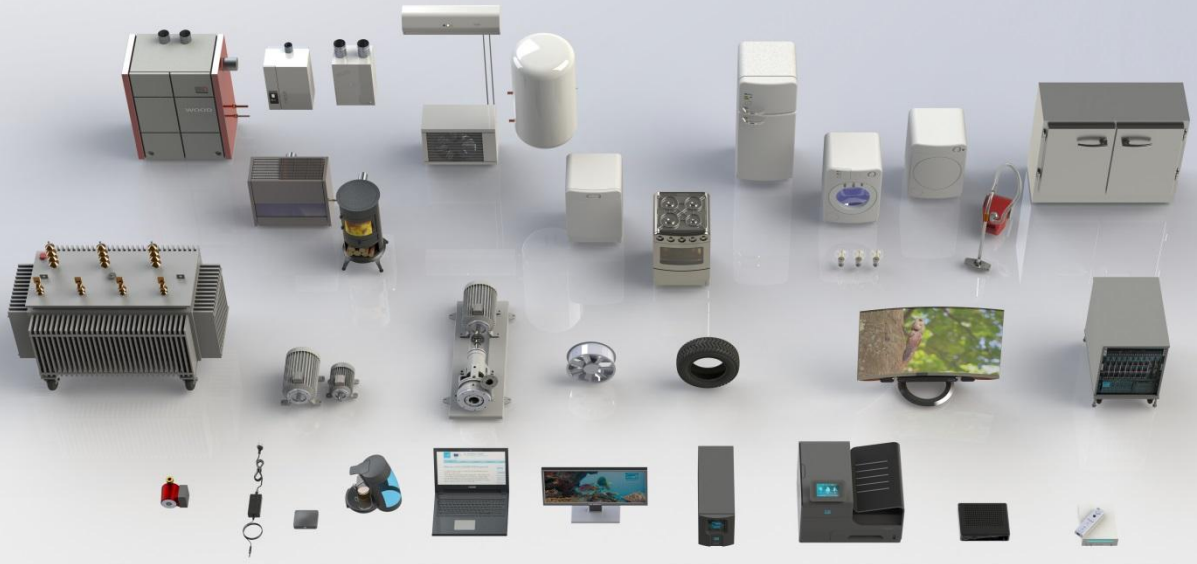
European Commission

Ecodesign Impact Accounting

EcoReport for the average EIA product

2016



Prepared by
VHK for the European Commission
December 2016

Energy

Prepared by:

Van Holsteijn en Kemna B.V. (VHK)
Elektronicaweg 14,
2628 XG Delft, The Netherlands
www.vhk.nl

Authors: Sanne Aarts, Leo Wierda, René Kemna

Date: 15 December 2016

Prepared for the European Commission, DG Energy, unit C.3
Contact person: Juan MORENO-ACEDO
SPECIFIC CONTRACT No ENER/C3/2013-523/09/FV2015-543/SI2.722015

Status: EcoReport for the average EIA product, 2016

This report was ordered and paid for by the European Commission, Directorate-General for Energy.

Executive Summary

The EcoReport[1] is a standard Excel tool to assess the life cycle environmental and economic impacts of products. It was developed as part of the Methodology for the Ecodesign of Energy related Products (MEErP).

Material data from the Special Report on Materials[2] and sales, stock, energy, GHG-emissions and other data from the Ecodesign Impact Accounting (EIA) report of June 2016[3] have been combined to provide an EcoReport input for the 'average EIA product', i.e. a product with the average characteristics of all products considered in EIA in June 2016. This provides a valuable insight in the associated environmental impacts.

As regards the amount of material used in EIA products, the energy consumption and greenhouse gas (GHG) emissions in the use-phase, and cost aspects, the EcoReport confirms the data from the two base documents. New information resulting from the EcoReport includes:

- Amount of material related to spare parts, consumables and refrigerants;
- End-of-life distribution of the materials over 'disposal' and 'recycling';
- Energy consumption and GHG-emission due to materials processing, manufacturing, distribution and end-of-life phases;
- Additional emissions to air and water (apart from the GHG-emissions);
- Waste generated during materials processing, manufacturing and energy generation.

The main conclusions that can be drawn from the EcoReport are:

1- As regards the amount of material contained in EIA products sold in 2010, the EcoReport outcome confirms the figure of the Special Report on Materials: 14459 kton. The EcoReport shows that additional 7999 kton of material is annually used for spare parts, consumables and refrigerants, for a total of 22458 kton. The EcoReport estimates that at product end-of-life (or after use for consumables) 34% of the material goes to 'disposal' (incineration without heat recovery, landfill, fugitive) and 66% is 'recycled' (including re-use and incineration with heat recovery).

2- The production and use of EIA products is estimated to be related to a net annual consumption of 3681 million m^3 of water, which is nearly 2% of the total amount of water abstracted every year in EU-28.

3- The primary energy consumption related to EIA products in 2010 was 40502 PJ (55% of EU-28 total primary energy consumption), of which 38864 PJ (95%) is consumed during product use. The latter coincides with the primary energy considered in the Ecodesign Impact Accounting, which takes into account only the use-phase.

4- The greenhouse gas emissions related to EIA products in 2010 were 2076 $MtCO_2$equivalent (42% of EU-28 total GHG-emission), of which 1988 $MtCO_2$eq

[1] http://ec.europa.eu/growth/industry/sustainability/ecodesign_en (section on 'support tools for experts')

[2] https://ec.europa.eu/energy/sites/ener/files/documents/EIA%20Special%20Report%20Material%20Consumption%20160607.pdf

[3] https://ec.europa.eu/energy/sites/ener/files/documents/Ecodesign%20Impacts%20Accounting%20%20-%20status%20January%202016%20-%20Final-20160607%20-%20N....pdf

(95%) is emitted during product use. Again, the latter coincides with the emissions considered in EIA.

5- The contribution of EIA-products to the total EU-28 annual emissions to air or water is also significant for Polycyclic Aromatic Hydrocarbons (PAHs, 39%), Eutrophication (mainly Phosphates from detergents, 37%), Acidifying agents (31%), Persistent Organic Pollutants (POPs, 18%), Heavy Metals to air (HM,13%) and Particulate matter (PM,14%). For all emissions, the use-phase has the largest impact (i.e. emissions are mainly related to energy consumption). The distribution-phase has a significant impact on PM-emissions (from vehicle exhausts). Materials extraction and processing has significant impacts on POP-, PAHs-, HM- and PM-emissions.

6- In addition to 'waste' deriving from product-materials and consumables (see point 1 above) EIA products are also responsible for waste generated during the extraction and processing of materials, during manufacturing and during generation and distribution of energy (fuels or electricity). This additional amount of waste is estimated 21310 kton net per year, and thus of the same order of magnitude as the waste from end-of-life products and consumables (22458 kton).

The total of 43.8 Mton means that the non-energy material resources consumed for EIA products during their product life are responsible for 0.6% of the total EU Domestic Material Consumption (7300 Mton).

Note: the conclusions are valid under the assumptions made in the EcoReport impact data (see the MEErP) and during the input definition (see chapter 2). In particular the default settings for end-of-life waste streams have been maintained, while environmental impacts for rubber- and tyre-production are limited to some energy contributions.

Contents

1 Introduction

In the context of the Ecodesign Impact Accounting (EIA) project in March 2016 a 'Special Report Material Inputs for Production' was issued[4]. Based on the Bills-of-Material for all Ecodesign products, this report presents an overview of the quantity and types of material used in manufacturing the EIA products sold in 2010 (sales based) or installed in 2010 (stock based). Amongst others the report identifies the most material-consuming product groups and the most consumed material types.

The current document continues the work presented in the Materials Report by inserting the material data, combined with EIA data (e.g. sales, stock, lifetimes, energy consumption during use, and economic data) in a standard EcoReport[5]. The result is a single EcoReport for a fictitious average EIA product that has the same material and energy consumption as all EIA products[6] together. Compared to the existing Materials Report and EIA-report it provides the Life Cycle Impacts and Costs of the combined EIA products, additional insight in the subdivision of environmental impacts over the various phases of product life (manufacturing, distribution, use, end-of-life), and additional information on waste streams and on emissions to water and air.
EIA-data used for the EcoReport have been taken from the June 2016 EIA report[7] and may slightly differ from those in the December 2016 EIA report. The difference, if any, is very small and negligible.

Preparation of the input for the EcoReport from the basic data in the Material Report and the EIA-report was not always straightforward. It required additional calculations, assumptions, and in some cases adaptation of the EcoReport default settings and formulas. These input-methodology-aspects are explained in chapter 2.

Subsequent chapters present the outputs of the EcoReport and the conclusions that can be drawn from them. This includes:

- A cross-check with data from the Materials Report or the EIA-report, for those parameters where this is possible;
- Presentation of new results that can only be found in the EcoReport;
- A comparison of the impact of EIA products with the total impacts in EU-28.

4 https://ec.europa.eu/energy/sites/ener/files/documents/EIA%20Special%20Report%20Material%20Consumption%20160607.pdf

5 http://ec.europa.eu/growth/industry/sustainability/ecodesign_en (section on 'support tools for experts')

6 The term 'EIA products' indicates the collection of products for which data are included in the Ecodesign Impact Accounting Report of June 2016. The term has been preferred over 'Ecodesign products' or 'regulated products' because it more clearly defines the targeted product group, including also products for which regulation has not been finalized yet (but which are already presented in EIA) and tyres (that are regulated separately from Ecodesign and Energy Labelling, but anyway included in EIA).

7 https://ec.europa.eu/energy/sites/ener/files/documents/Ecodesign%20Impacts%20Accounting%20%20-%20status%20January%202016%20-%20Final-20160607%20-%20N....pdf

2 Input-Methodology

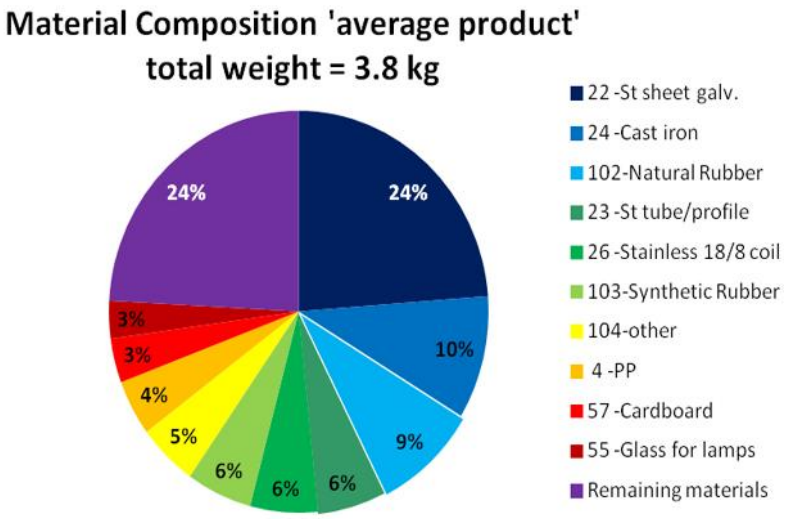
The product related input of the EcoReport is divided in five topics: 'Materials Extraction & Production', 'Manufacturing', 'Distribution', 'Use Phase' and 'Disposal & Recycling'. In addition some data on EU-totals and costs have to be inserted. This chapter discusses all the inputs and how they were 'averaged' over all products.
A full listing of the input is provided in Annex A.

2.1 Materials Extraction & Production

This part of the EcoReport input concerns the quantities and types of materials that can be found in the targeted product. The product analysed here is the 'average product' representing all products represented in EIA, i.e. all products studied in the context of Ecodesign and Energy Labelling, including also Tyres. This average product has little meaning in itself, but on total EU-28 sales or stock level it provides relevant results.

Aggregated material weight data were collected from the 'Special Report on Material Inputs for Production'. These total weights refer to the EIA data (sales, stock) for the year 2010. To calculate the material weight per average product, the total sales weight per material was divided by the 2010 sales from the June 2016 EIA version. This leads to an average product with a total weight of 3.8 kg (14,557 kton material / 3,821 mln sold products).

Figure 1. Material composition of the 'average product'



The material composition of this 'average product' reflects the material usage in the EU-28 for EIA products sold around 2010. Galvanized steel sheet is by far the most consumed material, followed by cast iron. Natural and synthetic rubber have significant shares due to the large sales numbers of Tyres. Cardboard is mainly used for packaging. The 'other' material group consists of several materials listed in the bills of materials of some EIA products, but for which the EcoReport does not contain impact data. The 'remaining materials' group collects individual materials with a share less than 3%, for which impacts are defined in the EcoReport. In total, 58 materials are defined in the EcoReport (see Annex A for the complete list). The graph shows how 10 materials (including the 'other' group) account for 76% of the total product weight.

