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Lot 23
Domestic and commercial hobs and grills

Task 5: Definition of Base-Case

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5. TASK 5 – DEFINITION OF BASE-CASE

The purpose of this task is:

- To select the average EU representative model or to construct an average EU model based on key characteristics from several important product subcategories.
- To define a standard Base-Case, i.e. the environmental impact, functionality and Life Cycle Costs for a reference year, measured according to harmonised test standards (that would also be used for compliance testing).
- To define a real-life Base-Case, i.e. the (estimated) environmental impact, functionality and Life Cycle Costs in real-life for a reference year with actual consumer behaviour and ambient conditions.

The Base-Case is a conscious abstraction of reality, which is a necessary instrument for practical reasons (budget, time). Given this abstraction, the question whether it leads to unsuitable conclusions for certain market segments will be addressed in the impact- and sensitivity analysis (Task 8).

The description of the Base-Cases is the synthesis of the results of Tasks 1 to 4. Most of the environmental and life cycle cost analysis are built on these Base-Cases throughout the rest of the study and it serves as the point-of-reference for Task 6 (technical analysis of BAT), Task 7 (improvement potential), and Task 8 (policy analysis).

5.1. PRODUCT-SPECIFIC INPUTS

This section describes the technical analysis of typical domestic and commercial hobs and grills which exist in the EU market. This data will cover the production phase, the distribution phase, the use phase and the end-of-life phase. Bill of materials (BOM) and resource consumption during product life are the most important parameters to be looked at[1]. This will be used as the general input for the Base-Case environmental impact assessment, in section 5.2.

5.1.1. Definition of Base-Cases

The objective of this section is to define and describe the Base-Cases, based on the previous tasks and the information recovered from the stakeholders and the literature review. The Base-Cases are “a conscious abstraction of reality” and have to cover the wide variety of existing products in order to be as representative of the European market as possible. Therefore, the number of Base-Cases is dimensioned to be small

[1] Necessary input into EuP EcoReport

enough to enable a simplified analysis of the market but large enough to deal with the technological panel of products.

The appliances covered by Lot 23 are very diverse in the way they are designed and used. The definition of base-cases has to take into account this diversity, but the MEEuP methodology requires the number of base-cases to be low. As a result, some appliances that are under the scope of this study will not be covered by the Base-Cases, as their energy consumption at the EU level was considered too low to be included as Base-case. The following paragraphs detail the choice of the base-cases presented in Table 5-1 **Erreur ! Source du renvoi introuvable.**.

- **Domestic Sector**

The electric hob using radiant technology is chosen as a representative of electric hobs based on its greater market share. Therefore, the Base-Case for domestic electric hob will be built on related data. Induction and solid plate hobs are not further characterised in this Task (induction hobs will be considered as BAT in the later tasks).

Grills in the domestic sector will not be further investigated either. This is due to their low frequency of use which leads to a low annual energy consumption at EU level. Therefore, any improvement potential in energy efficiency is currently not foreseen to have significant saving impacts at the EU level. Moreover, as the offer for domestic grills is quite diversified with many different designs, the identification of potential Base-Cases is problematic.

- **Commercial sector**

Hobs and grills used in the commercial sector are different from those found in the domestic sector, in terms of technology as well as user behaviour. Different designs and functionalities are available to meet specific needs of the commercial sector.

Currently, due to a lack of technical data on these commercial appliances, the identification of related Base-Cases has not been possible. (TBD)

- **Separation between appliances using different energy sources**

Electric and gas appliances of the same category will be treated in two Base-Cases, and not regrouped into one. This is due to two main reasons. First, no common performance methods allows a comparison of the energy consumption (see Task 1)

Secondly, the comparison between energy sources is difficult. If gas and electric appliances were to be compared in a common scheme (e.g. energy labelling scheme), the electricity consumption should be converted into primary energy consumption. However, a unique figure for the whole EU is not representative of the differences among the Member States (MS) concerning the electricity mix. Using the factor of 2.5 defined for the whole EU in Annex II of the Energy Services Directive (the production of 1 kWh of electricity requires 2.5 kWh of primary energy), electric appliances would be considered as less efficient until the next evaluation of the factor, no matter the innovations in terms of energy efficiency for this technology. Furthermore, CO_2 emissions from gas and electric cooking do not relate directly to energy consumption.

If primary energy consumption is considered, then gas would seem in most cooking processes to emit less CO_2 than electric (for the same quantity of heat delivered) although this is not the case in Member States where electricity is generated mainly from renewable or nuclear power.

For these two reasons, gas and electric appliances will be separately considered. This will have the benefit of stimulating the improvement of energy efficiency for both types of appliances. However, it is important to notice that the conversion factor of 2.5 was used in the Preparatory Study for Lot 1 (Boilers and combi-boilers). Moreover, in the future, working towards a harmonisation of the standards could allow a more accurate comparison of energy consumption between the two types of appliances. However, as the EU committed to reduce both energy consumption and GHG emissions, it is not currently possible or helpful to combine standards (and resulting energy ratings) for gas and electric.

- **Synthesis**

Although the MEEuP methodology foresees one or two BCs to cover the entire EU market for the products considered in each preparatory study, in this study four BCs emerged for hobs. Such a high number of BCs is necessary to appropriately cover the broad range of technical specifications and functionalities of hobs. Table 5-1 gives an overview of the four base-cases, which are products that have already been presented in the previous tasks.

Table 5-1: Description of the base-cases

Base-Case	Configuration	Number of cooking zones	Surface Material	Total maximum power (kW)
BC1 - Domestic electric (radiant) hob	Built-in independent	4	Vitroceramic	7.4
BC2 - Domestic gas hob	Built-in independent	4	Stainless Steel	9
BC3 - Commercial		tbd		

5.1.2. Domestic appliances

5.1.2.1. Inputs in the production phase

Production phase data related to typical hobs consists of the Bill of Materials (BOM) and the sheet metal scrap generated during the manufacturing phase. The BOMs have already been presented in Task 4.

