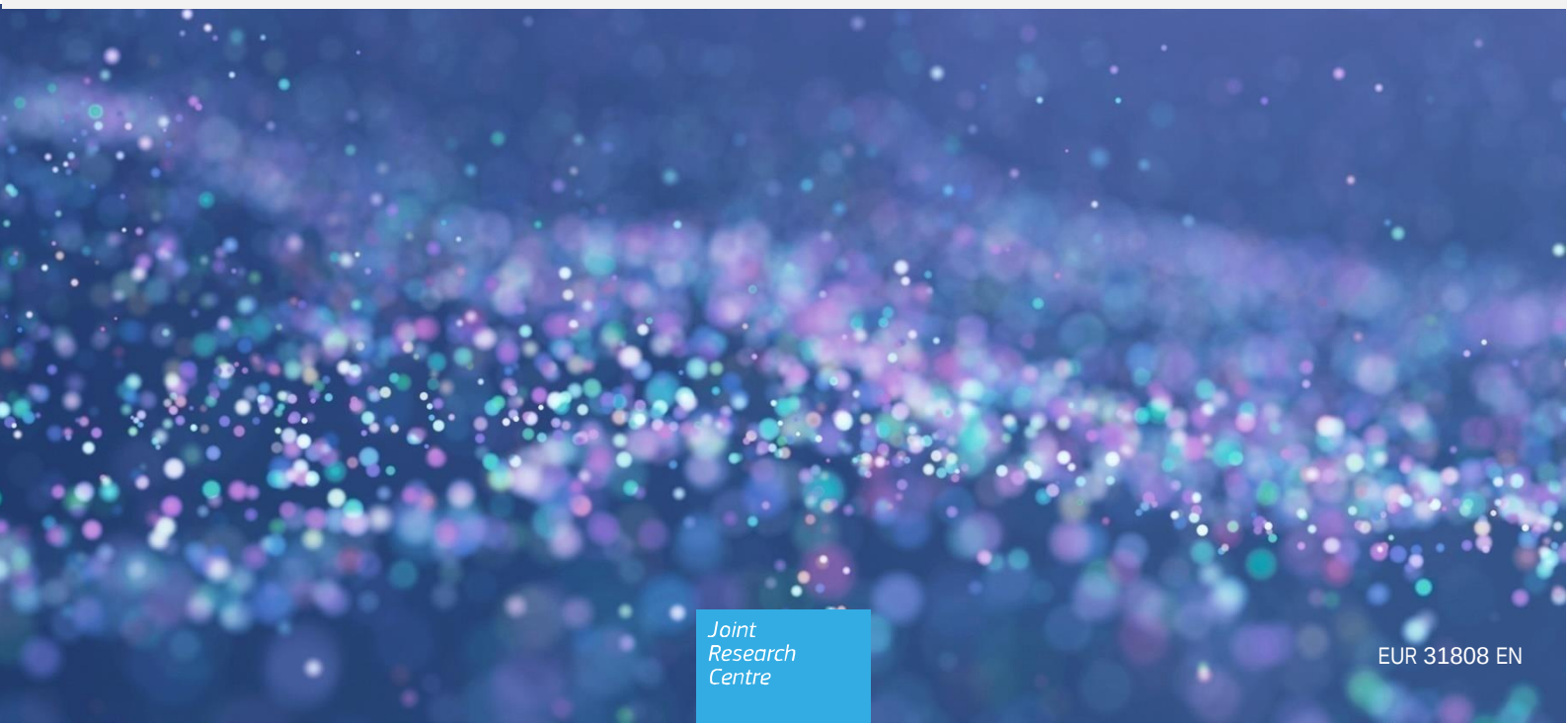
ISSN 1831-9424

Ecoreport tool - Manual

MEErp methodology - updates: Subtask 1.c: "preparation of instructions for ecodesign preparatory studies"; Subtask 1.i "procedure for future updates"

Eynard, U., Ardente, F., Gama Caldas, M., Spiliotopoulos, C., Mathieux, F.

2024



Joint
Research
Centre

EUR 31808 EN

Contact information
Name: Fulvio Ardente
Address: Via Enrico Fermi, 2749, 21027 Ispra (VA), Italy
Email: Fulvio.ARDENTE@ec.europa.eu
Tel.: +39 033278-6300

EU Science Hub
https://joint-research-centre.ec.europa.eu

JRC133597

EUR 31808 EN

PDF ISBN 978-92-68-11506-0 ISSN 1831-9424 doi:10.2760/473257 KJ-NA-31-808-EN-N

Luxembourg: Publications Office of the European Union, 2024

How to cite this report: European Commission, Joint Research Centre, Eynard, U., Ardente, F., Gama Caldas, M., Spiliotopoulos, C. and Mathieux, F., Ecoreport tool - Manual, Publications Office of the European Union, Luxembourg, 2024, https://data.europa.eu/doi/10.2760/473257, JRC133597.

Contents

Abstract

The Methodology for Ecodesign of Energy-related Products (MEErP henceforth) consists of a techno-economic-environmental assessment of a specific product group. This assessment is the main analytical step in the potential implementation of the Ecodesign Directive for a specific product group.
Since 2013 the current MEErP methodology has been in use and considered fit for purpose. However, since time has already elapsed in this very dynamic field, the need for an update is apparent.
The update of the MEErP put forth by the JRC at the request of DG GROW covers the following areas:

1) the updating of the EcoReport Tool;
2) a more systematic inclusion of material efficiency aspects and of environmental footprint/ecological profile aspects in the design options and in the LLCC curve;
3) a more systematic inclusion of societal life cycle costs;
4) a more refined evaluation of the economic impacts in task 7 of the MEErP.

The present manual:
- describes each worksheet of the revised Ecoreport tool, in the order as they appear to the users. The user can find, at the beginning of each section of this report, the references of cells, rows and columns in the excel file to help moving within the tool and describe its functionalities
- explains how/which sections of the MEErP have been updated or replaced by this revision (the present document and the review of MEErP report 2024), starting from the version of the MEErP used at the time of drafting this document for preparatory and review studies.

Acknowledgements

This report has been developed in the context of the Administrative Arrangement "Review of the MEErP - Methodology for Ecodesign of Energy-related Products" between DG GROW and DG Joint Research Centre. The project responsible for DG GROW was: Davide Polverini.

Authors

Eynard, Umberto (JRC D3); Ardente, Fulvio (JRC D3); Gama Caldas, Miguel (JRC B5); Spiliotopoulos, Christoforos (JRC B5); Mathieux, Fabrice (JRC D3)

Executive summary

Ecodesign and Energy Labelling legislation are key contributors in supporting the Commission's overarching priority to strengthen Europe's competitiveness and boost job creation and economic growth. Their effect can be felt in the Energy Union objectives, the transition to a Circular Economy, the internal market functioning and the environment. They also drive investment and innovation and save money for consumers.

The Methodology for Ecodesign of Energy-related Products (MEErP henceforth) consists of a techno-economic-environmental assessment of a specific product group. This assessment is the main analytical step in the potential implementation of the Ecodesign Directive on a specific product group.

Concerning the identification and the level of stringency of the (potential) Ecodesign requirements for a certain product group, the most important part of the analysis takes place within the techno-economic assessment, at the point when the life cycle cost curve is determined, and the Least Life Cycle Cost (LLCC henceforth) is defined. On the basis of the LLCC and related product environmental impact, Ecodesign requirements for a certain product can be set, aiming to gradually – and sustainably - push the market towards the LLCC. Once the requirements are defined, it is left to individual manufacturers to choose how, and with which technologies, to produce a compliant product (in line with the principle of technological neutrality). The LLCC is unique to each product category, and it provides the optimum level from a regulatory perspective because it minimises the total cost of ownership for the consumer and it pushes all manufacturers, at the same time, to make improvements to their products with existing technologies.

The MEErP is open, iterative, transparent, and utilises a tool (the EcoReport tool[1]) that is free at the point of use, and is simple to use whilst being sufficiently complex/ complete in order to capture the main inputs and outputs at product specific level. The EcoReport is a streamlined life-cycle based tool that is openly available, with no presumption or requirement of prior purchase of a commercially-available Life Cycle Assessment package.
In 2013, the MEErP was evaluated and considered fit for purpose in the decision-making process of the Ecodesign and Energy Labelling legislative framework. A new update is now needed, in particular a) to update, when and where necessary, some of the data used in the analysis and b) to ensure that the MEErP is still fit for its purpose, in line with the policy developments of the last years. Within this framework, several areas of analysis (together with, in some cases, potential solutions/approaches) have been identified in the course of the last years, namely:

- Need for the update of the environmental impact data contained in the EcoReport tool, as well as an evaluation of the relevance of the various input categories/indicators with regard to material efficiency.
- Relevance for a more systematic inclusion of material efficiency aspects in the modelling of the MEErP. These aspects have been assessed in recent eco-design and energy labelling preparatory studies, although without having as reference a harmonised and systematic methodology. This could be attained, in particular, by systematically including two separate but equally important aspects in the construction of the LLCC curve:
    - Systematic inclusion (when relevant for the specific product group under analysis) of design options related to material efficiency aspects (such as a) increased reparability, b) increased durability, c) increased recyclability or d) aimed at promoting the reuse of secondary raw materials and/or components).
    - Systematic inclusion of lifetime in the MEErP modelling of the LLCC. In order to properly analyse and model circular economy requirements, product lifetime must be taken into account. In practical terms, following this approach would imply that an 'equivalent annual cost' (for a design option) should be calculated. With the use of the 'equivalent annual cost' it is possible to properly compare design options with different (expected) lifetimes, such as, for example, the base case (i.e. the average EU product), compared to a second product with increased durability (e.g. thanks to the higher quality of its components) and a third product with higher lifetime than the base case as a result of its improved design for reparability (see the previous point).

[1] Available at: https://single-market-economy.ec.europa.eu/industry/sustainability/sustainable-product-policy-ecodesign_en

- Relevance of the development of the Product Environmental Footprint method (data and approach, e.g. for modelling impacts, normalising and weighting results) and related Product Environmental Footprint Category Rules to the MEErP and the EcoReport tool for assessing life cycle impacts both for developing the base case and the design options.
- Relevance for a more systematic inclusion of design options:
    - aimed at reducing the carbon and environmental footprint of the product.
    - (potentially linked to the previous point) compliant with generic ecodesign requirements based on the ecological profile of the product.
- Relevance of a more systematic inclusion of societal life cycle costs (direct environmental costs, externalities and other indirect costs) in the MEErP.
- Need for a more refined method for the evaluation of the economic impacts (e.g. impacts on employment).

The present manual:

- describes each worksheet of the revised Ecoreport tool, in the order as they appear to the users. The user can find, at the beginning of each section of this report, the references of cells, rows and columns in the excel file to help moving within the tool and describe its functionalities
- explains how/which sections of the MEErP have been updated or replaced by this revision (the present document and the review of MEErP report 2024), starting from the version of the MEErP4 used at the time of drafting this document for preparatory and review studies

Introduction

The Methodology for Ecodesign of Energy related Products (MEErP) consists of a techno-economic-environmental assessment of a specific product group, under analysis for potential Ecodesign requirements.
The MEErP includes a tool, named 'the EcoReport tool (Ecoreport tool)', which allows to perform environmental and economic assessments of products. The Ecoreport tool is simple to use whilst being sufficiently complex/complete in order to capture the main inputs and outputs at product specific level. The Ecoreport tool is a streamlined life-cycle based tool that is openly available, with no presumption or requirement of prior purchase of a commercially-available Life Cycle Assessment package.

The present manual:
- describes each worksheet of the revised Ecoreport tool, in the order as they appear to the users. The user can find, at the beginning of each section of this report, the references of cells, rows and columns in the excel file to help moving within the tool and describe its functionalities
- explains how/which sections of the MEErP have been updated or replaced by this revision (the present document and the review of MEErP report 2024), starting from the version of the MEErP used at the time of drafting this document for preparatory and review studies.