Each material type is linked to environmental impact data per unit mass (e.g. energy, emissions, waste) that are pre-defined in the EcoReport. For four materials appearing in

the ‘average product’ there were no associated impact data in the EcoReport template: natural rubber, synthetic rubber, mercury and ‘other’.

For the two rubber types, production energy impacts were added to the EcoReport. These data have been taken from ‘The Green Office’[8]: “Natural rubber requires approximately 15 GJ/ton for production vs. 100-200 GJ/ton for synthetic rubber.” Consequently impacts have been defined as 15 MJ/kg and 150 MJ/kg respectively. Information on other impacts related to rubber- or tyre-production is available in literature but would need further study before it can be inserted in the EcoReport. Such a study is out-of-scope for the EIA-project, and consequently all non-energy impacts for rubber (and for tyre manufacturing) have been set to zero.

For the group ‘other materials’ the environmental impacts have been defined as a mass-weighted average of the impacts of all other materials. This rough approximation has been preferred over leaving all impacts zero.

The impacts for mercury have been neglected.

2.2 Manufacturing

The manufacturing ‘input’ section of the EcoReport sums the material weights per manufacturing category (scheme below). The only input required is the percentage of scrap generated during sheet metal manufacturing. The default value of 25% has been maintained.

The manufacturing categories are linked to manufacturing impact data defined in the EcoReport. An exception is the category ‘other materials’ that has no separate manufacturing impacts defined (these impacts are assumed to be already included in those defined for the materials). See Annex A for the manufacturing categories and associated masses.

2.3 Distribution

The distribution impacts of the EcoReport cover those during Final Assembly and during Distribution & Retail.

For Final Assembly there is a fixed impact per product and a variable impact depending on the product volume. The latter impact is different if the product is an ‘ICT or Consumer Electronics (ICT/CE) product < 15 kg’.

For Distribution & Retail the impact depends on whether the product is an ‘installed appliance (e.g. boiler)’ or not. If it is, the impact depends on the product volume. If it is not (retail product), the impact has a fixed part per product and a variable part depending on product volume.

Consequently there are three input values to be set:

- Is product an ‘ICT or Consumer Electronics (ICT/CE) product < 15 kg’ (yes/no)
- Is product an ‘installed appliance (e.g. boiler)’ (yes/no)
- Product volume in m^3.

[8] https://www.thegreenoffice.com/go-green_greening-guide_white-papers_products-and-materials_rubber

2.3.1 Product volume

The volume of the 'average product' was calculated as the sales weighted average over all product volumes. The latter were taken from the original EcoReports for the individual products. In case no volume was available, an educated guess was made. The resulting average volume is 0.0255 m^3.

2.3.2 Product types

Being a combination of all products, the 'average product' partially is and partially is not an ICT/CE product, and partially is and partially is not an installed appliance. This situation was not foreseen in the EcoReport, so it has been adapted. All Booleans in the input section have been forced to 1, to activate impact data for all product type variants. In addition the impacts for each variant have been multiplied by a share.

The share of ICT/CE products has been defined by assuming that all EIA products accounted under 'Electronics' and having a mass below 15 kg fall into this category. This covers 18% of the overall sales. The other 82% are considered not to be ICT/CE products.

All products for which installation costs are included in EIA have been defined as 'installed units', leading to a share of 2% of the overall sales. The other 98% are considered to be 'retail' products.

Table 1. Product share ICT/CE and installed products

	YES	NO
ICT/CE	18%	82%
INSTALLED	2%	98%

The calculated shares have been inserted in the EcoReport (in the 'Uitrekensheet' on rows 234-240), as shown in Table 2 and were also added to the existing formulas.

Table 2. Implementation of product type shares for the distribution phase in the EcoReport (example for Primary Energy only; similar for other impact parameters)

				MJ
DISTRIBUTION (incl. Final Assembly)		FACTOR	DISTRIBUTION TOTAL	94.14
Description			per product 62	51.50
Is it an ICT or Consumer Electronics product <15 kg?	208	18%	ICT per m3 60	13.91
		82%	appliance per m3 61	14.60
Is it an installed appliance (e.g. boiler)?	209	98%	retail per m3 63	12.49
		2%	installed per m3 64	0.17
		98%	per retail product 65	1.47

2.4 Use Phase

The EcoReport input section for the 'use Phase' is split in an 'indirect ErP impact' and a 'direct ErP impact'. The indirect ErP impact reflects the influence of the treated product on (mainly the energy consumption of) other regulated products. An example is the influence of air conditioners and ventilation units on central heating products. In EIA however, these effects are already taken into account in the calculations on energy consumption. Therefore, only input for the direct ErP impact has been used.

2.4.1 Product life

The product life of the 'average product' is calculated as the sales weighted product life of all products: 5.5 years.

2.4.2 Electricity

The electricity consumption in the use-phase can be defined in the EcoReport for on-mode, standby-mode and off mode. For each mode, the input consists of the energy consumption per unit of time and the time per year the product operates in this mode.

To calculate the electricity consumption of the average product, the total 2010 electricity consumption reported in EIA for the ECO-scenario (sum over all modes) was divided by the total 2010 EIA stock, resulting in 167 kWh/a/unit, input as on-mode electricity (standby and off-mode electricity were set to zero). The time unit has been set to 1, since the calculated electricity is already the annual consumption.

In the EcoReport, the electricity consumption is multiplied by defined environmental impacts associated to the generation and distribution of electricity. The EcoReport assumes an energy efficiency of electricity generation and distribution of 40%, which is the same value used in EIA (i.e. the primary energy is 1/40%=2.5 times the electric energy). The Global Warming Potential (GWP) of electricity in the EcoReport is 420 $kgCO_2eq/MWh$, while in EIA the value depends on the year, but is 410 $kgCO_2eq/MWh$ in 2010.

2.4.3 Heat

The fuel based energy consumption is defined in the EcoReport by means of three input variables: the heat power output per unit of time (kW), the number of hours per year this output is required (h/a), and the efficiency of heat generation (%, defined in the EcoReport by selecting a fuel-type):

$$Energy_{in} = \frac{Heat\ Power\ Output\ \ kW\ \ * Hours\ per\ year\ (\text{□}/a)}{\eta\ (\%)}$$

For space heating and water heating products, the three inputs to the EcoReport could be derived from EIA data, but as regards fuel-consumption the average product also includes (non-electric) cooking appliances and tyres, for which the three inputs are not always meaningful. This has been resolved in the EcoReport input by setting the hours per year to 1 (as was done for electricity), and the efficiency of heat generation to 100%.

This enables the use of the average fuel consumption from EIA as input for the 'Heat Power Output' in the EcoReport. The average fuel-energy consumption is taken as the EIA FUELECO value of 2010 divided by the EIA 2010 stock:

$$\frac{3583\ \frac{\text{TWh}}{\text{a}}}{16686} * 10^3 = 215\ kW\text{□}$$

In the EcoReport, the above fuel consumption (+5% for extraction and transport) is multiplied by environmental impacts that depend on the type of fuel used (e.g. gas, oil, fossil, wood). The 'average product' considered here uses a mix of different fuels and consequently an 'average fuel', with corresponding 'average impacts' has been added in the EcoReport. As regards energy and GWP these impacts have been set to match the EIA totals for fuel-related energy consumption and fuel-related greenhouse gas emissions, i.e. 1000 MJ/GJ and 57.4 $kgCO_2eq/GJ$[9]. The other fuel-related environmental

[9] But the EcoReport adds 5% fuel for extraction and transport, so EcoReport results for fuel-related energy and emissions will anyway be 5% higher than in EIA.

impacts have been determined as stock-weighted averages of the impacts for the individual fuels.

Table 3. Environmental impacts per GJ of 'Average Fuel'. For energy and GWP set to match EIA data; for other impacts calculated as stock weighted average over all fuel types

	Primary Energy (MJ)	Electric energy (MJ)	Fd (MJ)	water process	Water cool	waste haz	waste non-haz	GWP	AD
AVERAGE FUEL	**1 000**	**0**	**0**	**-13**	**0**	**0**	**0**	**57.4**	**39**

VOC	POP	HMa	PAH	PM	HMw	EP
7	**17**	**9**	**28**	**14**	**0**	**0**

2.4.4 Consumables

Beside energy consumption, the Use Phase is also characterized by the consumption of additional resources or consumables. An overview of the consumables for the 2010 EIA stock, compiled by VHK, is included in Annex B. These data are used to derive the inputs for the EcoReport, see Annex A.

Water

Water is mainly consumed when using washing machines and dishwashers, with a smaller additional contribution from coffee makers. The amount of water used per year by the average product has been calculated dividing the 2010 total water consumption by the total 2010 product stock.

Auxiliaries

The auxiliary consumptions defined in EIA are related to Imaging Equipment (paper and ink/toner/cartridges), Washing Machines (detergent, fabric softener and stain remover, Dishwashers (detergent, salt and rinsing aid), Vacuum Cleaners (bags and filter sets) and Coffee Makers (paper filters and aluminium caps).

Auxiliaries for which environmental impacts are defined in the EcoReport are: office paper, toner, detergent dishwasher, rinsing agent dishwasher, regenerating salt dishwashers and vacuum cleaner bags.

The EcoReport for the 'average product' considers only the 6 auxiliaries for which impacts are already defined in the EcoReport template. The impacts of dishwasher detergent have also been applied to washing machine detergent. For every auxiliary material, the annual consumption for the 'average product' has been calculated as the total weight from Annex B divided by the total 2010 stock of EIA products.

Refrigerant

Products for cooling and refrigerating use refrigerants, that are 'consumed' during use (leakage) or can be released to the environment at product end-of-life. This causes greenhouse gas emissions depending on the Global Warming Potential (GWP) of the refrigerant. The EcoReport template contains GWP-data for 9 different refrigerant types. The 'average product' considered here uses a mix of these refrigerants. To express this, an 'average refrigerant' with 'average GWP' has been added to the EcoReport. The 'average GWP' has been determined to match the EIA total for greenhouse gas emissions due to refrigerants, leading to 1,889 $kgCO_2eq/kg$ refrigerant.

The total annual weight of refrigerant consumed by all cooling, refrigerating and freezing products has been derived from data reported in EIA, see details in Annex C. The total of 17.6 kton has been divided by the total EIA 2010 stock of all products (16,686 mln units) to determine the annual refrigerant consumption for the 'average product'.

2.4.5 Maintenance and repair

Final input for the Use Phase is the number of travelled kilometres for maintenance purposes. These data are unknown for many products. A short research into the formulas in the EcoReport shows that this input is not used anywhere and thus can be ignored.

The weight related to spare parts is calculated in the EcoReport as 1% of the total product weight. The 1% is the default setting and has been maintained.

2.5 Disposal and Recycling

Many of the 'input' values for the Disposal and Recycling Phase are automatically computed by the EcoReport, or default values are suggested. The editable fields include:

- Unit sales lifetime years ago: EIA sales data for year 2005 have been used (target year for the EcoReport is 2010; average product lifetime is 5.5 years);
- Mercury content of the average product: data have been linked to those in the materials input section.
- Material category shares lifetime years ago: values have been assumed identical to the current ones, i.e. 2005 shares are identical to 2010 shares.
- End-of-life mass fractions for re-use, recycling, (heat) recovery, incineration and landfill: the default values of the EcoReport template have been maintained.

2.6 Economic inputs

Sales and Stock

The Sales and Stock of the 'average product' have been taken as the sum of the EIA 2010 sales and stocks over all products. At this stage, double counting issues have not been assessed, meaning that a part of the sales/stock of e.g. circulators, fans and electric motors is counted double. This is compatible with the Special Report on Materials, where the same approach was used.

For the use-phase energy consumption resulting from the EcoReport, this double counting does not lead to errors, because the energy consumption of the 'average product' derives from the EIA total energy that has already been corrected for effects of double counting. The same is true for emissions related to use-phase energy consumption. Environmental impacts related to other product life phases (manufacturing, distribution, end-of-life) might be slightly overestimated due to the double counting, but this is expected to be well within error margins of the entire 'averaging exercise'.

Product price

The purchase price of the average product was computed dividing the total EIA 2010 acquisition costs of the Eco-scenario (including VAT and installation costs) by the sales and then subtracting the average installation costs. The latter have been determined as the total EIA 2010 installation costs divided by the sales.

Electricity Rate

The electricity rate in the EcoReport for the average product is a weighted average of the residential and non-residential rates used in EIA.

Considering EIA 2010 ECO data the total residential electricity consumption was 874 TWh at a rate of 0.170 euro/kWh and the total non-residential electricity was 1,910 TWh at a rate of 0.105 euro/kWh. This implies a total electricity cost of 348.4 bn euros for 2,783 TWh, or an average electricity rate of 0.1252 euro/kWh.

