Plastic	Plastic waste	89	2%	0%	1%	6%	25%	14%	2%	0%	19%	2%	28%	100%
Glass	Glass waste	93	2%	0%	2%	29%	22%	21%	1%	0%	13%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,190	1%	0%	6%	1%	23%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	1,065	0%	0%	0%	3%	11%	74%	0%	0%	5%	2%	5%	100%
	Bricks waste	76	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,527	0%	0%	1%	0%	2%	0%	3%	14%	2%	76%	2%	100%
	Metal ore waste	135	0%	0%	2%	0%	77%	2%	0%	0%	17%	0%	0%	100%
Metal	Iron waste	337	1%	0%	1%	2%	47%	17%	1%	0%	17%	4%	9%	100%
	Aluminium waste	31	2%	0%	1%	4%	45%	15%	1%	1%	18%	4%	10%	100%
	Copper waste	9	1%	0%	0%	2%	53%	11%	1%	1%	19%	2%	11%	100%
	Metals nec waste	11	2%	0%	1%	3%	40%	15%	1%	1%	22%	4%	12%	100%
	Other materials (non metal)	53	0%	0%	0%	1%	17%	6%	1%	1%	30%	2%	42%	100%
Special fractions	Special fractions	739	7%	0%	0%	1%	26%	1%	27%	1%	11%	1%	24%	100%
Total		**8,896**												

Table 3.6: Waste generation in the EU-27 in 2035, scenario 4: High growth, treatment.

3.2.5 Scenario 5: High growth scenario, recycling waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: high
Waste treatment scenario: Recycling

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	930	3%	0%	0%	33%	3%	0%	0%	0%	11%	0%	49%	100%
	Food waste to WWT	8	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	204	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	167	1%	10%	1%	2%	24%	20%	0%	18%	8%	1%	15%	100%
Textile	Textile waste	30	0%	0%	0%	1%	15%	2%	0%	0%	11%	1%	69%	100%
Paper	Paper waste	201	0%	0%	0%	8%	29%	1%	0%	0%	40%	2%	20%	100%
Plastic	Plastic waste	89	2%	0%	0%	6%	26%	14%	2%	0%	19%	1%	28%	100%
Glass	Glass waste	92	2%	0%	1%	30%	22%	21%	1%	0%	13%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,414	1%	0%	5%	1%	29%	46%	0%	0%	10%	5%	1%	100%
	Cement, concrete, asphalt	1,400	0%	0%	0%	2%	33%	56%	0%	0%	4%	1%	4%	100%
	Bricks waste	76	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,787	0%	0%	1%	0%	2%	0%	2%	10%	1%	82%	1%	100%
	Metal ore waste	135	0%	0%	2%	0%	77%	2%	0%	0%	17%	0%	0%	100%
Metal	Iron waste	345	1%	0%	1%	2%	49%	16%	1%	0%	17%	3%	9%	100%
	Aluminium waste	32	2%	0%	1%	4%	46%	15%	1%	1%	18%	3%	10%	100%
	Copper waste	9	1%	0%	0%	2%	53%	11%	1%	1%	19%	2%	11%	100%
	Metals nec waste	11	2%	0%	1%	3%	41%	14%	1%	1%	22%	4%	12%	100%
	Other materials (non metal)	53	0%	0%	0%	1%	17%	6%	1%	1%	30%	2%	42%	100%
Special fractions	Special fractions	984	6%	0%	0%	1%	45%	1%	20%	0%	8%	1%	18%	100%
Total		**9,967**												

Table 3.7: Waste generation in the EU-27 in 2035, scenario 5: High growth, recycling.

3.2.6 Scenario 6: High growth scenario, prevention waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: High
Waste treatment scenario: Waste prevention

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	908	3%	0%	0%	32%	3%	0%	0%	0%	11%	0%	50%	100%
	Food waste to WWT	8	0%	0%	0%	1%	2%	0%	0%	0%	19%	0%	77%	100%
	Manure	196	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	169	1%	11%	1%	2%	22%	19%	0%	20%	8%	1%	15%	100%
Textile	Textile waste	28	0%	0%	0%	1%	14%	1%	0%	0%	12%	1%	70%	100%
Paper	Paper waste	184	0%	0%	0%	8%	24%	1%	0%	0%	42%	2%	22%	100%
Plastic	Plastic waste	84	2%	0%	1%	6%	25%	12%	2%	0%	20%	1%	30%	100%
Glass	Glass waste	87	2%	0%	2%	31%	23%	18%	1%	0%	13%	4%	5%	100%
Construction and inert	Sand, stone, clay	3,032	1%	0%	6%	2%	23%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	967	0%	0%	0%	3%	9%	74%	0%	0%	6%	2%	6%	100%
	Bricks waste	73	0%	0%	0%	0%	9%	71%	0%	0%	9%	2%	9%	100%
	Ash and slag waste	1,273	0%	0%	2%	0%	2%	0%	3%	17%	2%	72%	2%	100%
	Metal ore waste	129	0%	0%	2%	0%	78%	2%	0%	0%	17%	0%	0%	100%
Metal	Iron waste	310	2%	0%	1%	2%	47%	15%	1%	1%	18%	3%	10%	100%
	Aluminium waste	29	2%	0%	1%	4%	46%	13%	1%	1%	19%	3%	11%	100%
	Copper waste	9	1%	0%	0%	2%	54%	9%	1%	1%	19%	2%	12%	100%
	Metals nec waste	10	2%	0%	1%	3%	40%	12%	1%	1%	23%	4%	13%	100%
	Other materials (non metal)	52	0%	0%	0%	1%	17%	5%	1%	1%	31%	2%	43%	100%
Special fractions	Special fractions	683	8%	0%	0%	1%	23%	1%	27%	1%	11%	1%	26%	100%
Total		**8,231**												

Table 3.8: Waste generation in the EU-27 in 2035, scenario 6: High growth, prevention.