It is envisaged that preparatory studies and review studies launched in the framework of (potential) implementing measures under the Ecodesign Directive 2009/125, as of now will be carried out in line with the MEErP methodology, as outlined in this document. Studies launched during 2023 may be used as 'pilot test' for the revised methodology.

The 2021-2023 review of the MEErP[2], aimed to keep the same format of the Ecoreport tool[3] (excel file), its logic (with spreadsheets with input data, background data, intermediate calculations and results), and simplified approach, whereas aiming at enhancing transparency (especially for the background data and modelling options), consistency across the different sections of the tool and flexibility for future updates.
The two tables below show which sections of the methodology (MEErP 2011 part 1 (COWI and VHK 2011a) and part 2 (COWI and VHK 2011b)) have been updated or replaced by this revision (the present document and the review of MEErP report 2024).
The following colour codes help to identify:

- what is replaced by this revision (green)
- what remains unchanged (grey)

Table 1: Sections of the MEErP 2011 part1 which are updated/replaced by the current document (2024 revision of the MEErP)

MEErP 2011 part 1: methods. Content		MEErP revision 2024 content
1. Task 1: Scope	Scope	Unchanged
2. Task 2: Markets	2.1 Introduction	Unchanged
	2.2 Sales and Trade	
	2.3 Energy rates for private households	
	2.4 Energy rates for industry	
	2.5 Water rates	
	2.6 Interest and inflation rates	
	2.7 Tax rates	
	2.8 Acquisition costs	
	2.9 Summary EU averages	
3. Task 3: Users	3.1 Extended product and systems approach	Unchanged
	3.2 Extended ErP product scope	
	3.3 Method indirect ErP effect	
	3.4-3.7 Examples	

[2] Project "Review of the MEErP - Methodology for Ecodesign of Energy-related Products".
[3] Version 3.06 VHK for European Commission 2011, modified by IZM for European Commission 2014

4. Task 4: Technologies	4.1 Technical product description	Unchanged
	4.2 Other subtasks	
5. Task 5/6: Environment	5.1 Introduction	Replaced by chapter 1 of the review of the MEErP report: • 1.1 Impact categories • 1.2 End of Life modelling • 1.3 Datasets and further improvements
	5.2 LCI accounting rules	Replaced by chapter 1 of the review of the MEErP report
	5.3 LCIA, impact indicators	Replaced by chapter 1 of the review of the MEErP report[4]
	5.4 ErP Ecoreport Manual	Replaced by this document
6. Task 5/6: Economics	6.1.1 Life cycle costs	Replaced by chapter 2 of the review of the MEErP report
	6.1.2 Least Life Cycle Costs (ranking design options)	Unchanged
7. Task 7: Scenarios	7. Scenarios	Replaced by chapter 1 (task 1.f), 2 and 3 of the review of the MEErP report

Source: JRC elaboration

Table 2: Sections of the MEErP 2011 part2 which are updated/replaced by the current document (2024 revision of the MEErP)

MEErP 2011 part 2: Environmental policies & data. Content		MEErP revision 2024 content
2. Resources	2.1.1 Materials (steel)	Unchanged. Not covered by this review
	2.1.2 Materials (plastics)	Unchanged. Not covered by this review
	2.1.3 Materials (aluminium)	Unchanged. Not covered by this review
	2.1.4 Materials (critical raw materials)	Replaced by section 1.6 of the review of the MEErP report
	2.2 Recycling	Replaced by chapter 1 of the review of the MEErP report: • 1.2 End of Life modelling • 1.4 Material efficiency
	2.3.1 Energy (Policy)	Unchanged. Not covered by this review
	2.3.2 Energy (Statistics)	Unchanged. Not covered by this review
	2.3.3 Energy (Trends)	Unchanged. Not covered by this review
	2.3.4 Energy (Consumption by application)	Unchanged. Not covered by this review
	2.3.5 Energy (Efficiency of power generation and distribution)	Primary energy factors updated as reported in chapter 1.1 of the review of the MEErP report
	2.3.6 Energy (Security of energy supply)	Unchanged. Not covered by this review
	2.3.7 Energy (Accounting units)	Unchanged. Not covered by this review

[4] The MEErP 2011 identified some environmental aspects not specifically related to LCA impact categories, such as content of Hazardous Substances and Substances of Very High Concern, and some physical impacts. These aspects were out of the scope of the current MEErP review. The analysis of these aspects would require additional investigation.

	2.4 Water	Unchanged. Not covered by this review
	2.5 Waste	Unchanged. Not covered by this review
3. Emissions	3. Emissions	Replaced by section 1.1 of the review of the MEErP report
4. Other impacts	4.1 Noise	Unchanged. Not covered by this review
	4.2 Other health-related impacts	
5. Ecoreport 2011 LCA unit indicators	5. Ecoreport 2011 LCA unit indicators	Replaced by chapter 1 of the review of the MEErP report
6. Climate, Energy & Buildings	6.2 Climate	Unchanged. Not covered by this review
	6.3 Domestic water consumption	
	6.4 Lighting	
	6.5 Residential buildings	
	6.6 Commercial buildings	
	6.7 Public sector and community sector buildings	
	6.8 Primary&secondary sector buildings	
7. People	7.1 Introduction	Unchanged. Not covered by this review
	7.2 Occupancy rate residential buildings	
	7.3 Occupancy rates tertiary sector buildings	

Source: JRC elaboration

The revised Ecoreport tool (2024)[5] was developed in Excel 2019 format (.xlsx) by using basic functions to make the tool easily accessible to non-expert users. It is compatible with Excel version 2010 and later.
The Eco Report tool was specifically developed to provide persons in charge for the preparatory study with a compact, easy-to-use instrument in the public domain.

The Ecoreport tool was redesigned and updated to encompass some key aspects of the Environmental Footprint (EF) method. The Ecoreport tool calculates the impacts originated by the Bill-of-Materials, energy and other resources used during product's operation and other life cycle stages as manufacturing, packaging, distribution, maintenance and repair, and end-of-life (EoL).

The EoL modelling has been updated according to the EF method by using the Circular Footprint Formula (CFF) with some simplifications (see sections 1.1 and 1.6 of this manual). This choice will grant internal consistency within the Ecoreport tool (in line with the updated background datasets implemented in the tool), and potential consistency with external studies (e.g. results of PEF studies developed by industries). Recyclability and recycled content are modelled as input parameters of the CFF formula.

The tool contains a compact database of Life Cycle Impact Assessment (LCIA) values for approximately 270 datasets of: materials (primary and secondary), components (manufacturing and end-of-life processes), manufacturing processes, transports and electricity and thermal energy consumption. Datasets and the corresponding LCIA values are derived from EF 3.1 datasets[6].
This version of the Ecoreport tool is aligned to the 16 impact categories used in the EF method (see section 1.3 for details). This choice allows to: use robust indicators aligned to prominent scientific literature and other LCA databases; facilitate future updates of the impact assessment methods (following scientific progress); grant alignment with indicators in use in other EU policies.

An additional technical information on "Primary Energy Consumption" is included in this version of the Ecoreport tool alongside the 16 EF impact categories. "Primary energy consumption" accounts for energy efficiency aspects and reflects the increasing share of electricity produced from renewable resources. The "Primary Energy

[5] Available at: https://single-market-economy.ec.europa.eu/industry/sustainability/sustainable-product-policy-ecodesign_en
[6] The following link includes a list of nodes managed by different data providers. EF datasets are stored in the nodes: https://eplca.jrc.ec.europa.eu/LCDN/contactListEF.html

Consumption" complements the "Resource use, fossil" impact category (as in the EF method) by considering also the contribution of renewable energy resources to the overall energy efficiency. The "Primary Energy Consumption" is based on primary energy factors according to the Energy Efficiency Directive 2018/2002 (see section 1.3).

The revised Ecoreport tool allow the user to expand the original background database with new datasets related to materials or components, processes, transport and direct emissions (see section 1.4 for the detailed procedure).

Main novelties of each worksheet are summarised at the beginning of each section. In particular, main novelties concern:

- Updated impact categories aligned with the 16 EF life cycle impact categories;
- Updated database based on EF 3.1 datasets;
- Extended database to include additional datasets on plastics, metals and electronics ;
- Streamlined process for the user to include additional datasets on (primary / recycled) materials and components, processes, energy sources and transport;
- New input boxes for packaging, distribution and maintenance & repair
- Possibility to model more in detail energy and materials consumed and direct emissions during manufacturing, packaging, use phase, maintenance & repair.
- End-of-Life modelling updated according to the EF method by using the Circular Footprint Formula (CFF);
- New step-by-step approach for the assessment of critical raw materials (CRMs) contained in the product under scrutiny (based on the numerical results of the EU 2023 Criticality Assessment);
- Use of basic excels functions to make the Ecoreport tool more flexible and suited for future updates.

Instructions for future updates of the Ecoreport tool are included in this document at the end of each section in dedicated boxes.

Ecoreport tool manual

1.1 **"Inputs" worksheet**

The Input worksheet is developed by keeping the same format and approach of the previous version of the Ecoreport tool. It is updated in order to account for new inputs needed for the implementation of the CFF and to allow more modelling choices in each life cycle stage.
The following sections of this chapter describe the main actions the user is requested to enter the input data. The main novelties are listed in the green boxes in each section.

General novelties in the worksheet
- Selection of virgin and corresponding recycling datasets concerning materials and components;
- Default parameters for the implementation of the CFF (editable);
- Possibility to improve the granularity of manufacturing, packaging, transport, use and maintenance stages by including energy, materials and processes;
- New input tables are included for: packaging, distribution and maintenance & repair;
- In the use phase it is possible to select different datasets on consumables (including potential new materials introduced by the user);
- Possibility to include direct emissions released during manufacturing and use phase[7];
- Possibility to select among a set of datasets on electricity and thermal energy sources;
- Maintenance & repair can be estimated either by a simplified approach, or by including a detail of energy, materials and processes consumed during this stage.

Versioning system of the Ecoreport tool

In the spreadsheet "Inputs" the version of the Ecoreport tool is reported in cell B2 (see Figure 1 below). The version shall be updated every time a change is made to the tool.

Figure 1: Version of the Ecoreport tool. Screenshot from the "Input" spreadsheet

Source: JRC elaboration

Versioning system is limited to two digits which shall be updated according to the following rules:

- The second digit (v. 1.y) will be increased for minor updates (e.g. fixing bugs, database update)
- The first digit (v. x.0) will be increased for major updates of modelling assumptions (e.g. lifetime estimation, CFF)

1.1.1 Bill-of-Materials

Novelties
- Selection of virgin and corresponding recycling datasets concerning materials and components;
- Implementation of default CFF parameters (potentially editable by the user);

Important: the user shall not insert additional lines in this spreadsheet.

Input – from Line 11 (from column C to H) The Input worksheet starts with a section of 40 lines reserved for the Bill-of-Materials. When more entries are needed, the plus sign "+" on the left (line 223) can be used to ungroup the list up to 200 lines.
Below the correct order to fill in the form (Figure 2):

[7] Guidance on how to include direct emissions is provided in section 2.1.5 and 2.3.

Column C - Descriptions of the components, to be filled in manually.
Column D - For the selection of a material (or component), first a category (i.e. plastics, metals, electronics, others) has to be selected by using the drop-down menu. If the dataset name is not entirely visible, it is possible to enlarge the column to enhance the visualisation).
Column E - The right material or component need to be selected from the drop-down menu.
Column F – Once the dataset of primary material or component is selected, the next step is to select the corresponding dataset of recycled material or recycling of the component from a pre-selected list depending on the selection in column E.
Column G – The amount has to be filled in manually. Unit of measure will appear automatically when a dataset is selected (Column H).

Figure 2: Input box for Bill of materials in the Ecoreport tool (2024)

	A	B	C	D	E	F	G	H
8		Pos	Bill of Materials	Category	Dataset on primary	Dataset on recycling	Amount	Unit of measure
9		nr	Description of component	Click &select	select Category first !	click & select		automatic, pls don't modify
10								
11		1	HDPE description	01-Plastics	6-HDPE production mix, at plant	25-High density polyethylene (HDPE), recycled	0.7	kg
12		2						
13		3						
14		4						

Source: JRC elaboration

Input – from Line 11 (from column I to Q) In the same line, next to unit of measure, there is the input box dedicated to the CFF parameters[8] (see Figure 3). A simplified version of the CFF is implemented in the Ecoreport tool. Among the adopted simplifications, the contributions to the CFF related to the "energy recovery" and disposal in landfill are not implemented in the Ecoreport tool.
The parameters to calculate the simplified CFF in the Ecoreport tool are: recycled content (R1), recycling output rate (R2) and the allocation factor (A).