Material equivalents

Because the EcoReport was initially designed as a simple and generic tool for all Ecodesign preparatory studies, its database does not include some materials found in domestic hobs. The list of those materials is presented in Table 5-2. The equivalences were mainly based from the assumptions made in previous Ecodesign preparatory studies.

Table 5-2: Material found in domestic appliances covered by Lot 23 not included in EcoReport

Material	BC	Weight	Percentage of the total weight	Most similar material available
Ceramic glass	BC1	3230 g	33%	54-Glass for lamps
Silicone seal	BC1	90	1%	16-Flex PUR
Silicone Glue	BC1	16	0.2%	14-Epoxy
PTFE	BC2	118.5	1.5%	11-PA6

The equivalence for the ceramic glass in BC1 is here pointed as a critical point as it represents around 33% of the total weight. A more detailed characterisation could be recommended in future work.

Weight distribution

In Table 5-3, the weight distribution according to material categories is presented.

Table 5-3: Composition of the Base-Cases, by category of materials

Base-Case	Weight	1 Bulk Plastics	2 Tech. Plastics	3 Ferro	4 Non-ferro	5 Coating	6 Electronics	7 Misc.	Total
Base-Case 1: Domestic electric hob	in g	121	106	5147	616	0	489	3230	9709
	in %	1%	1%	53%	7%	0%	5%	33%	100%
Base-Case 2: Domestic gas hob	in g	107	150,5	5467	2030,5	0	0	39	7794
	in %	1.5%	2%	70%	26%	0%	0%	0.5%	100%

As all domestic base-cases have a high proportion of ferrous materials in their BOM, environmental impacts of the production and manufacturing phases are expected to be mainly due to this category of materials. BC1 has also a significant proportion of materials under the category 7-Misc, mainly glassy materials. However, EcoReport provides only a few glassy materials (18-E-glass fiber and 54-Glass for lamps). Thus, the approximations which had to be made to fill the BOMs could bias the environmental analysis (as previously announced in the section on material equivalents).

Regarding the sheetmetal scrap percentage generated during the manufacturing phase, a rate of 5% has been assumed for all Base-Cases.

5.1.2.2. INPUTS IN THE DISTRIBUTION PHASE

Input data related to the distribution phase of the product to be used in the MEEuP EcoReport calculations are based on the volume of the packaged product. These volumes are exposed in Table 5-4 below.

Table 5-4: Volume of packaged product for base-cases

Base-Case	Volume of packaged product (in m^3)
BC1: Domestic electric hob	0.061
BC2: Domestic gas hob	0.057

Both BCs have similar package volumes.

Two other pieces of information are required in this section. These parameters will be common for all base-cases:

- Is it an ICT or Consumer Electronics product <15 kg: **No**
- Is it an installed appliance: **No**

5.1.2.3. INPUTS IN THE USE PHASE

- **Energy consumption**

The energy consumption during the use phase is expected to be a major contributor to the environmental impacts of a hob. The annual energy consumption is required as an input in EcoReport, as well as the product lifetime which was evaluated in the market analysis (see Task 2). These inputs will also be used to calculate the Life Cycle Costs (LCC) of the base-cases.

Table 5-5: Energy consumption for each base-case

Base-Cases	Consumption per cycle (kWh)	Number of cycle per year
BC1: Domestic electric hob	0.7	424
BC2: Domestic gas hob	0.9	424

The energy consumption per cycle and the number of cycle per year were assessed in Task 3.

The calculation of the impacts of gas consumption in EcoReport was intended to be applied to building heating systems. Consequently, an "Avg. Heat Power Output" is required. To input the gas consumption in the tool, "69-Gas, atmospheric" was selected as fuel, with an efficiency of 86.0%. The "heat output" parameter was calculated to have an energy input of 0.9kWh with an efficiency of 86.0%, which is 0.774kWh.

Number of kilometres over the product life

For all domestic Base-Cases, the number of kilometres travelled for maintenance and repair for one hob was estimated is given in Table 5-6.

Table 5-6: Number of kilometre over the product life

Base-Case	Number of kilometres over the product life
BC1: Domestic electric hob	15
BC2: Domestic gas hob	15

As no stakeholder was able to provide this information, the number of kilometres estimated in previous preparatory studies concerning household appliances[2] was reused.

5.1.2.4. INPUTS IN THE END-OF-LIFE PHASE

For the Base-Case 1, end-of-life inputs have been provided by a manufacturer of electric hob who stated that 54**%** of the product weight is not recovered (go to landfill). This significant share would correspond to the glassy materials that are currently not-well standardised for recycling.

For the Base-Case 2, the approach is different. Similarly to ovens, it is assumed that most all materials in the gas hob (98%) are recovered and follow one of the following options:

- metals are 100% recycled;
- paper, cardboard, and plastics are 100% incinerated or thermally recycled (benefits of energy recovery);
- Hazardous waste consists only of electronic components, which are considered easy to disassemble and are in limited quantity.

Regarding the plastic fraction, the following end-of-life management options were estimated for all domestic base-cases, based on stakeholders' feedback:

- Re-use, closed loop recycling: 15 %
- Material recycling: 83 %
- Thermal recycling: 2 %.

5.1.2.5. ECONOMIC INPUTS

Economic data used for the calculations of the Life Cycle Costs (LCC) were elaborated in Task 2 (product lifetime and product prices, energy rates, etc).

[2] See Preparatory Study for Eco-design Requirements of EuPs – Lot 13: Domestic refrigerators & Freezers: www.ecocold-domestic.org/index.php?option=com_docman&task=doc_download&gid=122&Itemid=40

Table 5-7 presents the lifetimes, sales and stock figures (which are used to assess environmental and economic impacts at EU level) and product prices for both Base-Cases. It is considered that consumers are not charged with any disposal costs.

Table 5-7: EcoReport economic inputs of the base-cases

Base-Case	Product Lifetime (in years)	Sales in 2007 (units)	Stock in 2007 (units)	Product price (in €)	Maintenance costs (in €)
BC1: Domestic electric hob	19	5,200,000	88,800,000	450*	0
BC2: Domestic gas hob	19	3,300,000	62,700,000	268	0

*calculated as a weighted average price including radiant, solid plate and induction systems.