3.2.7 Scenario 7: Low growth scenario, treatment waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Treatment

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	675	3%	0%	0%	32%	3%	0%	0%	1%	11%	1%	49%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	18%	0%	77%	100%
	Manure	175	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	155	1%	11%	1%	2%	23%	21%	0%	19%	8%	1%	13%	100%
Textile	Textile waste	23	0%	0%	0%	1%	15%	2%	0%	0%	11%	1%	68%	100%
Paper	Paper waste	148	0%	0%	0%	8%	28%	1%	0%	0%	39%	3%	20%	100%
Plastic	Plastic waste	68	2%	0%	1%	6%	26%	16%	2%	0%	18%	2%	27%	100%
Glass	Glass waste	77	2%	0%	2%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,071	1%	0%	6%	1%	23%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	985	0%	0%	0%	2%	10%	75%	0%	0%	5%	2%	5%	100%
	Bricks waste	74	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,222	0%	0%	2%	0%	2%	0%	3%	15%	1%	75%	2%	100%
	Metal ore waste	101	0%	0%	2%	0%	78%	2%	0%	0%	16%	1%	0%	100%
Metal	Iron waste	282	2%	0%	1%	2%	46%	18%	1%	1%	16%	4%	9%	100%
	Aluminium waste	26	2%	0%	1%	3%	44%	16%	1%	1%	17%	4%	10%	100%
	Copper waste	8	1%	0%	0%	2%	53%	11%	1%	1%	18%	2%	11%	100%
	Metals nec waste	9	2%	0%	1%	2%	39%	15%	1%	1%	21%	5%	12%	100%
	Other materials (non metal)	44	0%	0%	0%	1%	17%	7%	1%	1%	30%	2%	41%	100%
Special fractions	Special fractions	588	8%	0%	0%	1%	25%	1%	31%	1%	10%	1%	22%	100%
Total		**7,734**												

Table 3.9: Waste generation in the EU-27 in 2035, scenario 7: Low growth, treatment.

3.2.8 Scenario 8: Low growth scenario, recycling waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Recycling

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	676	3%	0%	0%	32%	3%	0%	0%	0%	11%	1%	49%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	18%	0%	77%	100%
	Manure	176	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	150	1%	10%	1%	2%	23%	22%	0%	17%	9%	2%	13%	100%
Textile	Textile waste	23	0%	0%	0%	1%	15%	2%	0%	0%	11%	1%	68%	100%
Paper	Paper waste	151	0%	0%	0%	7%	29%	1%	0%	0%	39%	3%	19%	100%
Plastic	Plastic waste	68	2%	0%	1%	6%	26%	15%	2%	0%	18%	2%	27%	100%
Glass	Glass waste	75	2%	0%	1%	28%	22%	22%	1%	0%	12%	5%	5%	100%
Construction and inert	Sand, stone, clay	3,276	1%	0%	5%	1%	28%	47%	0%	0%	10%	5%	1%	100%
	Cement, concrete, asphalt	1,253	0%	0%	0%	2%	30%	59%	0%	0%	4%	1%	4%	100%
	Bricks waste	74	0%	0%	0%	0%	9%	72%	0%	0%	8%	2%	8%	100%
	Ash and slag waste	1,439	0%	0%	1%	0%	2%	0%	3%	11%	1%	81%	1%	100%
	Metal ore waste	100	0%	0%	2%	0%	78%	2%	0%	0%	16%	1%	0%	100%
Metal	Iron waste	289	2%	0%	1%	2%	48%	17%	1%	0%	16%	4%	9%	100%
	Aluminium waste	26	2%	0%	1%	3%	45%	16%	1%	1%	17%	4%	10%	100%
	Copper waste	8	1%	0%	0%	2%	53%	11%	1%	1%	18%	2%	11%	100%
	Metals nec waste	9	2%	0%	1%	2%	40%	15%	1%	1%	21%	5%	12%	100%
	Other materials (non metal)	44	0%	0%	0%	1%	17%	7%	1%	1%	30%	2%	41%	100%
Special fractions	Special fractions	782	6%	0%	0%	1%	44%	1%	23%	0%	7%	1%	16%	100%
Total		**8,624**												

Table 3.10: Waste generation in the EU-27 in 2035, scenario 8: Low growth, recycling.