- R1 (recycled content): it is the proportion of material in the input to the production that has been recycled from a previous system
- R2 (recycling output rate): it is the proportion of the material in the product that will be recycled in a subsequent system. R2 considers the efficiencies in the collection and recycling processes. R2 shall be measured at the output of the recycling plant.
- A (allocation factor) [9]: allocation factor of burdens and credits between supplier and user of recycled materials

This table is divided in three boxes, each one dedicated to a single parameter. Each box reports in the first column the selection Yes/No (columns I, L and O) to define whether default values (columns J, M and P) or customised values (columns K, N and Q) have to be considered for each material/component.

The CFF parameters values are automatically assigned and appear when a dataset is selected in column E. Default values are based on the so called "Annex C" of the EF method[10] and are stored in a dedicated worksheet of the Ecoreport tool (see section 0).

Regarding the estimation of R2 for different design options, the user should follow the approach developed in the revised methodology (Task 2 – Dealing with material efficiency parameters). When defining R2 values. the user shall refer to the state of the art of current recycling activities.

[8] A simplified version of the CFF is implemented in the Ecoreport tool in the "Calculations" worksheet (see chapter 1.6)
[9] The "A" factor in the CFF allows to allocate impacts and/or benefits between the use of recycled materials as input (i.e. recycled content) and recycling at the end-of-life (i.e. recycling output rate).
[10] "Annex C" is available at: http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml. In case new data will be released for the EF method, these could be directly edited by the user.

Corresponding datasets on recycling in column F could be "not available" in case of materials that are not recyclable or no datasets available. In this case R1 and R2 are set equal to 0. Anyway, the user can include a new dataset (about primary and/or recycling or recycled materials) if specific information is available (see section 1.4) and enter R1 and R2 in column K and N accordingly.

In the columns I, L and O the user can select either "Yes" or "No" whether to use default or customised values. These columns will display by default:

- "Yes", for all the datasets included in the Ecoreport tool database. The CFF parameters values will appear in columns J, M and P (see Figure 3). The user can change the default values by selecting "No" in columns I, L and O and include the replacing values in columns K, N and Q.
- "No", if the dataset is included by the user (see section 1.4). "n.a." will appear in columns J and M and the user shall enter then the values in columns K and N which will be coloured in green. In this case the parameter A=0.5 is displayed by default in column P.

Any customised values introduced by the user shall be carefully checked preventively and based on ad-hoc analysis (or assumptions) about recyclability or recycled content[11]. The use of default values provided by the tool is highly recommended. Changes in the default values of parameter "A" should be in general be avoided, since these could produce distorted results. Any modifications and actions which deviate from default settings need to be thoroughly reported with the results[12].

The Ecoreport tool will use for the calculation of the CFF only values contained in the cells coloured in green.

Figure 3: Input box of CFF parameters for Bill of materials in the Ecoreport tool (2024)

	I	J	K	L	M	N	O	P	Q
8	Default R1?	R1, recycled content		Default R2?	R2, recyclability		Default A?	A coefficient	
9	Yes/No	default	custom	Yes/No	default	custom	Yes/No	default	custom
10		please insert			please insert			please insert	
11	Yes	0%		Yes	0%		Yes	50%	
12									
13									
14									

Source: JRC elaboration

Note that it is necessary that columns I, L and O are filled in with "Yes" or "No".

The instructions for data entry as provided in this section are valid also for the introduction of input materials (related to other life cycle stages) in fields where CFF parameters need to be included (i.e. manufacturing and assembly (see section 1.1.2 for details), packaging (section 1.1.3), use phase (section 1.1.5) and maintenance and repair (section 1.1.6)).

No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.1.2 Manufacturing/Assembly

Novelties
- Selection of datasets on energy, materials and processes related to product's manufacturing and assembly.
- Possibility to include impacts due to direct environmental emissions occurring during this phase

Input – from line 228 (from column C to I) The user can model the detail of the product's manufacturing and assembly (see Figure 4).

[11] For further information on how to select the parameter, please consult EF Recommendations 2021 Available at: https://environment.ec.europa.eu/publications/recommendation-use-environmental-footprint-methods_en
and the Annex C, available at: http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml

[12] In the absence of more precise information, it is recommended to use: R1=0%; R2=0%; A=0.5.

It is possible to include energy, materials and processes (e.g. electricity or ancillary materials consumed during the manufacturing) and impacts due to direct environmental emissions during manufacturing (e.g. emissions due to welding). The modelling of materials consumed in this phase are modelled as it is implemented in the BoM input table (see section 1.1.1).

Column C - Brief description of the process.
Column D – Select if the input is either a material, process or energy by using the drop-down menu.
Column E – Select a category, accordingly by using the drop-down menu.
Column F – Select the dataset by using the drop-down menu.
In case the categories "energy" or "process" are selected, only the white cells need to be filled in (column E and F). The cells coloured grey are not to be filled in.
Column H – Amounts to be filled in manually. Unit of measurement (column I) will compare automatically when a dataset is selected.

Input – from line 228 (from column J to R) The CFF parameters box has to be filled in only when "material" is selected in column D. Please refer to the instructions in section 1.1.1 regarding the CFF parameters.

Input – line 244 Direct emissions occurring during the manufacturing and assembly phases may be accounted for in the tool. In this case, a new "ad-hoc" dataset has to be inserted by the user in the database[13] and then the corresponding dataset (column F) can be selected here.
Note: The user can select a dataset from the drop-down menu, only after a new dataset on "direct emissions" is included in the "New datasets_user" worksheet (see chapter 1.4).

Figure 4: input box for manufacturing and assembly in the Ecoreport tool (2024)

	A	B	C	D	E	F	G	H	I
225		Pos	MANUFACTURING / ASSEMBLY		materials (in addition compared to the above BOM) specifically used in the manufacturing (e.g. lubricants for the machinery, gas for soldering, etc.).				
226			Description	Material/ Process/ Energy	Category	Datasets	Recycled material	Amount	Unit of measure
227		nr	please insert	Click and select	click and select	click and select	click and select	please insert	
228		201							
229		202							
230		203							
231		204							
232		205							
233		206							
234		207							
235		208							
241		214							
242		215							
243		216							
244		217		Direct emissions	08-Direct emissions				

Source: JRC elaboration

No changes are expected for these lines in potential future updates of the Ecoreport tool.

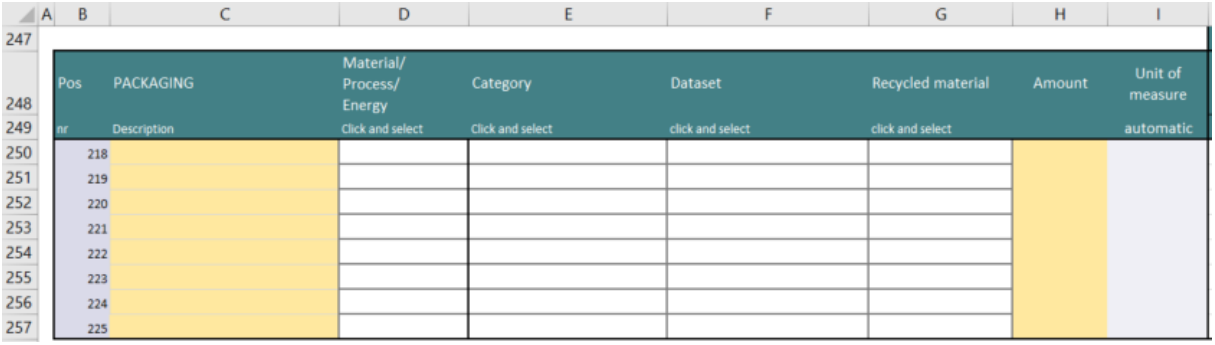
1.1.3 Packaging

Novelties
- Possibility to model in detail packaging, as selecting datasets on energy, materials and processes related to packaging.

Input – from line 250 The user can model the detail on the materials, energy or processes used to pack the product (see Figure 5). Please refer to the instructions in section 1.1.2. The only difference is that is not possible to include direct emissions here.

[13] The user has the possibility to include an ad hoc dataset in the worksheet "New datasets_user" (see section 1.4 for instructions on how to include direct emissions).

Figure 5: input box for packaging in the Ecoreport tool (2024)



Pos	PACKAGING	Material/ Process/ Energy	Category	Dataset	Recycled material	Amount	Unit of measure
nr	Description	Click and select	Click and select	click and select	click and select		automatic
218							
219							
220							
221							
222							
223							
224							
225							

Source: JRC elaboration

No changes are expected for these lines in potential future updates of the Ecoreport tool.

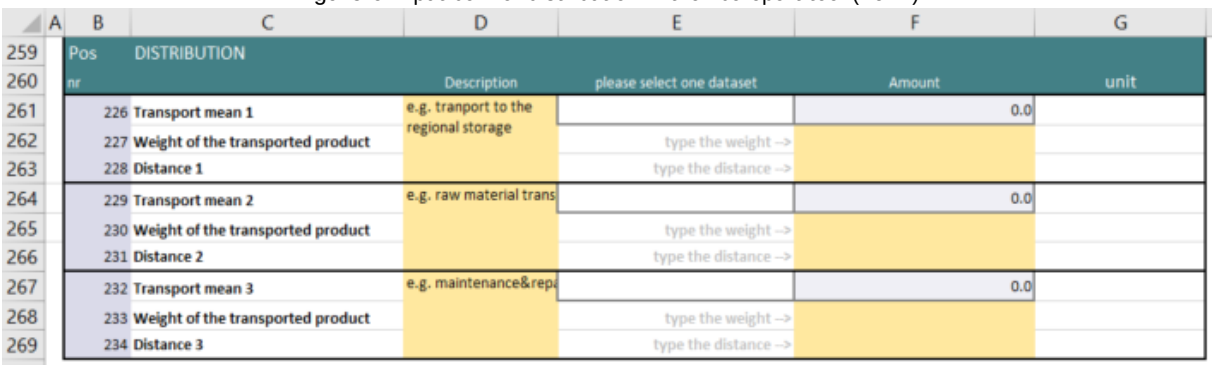
1.1.4 Distribution

Novelties
- Transport occurring over different life cycle stages can be modelled (up to three different means of transport).
- The user can select the following means of transport: articulated lorry, barge, cargo plane, freight train, or transoceanic ships
- User shall select the transport mean and enter load and distance

Input – from line 261 The input box for distribution allows the user to insert (up to three) different means of transport, including weight of the transported products and distance. The only accepted unit of measure is t*km as provided by default. The input box per each mean of transport is divided in three lines (see Figure 6). It is not allowed to insert additional lines in the Ecoreport tool.
Column D - First, the user may include a description of relevant information about transportation.
Column E first line - Second, the transport mean has to be selected among a list of datasets (using a drop-down menu).
Column F second line – enter the load according to the unit of measurement that appears in column G.
Column F third line – enter the distance.

Similarly, to the other input boxes, the user could introduce in the database new datasets on means of transport, following the instructions provided in chapter 1.4. After that, the user will have the possibility to select them among the input for distribution.

Figure 6: input box for distribution in the Ecoreport tool (2024)



Pos	DISTRIBUTION				
nr		Description	please select one dataset	Amount	unit
226	Transport mean 1	e.g. tranport to the regional storage		0.0	
227	Weight of the transported product		type the weight -->		
228	Distance 1		type the distance -->		
229	Transport mean 2	e.g. raw material trans		0.0	
230	Weight of the transported product		type the weight -->		
231	Distance 2		type the distance -->		
232	Transport mean 3	e.g. maintenance&repa		0.0	
233	Weight of the transported product		type the weight -->		
234	Distance 3		type the distance -->		

Source: JRC elaboration

No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.1.5 Use phase

Novelties
- Possibility to select different datasets on electricity and materials consumed during the operation - Possibility to introduce emissions of substances released during the operation.