In addition, Table 5-8 presents the energy rates used for each base-case.

Table 5-8: Energy, water and consumables rates, by base-case

Base-Case	Electricity rate (€/kWh)	Natural gas rate (€/MJ)
BC1: Domestic electric hob	0.1658	
BC2: Domestic gas hob		0.01621

Furthermore, the discount rate (4%) was provided by the EC and is the same for all Base-Cases. The overall improvement ratios (market over stock) were assumed to be 1. For each base-case, this improvement ratio indicates the difference of global efficiency during the use phase between the new sales and the current stock.

5.1.3. COMMERCIAL APPLIANCES (TBD)

5.1.3.1. INPUTS IN THE PRODUCTION PHASE

Table 5-9: Material found in appliances covered by Lot 22 not included in EcoReport[3]

Material	Comments	Most similar material available

Table 5-10: Composition of the base-cases, by category of materials

Base-Case	Weight	1 Bulk Plastics	2 Tech. Plastics	3 Ferro	4 Non-ferro	5 Coating	6 Electronics	7 Misc.	Total
Base-Case 3: Commercial …	in g								
	in %								

Regarding the sheetmetal scrap percentage generated during the production phase, a rate of 5% has been assumed.

5.1.3.2. INPUTS IN THE DISTRIBUTION PHASE

Input data related to the distribution phase of the product to be used in the MEEuP EcoReport calculations are based on the volume of the packaged product. These volumes are exposed in Table 5-11 below.

Table 5-11: Volume of packaged product for base-cases

Base-Case	Volume of packaged product (in m^3)
Base-Case 3: Commercial	

Two other pieces of information are required in this section. These parameters will be common for all base-cases:

- Is it an ICT or Consumer Electronics product <15 kg: **No**

[3] The correspondence between materials was mainly based on the hypothesis made for previous Ecodesign Preparatory studies.

- Is it an installed appliance: **No**

5.1.3.3. INPUTS IN THE USE PHASE

Energy consumption

The electricity consumption during the use phase is expected to be a major contributor to the environmental impacts of a hob. The annual energy consumption is required as an input in EcoReport, as well as the product lifetime which was evaluated in the market analysis (see Task 2). These inputs will also be used to calculate the Life Cycle Costs (LCC) of the base-cases.

Table 5-12: Energy consumption for each base-case

Base-Cases	Consumption per cycle (kWh)	Number of cycle per year
Base-Case 3: Commercial ...		

Number of kilometres over the product life

For all base-cases, the number of kilometres travelled for maintenance and repair for one hob was estimated is given in Table 5-13.

Table 5-13: Number of kilometre over the product life

Base-Case	Number of kilometres over the product life
Base-Case 3: Commercial ...	19

5.1.3.4. INPUTS IN THE END-OF-LIFE PHASE

5.1.3.5. ECONOMIC INPUTS

Table 5-14: EcoReport economic inputs of the base-cases

Base-Case	Product Lifetime (in years)	Sales (units)	Stock (units)	Product price (in €)	Maintenance costs (in €)
Base-Case 3: Commercial ...	19				

Table 5-15: Energy, water and consumables rates, by base-case

Base-Case	Electricity rate (€/kWh)	Natural gas rate (€/MJ)
Base-Case 3: Commercial …	0.1554	0.01481

Furthermore, the discount rate (4%) was provided by the EC and is the same for all base-cases. The overall improvement ratios (market over stock) were assumed to be 1. For each base-case, this improvement ratio indicates the difference of global efficiency during the use phase between the new sales and the current stock.

5.2. BASE-CASE ENVIRONMENTAL IMPACT ASSESSMENT

The aim of this subtask is to assess the environmental impacts of each Base-Case following the MEEuP (EcoReport Unit Indicators) for each life cycle stage:

- Raw Materials Use and Manufacturing (Production phase);
- Distribution;
- Use;
- End-of-Life.

The base-case environmental impact assessment will lead to an identification of basic technological design parameters being of outstanding environmental relevancy[4]. These parameters will be listed as they will serve as an important input to the identification of eco-design options.

The assessment results are tracked back to the main contributing components, materials and features of the hobs.

5.2.1. Domestic appliances

5.2.1.1. Base-Case 1: Domestic Electric hob

Table 5-16 shows the environmental impacts of a domestic electric hob over its whole life cycle. The total energy consumption for the whole life cycle of the Base-Case 1 is 60.6 GJ, of which 59.6 GJ (i.e. 16.6 MWh) comes from the electricity consumption.

[4] As far as the MEEuP EcoReport allows the identification of such indicators

Table 5-16: Life Cycle Impact (per unit) of Base-Case 1

	Life Cycle phases -->		PRODUCTION			DISTRI-	USE	END-OF-LIFE*			TOTAL
	Resources Use and Emissions		Material	Manuf.	**Total**	**BUTION**		Disposal	Recycl.	**Total**	
	Other Resources & Waste							debet	credit		
8	Total Energy (GER)	MJ	761	85	**847**	**134**	**59256**	362	12	**350**	**60587**
9	of which, electricity (in primary MJ)	MJ	356	51	**407**	**0**	**59216**	0	1	**-1**	**59622**
10	Water (process)	ltr	436	1	**437**	**0**	**3952**	0	1	**-1**	**4388**
11	Water (cooling)	ltr	108	23	**132**	**0**	**157899**	0	4	**-4**	**158026**
12	Waste, non-haz./ landfill	g	16712	302	**17014**	**91**	**68823**	6428	3	**6425**	**92353**
13	Waste, hazardous/ incinerated	g	324	0	**324**	**2**	**1368**	39	0	**38**	**1732**
	Emissions (Air)										
14	Greenhouse Gases in GWP100	kg CO2 eq.	54	5	**58**	**9**	**2587**	27	0	**27**	**2682**
15	Ozone Depletion, emissions	mg R-11 eq.	negligible								
16	Acidification, emissions	g SO2 eq.	489	21	**509**	**27**	**15255**	53	1	**52**	**15843**
17	Volatile Organic Compounds (VOC)	g	4	0	**4**	**1**	**23**	2	0	**2**	**30**
18	Persistent Organic Pollutants (POP)	ng i-Teq	97	3	**100**	**1**	**389**	44	0	**44**	**534**
19	Heavy Metals	mg Ni eq.	353	6	**359**	**5**	**1027**	106	0	**106**	**1497**
	PAHs	mg Ni eq.	55	0	**55**	**5**	**125**	0	0	**0**	**185**
20	Particulate Matter (PM, dust)	g	40	3	**43**	**209**	**458**	475	0	**475**	**1186**
	Emissions (Water)										
21	Heavy Metals	mg Hg/20	384	0	**384**	**0**	**386**	30	0	**30**	**800**
22	Eutrophication	g PO4	8	0	8	0	2	2	0	2	12
23	Persistent Organic Pollutants (POP)	ng i-Teq	negligible								