3.2.9 Scenario 9: Low growth scenario, prevention waste scenario, year 2035

Waste generation in:
Region: EU27
Year: 2035
Macro-economic scenario: low
Waste treatment scenario: Waste prevention

			Sector											
Waste category	**Waste fraction**	**Quantity, dry weight (Million t)**	Agriculture and fishery	Forestry	Ressource extraction	Food industry	Industry	Construction	Refineries and gas	Electricity and heat	Service	Waste treatment	Household	All sectors
Organic	Food waste	660	3%	0%	0%	31%	3%	0%	0%	1%	11%	0%	50%	100%
	Food waste to WWT	6	0%	0%	0%	1%	2%	0%	0%	0%	18%	0%	77%	100%
	Manure	168	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
	Wood waste	150	1%	11%	1%	2%	22%	21%	0%	19%	8%	1%	13%	100%
Textile	Textile waste	22	1%	0%	0%	1%	15%	1%	0%	0%	12%	1%	69%	100%
Paper	Paper waste	138	0%	0%	0%	8%	25%	1%	0%	0%	41%	3%	21%	100%
Plastic	Plastic waste	63	2%	0%	1%	6%	26%	13%	2%	0%	19%	2%	29%	100%
Glass	Glass waste	71	2%	0%	2%	30%	23%	19%	1%	0%	13%	5%	5%	100%
Construction and inert	Sand, stone, clay	2,925	1%	0%	6%	1%	22%	50%	0%	0%	11%	6%	2%	100%
	Cement, concrete, asphalt	900	0%	0%	0%	2%	8%	76%	0%	0%	5%	2%	6%	100%
	Bricks waste	72	0%	0%	0%	0%	9%	72%	0%	0%	9%	2%	8%	100%
	Ash and slag waste	1,017	0%	0%	2%	0%	2%	0%	4%	17%	2%	71%	2%	100%
	Metal ore waste	96	0%	0%	2%	0%	78%	2%	0%	0%	17%	1%	0%	100%
Metal	Iron waste	258	2%	0%	1%	2%	47%	16%	1%	1%	17%	4%	10%	100%
	Aluminium waste	24	2%	0%	1%	4%	45%	14%	1%	1%	18%	4%	11%	100%
	Copper waste	7	1%	0%	0%	2%	54%	9%	1%	1%	18%	2%	12%	100%
	Metals nec waste	8	2%	0%	1%	3%	40%	13%	1%	1%	22%	5%	12%	100%
	Other materials (non metal)	43	0%	0%	0%	1%	17%	5%	1%	1%	30%	2%	43%	100%
Special fractions	Special fractions	542	8%	0%	0%	1%	22%	1%	31%	1%	10%	1%	23%	100%
Total		**7,169**												

Table 3.11: Waste generation in the EU-27 in 2035, scenario 9: Low growth, prevention.

4 Forecasts of the environmental impacts for each scenario for EU-27 the next 25 years

This chapter presents the model results regarding environmental impacts in 2003 (reference year) and for the nine scenarios in year 2035. The previous chapters have presented results of waste generation and accumulated stocks within the EU-27. The scope of the results in the present chapter is not limited to flows and stocks within the EU-27 because the results on environmental impacts are life cycle based, i.e. impacts within as well as outside the EU-27 are included. The functional unit of the results on environmental impacts is the final demand (household uses and export).

It should be noted that the impact related to imported products is presumed to be equal to domestically produced products. Further, it should be noted that the model results are based on data collection from 20 out of the 27 EU-27 countries, and subsequently the ratio between domestic supply and imported products is also based on these 20 countries. Therefore, uncertainties in the environmental impact outside and inside the EU-27 are present. Uncertainties are further described in deliverable D6-3 'Documentation of the contribution analysis and uncertainty assessment. Results interpretation identifying priority material flows and wastes for waste prevention, recycling and choice of waste treatment options. Policy recommendations'

For all scenarios, the environmental is given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003). When calculating the environmental impacts, the following emissions have been included:

- Carbon dioxide (CO_2), fossil as well as biogenic
- Resource extraction of biogenic carbon
- Nitrogen oxides (NO_x)
- Methane (CH_4)
- Sulphur dioxide (SO_2)
- Dinitrogen monoxide (N_2O)
- Carbon monoxide (CO)
- Non-methane volatile organics (NMVOC)

The LCIA-method, Stepwise 2006 method, version 1.2, has been used for calculating environmental indicators per midpoint impact category and as aggregated, monetarised values. The method is described and documented in Weidema et al. (2007) and Weidema (2009). The method can be downloaded as a CSV-file for import in the LCA software SimaPro at: http://www.lca-net.com/projects/stepwise_ia/. It should be noted that 1 kg fossil and 1 kg biogenic CO_2 emission cause the same impact. Resource extraction of 1 kg biogenic carbon causes an impact of -3.66 kg CO_2-eq. Thus, the growing of an agricultural crop containing 1 kg carbon will cause the effect 3.66 kg CO_2-eq, and when it is digested or disposed of it will cause the effect of 3.66 kg CO_2-eq (if we assume that all carbon contained in the product is released as CO_2).

The results tables provided in the following shows the impacts per activity in economy. In this respect it should be noted that the impact represents the impact caused by the direct emissions of a given activity, e.g.

an impact in the aluminium activity does not include the emissions related to the use of electricity in aluminium manufacturing. These emissions are included in the electricity and heat activity.