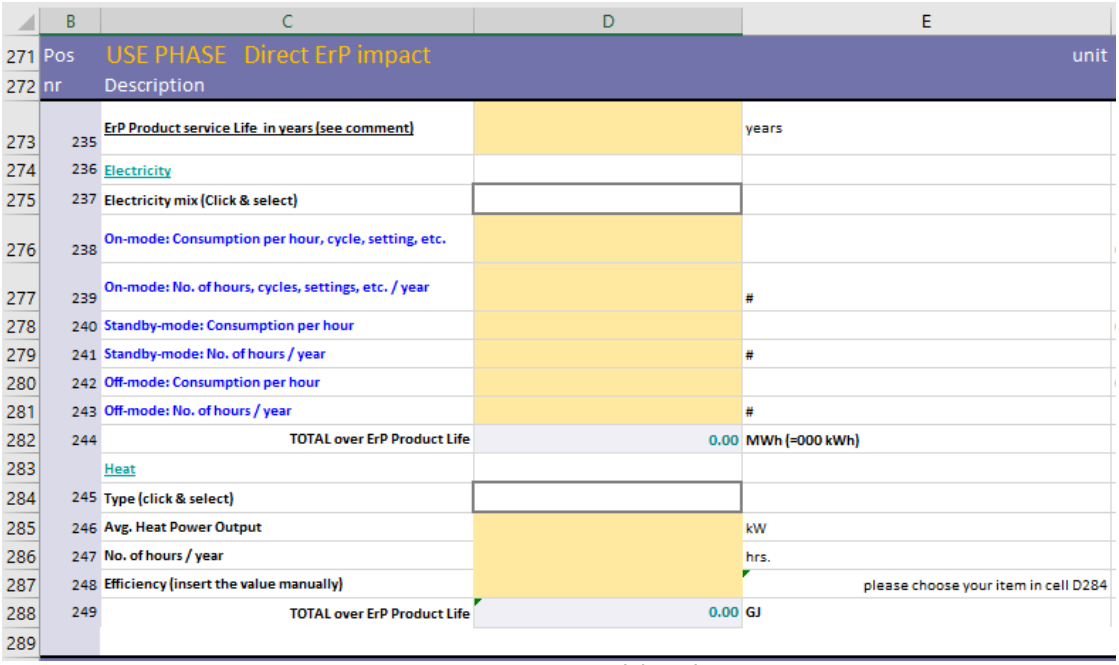
The Ecoreport tool foresees two sections to distinguish between direct and indirect impacts.
Input – from line 273 Use phase – Direct impacts (see Figure 7).
This section has to be filled in for those products that are using energy during the use phase.
Cell D273 - The average Product Life in years has to be filled in.
From line 274 down – The 'Electricity' subsection gives the option to fill in the electricity use split-up in 3 modes (on/standby/off mode). It is also possible to simply specify an annual energy use (in kWh) in the on-mode and fill in '1' in the next line. As a new functionality, the user can select a dataset for electricity production among a predefined list from a drop-down menu in cell D275. It is recommended to use the datasets from the list (e.g. "Electricity grid mix (EU mix)"), unless the user wants to model specific scenarios[14].
Please remember that the energy use is given per year. The electricity consumption shall be reported in kWh.
The product service life in years has to be included in cell D273. The Ecoreport tool just sums the electricity use over the 3 modes and multiplies with the Product Life (in years).

Please note that lines from 276 to 282 remained unchanged compared to previous Ecoreport tool version.

(from line 284) The "Heat" consumption applies specifically to central heating boilers (fossil fuels, wood and heat pump).
Cell D284 – the type of fuel used in the boiler has to be selected from a drop-down menu. These datasets consider the life cycle impacts of the fuel burned during the use phase, including both electricity consumed by the boiler (to be modelled from line 273 to line 281) and the upstream processes of boiler manufacturing and infrastructure.
It is required that the average heat output is filled in (in kW) in cell D285 as well as the number of hours the installation is supplying this heat output (or equivalent, if it is in part load) in cell D286. Under the heading 'Efficiency' in cell D287 the user shall include the efficiency according to the information related to the selected boiler as implemented in the old version of the Ecoreport tool. Also in this case the user can enter new datasets of boilers in the worksheet "New datasets_user" (see section 1.4).

[14] The user has the possibility to include an ad hoc dataset in the worksheet "New datasets_user" (see section 1.4 for instructions).

Figure 7: use phase input box in the Ecoreport tool (2024)



	B	C	D	E
271	Pos	USE PHASE Direct ErP impact		unit
272	nr	Description		
273	235	ErP Product service Life in years (see comment)		years
274	236	Electricity		
275	237	Electricity mix (Click & select)		
276	238	On-mode: Consumption per hour, cycle, setting, etc.		
277	239	On-mode: No. of hours, cycles, settings, etc. / year		#
278	240	Standby-mode: Consumption per hour		
279	241	Standby-mode: No. of hours / year		#
280	242	Off-mode: Consumption per hour		
281	243	Off-mode: No. of hours / year		#
282	244	TOTAL over ErP Product Life	0.00	MWh (=000 kWh)
283		Heat		
284	245	Type (click & select)		
285	246	Avg. Heat Power Output		kW
286	247	No. of hours / year		hrs.
287	248	Efficiency (insert the value manually)		please choose your item in cell D284
288	249	TOTAL over ErP Product Life	0.00	GJ
289				

Source: JRC elaboration

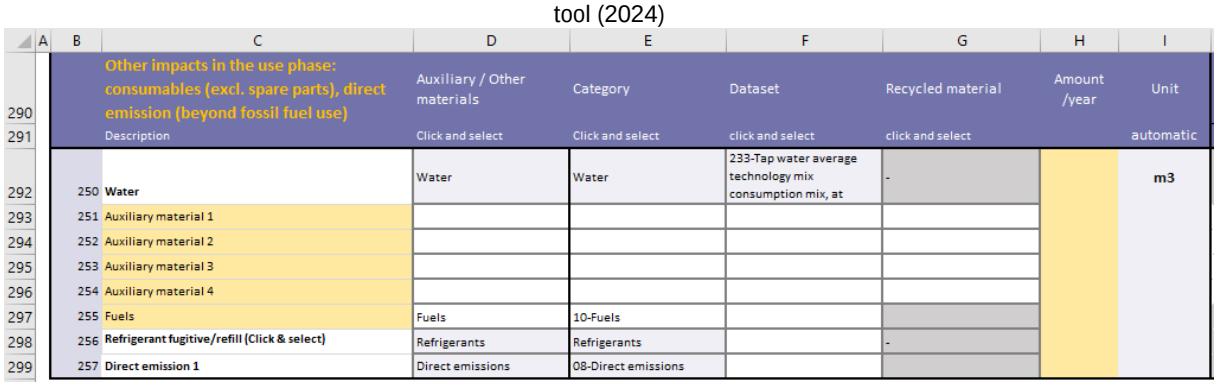
Input – from line 292 the user can fill in the annual consumption of consumables like water and other auxiliary materials consumed during the use phase.
Apart from water, the consumables can be selected among different datasets from drop-down lists (columns D, E and F).
Column D – the user can select either "Auxiliary", "Fuels",or "Other materials".
When "Auxiliary" or "Fuels" are selected in column (D and E), only a pre-defined set of datasets will appear in the drop-down menu. Alternatively, in the case of "Auxiliary", the user can select all the datasets on materials and components that are present in the Ecoreport tool database by selecting "Other materials" and the categories (column E).
For the compilation of the next cells please refer to the instructions as in section 1.1.1.

Input – from line 298 Refrigerants.
Column F - The user can select a dataset among four types of refrigerants provided by default
Column H – Add the amount of fugitive emissions of the refrigerant occurring during the use phase. In this case the Ecoreport tool accounts for the Global Warming Potential impact only[15].
It is possible to include an additional dataset on refrigerants by following the specific instructions in section 1.4. Please note that the refrigerant used as part of the BOM shall be entered in the first section of the Input worksheet (please see section 1.1.1) and the dataset is listed in the category "04-Others".

Input – from line 299 Direct emissions. This line allows to enter direct emissions (e.g. emissions from boilers' operation.) which are not already captured by the other datasets in the database and relevant for the product under study. Thus, it is important to avoid any double counting of such impacts. For example, impacts of boilers' operation can be modelled in lines 284-288 and the emissions are already captured by the selected datasets on central heating boilers. The inclusion of any direct emissions must be duly justified and reported. In this case, a new "ad-hoc" dataset has to be inserted by the user in the database[16] and then the corresponding dataset (column F) can be selected here.
Note: The user can select a dataset from the drop-down menu, only after a new dataset on "direct emissions" is included in the "New datasets_user" worksheet (see chapter 1.4).

[15] The approach remains unchanged compared to previous Ecoreport tool version. It considers the extra GWP impact from fugitive refrigerant during use phase, which also add on to the total GWP indicator. It is assumed that all the amount refilled has been lost.
[16] The user has the possibility to include an ad hoc dataset in the worksheet "New datasets_user" (see section 1.4 for instructions on how to include direct emissions).

Figure 8: Input box for other impacts in the use phase: consumables, refrigerants and direct emissions in the Ecoreport tool (2024)



		Other impacts in the use phase: consumables (excl. spare parts), direct emission (beyond fossil fuel use)	Auxiliary / Other materials	Category	Dataset	Recycled material	Amount /year	Unit
290								
291		Description	Click and select	Click and select	click and select	click and select		automatic
292	250	**Water**	Water	Water	233-Tap water average technology mix consumption mix, at	-		**m3**
293	251	Auxiliary material 1						
294	252	Auxiliary material 2						
295	253	Auxiliary material 3						
296	254	Auxiliary material 4						
297	255	Fuels	Fuels	10-Fuels				
298	256	**Refrigerant fugitive/refill (Click & select)**	Refrigerants	Refrigerants		-		
299	257	**Direct emission 1**	Direct emissions	08-Direct emissions				

Source: JRC elaboration

Input – from line 303 Use phase – Indirect impacts.
This section has to be filled for those products that, in the use phase do not use energy but have a significant impact on the energy consumption of products that are using energy. Please refer to the instructions on direct impacts for data entry.

No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.1.6 Maintenance and repair

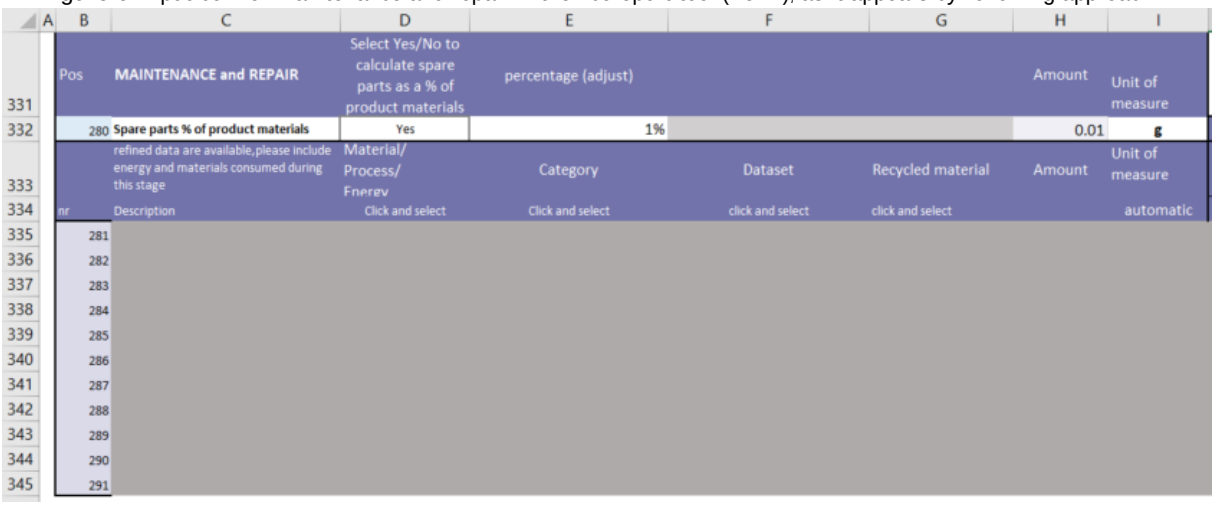
Novelties
- Possibility to estimate the impact of maintenance and repair as a present percentage (potentially adjustable) of the impacts of the materials as inputs to the BOM
- Alternatively, possibility to model in detail energy and materials necessary for maintenance and repair

Input – from line 332
The user can follow two alternative approaches:

1. account for impacts of this stage in a simplified way: it is possible to estimate the impacts of maintenance and repair as a percentage of the impacts of the materials used as inputs in the BOM. This option was already implemented in older versions of the Ecoreport tool. However, the user can now modify this percentage;
2. include a detail of energy, materials and processes related to the maintenance and repair stage, if relevant and more detailed data are available.