Fuel Rate

The fuel rate in the EcoReport for the average product is a weighted average of the EIA rates for the various types of fuel, sometimes split in a residential and a non-residential rate.

Considering EIA 2010 ECO data, the overall fuel consumption for EIA products was 3583 TWh (primary energy). Total energy costs were 564.6 bn euros, of which 348.4 spent for electricity, so 216.2 bn euros were fuel-related. This implies an average fuel rate of 216.2/3,583 = 0.0604 euro/kWh primary.

Water Rate

EIA uses a 2010 water rate of 3.84 euro/m^3. The same rate is applied in the EcoReport.

Auxiliary Rates

For paper used by printers and photocopiers, EIA uses 2.4 euro/kg.

Ink and Toner costs are computed in EIA as 26 bn euros per year. The total consumption is 0.101 Mton/year (Annex B), implying a cost of 26/0.101 = 257 euro/kg.

Considering EIA cost data and consumed quantities of Annex B, for dishwashers 0.7 Mton of detergent per year are consumed for a total cost of 1.6 bn euros, implying 2.30 euro/kg. For washing machines consumers use 4.0 Mton detergent per year, costing 5.3 bn euros, implying 1.33 euro/kg. The EcoReport considers all detergents together, with a weighted average cost of 1.47 euro/kg.

For vacuum cleaners, consumers use 0.178 Mton of bags per year (Annex B) for a total cost of 1.9 bn euros. This implies an average price of approximately 10 euro/kg.

For the other two additional auxiliaries, dishwasher rinsing agent and salt, no price data could be retrieved from EIA. Indicative price information found on the internet has been used.

Maintenance costs

The total annual maintenance costs for all products were retrieved from EIA (49 bn euros in 2010). The average costs per unit per year are calculated dividing this total by the stock (16686 mln units). Since the maintenance cost input has to be given over the product life, the annual costs are multiplied by the earlier calculated average product life (5.5 years), resulting in 16 euros maintenance costs per product life.

Other economic parameters

The EcoReport default values for discount and escalation rate (both 4%) have been maintained. In that case the Present Worth Factor (PWF) equals the average lifetime.

In the EcoReport for the average product, all energy data refer to the average for the 2010 stock. No distinction is made between the efficiency of new sold products in 2010 and the average efficiency of the entire stock in 2010. The stock efficiency parameter is therefore set to 1 (default value).

3 Results

3.1 Comparison of EcoReport data with EIA data

The input data for the EcoReport of the average EIA product are based on the Special Report on Materials (material types and quantities) and on EIA total data over all products for the year 2010 (e.g. sales, stock, energy consumption, GHG-emissions). Consequently the outcomes of the EcoReport would be expected to coincide with the corresponding data in the other two reports. This comparison is presented in Table 4.

Table 4. Comparison between EcoReport results and data from EIA (ECO-scenario for 2010) and Special Report on Materials (SRM)

	EcoReport	EIA/SRM	Difference	Comment
Production weight of sales [kton]				
Total	14 459	14 459	0	exact match with SRM
Primary Energy, Use-phase, [PJ/a]				
Total	38 865	37 947	+918	
o/w for electricity	25 081	25 047	+34	excellent match
o/w fuel	13 511	12 900	+611	due to +5% fuel in EcoReport for extraction and transport
o/w for consumables	262		+262	not considered in EIA
o/w for maintenance	11		+11	not considered in EIA
GHG-emissions, Use-phase [GWP100, Mt CO2 eq./a]				
Total	1 988	1 914	+74	
o/w from Electricity	1 169	1139	30	due to using GWPel 420 instead of 410 $kgCO_2eq/MWh$
o/w from Fuel	777	740	37	due to +5% fuel for extraction and transport in EcoReport
o/w from Water	0.5		0.5	not considered in EIA
o/w from Refrigerant	33	33	0.0	exact match
o/w from Auxiliaries	8.1	1.4	6.7	EIA considers only paper, not the other consumables
o/w from Maintenance	0.6		0.6	not considered in EIA
Consumer expenditure [bn Euros/a]				
Total	1 054	1 039	+15	
o/w for Acquisition	378	378	0	exact match
o/w for Energy	575	565	10	due to +5% fuel in EcoReport for extraction and transport
o/w for Consumables	52	48	4	Rinsing agent and salt not considered in EIA
o/w for Maintenance	49	49	0	exact match

As regards material use for production, the totals in the EcoReport and in the Special Report on Materials (SRM) are identical: 14 459 kton.

As regards energy, emissions and expenditure, EIA considers only the use-phase of the products, so data have to be compared with EcoReport data for that phase. For EIA the reference is the ECO-scenario for year 2010.
As can be verified in the table, the differences in Primary Energy, GHG-emissions and Consumer Expense between the EcoReport and EIA are negligible. They are mainly due to the EcoReport adding 5% fuel consumption to account for extraction and transport (not done in EIA), to a higher GWP for electricity in the EcoReport (420 vs 410 $kgCO_2eq/MWh$), and to some aspects not being taken account in EIA.

3.2 EU Impact of Products in reference year

The EcoReport contains 4 different result tables, that are included in Annex D:

(1) Life cycle impacts per product (for a single unit over its lifetime);

(2) Annual impacts per product (for a single unit in one year). These data are derived from (1) dividing by the lifetime in years;

(3) Life cycle impacts of new models sold in 2010 (sum over all units sold over their lifetime). These data are derived from (1) multiplying by the sales;

(4) Annual impacts of 2010 stock (covers impacts from products produced in 2010, from products discarded in 2010, and from products used (stock) in 2010). For the manufacturing, distribution and end-of-life phases this is identical to (3). For the use-phase the data are derived from (2) multiplying by the stock[10].

The use-phase data from the last table can be compared with EIA data that are also annual and for the stock (see previous paragraph). The following results presentation also focuses on data from table (4) for the 2010 stock.

3.2.1 Material consumption

The production of EIA products sold in 2010 required 14,459 kton of raw materials. In the same year, the product stock consumed 7,999 kton of materials on spare parts, consumables (auxiliaries) and refrigerants. Consequently the total material input in 2010 was 22,458 kton.

In the same year 2010, the products sold in 2005 reached their (average) end-of-life, producing 13,837 kton of material waste. This is 622 kton less than the 14,459 kton input reported above because sales in 2005 (3,657 mln) were lower than in 2010 (3,821 mln). In the EcoReport this difference is called the 'stock effect'. Adding the 7,999 kton of spare parts, auxiliaries and refrigerants[11] that provide waste in the same year they are being used, the total material waste stream in 2010 is 21,835 kton, of which 7,526 kton (34%) goes to 'disposal' (incineration without heat recovery, landfill, or fugitive) and 14,309 kton (66%) is 'recycled' (including re-use and incineration with heat recovery).

Around 98% of the materials related to the use-phase are auxiliaries (paper, toner, detergents, etc.): the contribution of spare parts and refrigerants is very small. Auxiliaries are also responsible for 58% of the disposed waste. The largest contributor to recycled materials is ferro-metals (42% of total).

[10] In the EcoReport template this was not done for materials consumed during use (spare parts, auxiliaries). This has been changed in the EcoReport for the 'average product'.

[11] Only refrigerant losses are considered in EIA and in the EcoReport for the average product. These losses partly occur during life (leakage) and partly at end-of-life. For simplicity of description they are treated as consumables here.

Figure 2. 2010 material consumption for production and use, and end-of-life destinations

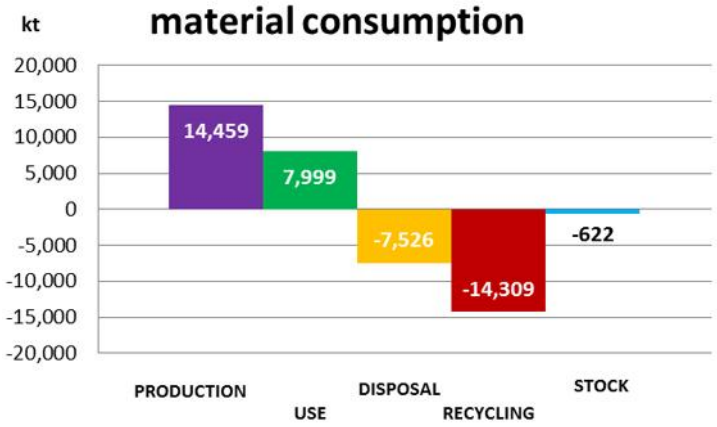
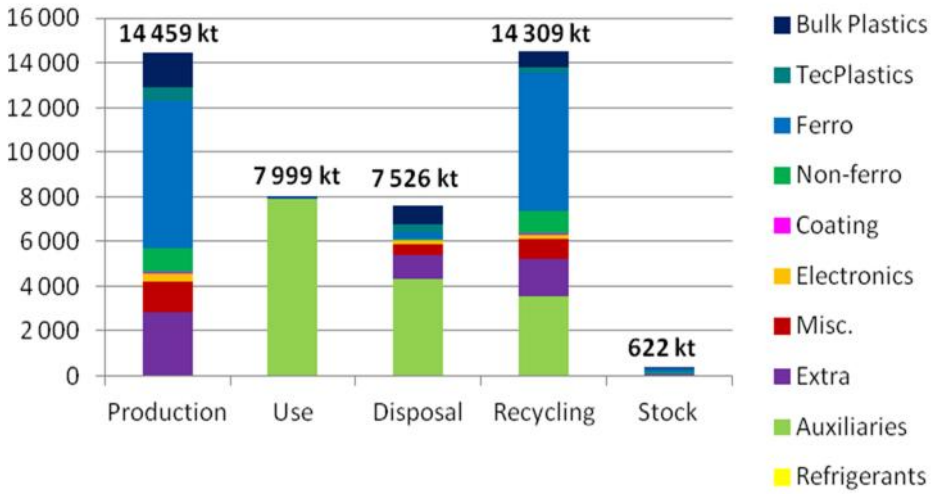


Figure 3. 2010 distribution of material types per phase and end-of-life destination



3.2.2 Energy use, Water consumption and additional Waste

For reference see Annex D, fourth table on annual impacts of 2010 stock, section on 'other resources and waste'.

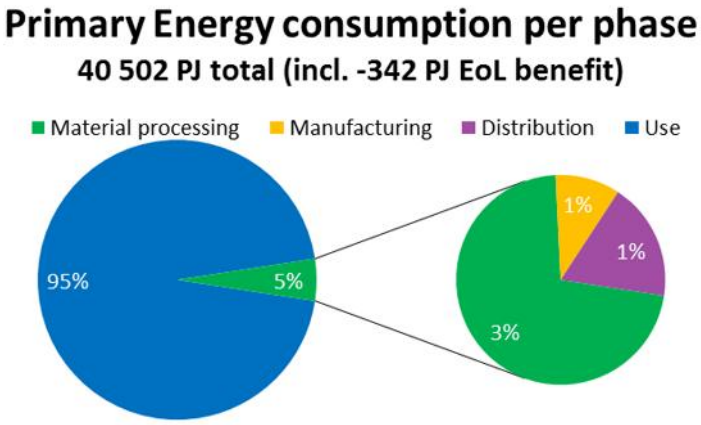
Energy

Figure 4 shows how the primary energy consumption of the 2010 stock of 'average EIA products' is distributed over the different phases in the life cycle. The vast majority of energy is consumed in the use phase (38,864 PJ, 95%). The remaining 5% (1,980 PJ) is used in material production (3.5%), manufacturing processes (0.5%) and distribution (1%).

The End of Life (EoL) phase contributes to the total energy consumption both positively and negatively. Product disposal requires 46 PJ of primary energy consumption, while recycling and heat recovery generate 388 PJ. This means a net primary energy benefit from production waste of 342 PJ.

65% of use-phase primary energy is used for generation and distribution of electricity.

Figure 4. Primary Energy distribution per life cycle phase



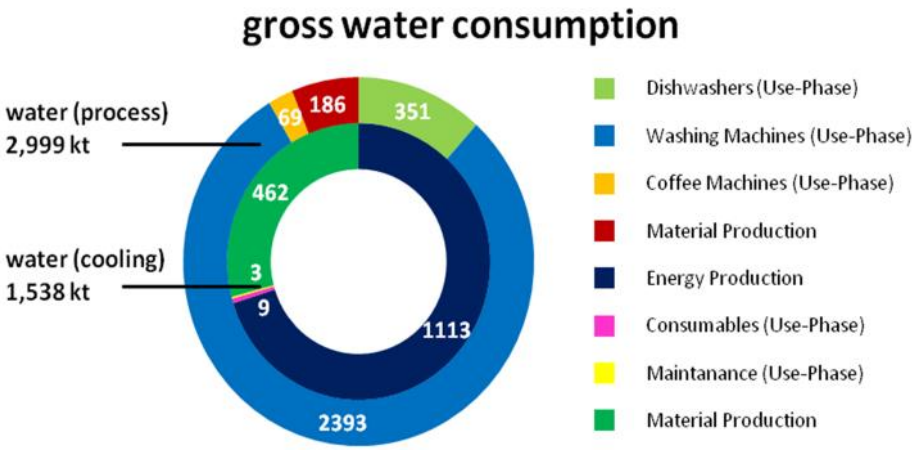
Water

The total net water consumption is 3,681 million m^3 in 2010, which is nearly the water volume of Lake Zürich in Switzerland (89 km^2, average depth 49 m). This water consumption is divided over process water and cooling water. The actual gross water consumption is 4,422 M m^3 (process and cooling combined), but around 17% (741 M m^3) can be re-used or recycled, which results in the stated net water consumption.