The results tables are divided in a column that shows impact from virgin production and the impact from recycling. The sum of the virgin column and the recycling column represents the sun of the current activity. The recycling column specifies the impact from the substances emitted from the recycling activities. Thus, a high impact in the recycling column indicate a high impact from the recycling activity. Also, high impacts in the recycling column indicates high recycling rates. The reason why the emissions from recycling activities are specified separately is, that the FORWAST project is dedicated analysing waste treatment scenarios. In this respect the recycling column allows seeing how the impact from recycling differs between the scenarios. It should be noted that the life cycle impact per unit of supply for virgin is higher than for recycling for most materials. This is further described in deliverable D6.3 ‘Documentation of the contribution analysis and uncertainty assessment. Results interpretation identifying priority material flows and wastes for waste prevention, recycling and choice of waste treatment options. Policy recommendations’.

4.1 Environmental impacts in EU-27 in year 2003

Table 4.1 below shows, the environmental impacts for EU-27 final demand.

2003 Reference				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,235		110	
Agriculture, plants	-1,298		-100	
Forest	-856	0.005	-70	0.0004
Fish	30		5	
Minerals and metals extraction	271		29	
Food	120		14	
Textiles	61		6	
Pulp and paper	154	0.3	17	0.03
Refined petroleum and gas	328		37	
Plastic	112	0.9	13	0.1
Glass	54	1.1	7	0.1
Cement	271	0.1	27	0.01
Iron	427	70	46	7
Aluminium	53	15	6	2
Copper	28	10	3	1.3
Other metals	17	0.7	2	0.1
Other industry	838		94	
Electricity and heat	2,362		288	
Service and transport	1,914		308	
Waste incineration	1,224		115	
Composting and biogas	111		9	
Waste water	1.0		0.1	
Landfill	968		86	
Households	944		96	
Sum	**9,369**	**98**	**1,152**	**11**
Sum all	**9,467**		**1,162**	

Table 4.1: Environmental impacts related to the EU-27 final uses in 2003. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

It appears from **Table 4.1** that the most significant emissions occur in the following activities:

- Electricity and heat
- Service and transport
- Agriculture, animals
- Waste incineration

Also the emissions in 'agriculture, plants' are significant, but this cannot be seen in the table, because the negative contribution to global warming from the resource extraction of carbon overrules the impact. If this biogenic carbon extraction is taken out of the impact from 'agriculture, plants', the impact would be 573 million tonne CO_2-eq.

The recycling columns in **Table 4.1** specify the impact from the substances emitted from the recycling activities. Thus, a high impact in the recycling column indicate a high impact from the recycling activity. Also, high impacts in the recycling column indicates high recycling rates. It should be noted that the impact per unit of supply for virgin is higher than for recycling for most materials. This is further described in deliver-

able D6.3 ‘Documentation of the contribution analysis and uncertainty assessment. Results interpretation identifying priority material flows and wastes for waste prevention, recycling and choice of waste treatment options. Policy recommendations’.

The total monetarised impact at 1,162 GEUR in **Table 4.1** is distributed on the impact categories given in **Table 4.2** below.

Impact category	Mid-point impact	Unit	End-point impact	Unit
Global warming	9,467	million tonne CO2-eq	786	GEUR
Respiratory inorganics	4.74	million tonne PM2.5-eq	320	GEUR
Photochemical ozone, vegetat.	104,545	billion m2*ppm*hours	39.0	GEUR
Eutrophication, terrestrial	799	billion m2UES	10.0	GEUR
Acidification	544	billion m2UES	4.21	GEUR
Respiratory organics	10.8	billion pers*ppm*h	2.76	GEUR
Eutrophication, aquatic	1.70	million tonne NO3-eq	0.172	GEUR
Total			**1,162**	**GEUR**

Table 4.2: Environmental impacts related to the EU-27 final uses in 2003. The impacts are given in mid-point units (characterised results) as well as end-point units (weighted results).

The monetarised impact at 1,162 GEUR can be compared with the EU-27 GDP in 2003 which was 10,108 GEUR (Eurostat 2009).However, it should be noted that part of the environmental impact takes place outside the EU-27.

The total impact on global warming at 9,467 million tonne CO_2-eq is distributed on 7,622 million tonne CO_2-eq in the EU-27 and 1,845 million tonne CO_2-eq outside the EU-27. Thus, 81% of the GHG-emissions related to EU-27 final uses take place domestically.

4.2 Environmental impacts in EU-27 in year 2035

Table 4.3 below summarises the total monetarised environmental impacts in all scenarios.