Figure 5-1 exposes the contribution of each life cycle phase to each environmental impact. Several observations can be made from this analysis:

- **Material acquisition** is predominant in the total environmental impact for the following categories :
  - Heavy metals emissions to water: 48% (mainly due to the stainless steel used for the heating elements and the electronic controls)
  - Eutrophication: 68% (mainly due to the stainless steel used for the heating elements and the electronic controls)

  and contributes for the categories:
  - Heavy metals emissions to the air: 24% (mainly due to the stainless steel used for the heating elements)
  - PAHs : 29% (mainly due to the aluminium used in the casing and the electronic controls)
- **Manufacturing** is not significantly impacting any of the categories
- **Distribution** is significantly contributing to the emissions of Particulate matter to the air, with 17%

- **The use phase** impacts are dominating the total environmental in the case of :
    - Total Energy (GER): 97.8%
    - Electricity: 99.3%
    - Water (process): 90.1%
    - Waste, non-hazardous / landfill : 74.5%
    - Waste, hazardous / incinerated: 79%
    - Greenhouse gases: 96.3%
    - Acidification (emissions to air): 96.3%
    - Volatile Organic Compounds (VOC): 77.3%
    - Persistent Organic Pollutants (POP): 72.9%
    - Heavy metals emissions to the air: 68.6%
    - PAHs (emissions to the air): 67.4%

  and contributes in the case of:
    - Particulate Matter: 38.7%
    - Heavy metals emissions to water: 48.2%

- **End-of-life** is having a significant impact on Particulate Matter : 40% (due to the high share of the product going to landfill)

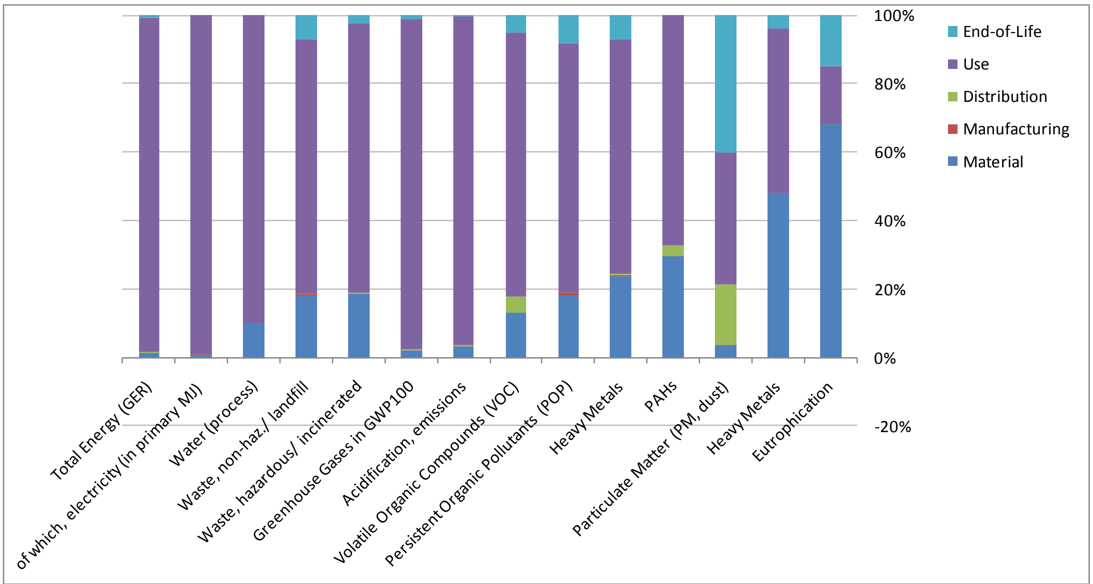


Figure 5-1: Distribution of environmental impacts of BC 1 per life cycle phase

5.2.1.2. BASE-CASE 2: DOMESTIC GAS HOB

Table 5-17 shows the environmental impacts of a domestic gas hob over its whole life cycle. The total energy consumption for the whole life cycle of the Base-Case 2 is 28.4 GJ, of which 73 MJ (i.e. 20.3 kWh) comes from the electricity consumption.