The major share of consumed water is process water (59%), of which a small part (6%) is used during materials processing and manufacturing, but the vast majority (2,649 M m^3, 94%) is consumed in the use-phase. The latter includes e.g. water used in washing machines and dishwashers, but also water contained in e.g. rinsing agents and detergents.

Cooling water is used to cool industrial machinery and processes, but the EcoReport assigns only 29% to the materials and manufacturing phase. The majority of cooling water is attributed to the use-phase and is associated with the production of the energy that is consumed during operation of EIA products. As this energy is accounted in the use-phase, the associated cooling water is taken into account in the same phase.

Figure 5. 2010 gross water consumption and distribution over life cycle phases



Waste

The waste considered here is in addition to the earlier discussed 'waste' from materials in the products and consumables. It is mainly waste that is generated during extraction and processing of raw materials, during product manufacturing (10,494 kton) and during the generation of energy (total 13,742 kton during the use-phase) [12].
The total annual amount of this additional waste (24 521 kton gross, 21,310 kton net) is of the same order of magnitude as discussed in paragraph 3.2.1 for product-materials and consumables (22,459 kton).
The majority of waste (98%) is non-hazardous and typically ends up as landfill. Only a small part (2%) is assumed to be hazardous and bound for incineration.
Of the 24,237 kton gross waste, 3 395 kton non-hazardous and 24 kton hazardous can be re-used, recycled or incinerated with heat recovery, but this process again produces 208 kton of waste for a net 'end-of-life' benefit of 3 211 kton.

Figure 6. 2010 total waste production

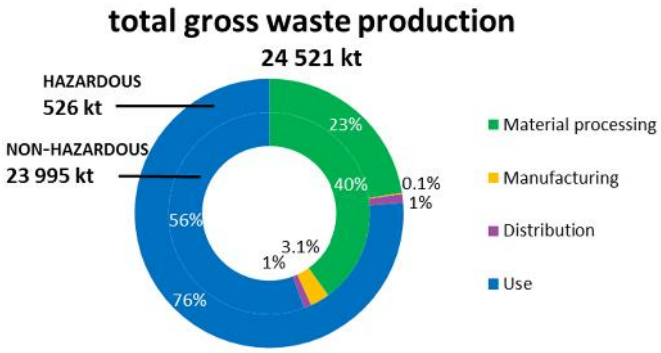
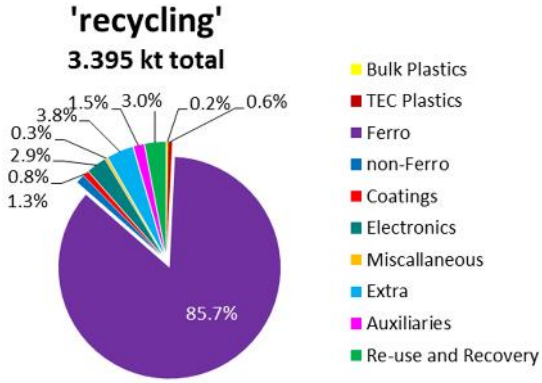


Figure 7. 'recycling' of non-hazardous waste



3.2.3 Emissions to Air

In addition to the Greenhouse Gas emissions that are also covered in EIA, the EcoReport addresses Acidification, Volatile Organic Compounds (VOCs), Persistent Organic Pollutants (POP), Heavy Metals, Polycyclic Aromatic Hydrocarbons (PAHs) and Particulate Matter (PM) emissions.

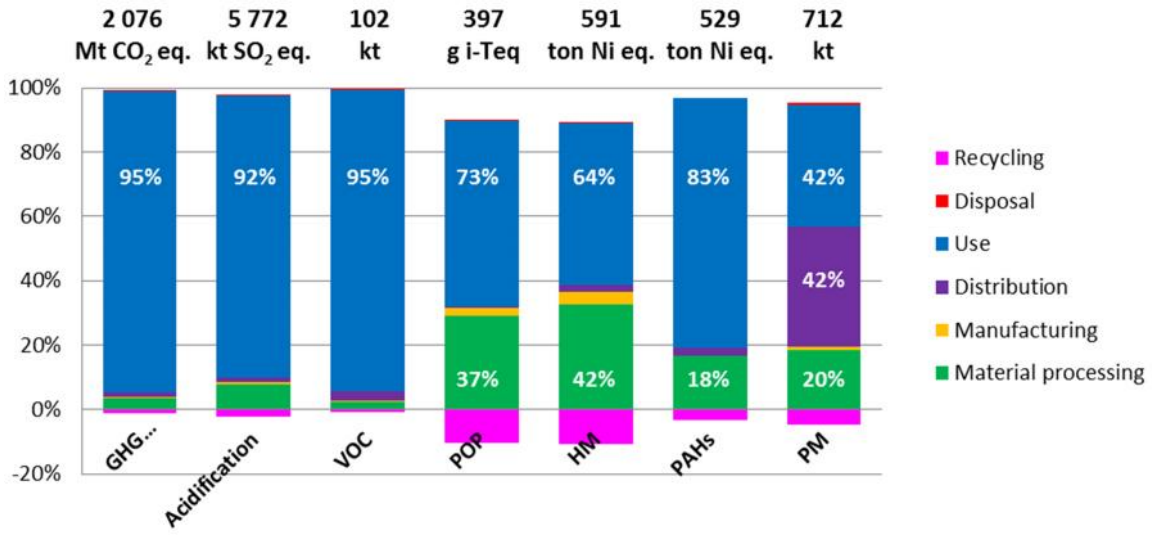
As shown in Figure 8, the use-phase is responsible for the largest part of the emissions to air, in particular as regards GHG, Acidification and VOC.

Material processing accounts for a significant share of the emissions of POP (37%), heavy metals (42%), PAHs (18%) and PM (20%).

The distribution-phase is relevant as regards the emission of particulate matter (42%). This derives mainly from the exhaust gasses of the vehicles used to transport products and product-related materials.

[12] The additional waste includes mining sludge (from metals), processing waste (after internal recycling etc. within the processes), and e.g. ashes from electricity production in coal-fired plants. In some sources the additional waste from the production of non-ferro metals is taken much higher than in the EcoReport. E.g. Eurostat assumes that 1 kg of copper yields around 200 kg waste, reasoning that the ore contains 0.5% of copper. The EcoReport figures consider a more complex situation where copper is co-produced with other metals, see the MEErP for details.

Figure 8. Emissions to air, shares of life cycle phases



3.2.4 Emissions to water

The EcoReport considers two emissions to water: heavy metals and eutrophication.

Eutrophication is a phenomenon in which phosphate-containing waste is discharged in water. A surplus of nutrients causes the depletion of oxygen in the water, causing animals and plants to die. Eutrophication is expressed in kton PO_4 (=phosphate). EIA products annually cause 272 kton PO_4 emissions to water, of which 99% is due to the use-phase and mainly derives from detergents (93%).

Emissions of heavy metals to water derive for approximately one-third (111 ton Hg/20) from the use-phase and two-thirds (207 ton Hg/20) from materials processing.

4 EcoReport outcomes vs. EU-28 totals

Table 5 compares the EcoReport outputs for the average EIA products in 2010 with the EU-28 totals for the same parameters. This provides insights in the relative impact of EIA products.

Table 5. EcoReport results for average EIA product vs. EU totals.

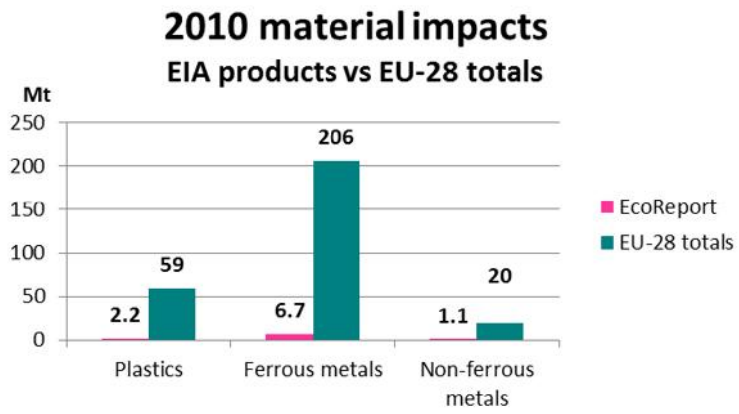
Main life cycle indicators	EcoReport value	unit	%	EU total	Reference
Materials					
Plastics	2.16	Mt	3.7%	59	Ref: Plastics production 2011 [13]
Ferrous metals	6.7	Mt	3.2%	206	Ref: Iron & Steel Statistics Bureau [1]
Non-ferrous metals	1.1	Mt	5.5%	20	Ref: www.eaa.net (Al 125+Cu 47 + Zn 08 + Pb 08 + Ni 03)
Other resources & waste					
Total Energy (GER)	40,502	PJ	55%	73,813	Ref: Eurostat Gross Inland Consumption EU-28 [14]
Electricity	2,848	TWh	89%	3,200	Ref: Net electricity generation[15]
Water (net total)*	3681	mln.m3	1.8%	210,044	Ref: Total gross abstraction [16]
Waste, non-haz./ landfill*	20.8	Mt	0.9%	2,363	Ref: Waste Statistics Explained [17]
Waste, hazardous/ incinerated*	0.5	Mt	0.5%	97.5	
Emissions (Air)					
Greenhouse Gases in GWP100	2076	Mt CO2eq.	42%	4,912	Air pollutant emissions data viewer (LRTAP Convention)[18]
Acidifying agents (AP)	5772	kton SO2 eq.	31%	18,349	Ref: see Annex E
Volatile Org. Compounds (VOC)	102	kton	1%	7,770	Ref: see Annex E
Persistent Org. Pollutants (POP)	397	g i-Teq.	18%	2,212	Ref: EEA1 (dioxins and furans only)[19]
Heavy Metals (HM)	591	ton Ni eq.	13%	4,534	Ref: see Annex E
PAHs	529	ton Ni eq.	39%	1,369	Ref: EEA1
Particulate Matter (PM10, dust)	712	kton	14%	5,007	Ref: see Annex E
Emissions (Water)					
Heavy Metals (HM)	283	ton Hg/20	2%	12,853	Ref: CML (As 17+Cd 213 + Cr 271 + Cu 1690 + Pb 2260 + Hg 143 + Ni 551 t + Zn 11200 t)
Eutrophication (EP)	337	kton PO4	37%	900	Ref: EEA2 (Baltic 861 N/54 P + North Sea 761 N/144 P + Danube/Black Sea 270 N/ 142 P)

*=caution: low accuracy for production phase

[13] https://issuu.com/plasticseuropeebook/docs/plastics_the_facts_2016_final_versi
[14] http://ec.europa.eu/eurostat/statistics-explained/index.php/Consumption_of_energy
[15] http://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_production,_consumption_and_market_overview
[16] http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=ten00006&language=en
[17] http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics
[18] http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer
[19] EEA1, European Environmental Agency, National emissions reported to the Convention on Long-range Transboundary Air Pollution (LRTAP Convention), EU-27 (national territory), 2007. (extract Feb. 2011)

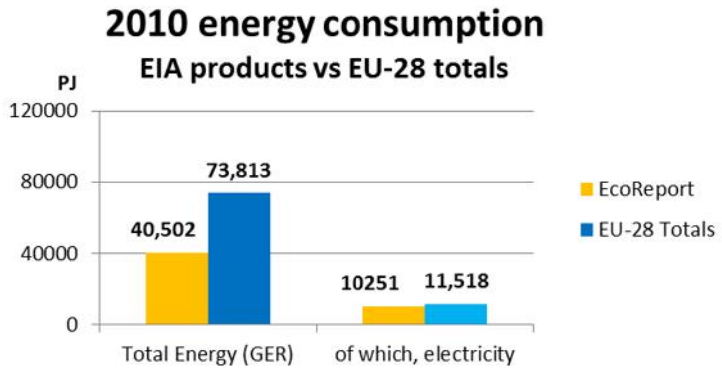
As regards material consumption, the Special Report on Materials concluded that the materials used annually in ErP account for 4-5% of the total material use in EU-28. The conclusion from the data of the EcoReport is similar: EIA products represent 3.7% of the plastics, 3.2% of ferrous metals and 5.5% of non-ferrous metals (aluminium, copper, zinc, lead and nickel) annually consumed in EU-28.