Approach 1) Use a percentage of the impacts of the materials used in the BOM.
Cell D332 - Select "Yes" and the Ecoreport tool calculate the impacts as 1% (provided by default) of the impacts calculated for the BOM section.
Cell E3332 - The user may decide to set a different percentage. The tool will estimate the amount of spare parts (in grams) (cell H332). The table below (from line 335) will be coloured grey meaning that the table has not to be filled in.

Figure 9: Input box for maintenance and repair in the Ecoreport tool (2024), as it appears by following approach 1

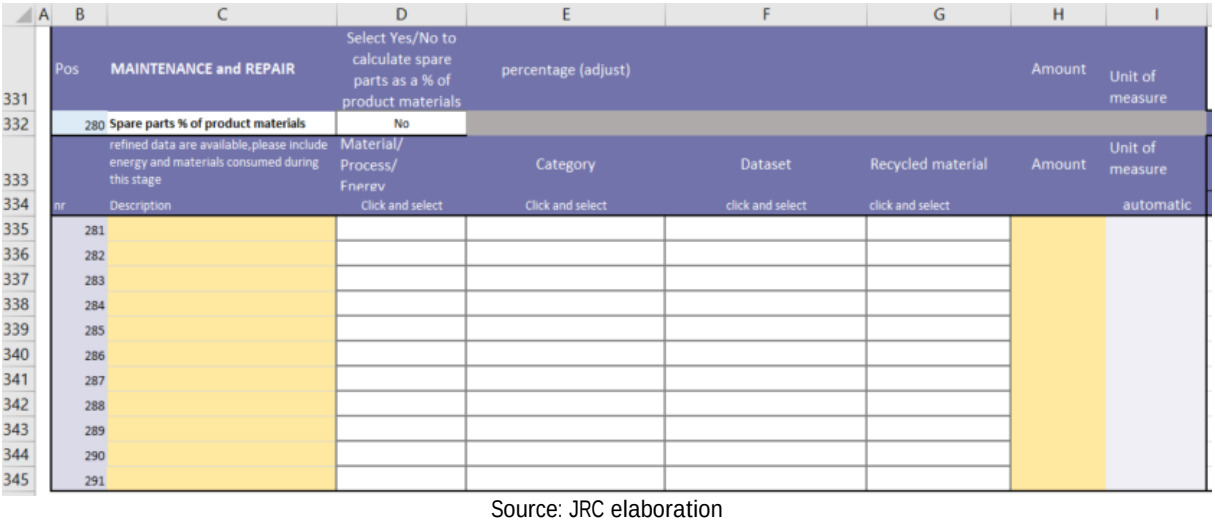


	Pos	MAINTENANCE and REPAIR	Select Yes/No to calculate spare parts as a % of product materials	percentage (adjust)			Amount	Unit of measure
331								
332	280	Spare parts % of product materials	Yes	1%			0.01	g
333		refined data are available, please include energy and materials consumed during this stage	Material/ Process/ Energy	Category	Dataset	Recycled material	Amount	Unit of measure
334	nr	Description	Click and select	Click and select	click and select	click and select		automatic
335	281							
336	282							
337	283							
338	284							
339	285							
340	286							
341	287							
342	288							
343	289							
344	290							
345	291							

Source: JRC elaboration

Approach 2) if relevant and more refined data are available then the user can adopt a more precise modelling, as following:
Cell D332 – The user shall select "No" and the input box below will be visible and to be filled in with datasets on materials, processes and energy and CFF parameters.
To fill in this input box, please refer to the instructions in section 1.1.2.

Figure 10: Input box for maintenance and repair in the Ecoreport tool (2024), as it appears by following approach 2



	Pos	MAINTENANCE and REPAIR	Select Yes/No to calculate spare parts as a % of product materials	percentage (adjust)			Amount	Unit of measure
331								
332	280	Spare parts % of product materials	No					
333		refined data are available, please include energy and materials consumed during this stage	Material/ Process/ Energy	Category	Dataset	Recycled material	Amount	Unit of measure
334	nr	Description	Click and select	Click and select	click and select	click and select		automatic
335	281							
336	282							
337	283							
338	284							
339	285							
340	286							
341	287							
342	288							
343	289							
344	290							
345	291							

Source: JRC elaboration

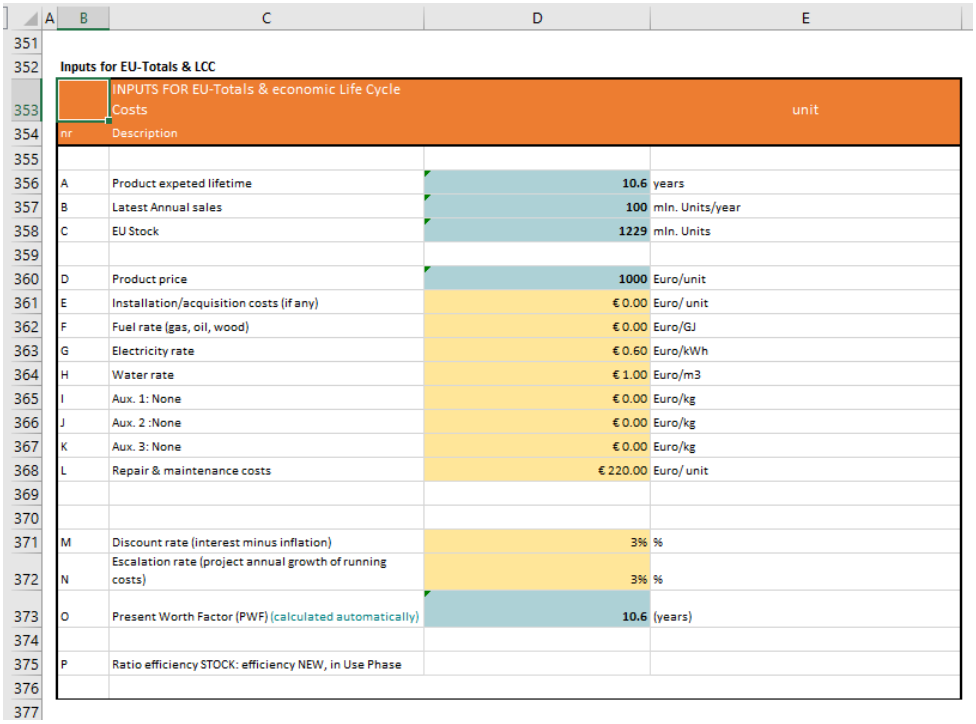
No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.1.7 EU total and LCC calculation

After the inputs for calculating the environmental impacts, there is a small section that allows the calculation of EU totals and of the Life Cycle Costs. The Product Life (in years) is derived from the lifetime worksheet. Next the total annual EU sales for the latest 30 years (should be estimated (in million units per year) together with the average lifetime of the products in the year of sale. These values, together with the Weibull shape parameter taken from the lifetime worksheet allow for the calculation of the installed EU stock in million units. These inputs should be inserted in the sales and stock dynamic model input box (see Figure 12).
Follows a section that takes the product's average price from the lifetime worksheet and requests - if applicable - the installation and maintenance costs of the product to the consumer (incl. taxes). For energy and water some default rates are given. Prices for other consumables can be filled in. All these prices and rates can be adjusted.

The same goes for the discount rate. What cannot be changed directly is the Present Worth Factor (in years). This is calculated from the discount rate, the escalation rate and the product life. The escalation rate, i.e. the annual growth rate of running costs (energy, water), allows the analyst to take into account energy price projections.
Finally, the last input in the LCC calculation is a rough indicator of the ratio between the energy consumption of the average new product and the energy consumption of the average product installed ('stock'). Approximately, if there has been no revolutionary growth or decrease in sales, the average product installed should equal the average new product a number of years ago, where the number of years equals half the product life. For instance, for whitegoods (refrigerators, dishwashers with a product life of ca. 15 years) this would be the average new product 7 to 8 years ago.

Figure 11: Input box for EU-Totals and economic life cycle in the Ecoreport tool (2024)



Inputs for EU-Totals & LCC

nr	INPUTS FOR EU-Totals & economic Life Cycle Costs Description		unit
A	Product expeted lifetime	10.6	years
B	Latest Annual sales	100	mln. Units/year
C	EU Stock	1229	mln. Units
D	Product price	1000	Euro/unit
E	Installation/acquisition costs (if any)	€ 0.00	Euro/ unit
F	Fuel rate (gas, oil, wood)	€ 0.00	Euro/GJ
G	Electricity rate	€ 0.60	Euro/kWh
H	Water rate	€ 1.00	Euro/m3
I	Aux. 1: None	€ 0.00	Euro/kg
J	Aux. 2 :None	€ 0.00	Euro/kg
K	Aux. 3: None	€ 0.00	Euro/kg
L	Repair & maintenance costs	€ 220.00	Euro/ unit
M	Discount rate (interest minus inflation)	3%	%
N	Escalation rate (project annual growth of running costs)	3%	%
O	Present Worth Factor (PWF) (calculated automatically)	10.6	(years)
P	Ratio efficiency STOCK: efficiency NEW, in Use Phase		

Source: JRC elaboration

Figure 12: Input box for the sales and stock dynamic model in the Ecoreport tool (2024).

	B	C	D	E	F	G
378	Stock calculation based on sales					
379	Weibull shape parameter (β)		2.2		Total EU Stock (mln. Units)	1229
380						
381	Year	Sales (mln. Units/year)	Expected lifetime (yrs)	Weibull location parameter (η)	Surv. factor	Surv.
382	0	100.0	12.3	13.9	1.000	100.0
383	-1	100.0	12.3	13.9	0.997	99.7
384	-2	100.0	12.3	13.9	0.986	98.6
385	-3	100.0	12.3	13.9	0.966	96.6
386	-4	100.0	12.3	13.9	0.937	93.7
387	-5	100.0	12.3	13.9	0.900	90.0
388	-6	100.0	12.3	13.9	0.854	85.4
389	-7	100.0	12.3	13.9	0.801	80.1
390	-8	100.0	12.3	13.9	0.743	74.3
391	-9	100.0	12.3	13.9	0.680	68.0
392	-10	100.0	12.3	13.9	0.615	61.5
393	-11	100.0	12.3	13.9	0.550	55.0
394	-12	100.0	12.3	13.9	0.484	48.4
395	-13	100.0	12.3	13.9	0.421	42.1
396	-14	100.0	12.3	13.9	0.361	36.1
397	-15	100.0	12.3	13.9	0.306	30.6
398	-16	100.0	12.3	13.9	0.255	25.5
399	-17	100.0	12.3	13.9	0.210	21.0
400	-18	100.0	12.3	13.9	0.170	17.0
401	-19	100.0	12.3	13.9	0.136	13.6
402	-20	100.0	12.3	13.9	0.107	10.7
403	-21	100.0	12.3	13.9	0.083	8.3
404	-22	100.0	12.3	13.9	0.064	6.4
405	-23	100.0	12.3	13.9	0.048	4.8
406	-24	100.0	12.3	13.9	0.036	3.6
407	-25	100.0	12.3	13.9	0.026	2.6
408	-26	100.0	12.3	13.9	0.019	1.9
409	-27	100.0	12.3	13.9	0.013	1.3
410	-28	100.0	12.3	13.9	0.009	0.9
411	-29	100.0	12.3	13.9	0.006	0.6
412	-30	100.0	12.3	13.9	0.004	0.4

Source: JRC elaboration

1.2 **"Lifetime" worksheet**

Novelties
The entire worksheet is new

In this worksheet the calculations both for the product's lifetime and for the employment effect are performed. For this, the product's Weibull shape parameter, the number of priority parts and the product's purchase price should be imputed in the corresponding cells (input cell are painted yellow or light blue).