	Environmental impact (GEUR)									
Activity	Reference year	Sc1: Baseline, treatment	Sc2: Baseline, recycling	Sc3: Baseline, prevention	Sc4: High growth, treatment	Sc5: High growth, recycling	Sc6: High growth, prevention	Sc7: Low growth, treatment	Sc8: Low growth, recycling	Sc9: Low growth, prevention
Agriculture, animals	110	165	162	157	198	195	189	141	139	135
Agriculture, plants	-100	-146	-144	-143	-176	-174	-171	-126	-124	-123
Forest	-70	-154	-120	-142	-181	-133	-168	-134	-109	-124
Fish	5	8	8	8	10	10	9	7	7	7
Minerals and metals extraction	29	92	81	83	108	93	97	80	71	72
Food	14	30	30	28	36	36	33	26	25	24
Textiles	6	10	10	9	13	12	11	9	8	8
Pulp and paper	17	35	23	28	41	23	33	31	22	25
Refined petroleum and gas	37	105	97	94	124	114	111	90	83	80
Plastic	13	20	18	18	24	22	22	17	16	16
Glass	7	14	12	12	17	14	14	12	10	10
Cement	27	52	27	40	65	34	50	44	23	34
Iron	53	77	72	69	90	84	81	67	63	60
Aluminium	8	14	13	13	17	16	15	12	12	11
Copper	4	7	7	6	8	8	8	6	6	6
Other metals	3	4	4	4	5	5	5	4	4	3
Other industry	94	193	170	162	232	202	194	169	149	142
Electricity and heat	288	1,042	866	1,008	1,231	982	1,194	904	770	874
Service and transport	308	841	801	767	1,007	957	918	719	684	656
Waste incineration	115	257	145	173	367	200	244	188	107	127
Composting and biogas	9	15	146	13	22	220	20	10	104	10
Waste water	0	0	0	0	0	0	0	0	0	0
Landfill	86	61	41	122	87	62	181	45	30	88
Households	96	211	211	201	251	251	239	182	182	173
Sum	**1,162**	**2,954**	**2,680**	**2,730**	**3,596**	**3,234**	**3,327**	**2,504**	**2,283**	**2,312**

Table 4.3: Monetarised environmental impact in the EU-27 in the 2003 (reference year) and in 2035 for the nine scenarios. The unit is billion EUR2003.

4.2.1 Scenario 1: Baseline scenario, treatment waste scenario, year 2035

2035 Baseline, treatment				
	GHG-emissions (million tonne CO2-e)		**Environmental impact (GEUR)**	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,840		165	
Agriculture, plants	-1,890		-146	
Forest	-1,890	0.007	-154	0.001
Fish	52		8	
Minerals and metals extraction	885		92	
Food	295		30	
Textiles	100		10	
Pulp and paper	343	0.6	35	0.1
Refined petroleum and gas	940		105	
Plastic	170	1.9	19	0.2
Glass	119	3	14	0.3
Cement	528	0.6	52	0.1
Iron	536	189	58	19
Aluminium	79	49	9	5
Copper	42	21	4	3
Other metals	29	1.7	4	0.2
Other industry	1,835		193	
Electricity and heat	8,223		1,042	
Service and transport	7,325		841	
Waste incineration	2,755		257	
Composting and biogas	174		15	
Waste water	1.7		0.1	
Landfill	658		61	
Households	2,228		211	
Sum	**25,376**	**267**	**2,927**	**27**
Sum all	**25,643**		**2,954**	

Table 4.4: Environmental impacts in EU-27 in 2035: Scenario 1. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Baseline, treatment			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	605		54	
Agriculture, plants	-592		-46	
Forest	-1,034	0.002	-84	0.0002
Fish	22		3	
Minerals and metals extraction	615		63	
Food	174		16	
Textiles	40		4	
Pulp and paper	189	0.3	18	0.03
Refined petroleum and gas	612		68	
Plastic	58	0.9	7	0.1
Glass	65	1.6	7	0.2
Cement	256	0.5	25	0.04
Iron	109	119	13	11
Aluminium	26	34	3	3
Copper	15	11	1.5	1.3
Other metals	12	1.0	2	0.1
Other industry	997		98	
Electricity and heat	5,861		754	
Service and transport	5,411		533	
Waste incineration	1,531		142	
Composting and biogas	62		5	
Waste water	0.7		0.1	
Landfill	-310		-26	
Households	1,283		115	
Sum	**16,007**	**169**	**1,775**	**16**
Sum all	**16,176**		**1,792**	

Table 4.5: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 1. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.2 Scenario 2: Baseline scenario, recycling waste scenario, year 2035

2035 Baseline, recycling				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,810		162	
Agriculture, plants	-1,865		-144	
Forest	-1,480	0.006	-120	0.001
Fish	52		8	
Minerals and metals extraction	776		81	
Food	292		30	
Textiles	98		10	
Pulp and paper	211	2.2	23	0.2
Refined petroleum and gas	870		97	
Plastic	155	3.1	18	0.3
Glass	98	6	11	0.6
Cement	277	0.2	27	0.01
Iron	544	133	59	13
Aluminium	80	39	10	4
Copper	43	19	4	2
Other metals	28	1.5	4	0.2
Other industry	1,611		170	
Electricity and heat	6,834		866	
Service and transport	6,963		801	
Waste incineration	1,446		145	
Composting and biogas	1,490		146	
Waste water	1.6		0.1	
Landfill	476		41	
Households	2,228		211	
Sum	**23,037**	**203**	**2,660**	**21**
Sum all	**23,240**		**2,680**	

Table 4.6: Environmental impacts in EU-27 in 2035: Scenario 2. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Baseline, recycling			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	575		52	
Agriculture, plants	-567		-44	
Forest	-624	0.002	-51	0.000
Fish	22		3	
Minerals and metals extraction	505		52	
Food	172		16	
Textiles	37		4	
Pulp and paper	57	1.9	5	0.18
Refined petroleum and gas	542		60	
Plastic	43	2.2	5	0.2
Glass	44	4.9	4	0.5
Cement	6	0.03	0.4	0.002
Iron	117	62	14	6
Aluminium	28	24	3	2
Copper	15	9	1.5	1.1
Other metals	11	0.7	1.3	0.1
Other industry	773		75	
Electricity and heat	4,471		578	
Service and transport	5,048		493	
Waste incineration	222		29	
Composting and biogas	1,378		136	
Waste water	0.6		0.1	
Landfill	-492		-45	
Households	1,283		115	
Sum	**13,668**	**105**	**1,508**	**10**
Sum all	**13,773**		**1,518**	