Table 5-17: Life Cycle Impact (per unit) of Base-Case 2

	Life Cycle phases -->		PRODUCTION			DISTRI-	USE	END-OF-LIFE*			TOTAL
	Resources Use and Emissions		Material	Manuf.	Total	BUTION		Disposal	Recycl.	Total	
	Other Resources & Waste							debet	credit		
8	Total Energy (GER)	MJ	346	86	**431**	**129**	**27837**	13	13	**0**	**28397**
9	of which, electricity (in primary MJ)	MJ	22	51	**73**	**0**	**1**	0	1	**-1**	**73**
10	Water (process)	ltr	76	1	**77**	**0**	**1**	0	1	**-1**	**77**
11	Water (cooling)	ltr	36	24	**60**	**0**	**1**	0	5	**-5**	**55**
12	Waste, non-haz./ landfill	g	19882	299	**20180**	**89**	**202**	192	4	**188**	**20659**
13	Waste, hazardous/ incinerated	g	4	0	**4**	**2**	**0**	5	1	**5**	**10**
	Emissions (Air)										
14	Greenhouse Gases in GWP100	kg CO2 eq.	25	5	**30**	**9**	**1540**	1	0	**1**	**1579**
15	Ozone Depletion, emissions	mg R-11 eq.	negligible								
16	Acidification, emissions	g SO2 eq.	190	21	**210**	**26**	**452**	2	1	**1**	**690**
17	Volatile Organic Compounds (VOC)	g	1	0	**1**	**1**	**21**	0	0	**0**	**23**
18	Persistent Organic Pollutants (POP)	ng i-Teq	194	2	**197**	**1**	**2**	1	0	**1**	**200**
19	Heavy Metals	mg Ni eq.	134	5	**139**	**5**	**9**	4	0	**4**	**156**
	PAHs	mg Ni eq.	23	0	**23**	**5**	**9**	0	0	**0**	**36**
20	Particulate Matter (PM, dust)	g	22	3	**25**	**195**	**140**	22	0	**22**	**383**
	Emissions (Water)										
21	Heavy Metals	mg Hg/20	45	0	**45**	**0**	**0**	1	0	**1**	**47**
22	Eutrophication	g PO4	1	0	**1**	**0**	**0**	0	0	**0**	**1**
23	Persistent Organic Pollutants (POP)	ng i-Teq	negligible								

Figure 5-2 exposes the contribution of each life cycle phase to each impact. Several observations can be made from this analysis:

- **Material acquisition** is predominant in the total environmental impact for the following categories :
  - Water (process) : 98.7% (mainly due to the ferrite used in the burners and the pan support)
  - Waste, non-hazardous /landfill: 96.2% (mainly due to the steel used for the casing to the ferrite used in the burners)
  - Persistent Organic Pollutants (POP): 97% (mainly due to the steel used for the casing and to the ferrite used in the burners and pan support)
  - Heavy metals emissions to the air: 85.5% (mainly due to the ferrite used in the burners and pan support)
  - PAHs (emissions to the air): 62.0% (mainly due to the aluminium used for the burners)
  - Heavy metals emissions to water: 96.8% (mainly due to the steel used for the casing and to the cupper used in the thermocouple)
  - Eutrophication: 90.8% (due to most metals and tec. plastics)

  and contributes for the categories:

- o Electricity consumption: 29.8% (mainly due to the steel used for the casing)
- o Waste, hazardous / incinerated: 35.9% (mainly due to PA-6)
- o Acidification, emissions: 27.5% (due to most metals)

- **Manufacturing** is the phase where 70% of the electricity is consumed, but the overall energy consumption of the manufacturing phase can be neglected compared to the total energy consumption.

- **Distribution** is significantly contributing to the categories:
  - o Particulate Matter (PM, dust): 51%
  - o Waste, hazardous / incinerated: 20%

  and to lower extend to :
  - o PAHs: 14%

- **The use phase** impacts are dominating the total environmental impacts in the case of :
  - o Total Energy (GER): 98%
  - o Greenhouse gases: 97.5%
  - o Acidification, emissions: 65.5%
  - o Volatile Organic Compounds (VOC): 90.2%

- **End-of-life is contributing to the category:**
  - o Waste, hazardous / incinerated: 50% (this was not the case for BC1 as the majority of this impact came from the electricity consumption during the use phase. For gas hobs, the use phase is less significant. Therefore, in relative terms, the share of the end-of-life phase is greater even if in quantitative terms the impact from this stage is weaker than in BC1)

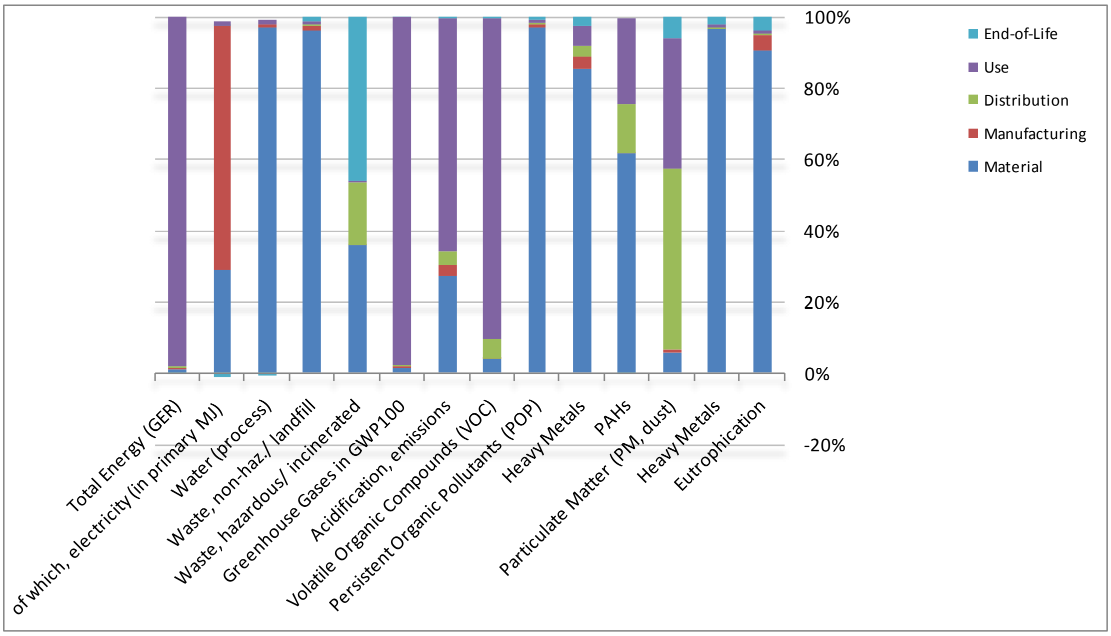


Figure 5-2: Distribution of environmental impacts of BC 2 per life cycle phase

5.2.1.3. CONCLUSIONS

The contribution of each life cycle phase to the indicators is widely varying depending on the Base-Case. However, some trends common to both domestic base-cases can be highlighted. The use phase is by far, and as expected, the main contributor to the energy consumption and greenhouse gases emissions. Non-hazardous waste is mainly produced during the material acquisition phase, which is also the most impacting phase regarding persistent organic pollutants emissions to the air and eutrophication. Particulate matter is significantly emitted during the distribution phase, and the end-of-life is not dominating any category.