Then the average expected lifetimes for the different reliability levels should also be inputted in the reliability section.

Figure 13: General input for lifetime and employment impacts calculations and reliability inputs. Screenshot taken from the Ecoreport tool (2024)

	A	B	C	D
1	Product type	Laptop computer		
2	Weibull shape parameter (β)	1.5		
3	Number of priority parts for repair and upgrade	1000		
4	s parameter	0.00		
5	Assumed purchase price [€]	1000.00		
6	Elasticity of demand	-3.0		
7	Yearly EU production [units]	6.30E+06		
8	Yearly EU sales and trade [units]	9.49E+07		
9				
10	Reliability	level	Average expected initial lifetime [yrs]	Weibull location parameter (η)
11		1	5.9	6.5
12		2	5.5	6.1
13		3	5.1	5.6
14		4	4.7	5.2
15				

Source: JRC elaboration

Following that, data on the costs and time required for repair and upgrade operations should be inserted in the respective input cells as depicted in Figure 14. Notice that in Figure 14 in columns J and L the cells

referring to t'_{cr} and % increase in lifetime are coloured yellow to signal that the study team might want to use a different model to calculate these and, therefore, input values in those cells. However, if the study team prefers to use the proposed approach, then these cell are calculated automatically and no input is needed.

Figure 14: Cost and time inputs for reparability and upgradability. Screenshot taken from the Ecoreport tool (2024)

17	Reparability	level	Total time to carry-out a typical repair activity [h]	Average rate of labour for repair [€/h]	Average cost of spare parts for repair [€]	total expected cost of the repair [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔLt_R)
18		1	0.8	96.00	139.00	220.00	1.03	0.20	2.33	2.33	12.2	50%
19		2	1.1	120.00	139.00	274.00	1.29	0.25	1.79	1.79	9.3	49%
20		3	1.5	150.00	139.00	364.00	1.71	0.33	1.23	1.23	6.4	43%
21		4	-	-	-	-	-	-	-	-	-	0%
22												
23												
24	Upgradability	level	Total time to carry-out a typical upgrade activity [h]	Average rate of labour for upgrade [€/h]	Average cost of spare parts for upgrade [€]	total expected cost of the upgrade [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔLt_U)
25		1	0.6	96.00	40.00	94.00	0.44	0.08	5.75	5.76	30.0	50%
26		2	0.8	120.00	40.00	130.00	0.61	0.12	4.14	4.14	21.6	50%
27		3	1.0	150.00	40.00	190.00	0.89	0.17	2.76	2.76	14.4	50%
28		4	-	-	-	-	-	-	-	-	-	0%

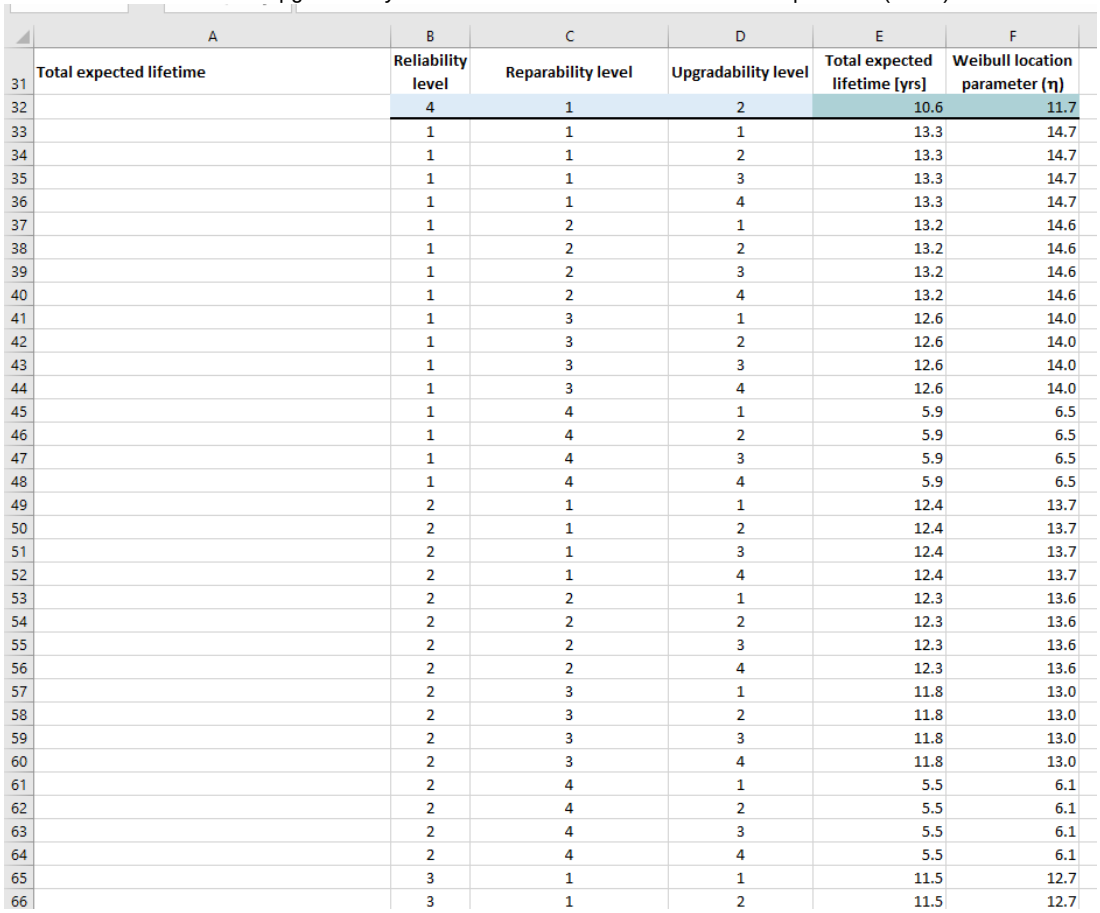
Source: JRC elaboration

After that input has been inserted, the product expected lifetime can be easily calculated just by inserting the reliability, reparability and upgradability levels in cells B32 to D32 (see Figure 15). The calculations results for the product's expected lifetime and Weibull location parameter are presented in Cells E32 and F32 and can be used in other worksheets as needed.

In or to facilitate the input of data from the user, a colour code is used in this worksheet:

a) Data should be inputted in cells that are coloured yellow
b) Cells that are coloured light-yellow are calculated by default using the models presented in the report but these calculations can be overwritten by the user, who can insert bespoke values if desired.

Figure 15: Calculation of the total expected lifetime and Weibull location parameter given the reliability, reparability and upgradability levels. Screenshot taken from the Ecoreport tool (2024)

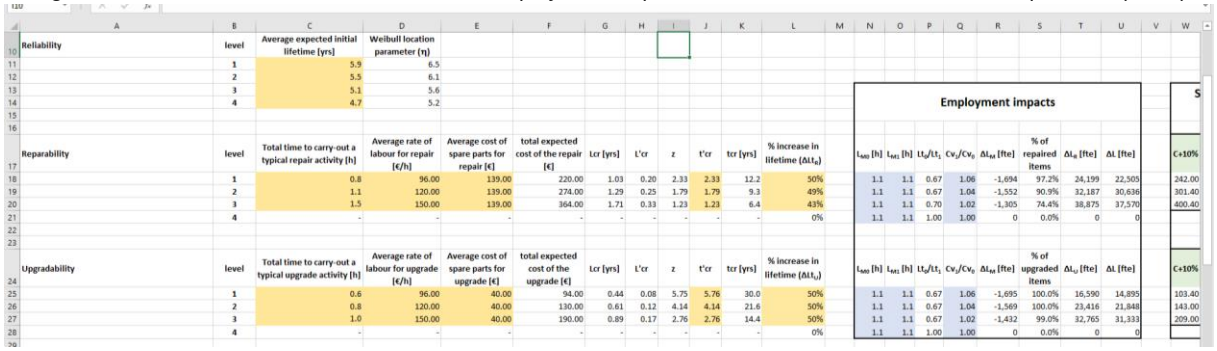


	A	B	C	D	E	F
31	Total expected lifetime	Reliability level	Reparability level	Upgradability level	Total expected lifetime [yrs]	Weibull location parameter (η)
32		4	1	2	10.6	11.7
33		1	1	1	13.3	14.7
34		1	1	2	13.3	14.7
35		1	1	3	13.3	14.7
36		1	1	4	13.3	14.7
37		1	2	1	13.2	14.6
38		1	2	2	13.2	14.6
39		1	2	3	13.2	14.6
40		1	2	4	13.2	14.6
41		1	3	1	12.6	14.0
42		1	3	2	12.6	14.0
43		1	3	3	12.6	14.0
44		1	3	4	12.6	14.0
45		1	4	1	5.9	6.5
46		1	4	2	5.9	6.5
47		1	4	3	5.9	6.5
48		1	4	4	5.9	6.5
49		2	1	1	12.4	13.7
50		2	1	2	12.4	13.7
51		2	1	3	12.4	13.7
52		2	1	4	12.4	13.7
53		2	2	1	12.3	13.6
54		2	2	2	12.3	13.6
55		2	2	3	12.3	13.6
56		2	2	4	12.3	13.6
57		2	3	1	11.8	13.0
58		2	3	2	11.8	13.0
59		2	3	3	11.8	13.0
60		2	3	4	11.8	13.0
61		2	4	1	5.5	6.1
62		2	4	2	5.5	6.1
63		2	4	3	5.5	6.1
64		2	4	4	5.5	6.1
65		3	1	1	11.5	12.7
66		3	1	2	11.5	12.7

Source: JRC elaboration

Finally, the employment impacts are automatically calculated in the box comprising cells N13 to U28 (Figure 16) and the sensitivity analysis is carried out in two boxes comprising cells W13 to AH28 and AJ13 to AU28 (Figure 17).