Table 4.7: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 2. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.3 Scenario 3: Baseline scenario, prevention waste scenario, year 2035

2035 Baseline, prevention				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,756		157	
Agriculture, plants	-1,845		-143	
Forest	-1,753	0.006	-142	0.001
Fish	45		8	
Minerals and metals extraction	788		83	
Food	269		28	
Textiles	88		9	
Pulp and paper	273	0.4	28	0.04
Refined petroleum and gas	843		94	
Plastic	158	1.5	18	0.2
Glass	100	2	12	0.2
Cement	403	0.5	40	0.04
Iron	517	122	57	12
Aluminium	77	35	9	3
Copper	41	16	4	2
Other metals	27	1.2	4	0.2
Other industry	1,524		162	
Electricity and heat	7,958		1,008	
Service and transport	6,530		767	
Waste incineration	1,788		173	
Composting and biogas	161		13	
Waste water	1.4		0.1	
Landfill	1,357		122	
Households	2,108		201	
Sum	**23,213**	**178**	**2,712**	**18**
Sum all	**23,391**		**2,730**	

Table 4.8: Environmental impacts in EU-27 in 2035: Scenario 3. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Baseline, prevention			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	521		47	
Agriculture, plants	-547		-42	
Forest	-897	0.001	-73	0.0001
Fish	15		2	
Minerals and metals extraction	518		54	
Food	149		14	
Textiles	27		3	
Pulp and paper	119	0.2	11	0.01
Refined petroleum and gas	515		57	
Plastic	46	0.6	5	0.1
Glass	46	1.0	5	0.1
Cement	131	0.3	13	0.03
Iron	91	52	11	5
Aluminium	24	20	3	2
Copper	13	6	1.4	0.7
Other metals	10	0.5	1.2	0.1
Other industry	685		67	
Electricity and heat	5,596		720	
Service and transport	4,616		459	
Waste incineration	564		58	
Composting and biogas	50		4	
Waste water	0.3		0.03	
Landfill	390		35	
Households	1,163		105	
Sum	**13,844**	**80**	**1,561**	**8**
Sum all	**13,924**		**1,568**	

Table 4.9: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 3. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.4 Scenario 4: High growth scenario, treatment waste scenario, year 2035

2035	High growth, treatment			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	2,213		198	
Agriculture, plants	-2,276		-176	
Forest	-2,228	0.009	-181	0.001
Fish	62		10	
Minerals and metals extract	1,037		108	
Food	354		36	
Textiles	123		13	
Pulp and paper	398	0.9	41	0.1
Refined petroleum and gas	1,111		124	
Plastic	202	2.7	23	0.3
Glass	142	4	16	0.4
Cement	656	0.9	65	0.1
Iron	582	267	63	26
Aluminium	86	68	10	6
Copper	47	28	5	4
Other metals	34	2.4	5	0.3
Other industry	2,212		232	
Electricity and heat	9,716		1,231	
Service and transport	8,770		1,007	
Waste incineration	3,964		367	
Composting and biogas	263		22	
Waste water	2.3		0.2	
Landfill	952		87	
Households	2,644		251	
Sum	**31,067**	**373**	**3,558**	**38**
Sum all	**31,441**		**3,596**	

Table 4.10: Environmental impacts in EU-27 in 2035: Scenario 4. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	High growth, treatment			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	978		87	
Agriculture, plants	-978		-75	
Forest	-1,372	0.005	-111	0.0004
Fish	32		5	
Minerals and metals extract	766		79	
Food	234		22	
Textiles	63		6	
Pulp and paper	244	0.6	24	0.06
Refined petroleum and gas	783		87	
Plastic	90	1.7	10	0.2
Glass	88	2.8	9	0.3
Cement	384	0.7	38	0.06
Iron	155	197	18	19
Aluminium	33	53	4	5
Copper	19	19	1.9	2.2
Other metals	17	1.7	2	0.2
Other industry	1,374		138	
Electricity and heat	7,354		943	
Service and transport	6,856		699	
Waste incineration	2,740		251	
Composting and biogas	151		13	
Waste water	1.3		0.1	
Landfill	-15		1.2	
Households	1,700		155	
Sum	**21,699**	**275**	**2,407**	**27**
Sum all	**21,974**		**2,434**	

Table 4.11: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 4. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.5 Scenario 5: High growth scenario, recycling waste scenario, year 2035