It is interesting to highlight that the energy consumption per unit in BC2 is significantly lower (-55%) than in BC1. More generally, life cycle quantitative impacts in BC1 can be up to a factor 10 higher than in BC2. It has direct consequences on the overall distribution of the life cycle phases' contribution to the different indicators, as the use phase in BC 2 is not as dominant as it is in BC1.

5.2.2. COMMERCIAL APPLIANCES (TBD)

5.2.2.1. BASE-CASE 3: COMMERCIAL ..

5.2.2.2. CONCLUSIONS

5.3. BASE-CASE LIFE CYCLE COSTS

The result of the procurement process should be the cheapest hobs, having the lowest total cost of ownership, i.e. taking into account the whole life cycle of the product.

5.3.1. DOMESTIC APPLIANCES

The Life Cycle Cost (LCC) of the domestic base-cases is presented in Table 5-18. This was automatically calculated by EcoReport using the product price, the energy consumption and the price of energy, and the discount rate.

Table 5-18: EcoReport outcomes of the LCC calculations of the base-cases

Environmental Impact	Base-Case 1	Base-Case 2
Product price (€)	450	268
Energy cost (€)	646	292
Life Cycle Cost (€)	1096	560

5.3.2. COMMERCIAL APPLIANCES (TBD)

Table 5-19: EcoReport outcomes of the LCC calculations of the base-cases

Environmental Impact	Base-Case 3	
Product price (€)		
Electricity cost (€)		
Life Cycle Cost (€)		

5.4. EU TOTALS

This section provides the environmental assessment of the base-cases at the EU-27 level using stock and market data from Task 2.

5.4.1. DOMESTIC APPLIANCES

5.4.1.1. MARKET DATA

Table 5-20 displays the market data of the two domestic base-cases in EU-27 in 2007.

Table 5-20: Market and technical data for all base-cases in 2007

Base-Case	Lifetime (years)	EU stock (units)	Annual sales (units/year)
BC1: Domestic electric hob	19	88,800,000	5,200,000
BC2: Domestic gas hob	19	62,700,000	3,300,000

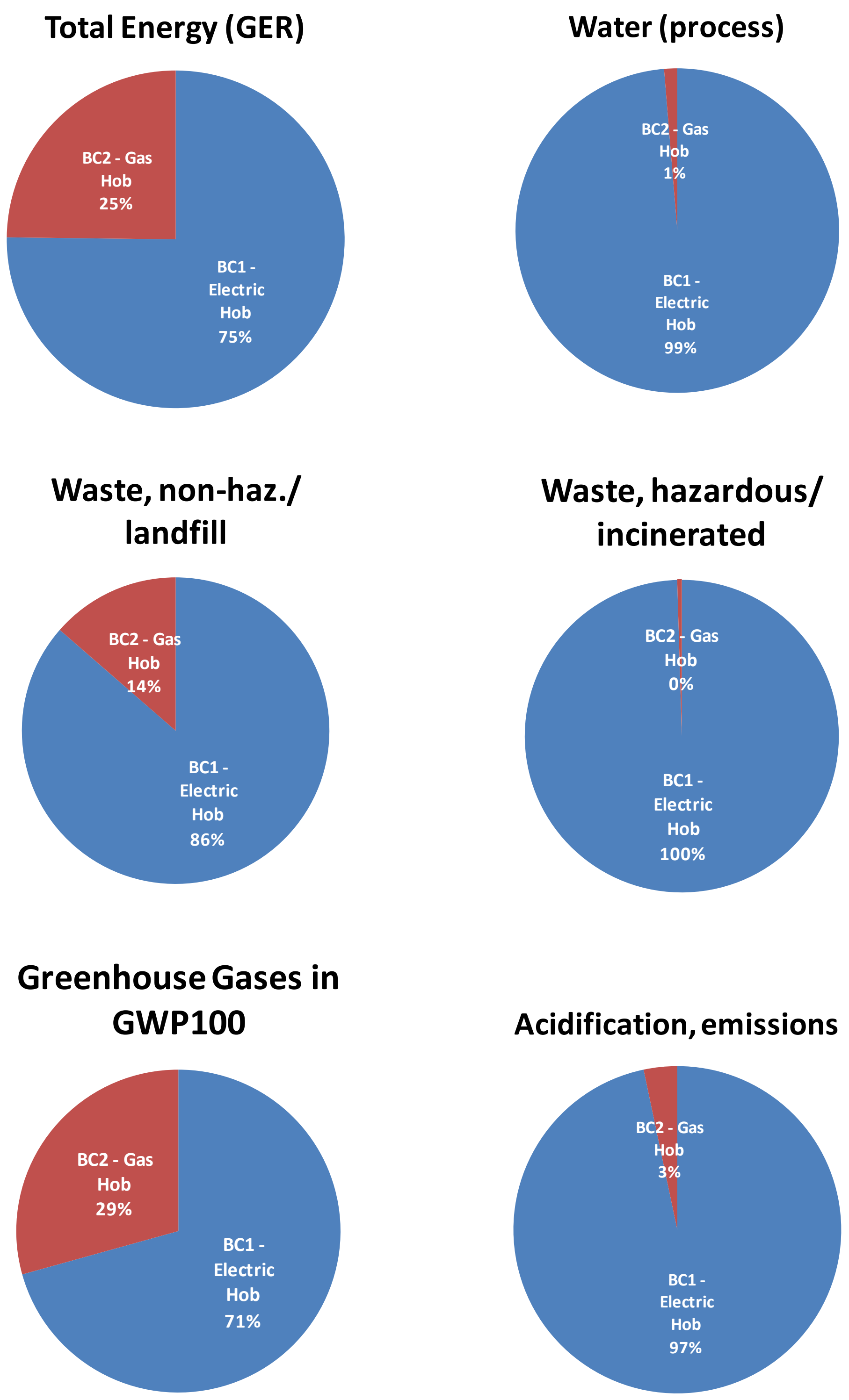
5.4.1.2. LIFE CYCLE ENVIRONMENTAL IMPACTS

Table 5-21 shows the total environmental impacts of all products in operation in EU-27 in 2007, based on the extrapolation of the base-cases impacts (all hobs have the same impacts as the base-case of their category). These figures come from the EcoReport tool by multiplying the individual environmental impacts of a base-case with the stock of this base-case in 2007.