Figure 9. Use of plastics, ferrous and non-ferrous metals in EIA products compared to the total EU-28 consumption of these materials



The annual primary energy consumption of EIA products sold, discarded and/or operated in 2010 is 55% of the total EU-28 consumption. This result is similar to the one declared in the EIA report of June 2016 (53%, for use-phase energy only). As regards electricity, the share of EIA products is approximately 89% of the EU-28 total.

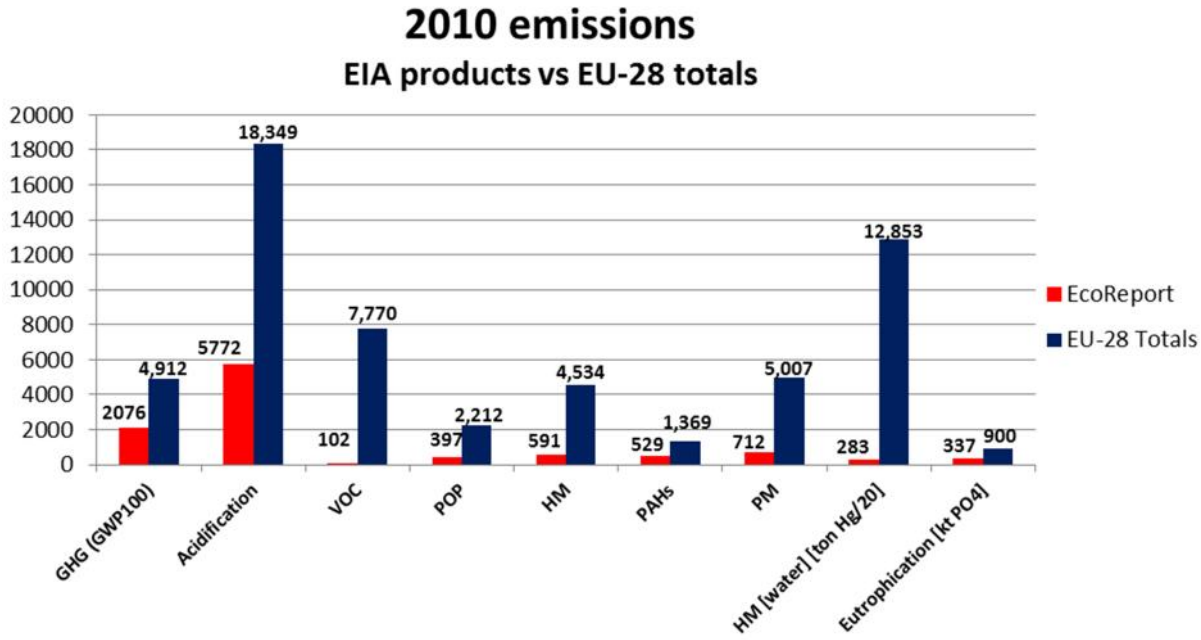
Figure 10. Primary energy and electricity related to EIA products compared to the total EU-28 consumption (values for electricity are final energy, not primary energy)



As regards water consumption and waste production, EIA products are responsible for less than 2% of the EU-28 total. Note however that EcoReport data for the materials processing and manufacturing phase are uncertain here.

EIA products have a large contribution to the total EU-28 emissions of Greenhouse gases (42%), Acidifying agents (31%), PAHs (39%) and Eutrophication (37%). Smaller but still significant contributions are identified for POPs (18%), Heavy Metals to air (13%) and Particulate matter (14%).

Figure 11 Annual emissions of EIA products compared to total EU-28 emissions of the same type (Note: units of measurement differ between emissions, so impacts of different emission types should not be compared)



See Table 5 for units of measurement

5 Life cycle costs and expenditure

The table shows the Life Cycle Cost (over the average useful lifetime of 5.5 years) for a unit average EIA product, and the total EU-28 Consumer Expenditure for all average EIA products sold or operated in 2010.

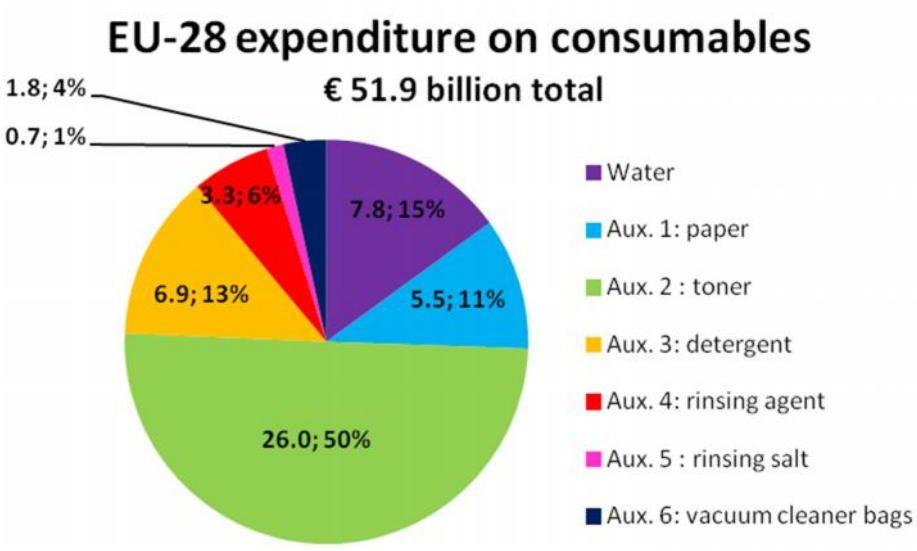
Table 6 Life Cycle Cost for a unit average EIA product and total EU-28 Consumer Expenditure for average EIA products sold or operated in 2010.

	Life Cycle Cost for a unit average 2010 EIA product over 5.52 years lifetime (in euro)	Annual cost for acquisition, installation, maintenance and use of average EIA products sold or operated in EU-28 in 2010 (in bn euros)
	€	bn €
Product price	80.84	308.9
Installation/ acquisition costs	17.95	68.6
Fuel (gas, oil, wood)	73.78	227.1
Electricity	113.22	348.4
Water	2.53	7.8
Aux. 1: paper	1.78	5.5
Aux. 2 : ink and toner	8.45	26.0
Aux. 3: detergent	2.24	6.9
Aux. 4: rinsing agent	1.06	3.3
Aux. 5 : rinsing salt	0.23	0.7
Aux. 6: vacuum cleaner bags	0.58	1.8
Repair & maintenance costs	15.98	49.2
Total	319	1 054

Over its lifetime of 5.5 years, the unit 'average EIA product' costs the buyer/user 319 euros, of which 99 euros (31%) for purchase and installation, 187 euros (59%) for energy costs, 17 euros (5%) for consumables and 16 euros (5%) for maintenance.

The total EU-28 consumer expense for EIA products in 2010 amounted to 1 054 bn euros. The major part (575 bn euros, 55%) are energy costs, while purchase and installation accounted for 378 bn euros (36%). Consumables (52 bn euros) and maintenance (49 bn euros) each cover 5% of the total expense.

Figure 12. EU-28 total consumer expenditure on consumables for EIA products (in billion euros per year in 2010)



6 Conclusions

1- Material data from the Special Report on Materials4 and sales, stock, energy, GHG-emissions and other data from the EIA report of June 2016[7] have been combined to provide EcoReport input for an 'average EIA product'.

2- As regards the amount of material contained in EIA products sold in 2010, the EcoReport outcome confirms the data of the Special Report on Materials: 14459 kton. In addition the EcoReport shows that additional 7999 kton of material is annually used for spare parts, consumables and refrigerants, for a total of 22458 kton. The EcoReport estimates that at product end-of-life (or after use for consumables) 34% of this material goes to 'disposal' (incineration without heat recovery, landfill, fugitive) and 66% is 'recycled' (including re-use and incineration with heat recovery).

3- In addition, the production and use of EIA products is estimated to be related to a net annual consumption of 3681 million m^3 of water, which is nearly 2% of the total amount of water abstracted every year in EU-28.

4- The primary energy consumption related to EIA products in 2010 was 40502 PJ (55% of EU-28 total primary energy consumption), of which 38864 PJ (95%) is consumed during product use. The latter coincides with the primary energy considered in the Ecodesign Impact Accounting, which takes into account only the use-phase.

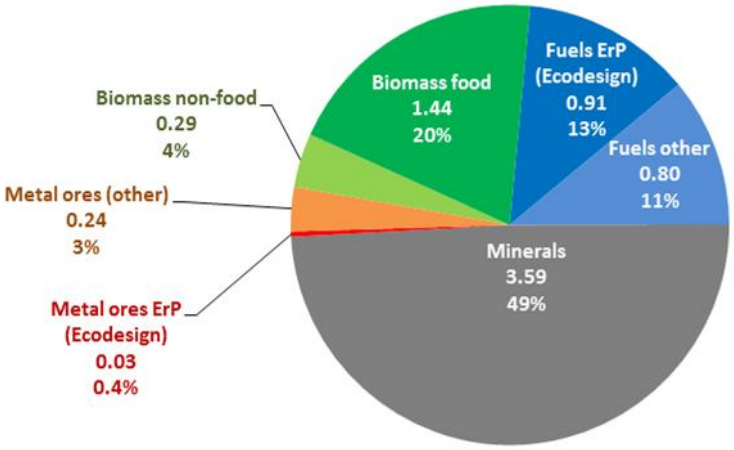
5- The greenhouse gas emissions related to EIA products in 2010 were 2076 $MtCO_2$equivalent (42% of EU-28 total GHG-emission), of which 1988 $MtCO_2$eq (95%) is emitted during product use. Again, the latter coincides with the emissions considered in EIA.

6- The contribution of EIA-products to the total EU-28 annual emissions to air or water is also significant for Polycyclic Aromatic Hydrocarbons (PAHs, 39%), Eutrophication (mainly Phosphates from detergents, 37%), Acidifying agents (31%), Persistent Organic Pollutants (POPs, 18%), Heavy Metals to air (HM,13%) and Particulate matter (PM,14%). For all emissions, the use-phase has the largest impact (i.e. emissions are mainly related to energy consumption). The distribution-phase has a significant impact on PM-emissions (from vehicle exhausts). Materials extraction and processing has significant impacts on POP-, PAHs-, HM- and PM-emissions.

7- In addition to 'waste' deriving from product-materials and consumables (see point 2 above) EIA products are all also responsible for waste generated during the extraction and processing of materials, during manufacturing and during generation and distribution of energy (fuels or electricity). This additional amount of waste is estimated 21310 kton net per year, and thus of the same order of magnitude as the waste from end-of-life products and consumables (22458 kton).

   The total of 43.8 Mton means that the non-energy material resources consumed for EIA products during their product life are responsible for 0.6% of the total EU Domestic Material Consumption (7300 Mton), for 0.4% of metal ores, 0.15% of oil as feedstock for plastics, synthetic rubber, detergents, >0.05% of biomass for e.g. paper & natural rubber, >0.01% of minerals for e.g. glass, concrete.