2035	High growth, recycling			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	2,179		195	
Agriculture, plants	-2,247		-174	
Forest	-1,636	0.008	-133	0.001
Fish	62		10	
Minerals and metals extract	884		93	
Food	351		36	
Textiles	120		12	
Pulp and paper	204	3.2	23	0.3
Refined petroleum and gas	1,020		114	
Plastic	184	4.5	21	0.5
Glass	115	8	13	0.9
Cement	346	0.2	34	0.02
Iron	599	192	65	19
Aluminium	88	54	11	5
Copper	47	26	5	3
Other metals	32	2.0	4	0.3
Other industry	1,921		202	
Electricity and heat	7,748		982	
Service and transport	8,322		957	
Waste incineration	2,018		200	
Composting and biogas	2,256		220	
Waste water	2.2		0.2	
Landfill	713		62	
Households	2,644		251	
Sum	**27,973**	**290**	**3,205**	**29**
Sum all	**28,264**		**3,234**	

Table 4.12: Environmental impacts in EU-27 in 2035: Scenario 5. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	High growth, recycling			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	944		85	
Agriculture, plants	-949		-73	
Forest	-780	0.003	-63	0.0003
Fish	32		5	
Minerals and metals extract	613		64	
Food	231		22	
Textiles	59		6	
Pulp and paper	50	2.9	5	0.29
Refined petroleum and gas	692		77	
Plastic	72	3.6	8	0.4
Glass	61	7.3	6	0.7
Cement	75	0.1	7.2	0.01
Iron	172	122	20	12
Aluminium	36	38	4	4
Copper	19	16	1.9	1.9
Other metals	15	1.3	1.9	0.2
Other industry	1,083		108	
Electricity and heat	5,386		694	
Service and transport	6,408		649	
Waste incineration	794		85	
Composting and biogas	2,144		211	
Waste water	1.1		0.1	
Landfill	-255		-24	
Households	1,700		155	
Sum	**18,605**	**192**	**2,053**	**19**
Sum all	**18,797**		**2,072**	

Table 4.13: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 5. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.6 Scenario 6: High growth scenario, prevention waste scenario, year 2035

2035	High growth, prevention			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	2,111		189	
Agriculture, plants	-2,218		-171	
Forest	-2,068	0.008	-168	0.001
Fish	53		9	
Minerals and metals extract	923		97	
Food	323		33	
Textiles	107		11	
Pulp and paper	317	0.6	33	0.06
Refined petroleum and gas	994		111	
Plastic	188	2.2	22	0.2
Glass	118	3	14	0.3
Cement	499	0.6	50	0.05
Iron	579	172	64	17
Aluminium	86	47	10	5
Copper	46	21	5	3
Other metals	31	1.7	4	0.2
Other industry	1,832		194	
Electricity and heat	16,308		1,194	
Service and transport	7,814		918	
Waste incineration	2,535		244	
Composting and biogas	244		20	
Waste water	1.8		0.2	
Landfill	2,023		181	
Households	2,502		239	
Sum	**35,349**	**249**	**3,301**	**25**
Sum all	**35,598**		**3,327**	

Table 4.14: Environmental impacts in EU-27 in 2035: Scenario 6. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	High growth, prevention			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	876		78	
Agriculture, plants	-920		-71	
Forest	-1,212	0.003	-98	0.0003
Fish	23		4	
Minerals and metals extract	653		68	
Food	203		20	
Textiles	47		5	
Pulp and paper	163	0.3	15	0.03
Refined petroleum and gas	666		74	
Plastic	76	1.3	9	0.1
Glass	64	1.9	7	0.2
Cement	228	0.5	22	0.04
Iron	152	102	18	10
Aluminium	33	32	4	3
Copper	18	11	1.9	1.4
Other metals	14	0.9	1.9	0.1
Other industry	993		100	
Electricity and heat	13,946		905	
Service and transport	5,900		610	
Waste incineration	1,311		128	
Composting and biogas	133		11	
Waste water	0.8		0.1	
Landfill	1,055		94	
Households	1,557		143	
Sum	**25,980**	**151**	**2,150**	**15**
Sum all	**26,131**		**2,165**	

Table 4.15: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 6. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.7 Scenario 7: Low growth scenario, treatment waste scenario, year 2035

2035 Low growth, treatment				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,582		141	
Agriculture, plants	-1,628		-126	
Forest	-1,649	0.006	-134	0.0005
Fish	45		7	
Minerals and metals extract	766		80	
Food	253		26	
Textiles	84		9	
Pulp and paper	302	0.4	31	0.04
Refined petroleum and gas	802		90	
Plastic	147	1.4	17	0.2
Glass	103	2	12	0.2
Cement	443	0.5	44	0.04
Iron	489	140	53	14
Aluminium	73	38	9	4
Copper	40	17	4	2
Other metals	26	1.3	4	0.2
Other industry	1,604		169	
Electricity and heat	7,134		904	
Service and transport	6,263		719	
Waste incineration	2,015		188	
Composting and biogas	124		10	
Waste water	1.4		0.1	
Landfill	486		45	
Households	1,917		182	
Sum	**21,424**	**201**	**2,484**	**20**
Sum all	**21,625**		**2,504**	