Figure 16: Presentation of the results for the employment impacts. Screenshot taken from the Ecoreport tool (2024)



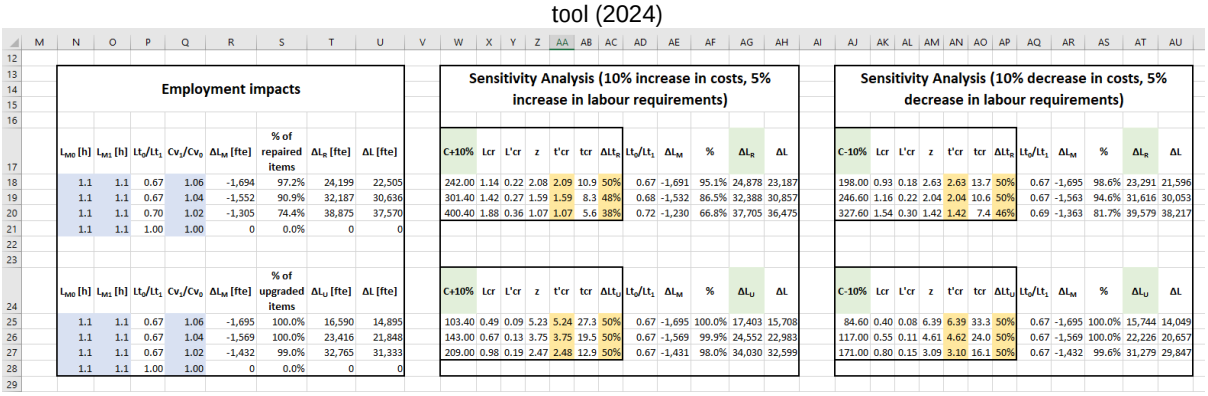
	A	B	C	D
10	Reliability	level	Average expected initial lifetime [yrs]	Weibull location parameter (η)
11		1	5.9	6.5
12		2	5.5	6.1
13		3	5.1	5.6
14		4	4.7	5.2

	A	B	C	D	E	F	G	H	I	J	K	L
17	Reparability	level	Total time to carry-out a typical repair activity [h]	Average rate of labour for repair [€/h]	Average cost of spare parts for repair [€]	total expected cost of the repair [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔLt_0)
18		1	0.8	96.00	139.00	220.00	1.03	0.20	2.33	2.33	12.2	50%
19		2	1.1	120.00	139.00	274.00	1.29	0.25	1.79	1.79	9.3	49%
20		3	1.5	150.00	139.00	364.00	1.71	0.33	1.23	1.23	6.4	43%
21		4	-	-	-	-	-	-	-	-	-	0%
22												
23												
24	Upgradability	level	Total time to carry-out a typical upgrade activity [h]	Average rate of labour for upgrade [€/h]	Average cost of spare parts for upgrade [€]	total expected cost of the upgrade [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔLt_0)
25		1	0.6	96.00	40.00	94.00	0.44	0.08	5.75	5.76	30.0	50%
26		2	0.8	120.00	40.00	130.00	0.61	0.12	4.14	4.14	21.6	50%
27		3	1.0	150.00	40.00	190.00	0.89	0.17	2.76	2.76	14.4	50%
28		4	-	-	-	-	-	-	-	-	-	0%

	M	N	O	P	Q	R	S	T	U	V	W
13		Employment impacts									S
17		L_{adj} [h]	L_{ref1} [h]	Lt_0/Lt_1	Cv_0/Cv_0	ΔL_{tot} [fte]	% of repaired items	ΔL_0 [fte]	ΔL [fte]		C+10%
18		1.1	1.1	0.67	1.06	-1,694	97.2%	24,199	22,505		242.00
19		1.1	1.1	0.67	1.04	-1,552	90.9%	32,187	30,636		301.40
20		1.1	1.1	0.70	1.02	-1,305	74.4%	38,875	37,570		400.40
21		1.1	1.1	1.00	1.00	0	0.0%	0	0		
22											
23											
24		L_{adj} [h]	L_{ref1} [h]	Lt_0/Lt_1	Cv_0/Cv_0	ΔL_{tot} [fte]	% of upgraded items	ΔL_{up} [fte]	ΔL [fte]		C+10%
25		1.1	1.1	0.67	1.06	-1,695	100.0%	16,590	14,895		103.40
26		1.1	1.1	0.67	1.04	-1,569	100.0%	23,416	21,848		143.00
27		1.1	1.1	0.67	1.02	-1,432	99.0%	32,765	31,333		209.00
28		1.1	1.1	1.00	1.00	0	0.0%	0	0		

Source: JRC elaboration

Figure 17: Sensitivity analysis for higher and lower costs and labour requirements. Screenshot taken from the Ecoreport tool (2024)



Employment impacts

L_{M0} [h]	L_{M1} [h]	Lt_0/Lt_1	Cv_1/Cv_0	ΔL_M [fte]	% of repaired items	ΔL_R [fte]	ΔL [fte]
1.1	1.1	0.67	1.06	-1,694	97.2%	24,199	22,505
1.1	1.1	0.67	1.04	-1,552	90.9%	32,187	30,636
1.1	1.1	0.70	1.02	-1,305	74.4%	38,875	37,570
1.1	1.1	1.00	1.00	0	0.0%	0	0

L_{M0} [h]	L_{M1} [h]	Lt_0/Lt_1	Cv_1/Cv_0	ΔL_M [fte]	% of upgraded items	ΔL_U [fte]	ΔL [fte]
1.1	1.1	0.67	1.06	-1,695	100.0%	16,590	14,895
1.1	1.1	0.67	1.04	-1,569	100.0%	23,416	21,848
1.1	1.1	0.67	1.02	-1,432	99.0%	32,765	31,333
1.1	1.1	1.00	1.00	0	0.0%	0	0

Sensitivity Analysis (10% increase in costs, 5% increase in labour requirements)

C+10%	Lcr	L'cr	z	t'cr	tcr	ΔLt_R	Lt_0/Lt_1	ΔL_M	%	ΔL_R	ΔL
242.00	1.14	0.22	2.08	2.09	10.9	50%	0.67	-1,691	95.1%	24,878	23,187
301.40	1.42	0.27	1.59	1.59	8.3	48%	0.68	-1,532	86.5%	32,388	30,857
400.40	1.88	0.36	1.07	1.07	5.6	38%	0.72	-1,230	66.8%	37,705	36,475

C+10%	Lcr	L'cr	z	t'cr	tcr	ΔLt_U	Lt_0/Lt_1	ΔL_M	%	ΔL_U	ΔL
103.40	0.49	0.09	5.23	5.24	27.3	50%	0.67	-1,695	100.0%	17,403	15,708
143.00	0.67	0.13	3.75	3.75	19.5	50%	0.67	-1,569	99.9%	24,552	22,983
209.00	0.98	0.19	2.47	2.48	12.9	50%	0.67	-1,431	98.0%	34,030	32,599

Sensitivity Analysis (10% decrease in costs, 5% decrease in labour requirements)

C-10%	Lcr	L'cr	z	t'cr	tcr	ΔLt_R	Lt_0/Lt_1	ΔL_M	%	ΔL_R	ΔL
198.00	0.93	0.18	2.63	2.63	13.7	50%	0.67	-1,695	98.6%	23,291	21,596
246.60	1.16	0.22	2.04	2.04	10.6	50%	0.67	-1,563	94.6%	31,616	30,053
327.60	1.54	0.30	1.42	1.42	7.4	46%	0.69	-1,363	81.7%	39,579	38,217

C-10%	Lcr	L'cr	z	t'cr	tcr	ΔLt_U	Lt_0/Lt_1	ΔL_M	%	ΔL_U	ΔL
84.60	0.40	0.08	6.39	6.39	33.3	50%	0.67	-1,695	100.0%	15,744	14,049
117.00	0.55	0.11	4.61	4.62	24.0	50%	0.67	-1,569	100.0%	22,226	20,657
171.00	0.80	0.15	3.09	3.10	16.1	50%	0.67	-1,432	99.6%	31,279	29,847

Source: JRC elaboration

Instructions for future updates (for developers):
- If more than 4 levels are required for the reliability, reparability and upgradability levels, the worksheet can be edited in a straightforward way in order to accommodate that.
- If changes are desired in the sensitivity analysis, the cells with the headings clored in light green should be edited in a straightforward way in oreder to change the increase/decrease from +/- 10% and +/- 5% to the desired values.

1.3 **"Impact categories" worksheet**

Novelties
- New worksheet dedicated to the impact category selection. It serves the purpose to expand/modify the impact categories in a simple way, in case new relevant impact categories (or new additional information) would be identified for future revisions.
- 16 life cycle impact categories are used as default (in line with recommendations of the EF method)
- Additional technical information related to the "Primary Energy Consumption" is also included.

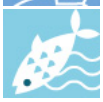
Column D - The user can easily select the list of impact categories. Only the selected categories will be visualised in "Results".
The 16 EF impact categories are considered in the Ecoreport tool. Please refer to the EF method[17] for specific information on the EF impact categories.

Table 3 illustrates the impact categories considered in the EF method and the indicators used to assess them. Overtime, the set of models has been updated to reflect the best available practices to address each impact category. The updating has been based on the discussions and agreements achieved within the working groups of the Environmental Footprint and in the UN Life Cycle Initiative[18]. An evolution of the selected LCIA models, starting from those in 2013 recommendations up to 2021, is available on the European Platform on LCA (EPLCA) website[19].

Normalisations factors and weighting are not covered in the Ecoreport tool. However, the results of the Ecoreport tool will be aligned with those of PEF studies, and therefore it would be easy to apply normalisation/weighting to the results, when considered relevant for the product in study. For further information about applying normalisation and weighting please refer to the EF method[20].

[17] https://publications.jrc.ec.europa.eu/repository/handle/JRC115959
[18] https://www.lifecycleinitiative.org. The recommendations of the UNEP Life Cycle Initiative and those in the European EF are generally aligned, but some differences may exist.
[19] https://eplca.jrc.ec.europa.eu/EFVersioning.html
[20] EF methods Recommendation, 2021 (https://environment.ec.europa.eu/publications/recommendation-use-environmental-footprint-methods_en)

Table 3: Impact categories included in PEF/OEF and details of the methods and indicators used to assess them[21]

Impact category		Impact category Indicator (unit of measure)	Description
	Climate change, total	Radiative forcing as global warming potential – GWP100 (kg CO_2 eq)	Increase in the average global temperature resulting from greenhouse gas emissions (GHG)
	Ozone depletion	Ozone Depletion Potential – ODP (kg CFC-11 eq)	Depletion of the stratospheric ozone layer protecting from hazardous ultraviolet radiation
	Human toxicity, cancer	Comparative Toxic Unit for humans (CTUh)	Impact on human health caused by absorbing substances through the air, water, and soil. Direct effects of products on humans are not measured
	Human toxicity, non-cancer	Comparative Toxic Unit for humans (CTUh)	
	Particulate matter	Impact on human health (disease incidence)	Impact on human health caused by particulate matter emissions and its precursors (e.g. sulfur and nitrogen oxides)
	Ionising radiation, human health	Human exposure efficiency relative to U-235 (kBq U-235 eq)	Impact of exposure to ionising radiations on human health
	Photochemical ozone formation, human health	Tropospheric ozone concentration increase (kg NMVOC eq)	Potential of harmful tropospheric ozone formation ("summer smog") from air emissions
	Acidification	Accumulated Exceedance – AE (mol H^+ eq)	Acidification from air, water, and soil emissions (primarily sulfur compounds) mainly due to combustion processes in electricity generation, heating, and transport
	Eutrophication, terrestrial	Accumulated Exceedance – AE (mol N eq)	Eutrophication and potential impact on ecosystems caused by nitrogen and phosphorous emissions mainly due to fertilizers, combustion, sewage systems
	Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (kg P eq)	
	Eutrophication, marine	Fraction of nutrients reaching marine end compartment (kg N eq)	
	Ecotoxicity, freshwater	Comparative Toxic Unit for ecosystems (CTUe)	Impact of toxic substances on freshwater ecosystems
	Land use	Soil quality index, representing the aggregated impact of land use on: Biotic production; Erosion resistance; Mechanical filtration; Groundwater replenishment (Dimensionless – pt)	Transformation and use of land for agriculture, roads, housing, mining or other purposes. The impact can include loss of species, organic matter, soil, filtration capacity, permeability
	Water use	Weighted user deprivation potential (m^3 world eq)	Depletion of available water depending on local water scarcity and water needs for human activities and ecosystem integrity
	Resource use, minerals and metals	Abiotic resource depletion – ADP ultimate reserves (kg Sb eq)	Depletion of non-renewable resources and deprivation for future generations

[21] JRC Report 2021, Understanding Product Environmental Footprint and Organisation Environmental Footprint methods. Available at: https://ec.europa.eu/environment/eussd/smgp/pdf/EF%20simple%20guide_v7_clen.pdf

	Resource use, fossils	Abiotic resource depletion, fossil fuels – ADP-fossil (MJ)

Source: (European Commission 2021)

Line 18 - The additional information on "Primary Energy Consumption - MJ" is included in this version of the Ecoreport tool. This inclusion was considered relevant to account for energy efficiency aspects. "Primary Energy Consumption" complements the "Resource use, fossil" by considering also the contribution of renewable resources during the manufacturing, packaging processes, use, maintenance and repair.

The additional information concerning the "Primary Energy Consumption" is estimated as follows:

1. Primary energy factors (applied to the consumption of electricity and heat, as introduced in the Ecoreport tool for the use phase, manufacturing, packaging processes, maintenance and repair) estimated according to the Energy Efficiency Directive 2018/2002.
2. For the datasets on materials (as included in the background Ecoreport tool database), the primary energy consumption is assimilated to the "Resource use, fossil" consumption.