Figure 13. EU Domestic Material Consumption 2011, in Gton (total 7.3 Gton)



Annex A. EcoReport Input data listing

Version 3.06 VHK for European Commission 2011, modified by IZM for European Commission 2014						
ECO-DESIGN OF ENERGY RELATED/USING PRODUCTS			**EcoReport 2014: INPUTS Assessment of Environmental Impact**			
Nr	Product name		Date	Author		
	"Average EIA Product"		24/11/2016	VHK		
Pos	MATERIALS Extraction & Production	Weight	Category	Material or Process	Recyclable?	
Nr	Description of component	in g	Click &select	select Category first !		
1	LDPE	14	1-BlkPlastics	1 –LDPE		*0.4%*
2	HDPE	7	1-BlkPlastics	2 –HDPE		0.2%
3	LLDPE	0	1-BlkPlastics	3 –LLDPE		0.0%
4	PP	170	1-BlkPlastics	4 –PP		4.5%
5	PS	64	1-BlkPlastics	5 –PS		1.7%
6	EPS	17	1-BlkPlastics	6 –EPS		0.4%
7	HI-PS	27	1-BlkPlastics	7 –HI-PS		0.7%
8	PVC	25	1-BlkPlastics	8 –PVC		0.7%
9	SAN	1	1-BlkPlastics	9 –SAN		0.0%
10	ABS	69	1-BlkPlastics	11 –ABS		1.8%
11	PA 6	20	2-TecPlastics	12 –PA 6		0.5%
12	PC	45	2-TecPlastics	13 –PC		1.2%
13	PMMA	23	2-TecPlastics	14 –PMMA		0.6%
14	Epoxy	3	2-TecPlastics	15 –Epoxy		0.1%
15	Rigid PUR	63	2-TecPlastics	16 –Rigid PUR		1.7%
16	Flex PUR	4	2-TecPlastics	17 –Flex PUR		0.1%
17	Talcum filler	1	2-TecPlastics	18 –Talcum filler		0.0%
18	E-glass fibre	3	2-TecPlastics	19 –E-glass fibre		0.1%
19	Aramid fibre	0	2-TecPlastics	20 –Aramid fibre		0.0%
20	St sheet galv	900	3-Ferro	22 –St sheet galv.		23.8%
21	St tube/profile	221	3-Ferro	23 –St tube/profile		5.8%
22	Cast iron	374	3-Ferro	24 –Cast iron		9.9%
23	Ferrite	20	3-Ferro	25 –Ferrite		0.5%
24	Stainless 18/8 coil	218	3-Ferro	26 –Stainless 18/8 coil		5.8%
25	Al sheet/extrusion	45	4-Non-ferro	27 –Al sheet/extrusion		1.2%
26	Al diecast	72	4-Non-ferro	28 –Al diecast		1.9%
27	Cu winding wire	43	4-Non-ferro	29 –Cu winding wire		1.1%
28	Cu wire	48	4-Non-ferro	30 –Cu wire		1.3%
29	Cu tube/sheet	65	4-Non-ferro	31 –Cu tube/sheet		1.7%
30	CuZn38 cast	9	4-Non-ferro	32 –CuZn38 cast		0.2%
31	ZnAl4 cast	4	4-Non-ferro	33 –ZnAl4 cast		0.1%
32	MgZn5 cast	1	4-Non-ferro	34 –MgZn5 cast		0.0%
33	pre-coating coil	4	5-Coating	39 –pre-coating coil		0.1%
34	powder coating	9	5-Coating	40 –powder coating		0.2%
35	Cu/Ni/Cr plating	1	5-Coating	41 –Cu/Ni/Cr plating		0.0%
36	Au/Pt/Pd per g	0	5-Coating	42 –Au/Pt/Pd		0.0%
37	LCD per m2 scrn	22	6-Electronics	43 –LCD per m2 scrn		0.6%
38	big caps & coils	15	6-Electronics	45 –big caps & coils		0.4%
39	slots / ext. ports	8	6-Electronics	46 –slots / ext. ports		0.2%
40	large IC	2	6-Electronics	47 –IC's avg., 5% Si, Au		0.1%
41	small IC	2	6-Electronics	48 –IC's avg., 1% Si		0.0%

42	SMD/ LED's avg.	2	6-Electronics	49 –SMD/ LED's avg.		0.1%
43	PWB ½ lay 3.75kg/m2	6	6-Electronics	50 –PWB ½ lay 3.75kg/m2		0.2%
44	PWB 6 lay 4.5 kg/m2	5	6-Electronics	51 –PWB 6 lay 4.5 kg/m2		0.1%
45	PWB 6 lay 2 kg/m2	0	6-Electronics	52 –PWB 6 lay 2 kg/m2		0.0%
46	Solder SnAg4Cu0.5	1	6-Electronics	53 –Solder SnAg4Cu0.5		0.0%
47	PWB assembly	0	6-Electronics			0.0%
48	Glass for lamps	114	7-Misc.	55 –Glass for lamps		3.0%
49	Bitumen	5	7-Misc.	56 –Bitumen		0.1%
50	Cardboard	134	7-Misc.	57 –Cardboard		3.5%
51	Office paper	35	7-Misc.	58 –Office paper		0.9%
52	Concrete	73	7-Misc.	59 –Concrete		1.9%
53	Natural Rubber	335	8-Extra	102-Natural Rubber		8.9%
54	Synthetic Rubber	212	8-Extra	103-Synthetic Rubber		5.6%
55	Mercury (Hg)	0	8-Extra			0.0%
56	Controller board	26	6-Electronics	98 –controller board		0.7%
57	Other	192	8-Extra	104-other		5.1%
58	PET	5	1-BlkPlastics	10 –PET		0.1%
	TOTAL	**3784**				

Pos	MANUFACTURING	Weight	Percentage	Category index (fixed)
nr	Description	in g	Adjust	
201	**OEM Plastics Manufacturing** (fixed)	561		21
202	**Foundries Fe/Cu/Zn** (fixed)	387		35
203	**Foundries Al/Mg** (fixed)	73		36
204	**Sheetmetal Manufacturing** (fixed)	1248		37
205	**PWB Manufacturing** (fixed)	40		54
206	**Other materials** (Manufacturing already included)	1474		
207	**Sheetmetal Scrap** (Please adjust percentage only)	312	25%	38

Pos	DISTRIBUTION (incl. Final Assembly)		Answer	Category index (fixed)		
nr	Description					
208	**Is it an ICT or Consumer Electronics product <15 kg ?**		YES	60	1	1
209	**Is it an installed appliance (e.g. boiler)?**		YES	61	0	1
				63	0	1
210	**Volume of packaged final product in m³**	in m3	0.0255	64	1	1
				65	1	1

Pos	USE PHASE direct ErP impact		unit	Subtotals
nr	Description			
226	**ErP Product (service) Life in years**	**5.5**	years	
	Electricity			
227	**On-mode: Consumption per hour, cycle, setting, etc.**	167	kWh	166.7945603
228	**On-mode: No. of hours, cycles, settings, etc. / year**	1	#	
229	**Standby-mode: Consumption per hour**	0	kWh	0
230	**Standby-mode: No. of hours / year**	0	#	
231	**Off-mode: Consumption per hour**	0	kWh	0
232	**Off-mode: No. of hours / year**	0	#	
	TOTAL over ErP Product Life	**0.90**	**MWh (=000 kWh)**	66
	Heat			
233	**Avg. Heat Power Output**	215	kW	
234	**No. of hours / year**	1	hrs.	
235	**Type and efficiency (Click & select)**	**100.0%**		79 –AVERAGE FUEL
	TOTAL over ErP Product Life	**4.2**	**GJ**	
	Consumables (excl, spare parts)			**material**
236	**Water**	0.12	m^3/year	**84-Water per m3**
237	**Auxilliary material 1 (Click & select)**	0.14	kg/ year	**58 –Office paper**
238	**Auxilliary material 2 (Click & select)**	0.01	kg/ year	**80 –Toner**
239	**Auxilliary material 3 (Click & select)**	0.28	kg/ year	**81 –Detergent dishw.**
	Auxilliary material 4 (Click & select)	0.01	kg/ year	**82 –Rinsing agent dish**
	Auxilliary material 5(Click & select)	0.03	kg/ year	**83 –Regen. Salt dishw**
	Auxilliary material 6(Click & select)	0.01	kg/ year	**85 –Vacuum cl. Bags**
240	**Refrigerant refill (Click & select type, even if there is no refill)**	0.0011	kg/ year	**10 –AVG Refrigerant; 1889**
	Maintenance, Repairs, Service			
241	**No. of km over Product-Life**	100	km / Product Life	87
242	**Spare parts (fixed, 1% of product materials & manuf.)**	38	g	1%

Pos	ENERGY TOTAL (=indirect + direct ErP impact in use phase)		unit	Subtotals
nr	Description			
	Electricity			*5.422185286*
243	***TOTAL over Product Life of ERP***	***0.90***	***MWh (=000 kWh)***	*66*
	Heat			
244	**extra for extraction and transport, ErP indirect**	7%		
245	**extra for extraction and transport, ErP direct**	5%		
246	***TOTAL over Product Life of ERP indirect***	***0.00***	***GJ***	69 –Gas, atmospheric 86
247	***TOTAL over Product Life of ERP direct***	***4.40***	***GJ***	79 –AVERAGE FUEL
	Consumables (excl, spare parts)			***material***
248	***Water, Total over ErP Product Life***	*0.658684262*	*m^3*	**84-Water per m3**
249	Aux. 1: paper	*0.757145698*	*kg*	***58 –Office paper***
250	Aux. 2 : toner	*0.032820479*	*kg*	***80 –Toner***
251	Aux. 3: detergent	*1.525989784*	*kg*	***81 –Detergent dishw.***
	Aux. 4: rinsing agent	*0.029895882*	*kg*	***82 –Rinsing agent dish***
	Aux. 5 : salt	*0.150779229*	*kg*	***83 –Regen. Salt dishw***
	Aux. 6: vacuum cleaner bags	*0.057842032*	*kg*	***85 –Vacuum cl. Bags***
252	***Refrigerant refill (Click & select type, even if there is no refill)***	*0.005729*	*kg*	***Average GWP is 1889***

DISPOSAL & RECYCLING												
Description												
product (stock) life L, in years	5.5		Please edit values with red font									
	current		L years ago		period growth PG in %			CAGR in %/a				
unit sales in million units/year	3821		3657		4.5%			0.8%				
product & aux. mass over service life, in g/unit	6382		6382		0.0%			0.0%				
total mass sold, in t (1000 kg)	24387		23339		4.5%			0.8%				
Per fraction (post-consumer)	1	2	3	4	5	6	7a	7b	7c	8	9	
	Bulk Plastics	TecPlastics	Ferro	Non-ferro	Coating	Electronics	Misc. , excluding refrigant & Hg	refrigerant	Hg (mercury), **in mg/unit**	Extra	Auxiliaries	***TOTAL (CARG avg.)***
current fraction, in % of total mass (or mg/unit Hg)	6.3%	2.6%	27.4%	4.5%	0.2%	1.4%	5.7%	0.1%	**0.6**	11.7%	40.0%	*100.0%*
fraction x years ago, in % of total mass	**6.3%**	**2.6%**	**27.4%**	**4.5%**	**0.2%**	**1.4%**	**5.7%**	**0.1%**	**0.6**	**11.7%**	**40.0%**	*60.0%*
CAGR per fraction r, in %	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	
current product mass in g	*402*	*164*	*1751*	*290*	*14*	*89*	*366*	*6*	*0*	*746*	*2554*	*6382*
stock-effect, total mass in g/unit	17	7	75	12	1	4	16	0	0.0	32	110	*274*
EoL available, total mass ('arisings') in g/unit	385	157	1676	278	13	85	350	5	0.6	714	2445	*6108*
EoL available, subtotals in g		542		1966		85	350	5	0.6	714	2445	*6108*
												AVG
EoL mass fraction to re-use, in %				**1%**					1%		**5%**	*2.6%*
EoL mass fraction to (materials) recycling, in %	29%	**29%**		94%		**50%**	**64%**	**30%**	**39%**	**60.00%**	**30%**	*56.3%*
EoL mass fraction to (heat) recovery, in %	15%	**15%**		0%		**0%**	**1%**	**0%**	**0%**	**0.00%**	**10%**	*5.4%*
EoL mass fraction to non-recov. Incineration, in %	22%	**22%**		0%		**30%**	**5%**	**5%**	**5%**	**10.00%**	**10%**	*7.8%*
EoL mass fraction to landfill/missing/fugitive, in %	33%	**33%**		5%		**19%**	**29%**	**64%**	**55%**	**29.00%**	**45%**	*27.9%*
TOTAL	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100.00%*	*100%*	*100%*
EoL recyclability****, (click& select: 'best', '>avg', 'avg' (basecase); '< avg'.; 'worst')	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	**avg**	***avg***

	INPUTS FOR EU-Totals & economic Life Cycle Costs		unit
nr	Description		
A	Product Life	**5.5**	years
B	Annual sales	3821	mln. Units/year
C	EU Stock	16686	mln. Units
D	Product price (exc installation)	€ 80.84	Euro/unit
E	Installation/acquisition costs (if any)	€ 17.95	Euro/ unit
F	Fuel rate (gas, oil, wood)	€ 0.06	Euro/kWh
G	Electricity rate	€ 0.13	Euro/kWh
H	Water rate	€ 3.84	Euro/m3
I	Aux. 1: paper	€ 2.35	Euro/kg
J	Aux. 2 : toner	€ 257.43	Euro/kg
K	Aux. 3: detergent	€ 1.47	Euro/kg
	Aux. 4: rinsing agent	€ 35.42	Euro/kg
	Aux. 5 : dishwasher salt	€ 1.50	Euro/kg
	Aux. 6: vacuum cleaner bags	€ 10.00	Euro/kg
L	Repair & maintenance costs (over life)	€ 15.98	Euro/ unit
M	Discount rate (interest minus inflation)	4%	%
N	Escalation rate (project annual growth of running costs)	4%	%
O	Present Worth Factor (PWF) (calculated automatically)	5.52	(years)
P	Ratio efficiency STOCK: efficiency NEW, in Use Phase	1.00	