Table 4.16: Environmental impacts in EU-27 in 2035: Scenario 7. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Low growth, treatment			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	348		31	
Agriculture, plants	-331		-25	
Forest	-792	0.001	-64	0.0001
Fish	15		2	
Minerals and metals extract	495		51	
Food	133		12	
Textiles	23		2	
Pulp and paper	147	0.2	14	0.02
Refined petroleum and gas	474		52	
Plastic	35	0.5	4	0.0
Glass	49	0.9	5	0.1
Cement	172	0.4	17	0.03
Iron	63	70	8	7
Aluminium	21	23	2	2
Copper	12	7	1.2	0.8
Other metals	9	0.6	1.1	0.1
Other industry	766		74	
Electricity and heat	4,772		616	
Service and transport	4,349		411	
Waste incineration	791		73	
Composting and biogas	13		1.0	
Waste water	0.3		0.0	
Landfill	-482		-41	
Households	973		86	
Sum	**12,055**	**103**	**1,332**	**10**
Sum all	**12,158**		**1,342**	

Table 4.17: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 7. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.8 Scenario 8: Low growth scenario, recycling waste scenario, year 2035

2035 Low growth, recycling				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,555		139	
Agriculture, plants	-1,607		-124	
Forest	-1,341	0.005	-109	0.000
Fish	45		7	
Minerals and metals extract	681		71	
Food	251		25	
Textiles	81		8	
Pulp and paper	206	1.5	22	0.2
Refined petroleum and gas	745		83	
Plastic	136	2.3	16	0.3
Glass	86	4	10	0.5
Cement	232	0.1	23	0.01
Iron	490	96	53	10
Aluminium	74	30	9	3
Copper	40	15	4	2
Other metals	25	1.1	3	0.2
Other industry	1,418		149	
Electricity and heat	6,076		770	
Service and transport	5,950		684	
Waste incineration	1,071		107	
Composting and biogas	1,060		104	
Waste water	1.3		0.1	
Landfill	343		30	
Households	1,917		182	
Sum	**19,534**	**151**	**2,268**	**15**
Sum all	**19,685**		**2,283**	

Table 4.18: Environmental impacts in EU-27 in 2035: Scenario 8. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Low growth, recycling			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	320		29	
Agriculture, plants	-309		-24	
Forest	-485	0.000	-39	0.000
Fish	15		2	
Minerals and metals extract	410		42	
Food	131		12	
Textiles	21		2	
Pulp and paper	51	1.3	4	0.12
Refined petroleum and gas	417		46	
Plastic	24	1.4	3	0.1
Glass	32	3.4	3	0.3
Cement	-39	-0.01	-4.1	-0.002
Iron	63	26	8	2
Aluminium	22	15	2	1
Copper	12	6	1.2	0.6
Other metals	8	0.4	0.9	0.05
Other industry	580		55	
Electricity and heat	3,713		482	
Service and transport	4,036		376	
Waste incineration	-153		-8	
Composting and biogas	949		94	
Waste water	0.3		0.02	
Landfill	-625		-57	
Households	973		86	
Sum	**10,165**	**53**	**1,116**	**5**
Sum all	**10,218**		**1,121**	

Table 4.19: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 8. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

4.2.9 Scenario 9: Low growth scenario, prevention waste scenario, year 2035

2035 Low growth, prevention				
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	1,510		135	
Agriculture, plants	-1,591		-123	
Forest	-1,527	0.005	-124	0.0004
Fish	39		7	
Minerals and metals extract	681		72	
Food	231		24	
Textiles	73		8	
Pulp and paper	240	0.3	25	0.03
Refined petroleum and gas	719		80	
Plastic	137	1.2	16	0.1
Glass	87	2	10	0.2
Cement	339	0.4	34	0.03
Iron	462	92	51	9
Aluminium	71	27	9	3
Copper	38	13	4	2
Other metals	24	0.9	3	0.1
Other industry	1,337		142	
Electricity and heat	6,894		874	
Service and transport	5,582		656	
Waste incineration	1,314		127	
Composting and biogas	114		10	
Waste water	1.1		0.1	
Landfill	979		88	
Households	1,814		173	
Sum	**19,567**	**136**	**2,298**	**14**
Sum all	**19,703**		**2,312**	

Table 4.20: Environmental impacts in EU-27 in 2035: Scenario 9. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

From 2003 to 2035	Low growth, prevention			
	GHG-emissions (million tonne CO2-e)		Environmental impact (GEUR)	
Activity	Virgin	Recycling	Virgin	Recycling
Agriculture, animals	275		25	
Agriculture, plants	-293		-23	
Forest	-671	0.0002	-54	0.00002
Fish	9		1	
Minerals and metals extract	410		42	
Food	111		10	
Textiles	12		1	
Pulp and paper	86	0.05	7	0.003
Refined petroleum and gas	392		43	
Plastic	25	0.2	3	0.02
Glass	33	0.5	3	0.04
Cement	68	0.2	7	0.02
Iron	35	21	5	2
Aluminium	18	12	2	1.0
Copper	10	3	1.0	0.3
Other metals	7	0.2	0.8	0.02
Other industry	498		48	
Electricity and heat	4,532		585	
Service and transport	3,667		347	
Waste incineration	90		12	
Composting and biogas	3		0.2	
Waste water	0.03		0.003	
Landfill	11		2	
Households	870		77	
Sum	**10,198**	**38**	**1,147**	**3**
Sum all	**10,236**		**1,150**	

Table 4.21: Difference in environmental impacts in EU-27 in 2035 and 2003: Scenario 9. Positive values indicate a growth in impact and negative values indicate a reduction. Environmental impacts are given in GHG units (million tonne CO2-eq) as well as in monetarised units (billion EUR2003, i.e. GEUR2003).

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