Table 5-21: Environmental impacts of the EU-27 stock in 2007 for all base-cases

Environmental Impact	Base-Case 1	Base-Case 2	Total Domestic
Total Energy (GER) (in PJ)	**283**	**94**	**377**
of which electricity (in TWh)	**279**	**0**	**279**
Water process (in million m^3)	**21**	**0**	**21**
Waste,non-hazardous/landfill (in kt)	**432**	**68**	**500**
Waste, hazardous/ incinerated *(in kt)*	**8**	**0**	**8**
Emissions to air			
Greenhouse Gases in GWP100 (in Mt CO_2 eq.)	**13**	**5**	**18**
Acidification, emissions (in kt SO_2 eq.)	**74**	**2**	**76**
Volatile Organic Compounds (VOC) (in kt)	**0.1**	**0.1**	**0.2**
Persistent Organic Pollutants (POP) (in g i-Teq.)	**2.5**	**0.7**	**3.2**
Heavy Metals emissions to the air (in ton Ni eq.)	**7.0**	**0.5**	**7.5**
PAHs (in ton Ni eq.)	**0.9**	**0.1**	**1.0**
Particulate Matter (PM, dust) (in kt)	**5.5**	**1.3**	**6.8**
Emissions to water			
Heavy Metals emissions to water (in ton Hg/20)	**3.7**	**0.2**	**3.9**
Eutrophication (in kt PO_4)	**0**	**0**	**0**

Summary of environmental impacts of base-cases as a percentage of total impact are presented in Figure 5-3


Total Energy (GER)
BC2 - Gas Hob 25%
BC1 - Electric Hob 75%
Water (process)
BC2 - Gas Hob 1%
BC1 - Electric Hob 99%
Waste, non-haz./ landfill
BC2 - Gas Hob 14%
BC1 - Electric Hob 86%
Waste, hazardous/ incinerated
BC2 - Gas Hob 0%
BC1 - Electric Hob 100%
Greenhouse Gases in GWP100
BC2 - Gas Hob 29%
BC1 - Electric Hob 71%
Acidification, emissions
BC2 - Gas Hob 3%
BC1 - Electric Hob 97%

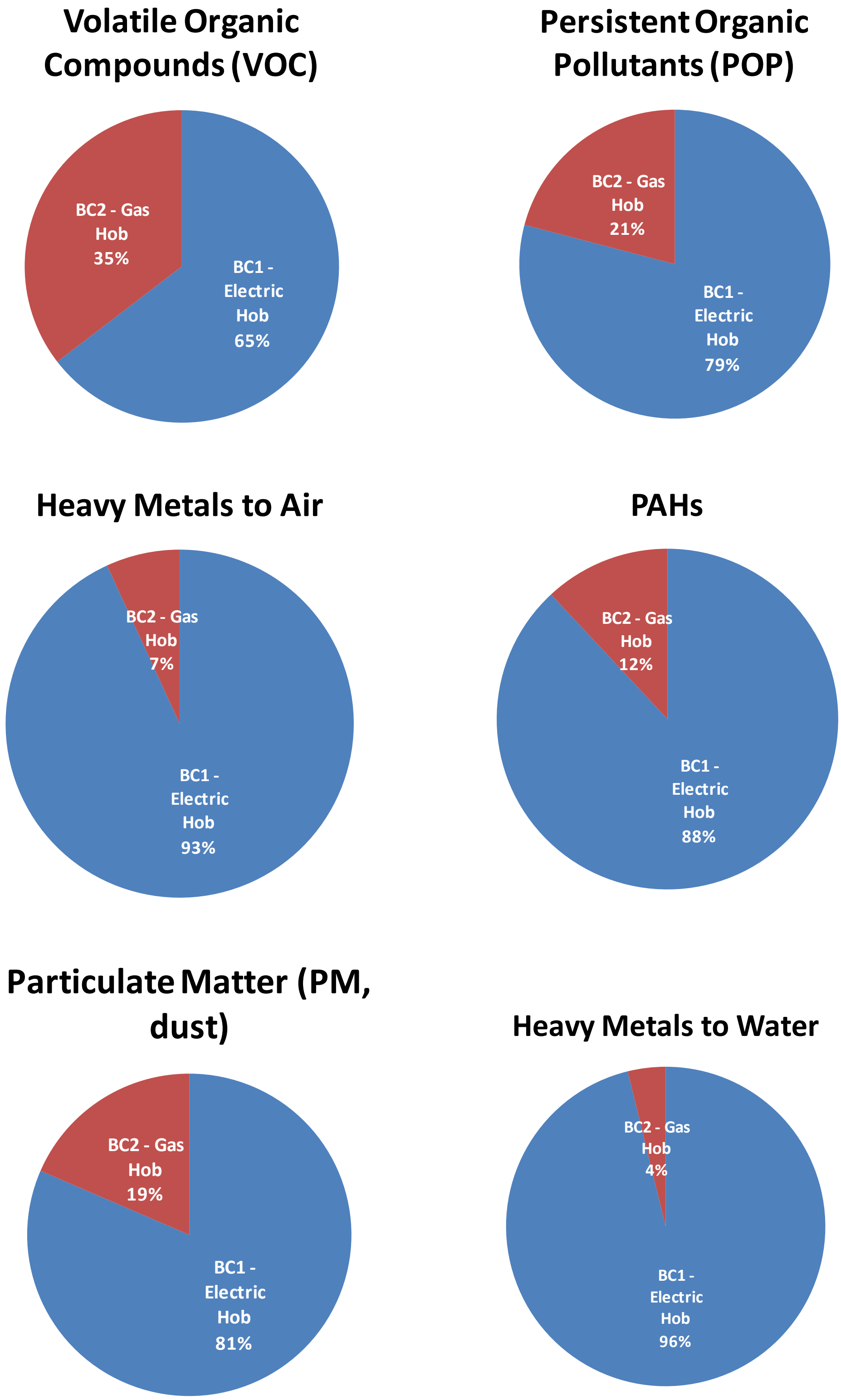


Figure 5-3: Base-cases' share of the environmental impacts of the 2007 domestic stock

Domestic electric hobs clearly contribute to the biggest share in all indicators calculated by EcoReport. This cannot be only explained by a more important stock. Differences in the energy requirements and the landfill waste production are 2 other significant reasons.