Annex B. Consumables

Use of consumables by EIA products, EU-2010

Product groups	***Solids***		***Water***
	Mt	**Mt**	*Mm³=Mt*
IE Imaging Equipment		**2.43**	
--Paper	2.330		
--Ink/toner	0.027		
--Ink/toner cartridge	0.074		
WM Washing Machine		**5.31**	*1724*
-- detergent	4.000		
-- fabric softener	1.200		
-- stain remover	0.110		
DW Dishwasher		**1.25**	*253*
-- detergent	0.696		
-- salt	0.464		
-- rinse aid	0.092		
VC Vacuum Cleaner		**0.20**	
-- bags	0.178		
-- filter set	0.018		
COFFEE Coffee Maker (excl. 2.4 Mt Coffee)		**0.29**	*50*
-- paper filter (dripfilter and pad)	0.254		
-- aluminium caps (espresso)	0.040		
Spare parts (all, 1%)		**0.15**	
Other (e.g. filters)		**0.10**	
TOTAL CONSUMABLES (excl. water)		**9.73**	*2027*

IE is based stock 2010 of 122.6 mln. With 6000 images per year (ipy) with 65% duplex and 15% N-print (see EIA). This results in 3800 pages @ 200 pages/kg (A4, 80 g/m2)→ 19 kg. Ink/toner 0.037 g/image. A 78 g ink cartridge weighs 173 g (95 g plastic) and is wrapped in a carboard box of 40 g (archetype HP Officejet X551dw, average between EP and IJ) .
WM based on DK Ecolabel study (data 2008) mentioning 4 Mt detergent, 1.2 Mt softener and 0.11 Mt stain remover. Stock of 185.8 mln. (EIA for 2010), 220 cycles/yr--> 40876 million cycles. This is 98 g detergent, 29 g softener and 2 g stain remover per cycle. The correct dosage according to EN standard is 40g + 12g/kg load. With 3.8 kg/load this is 86 g. AISE estimates that 66% of people dose correctly, the rest overdose. Water is 42 litre/cycle (EIA 2010)
DW based on 30 g detergent, 20 g salt and 4 g rinse aid per cycle. Stock 2010 is 82.8 mln. units at 280 cycles/yr --> 23184 mln. cycles. Note that figures are based on traditional behaviour. Modern machines use multi-phase tablets (all-in-one e.g. 20 g/tablet) and thus less than half of the weight. Water is 10.9 litre/cycle.

VC based on 5 bags @ 100 g + 1 filterset @ 50 g per year for a stock of 356 mln. household vacuumcleaners
COFFEE based on EU-consumption of 400 bn cups: 70% dripfilter 3g paper/4 cups =0.75 g/cup; 20% pad 1.3 g paper/cup; 10% aluminium capsules 1g/cup. Water is based on 125 ml/cup -->

Spare parts: In EcoReport a standard of 1% of product weight is common. Total product weight of all regulated products is 14.55 Mt.

Other: Dome estimate for all filters in ventilation, flue gas treatment, etc.. (actual numbers unknown).

Annex C. Refrigerants

variable	avg. refrigerant mix (source: prep. study or IA)		GWP kg CO_2 /kg	kg CO_2/ a /unit	STOCK	Refrigerant impact total [Mt CO_2]	Refrigerant [kton]
GWPRAC [ca.3.5 kW]	avg. RAC (Lot 10)	kgCO_2/a	1934	69	49 470	3.4	1.8
GWPCHAS [44 kW]	CHAS (Lot 21_6)	kgCO_2/a	1922	2029	1 210	2.5	1.3
GWPCHAL [714 kW]	CHAL (Lot 21_6)	kgCO_2/a	1423	5564	103	0.6	
GWPCHWS [61 kW]	CHWS (Lot 21_6)	kgCO_2/a	1783	1046	122	0.1	0.4
GWPCHWL [894 kW]	CHWL (Lot 21_6)	kgCO_2/a	1423	10015	10	0.1	0.1
GWPACroof [80 kW]	ACroof (Lot 21_6)	kgCO_2/a	2025	2835	502	1.4	0.1
GWPACsplit [14 kW]	ACsplit (Lot 21_6)	kgCO_2/a	2025	794	4 506	3.6	0.7
GWPACVRF [50 kW]	AC VRF (Lot 21_6)	kgCO_2/a	2025	3544	707	2.5	
LOT ENER 12	**Commercial Refrigeration**						
GWPCF1	CF vertical chilled	kgCO_2/a	2280	3876	863	3.3	1.2
GWPCF2	CF horizontal frozen	kgCO_2/a	2280	3876	90	0.3	
GWPCF3	CF beverage cooler	kgCO_2/a	1300	19	7 097	0.1	1.5
GWPCF4	CF ice cream freezer	kgCO_2/a	2550	25	3 041	0.1	0.2
GWPCF5	CF vending machine	kgCO_2/a	1300	28	1 161	0.0	
GWPCF1	CF other supermarket	kgCO_2/a	2280	3876	3 448	13.4	0.1
Lot ENTR 01, PF	**Storage cabinets**						
GWPPFCV	Vertical Chilled	kgCO_2/a	1430	28	1 613	0.0	0.0
GWPPFFV	Vertical frozen	kgCO_2/a	3922	106	715	0.1	0.0
GWPPFCH	Counter chilled	kgCO_2/a	1430	17	691	0.0	0.0
GWPPFFH	Counter frozen	kgCO_2/a	3922	47	306	0.0	0.0
	Process Chillers						
GWPCHACMTS	PTCH AC-mt-S	kgCO_2/a	2280	2242	25	0.1	0.0
GWPCHACMTL	PTCH AC-mt-L	kgCO_2/a	2280	3952	8	0.0	0.0
GWPCHACLTS	PTCH AC-lt-S	kgCO_2/a	2280	2128	19	0.0	0.0
GWPCHACLTL	PTCH AC-lt-L	kgCO_2/a	2280	5320	6	0.0	0.0
GWPCHWCMTS	PTCH WC-mt-S	kgCO_2/a	2280	1786	8	0.0	0.0
GWPCHWCMTL	PTCH WC-mt-l	kgCO_2/a	2280	2584	4	0.0	0.0
GWPCHWCLTS	PTCH WC-lt-S	kgCO_2/a	2280	1558	7	0.0	0.0
GWPCHWCLTL	PTCH WC-lt-L	kgCO_2/a	2280	3040	3	0.0	0.0
	Condensing Units						
GWPCUMTS	CU-mt [0.2 -1 kW]	kgCO_2/a	2280	285	2 159	0.6	0.3
GWPCUMTM	CU-mt –1 - 5 kW]	kgCO_2/a	2280	741	1 295	1.0	0.4
GWPCUMTL	CU-mt –5 - 20 kW]	kgCO_2/a	2280	2337	648	1.5	0.7
GWPCUMTXL	CU-mt [20-50 kW]	kgCO_2/a	2280	5757	216	1.2	0.5
GWPCULTS	CU-lt [0.1 -0.4 kW]	kgCO_2/a	2280	285	311	0.1	0.0
GWPCULTM	CU-lt [0–4 - 2kW]	kgCO_2/a	2280	741	414	0.3	0.1
GWPCULTL	CU-lt –2 - 8 kW]	kgCO_2/a	2280	2337	207	0.5	0.2
GWPCULTXL	CU-lt –8 - 20 kW]	kgCO_2/a	2280	5757	104	0.6	0.3
TOTAL		**kgCO_2/a**	***1951 (1889)***	**464**		**27.6**	**17.6**

Annex D. EcoReport Output data listing

Data for a single 'average EIA product' over its lifetime.

Life Cycle phases -->		PRODUCTION			DISTRI-	USE	END-OF-LIFE			TOTAL
Resources Use and Emissions		Material	Manuf.	**Total**	BUTION		Disposal	Recycl.	**Stock**	
Materials	**unit**									
Bulk Plastics	g			**398**		**4**	212	173	17	**0.00**
TecPlastics	g			**162**		**2**	86	71	7	**0.00**
Ferro	g			**1,733**		**17**	84	1,592	75	**0.00**
Non-ferro	g			**287**		**3**	14	264	12	**0.00**
Coating	g			**13**		**0**	1	12	1	**0.00**
Electronics	g			**88**		**1**	42	43	4	**0.00**
Misc.	g			**362**		**4**	119	231	16	**0.00**
Extra	g			**739**		**7**	279	436	32	**0.00**
Auxiliaries	g			**0**		**2,554**	1,345	1,100	110	**0.00**
Refrigerant	g			**0**		**5.7**	3.8	1.7	0.2	**0.00**
Total weight	g			**3,784**		**2,598**	2,184	3,924	274	**0.00**
Other Resources & Waste							debet	credit		
Total Energy (GER)	MJ	372	52	**424**	**94**	**12,629**	12	-102		**13,058**
of which, electricity (in primary MJ)	MJ	148	28	**176**	**0**	**8,150**	0	-32		**8,293**
Water (process)	ltr	48	1	**49**	**0**	**861**	0	-176		**733**
Water (cooling)	ltr	107	14	**121**	**0**	**366**	0	-17		**469**
Waste, non-haz./ landfill	g	2,519	196	**2,715**	**73**	**4,335**	54	-888		**6,289**
Waste, hazardous/ incinerated	g	31	0	**31**	**1**	**130**	0	-6		**157**
Emissions (Air)										
Greenhouse Gases in GWP100	kg CO2 eq.	19	3	**22**	**7**	**646**	0	-7		**669**
Acidification, emissions	g SO2 eq.	121	13	**134**	**22**	**1,727**	0	-36		**1,847**
Volatile Organic Compounds (VOC)	g	1	0	**1**	**1**	**32**	0	0		**33**
Persistent Organic Pollutants (POP)	ng i-Teq	38	3	**41**	**0**	**94**	0	-14		**122**
Heavy Metals	mg Ni eq.	64	8	**72**	**4**	**124**	0	-21		**179**
PAHs	mg Ni eq.	24	0	**25**	**4**	**143**	0	-5		**166**
Particulate Matter (PM, dust)	g	38	2	**40**	**77**	**97**	1	-10		**205**
Emissions (Water)										
Heavy Metals	mg Hg/20	54	0	**54**	**0**	**36**	0	-16		**74**
Eutrophication	g PO4	2	0	**2**	**0**	**87**	15	-16		**88**

Data for a single 'average EIA product' per year
(data derived from those in the previous table dividing by the average lifetime).

Life Cycle phases -->		PRODUCTION			DISTRI-	USE	END-OF-LIFE			TOTAL
Resources Use and Emissions		Material	Manuf.	**Total**	BUTION		Disposal	Recycl.	**Stock**	VHK
Materials	**unit**									
Bulk Plastics	g			**73**		**1**	39	32	3	**0**
TecPlastics	g			**30**		**0**	16	13	1	**0**
Ferro	g			**320**		**3**	15	294	14	**0**
Non-ferro	g			**53**		**1**	3	49	2	**0**
Coating	g			**2**		**0**	0	2	0	**0**
Electronics	g			**16**		**0**	8	8	1	**0**
Misc.	g			**67**		**1**	22	43	3	**0**
Extra	g			**136**		**1**	51	80	6	**0**
Auxiliaries	g			**0**		**471**	248	203	20	**0**
Refrigerant	g			**0**		**1.057**	1	0	0	**0**
Total weight	g			**698**		**479**	403	724	51	**0**
Other Resources & Waste							debet	credit		
Total Energy (GER)	MJ	69	10	**78**	**17**	**2,329**	2	-19		**2,408**
of which, electricity (in primary MJ)	MJ	27	5	**32**	**0**	**1,503**	0	-6		**1,530**
Water (process)	ltr	9	0	**9**	**0**	**159**	0	-33		**135**
Water (cooling)	ltr	20	3	22	0	67	0	-3		**87**
Waste, non-haz./ landfill	g	465	36	**501**	**13**	**800**	10	-164		**1,160**
Waste, hazardous/ incinerated	g	6	0	**6**	**0**	**24**	0	-1		**29**
Emissions (Air)										
Greenhouse Gases in GWP100	kg CO2 eq.	4	1	**4**	**1**	**119**	0	-1		**123**
Acidification, emissions	g SO2 eq.	22	2	**25**	**4**	**319**	0	-7		**341**
Volatile Organic Compounds (VOC)	g	0	0	**0**	**0**	**6**	0	0		**6**
Persistent Organic Pollutants (POP)	ng i-Teq	7	1	**8**	**0**	**17**	0	-3		**23**
Heavy Metals	mg Ni eq.	12	1	**13**	**1**	**23**	0	-4		**33**
PAHs	mg Ni eq.	4	0	**5**	**1**	**26**	0	-1		**31**
Particulate Matter (PM, dust)	g	7	0	**7**	**14**	**18**	0	-2		**38**
Emissions (Water)										
Heavy Metals	mg Hg/20	10	0	**10**	**0**	**7**	0	-3		**14**
Eutrophication	g PO4	0	0	**0**	**0**	**16**	3	-3		**16**

Data for 'average EIA product' sold in 2010, over their lifetime
(data derived from those in the first table multiplying by the total sales).

Life Cycle phases -->		PRODUCTION			DISTRI-	USE	END-OF-LIFE			TOTAL
Resources Use and Emissions		Material	Manuf.	**Total**	BUTION		Disposal	Recycl.	**Stock**	
Materials	**unit**									
Bulk Plastics	kton			**1,522**		**15**	809	662	66	**0**
TecPlastics	kton			**620**		**6**	330	270	27	**0**
Ferro	kton			**6,624**		**66**	320	6,083	287	**0**
Non-ferro	kton			**1,098**		**11**	53	1,008	48	**0**
Coating	kton			**52**		**1**	2	47	2	**0**
Electronics	kton			**336**		**3**	159	166	15	**0**
Misc.	kton			**1,383**		**14**	455	882	60	**0**
Extra	kton			**2,824**		**28**	1,065	1,665	123	**0**
Auxiliaries	kton			**0**		**9,761**	5,138	4,204	419	**0**
Refrigerant	kton			**0**		**21.89**	14	6	1	**0**
Total weight	kton			**14,459**		**9,928**	8,346	14,994	1,048	**0**
Other Resources & Waste							debet	credit		
Total Energy (GER)	PJ	1,421	199	**1,620**	**360**	**8,900**	46	-388	0	**10,538**
of which, electricity (in primary PJ)	PJ	565	106	**671**	**0**	**5,744**	0	-123	0	**6,292**
Water (process)	mln. m3	182	3	**186**	**0**	**607**	0	-674	0	**118**
Water (cooling)	mln. m3	410	52	**462**	**0**	**258**	0	-67	0	**653**
Waste, non-haz./ landfill	kton	9,628	748	**10,375**	**278**	**3,055**	208	-3,395	0	**10,522**
Waste, hazardous/ incinerated	kton	119	1	**119**	**6**	**92**	0	-24	0	**193**
Emissions (Air)										
Greenhouse Gases in GWP100	mt CO2 eq.	73	11	**85**	**28**	**455**	0	-25	0	**543**
Acidification, emissions	kton SO2 eq.	461	51	**512**	**82**	**1,217**	2	-139	0	**1,674**
Volatile Organic Compounds (VOC)	kton	3	0	**3**	**3**	**22**	0	-1	0	**27**
Persistent Organic Pollutants (POP)	g i-Teq	145	13	**158**	**2**	**66**	0	-52	0	**174**
Heavy Metals	ton Ni eq.	246	30	**276**	**14**	**87**	1	-81	0	**297**
PAHs	ton Ni eq.	93	1	**94**	**14**	**101**	0	-18	0	**191**
Particulate Matter (PM, dust)	kton	144	9	**153**	**293**	**68**	5	-37	0	**482**
Emissions (Water)										
Heavy Metals	ton Hg/20	206	1	**207**	**0**	**137**	0	-62	0	**283**
Eutrophication	kton PO4	7	0	**7**	**0**	**334**	57	-61	0	**337**

Data for 'average EIA products' sold, discarded and/or operated in 2010, per year
(for manufacturing, distribution and end-of-life phases this is identical to the previous table. For the use-phase the data are derived from the second table multiplying by the stock).

Life Cycle phases -->		Production			Distri-bution	Use	END-OF-LIFE*			TOTAL
Resources Use and Emissions		Material process	Manuf.	**Total**			Disposal	Recycling	**Stock**	
Materials	**unit**									
Bulk Plastics	kton			**1,522**		**12**	808	661	65	**0**
TecPlastics	kton			**620**		**5**	329	269	27	**0**
Ferro	kton			**6,624**		**53**	320	6,072	285	**1**
Non-ferro	kton			**1,098**		**9**	53	1,006	47	**0**
Coating	kton			**52**		**0**	2	47	2	**0**
Electronics	kton			**336**		**3**	159	165	14	**0**
Misc.	kton			**1,383**		**11**	454	881	59	**0**
Extra	kton			**2,824**		**23**	1,063	1,663	121	**0**
Auxiliaries	kton			**0**		**7,861**	4,324	3,537	0	**0**
Refrigerants	kton			**0**		**21.9**	14	6	1	**0**
Total weight	kton			**14,459**		**7,999**	7,526	14,309	622	**1**
Other Resources & Waste							debet	credit		
Total Energy (GER)	PJ	1,421	199	**1,620**	**360**	**38,864**	46	-388	0	**40,502**
of which, electricity (in primary PJ)	PJ	565	106	**671**	**0**	**25,081**	0	-123	0	**25,628**
Water (process)	mln. m3	182	3	**186**	**0**	**2,649**	0	-674	0	**2,160**
Water (cooling)	mln. m3	410	52	**462**	**0**	**1,125**	0	-67	0	**1,521**
Waste, non-haz./ landfill	kton	9,628	748	**10,375**	**278**	**13,341**	208	-3,395	0	**20,808**
Waste, hazardous/ incinerated	kton	119	1	**119**	**6**	**401**	0	-24	0	**502**
Emissions (Air)										
Greenhouse Gases in GWP100	Mt CO2 eq.	73	11	**85**	**28**	**1,988**	0	-25	0	**2,076**
Acidification, emissions	kton SO2 eq.	461	51	**512**	**82**	**5,315**	2	-139	0	**5,772**
Volatile Organic Compounds (VOC)	kton	3	0	**3**	**3**	**97**	0	-1	0	**102**
Persistent Organic Pollutants (POP)	g i-Teq	145	13	**158**	**2**	**290**	0	-52	0	**397**
Heavy Metals	ton Ni eq.	246	30	**276**	**14**	**381**	1	-81	0	**591**
PAHs	ton Ni eq.	93	1	**94**	**14**	**439**	0	-18	0	**529**
Particulate Matter (PM, dust)	kton	144	9	**153**	**293**	**298**	5	-37	0	**712**
Emissions (Water)										
Heavy Metals	ton Hg/20	206	1	**207**	**0**	**111**	0	-62	0	**256**
Eutrophication	kton PO4	7	0	**7**	**0**	**269**	57	-61	0	**272**

Annex E. EU-28 totals conversion

	2010 data [kton]	conversion factor [g -> g eq. X]	source	New data	Unit	source
Greenhouse gasses	4912262	0.001	[4]	**4912**	**Mt CO2 eq.**	
Acidifying agents				**18349**	**kg eq SO2**	
Suplhur dioxide [SO2]	4510	1.00	[2]	4510	kg eq SO2	[1][2]
Nitrogen oxidens [Nox]	9315	0.70	[2]	6520	kg eq SO2	[1][2]
ammonia [NH3]	3893	1.88	[2]	7318	kg eq SO2	[1][2]
Volatile Org. Compounds (VOC)				**7770**	**kton**	
Non-methane volatile organic compound [NMVOC]	7770			7770	kton	[1]
Persistent Org. Pollutants (POP)	0.0			0	**g i-Teq.**	
Heavy Metals air (HM)	**14**			**4534**	**ton Ni eq.**	
Cadmium [Cd]	0.1	5	[3]	345	ton Ni eq.	[1]
Mercury [Hg]	0.1	5	[3]	325	ton Ni eq.	[1]
Lead [Pb]	1.9	0.04	[3]	76	ton Ni eq.	[1]
Arsenic [As]	0.195	3.33	[3]	649	ton Ni eq.	[1]
Nickel [Ni]	0.9	1	[3]	882	ton Ni eq.	[1]
Chromium [Cr]	0.4	0.5	[3]	189	ton Ni eq.	[1]
Zinc [Zn]	7.0	0.04	[3]	282	ton Ni eq.	[1]
Copper [Cu]	3.6	0.5	[3]	1785	ton Ni eq.	[1]
PAHs	**1.2**	**20**		**23000**	**ton Ni eq.**	[1]
PM	**3576**			**5007**	**kton**	
PM10	2145	1	[3]	2145	kton	[1]
PM2.5	1431	2	[3]	2863	kton	[1]
Heavy Metals water (HM)					**ton Hg/20**	
Arsenic [As]					ton Hg/20	
Cadmium [Cd]		11.1	[3]		ton Hg/20	
Chromium [Cr]					ton Hg/20	
Copper [Cu]					ton Hg/20	
Lead [Pb]		0.14	[3]		ton Hg/20	
Nickel [Ni]		0.05	[3]		ton Hg/20	
Mercury [Hg]		20	[3]		ton Hg/20	
Zinc [Zn]					ton Hg/20	
Eutrophication (EP)					**kton PO4**	

Annex F. EU total Water abstraction

The total EU-28 water abstraction was calculated from Eurostat data[20]. The Eurostat database provided data on the total gross water abstraction, abstraction for cooling water, public water supply, water for agriculture and manufacturing. However, the datasets are not complete and also contain some ambiguous information. In addition no EU-28 total is provided.

The first column presents the aggregated results of the five subdivisions in the water supply. It does not exactly comply with the total gross abstraction. Blue data were missing in Eurostat. In some cases it was tried to estimate the amount, based on the water consumption of similar sized countries.

	sum	total gross		elec cooling		manu. cooling		manufacturing		agriculture		public water	
Belgium	**6 214**	5341		3 883		896		1164		4		266	
Bulgaria	**5 019**	5840		3 486		36		81		928		488	
Czech	**1 343**	1573		697		53		218		25		349	
Denmark	**5**	4		-		**0**		2		3		0.2	
Germany	**27 714**	27195		22 218	*2004*	**0**		3896		54		1546	
Estonia	**1 541**	1546		1 496		**0**		17		0.2	*2009*	28	
Ireland	**532**	561	*2008*	-		**0**		**0**		**0**		532	
Greec	**4 255**	5821	*2007*	74	*2007*	**0**		**0**		3577	*2011*	604	*2011*
Spain	**29 014**	29009		6 300		63		331		18560		3760	
France	**22 356**	22356		17 139		**0**		1612		1832		1773	
Croatia	**189**	190		93		**0**		31		8		57	
Italy	**23 427**	**27500**		**22 000**		**0**		**0**		**0**		1427	*2012*
Cyprus	**64**	61		**5**		**0**		**0**		37		21	
Latvia	**83**	105		2		**0**		16		31		35	
Lithuania	**479**	583		**395**		**0**		20		64		0	
Luxembourg	**27**	24		-		2		3		**0**		22	
Hungary	**4 535**	4835		3 961		65	*2004*	33		228		248	
Malta	-	**30**		-		**0**		**0**		0.0		**0**	
Netherlands	**11 820**	9927		6 142		2 460	*2004*	2735		26		456	
Austria	**1 222**	**1000**		**35**		1 186	*2008*	**0**		**0**		0.6	*2008*
Poland	**8 802**	8923		6 548		234		230		1153		637	
Portugal	**786**	**6000**		**175**		**0**		**0**		**0**		611	*2009*
Romania	**6 494**	5595		901		901		3326		716		650	
Slovenia	**740**	740		707		**0**		28		1		4	
Slovakia	**490**	260		85		145	*2012*	206		6		48	
Finland	**1 758**	6298	*2006*	174	*2005*	**0**		1414		**0**		170	
Sweden	**2 884**	2715		110		598		1438		50		688	
UK	**6 336**	6111		188		242		696		982		4227	
Iceland	**33**	35		2		**0**		10		0.0		21	
Liechtenstein	-	**2**		-		**0**		**0**		**0**		**0**	
Norway	**2 459**	2476	*2003*	**125**		601	*2003*	1005	2009	**0**		728	
Switzerland	**789**	1000	*2012*	37	*2012*	**0**		442	2012	120	*2012*	189	
Montenegro	**5**	**15**		**5**		**0**				**0**		**0**	
FYROM	**477**	885	*2009*	18	*2009*	20	*2009*	40		359	*2009*	39	
Albania	**759**	494	*2013*	**275**		**0**		**0**		182	*2014*	302	
Serbia	**3 364**	3377		2 986		38		57		96		186	
Turkey	**33 872**	33818		63		78		224		30949		2559	
Bosnia	**130**	191		**75**		**0**		**0**		**0**		55	*2011*
Kosovo	**30**	33		14		**0**		16		**0**		**0**	
mln m3	**210044**	**222468**		**100415**		**7620**		**19290**		**59991**		**22728**	

[20] http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=ten00006&language=en