5.4.1.3. Life Cycle Costs

Regarding the total consumer expenditure in 2007 related to domestic hobs, around 50-60% of the total costs is due to energy consumption. The distribution per base-case is given in Figure 5-4 and details on consumer expenditure are presented in Table 5-22.

Table 5-22: Total Annual Consumer expenditure in EU-27 in 2007

Environmental Impact	Base-Case 1	Base-Case 2	Total domestic
EU-27 sales (in mln units)	5.2	3.3	**7.0**
Share of the EU-27 sales	*61%*	*39%*	***100%***
Product Price (in mln €)	2352	883	**3235**
Energy (in mln €)	3377	919	**4296**
Total (in mln €)	**5729**	**1815**	**7544**
Share of the total expenses	*76 %*	*24%*	***100%***

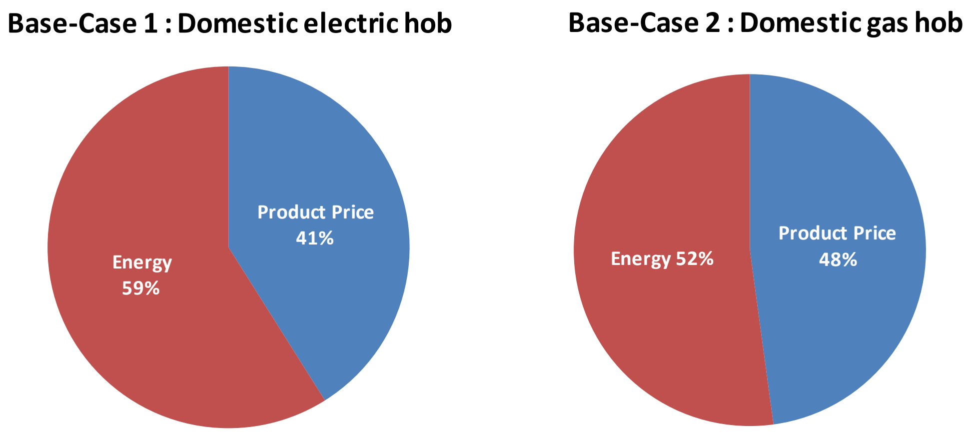


Figure 5-4: Base-cases' share of the life-cycle cost

5.4.2. COMMERCIAL APPLIANCES (TBD)

5.4.2.1. MARKET DATA

Table 5-23 displays the market data of the commercial base-cases in EU-27 in 200X.

Table 5-23: Market and technical data for all base-cases in 200X

Base-Case	Lifetime (years)	EU stock (units)	Annual sales (units/year)
BC3: Commercial			

5.4.2.2. LIFE CYCLE ENVIRONMENTAL IMPACTS

Table 5-24 shows the total environmental impacts of all products in operation in EU-27 in 2008, based on the extrapolation of the base-cases impacts (all hobs have the same impacts as the base-case of their category). These figures come from the EcoReport tool by multiplying the individual environmental impacts of a base-case with the stock of this base-case in 2008.

Table 5-24: Environmental impacts of the EU-27 stock in 2008 for all base-cases

Summary of environmental impacts of base-cases as a percentage of total impact are presented in Figure.

5.4.2.3. LIFE CYCLE COSTS

Regarding the total consumer expenditure in 2008 related to the base-cases, about XX% of the total costs is due to electricity consumption, XX% to water consumption and XX% to detergent and rinse aid consumption. The distribution per base-case is given in Figure and details on consumer expenditure are presented in Table 5-25.

Table 5-25: Total Annual Consumer expenditure in EU-27 in 2008

Environmental Impact	Base-Case 3		Total commercial
EU-27 sales (in units)			
Share of the EU-27 sales			*100%*
Product Price (in mln €)			
Energy (in mln €)			
Total (in mln €)			

Environmental Impact	Base-Case 3		Total commercial
Share of the total expenses			***100%***

5.5. EU-27 TOTAL SYSTEM IMPACT

When operating, hobs produce heat which is partially transferred to the room where it is located. The environmental impacts of this heat transfer can be positive as well as negative, depending on several parameters:

- The climate: if the room needs to be heated, the hob will complement the heating system. On the contrary, if the room needs to be cooled, using a hob will require additional cooling.
- The energy source of the hob and of the heating system: electricity needs to be produced from a primary energy, generally with low efficiency. If both appliances are using the same energy source, there will be no noticeable difference in the energy efficiency. However, if they use different energy efficiency, the global efficiency of heating will be modified.

Due to huge differences between Member States and appliances, no global heat transfer can be estimated at EU level with reliability.

5.6. CONCLUSIONS

The environmental impact assessments carried out with the EcoReport tool shows that there are some common observations to both domestic Base-Cases: the use phase is by far the most impacting stage of the life cycle in terms of energy consumption and greenhouse gases emissions. The production phase has a significant contribution to the following impacts: generation of non-hazardous waste, heavy metals emissions to air and water and eutrophication. Finally, the end-of-life phase is not dominating any category.

However, electricity generation is contributing to an important part of the global environmental impacts of the electric appliances, and so the impacts of the gas hob are different: the use phase in gas hob is not as a dominant contributor as it is with electric hob and the quantitative impacts are also significantly lower.

The analysis of the improvement potential in Task 7 will focus on technologies that reduce the energy consumption, and also on alternative material reducing environmental impacts.

Task 6 will examine the improvement options of hobs considered as best available technologies, in an attempt to improve upon the base-cases.