Figure 13: List of new impact categories and additional information in the revised Ecoreport tool. Screenshot taken from the Ecoreport tool (2024)

	A	B	C	D
1		Impact categories and additional technical information	Unit of measure	Selection
2	Impact Category 1	Climate change, total	kg CO_2 eq	☑
3	Impact Category 2	Ozone depletion	kg CFC-11 eq	☑
4	Impact Category 3	Human toxicity, cancer	CTUh	☑
5	Impact Category 4	Human toxicity, non-cancer	CTUh	☑
6	Impact Category 5	Particulate matter	disease incidence	☑
7	Impact Category 6	Ionising radiation, human health	kBq U_{235} eq	☑
8	Impact Category 7	Photochemical ozone formation, human health	kg NMVOC eq	☑
9	Impact Category 8	Acidification	mol H+ eq	☑
10	Impact Category 9	Eutrophication, terrestrial	mol N eq	☑
11	Impact Category 10	Eutrophication, freshwater	kg P eq	☑
12	Impact Category 11	Eutrophication, marine	kg N eq	☑
13	Impact Category 12	Ecotoxicity, freshwater	CTUe	☑
14	Impact Category 13	Land use	pt	☑
15	Impact Category 14	Water use	m^3 water eq. of deprived water	☑
16	Impact Category 15	Resource use, minerals and metals	kg Sb eq	☑
17	Impact Category 16	Resource use, fossils	MJ	☑
18	Additional technical information	Primary energy consumption	MJ	☑
19	Additional technical information			☐
20	Additional technical information			☐
21	Additional technical information			☐

Source: JRC elaboration

Instructions for future updates (for developers):
All the 20 lines are editable for future updates. The list of impact categories will be automatically updated throughout the Ecoreport tool.

Note: Please remember that when adding new impacts categories or new additional technical information, also LCIA values in the worksheet "EF3_1 datasets" need to be correctly aligned with the updated impact categories.

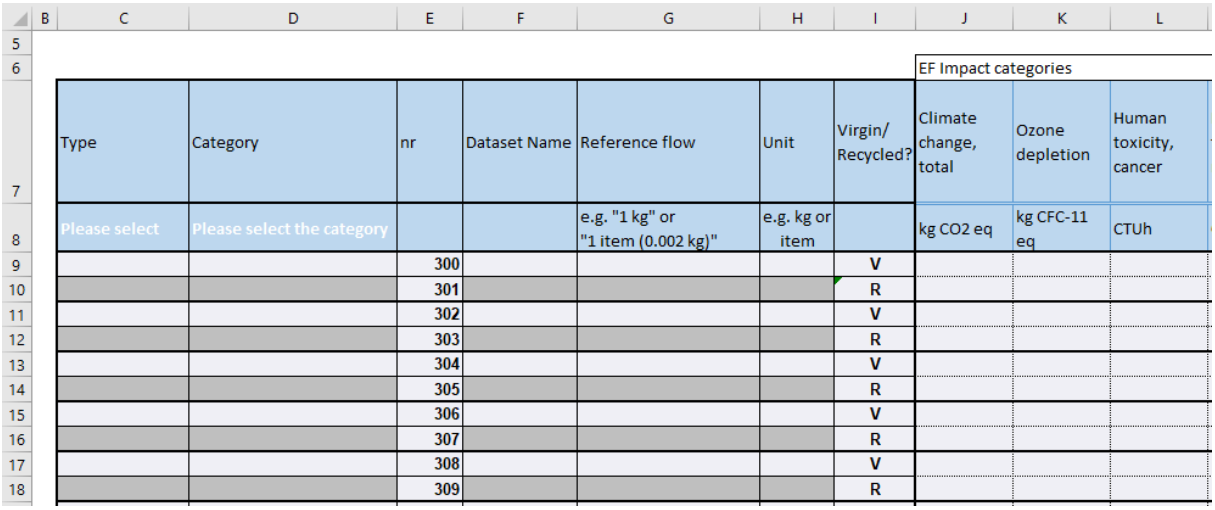
1.4 **"New datasets_user" worksheet**

Novelties
- Streamlined process to introduce new materials, energy sources and processes, and possibility to use these datasets in the different input sections of the Ecoreport tool
- For new materials and components introduced, both virgin and recycling datasets are requested

This worksheet replaces the former worksheet "Extra materials".

It has been developed for users that want to insert additional datasets currently not present in the database. All datasets included during preparatory studies shall be reported because they might be also relevant for other product groups and ensure consistency among the different product groups. These datasets will be included in future updates of the database. The additional datasets should meet the International reference Life Cycle Data System (ILCD) entry-level requirements[22]. These requirements were established to guarantee a minimum level of documentation, methodological consistency among datasets, and coherence in terms of format and nomenclature, and with useful information on data quality.
This new sheet contains a simple table allowing the user to include new datasets relevant for specific products.

Figure 14: Input box for new datasets included by the user. Screenshot taken from the Ecoreport tool (2024)



	Type	Category	nr	Dataset Name	Reference flow	Unit	Virgin/ Recycled?	EF Impact categories: Climate change, total	Ozone depletion	Human toxicity, cancer
	Please select	Please select the category			e.g. "1 kg" or "1 item (0.002 kg)"	e.g. kg or item		kg CO2 eq	kg CFC-11 eq	CTUh
9			300				V			
10			301				R			
11			302				V			
12			303				R			
13			304				V			
14			305				R			
15			306				V			
16			307				R			
17			308				V			
18			309				R			

Source: JRC elaboration

Column C – First the user shall select which type of dataset wants to include among:

- Material
- Process
- Energy
- Transport
- Boiler
- Direct emissions
- Fuels

Column D - After the selection in column C, a category has to be selected. The name and unit of measure of Column F and H – Dataset name and its reference flow and unit shall be included manually. For instance, if the user wants to include a dataset and use a different reference flow than "1 kg", please type the unit of measure and the corresponding conversion factor in kg. For example for a dataset with reference flow "1 item" weighting 0.002 kg, the user shall input in column H: "1 item (0.002 kg)". Please make sure that all the characters are inserted as in the example (also space and brackets). The unit in column H shall correspond to the unit introduced by the user in the reference flow, column G. This is particularly relevant for datasets on electronics which frequently refer to different reference flow than 1 kg such as items, m and m^2. Thanks to this information the Ecoreport tool can calculate the total mass in kilograms of materials and components entered in the BoM and reported in the "Results" worksheet (see section 1.5). When a dataset on electricity is inserted by the user, the reference flow in column G shall be "1 kWh".
For datasets on transport the only accepted unit of measurement is "kgkm" or "tkm".

The dark grey cells shall not be edited by the user. Referring to Figure 14, columns C, D, F, G and H of line 10 shall not be edited.

[22] International Reference Life Cycle Data System (ILCD) Data Network Compliance rules and entry-level requirements, V1.1: https://eplca.jrc.ec.europa.eu/uploads/ILCD-Data-Network-Compliance-Entry-level-Version1.1-Jan2012.pdf

Column J to Z - The Life Cycle Impact Assessment values per each Impact category shall be entered. According to the selection in column C, it can happen:

- **"Material"** is selected: the user shall enter the full list of impacts values[23] in the two lines, one for the primary material/component "V" and the corresponding values of recycled material/recycling component "R" (to be included only if recycling is technically feasible at the state of the art). The CFF parameters are set by default as R1=n.a. R2=n.a. and A=0.5. The user shall enter the values in the boxes dedicated to the CFF parameters in the "Input" spreadsheets when selecting the dataset (see instructions in section 1.1.1).
- In the other cases: The second line will be coloured grey and the user shall enter the impact values only for the first line.

Some considerations when entering the impact values:

- Additional information "Primary energy consumption" (Column 7):
  - For datasets of energy produced from renewables, use primary energy factor = 1, e.g. for 1kWh (i.e. 3.6 MJ) of electricity produced by photovoltaics the primary energy consumption to be entered in the table is 3.6 MJ.
  - For all the other datasets such as materials, components, transport and processes the user has to enter the same value for the EF impact category "Resource use, fossil".
- If impact values of recycling are not available it is suggested to:
  - Use the impact values of a dataset in the Ecoreport tool database with similar characteristics (e.g. using recycling of polypropylene in place of recycling of a polyolefin).
  - Estimate the impacts as a percentage of the primary production to apply to each impact value (to be duly reported and justified).
  - Estimate the impacts according to a more precise ad hoc assessment or sensitivity analysis (to be duly reported and justified)

Other situations can occur:

1. For **"Material"** the user could:
   a. include/substitute a dataset on recycling or recycled material but keep the corresponding dataset on virgin material as it is in the Ecoreport tool database. In this case, the user shall select in column C "Material" and fill in all the requested fields. Then, copy and paste in line "V" the same impact indicators of the dataset as in the "Ecoreport tool_database" worksheet. Then, include the new impact values in line "R".
   b. include/substitute a new dataset on virgin material but keep the corresponding dataset on recycling as it is in the Ecoreport tool database. The user shall select in column C "Material", fill in all the requested fields and the impact values. For the corresponding recycling dataset, it is sufficient to copy and paste the impact values from the "Ecoreport tool_database".

2. Include **"D**irect emissions**"** occurring during manufacturing and use phase:

Select "Direct emissions" In column C and fill in all the other fields. When entering the impact values, it is important that direct emissions are duly characterised by using the factors as provided by the EF method[24].

This procedure may request a user experienced in calculating life cycle impacts. It is recommended that such modified of the Ecoreport tool are duly reported and justified. Example: user may want to account for the emission of a certain pollutant released in air during the manufacturing, as not captured by any other material, energy or processes in the model. In this case, the user needs to insert this pollutant as a new dataset on "direct emissions", following the procedure above. The impacts of this emission have to be separately assessed by the user by multiplying the amount released by the correct characterisation factors (for each impact category which the emission is contributing to) and enter the value with the correct unit of measure. The unit of measure is reported in line 8 below each impact categories or retrievable from the EF method. For this procedure, the user could also retrieve the information about the impacts of the pollutant as reported by other LCA software available (as characterised according to the EF methods).

[23] Same list as in the "impact categories" sheet.
[24] https://publications.jrc.ec.europa.eu/repository/handle/JRC115959

3. Include a dataset on **"**Refrigerants**"**.

The user shall follow the general instructions for entering a dataset "Material" and category "04-Others" and include the LCIA values both for "V" and "R" lines.

To each dataset on refrigerants is associated a GWP value to consider the impacts of fugitive emissions during product life. To include this value, the user shall open the worksheet "List" and paste the exact name in the cell G956 (or in the first empty cell after the list of refrigerants) and enter the GWP value (kg CO2eq/kg) in cell I956.

The LCIA values of both datasets "V" and "R" will be used to calculate the impacts of the refrigerants as included in the BoM by using the CFF, while the GWP to consider the impact on climate change because of fugitive emissions.

No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.5 **"Results" worksheet**

Novelties
- Update of all impact categories
- Addition of "Energy consumption", both electricity and thermal energy consumed in each stage.

The Results worksheet immediately reflects the changes in the Input worksheet. All the cells reporting the numerical results are linked to the "Calculations" and "input" worksheets. The first table (B8:M45) indicates the environmental impacts per product over its life-cycle, subdivided in raw materials (bill of materials), manufacturing, distribution, packaging, use, maintenance and repair and end-of-life. End-of-life is further split between impacts and credits calculated according to the CFF. Along with the materials consumption, "Energy consumption" have been added (lines 19 and 20 of the worksheet). Both electricity and thermal energy consumption reflects the values entered by the user in the "inputs" worksheet.

A part from the impacts from energy (electricity and thermal) consumption, distribution and manufacturing processes, the impacts and credits due to end-of-life of materials are calculated as following:

- IMPACTS associated to recycling processes of materials and components at the EoL:

$$(\mathbf{1}-\boldsymbol{A})\boldsymbol{R_2}\times\boldsymbol{E_{recycled}}$$

Equation 1

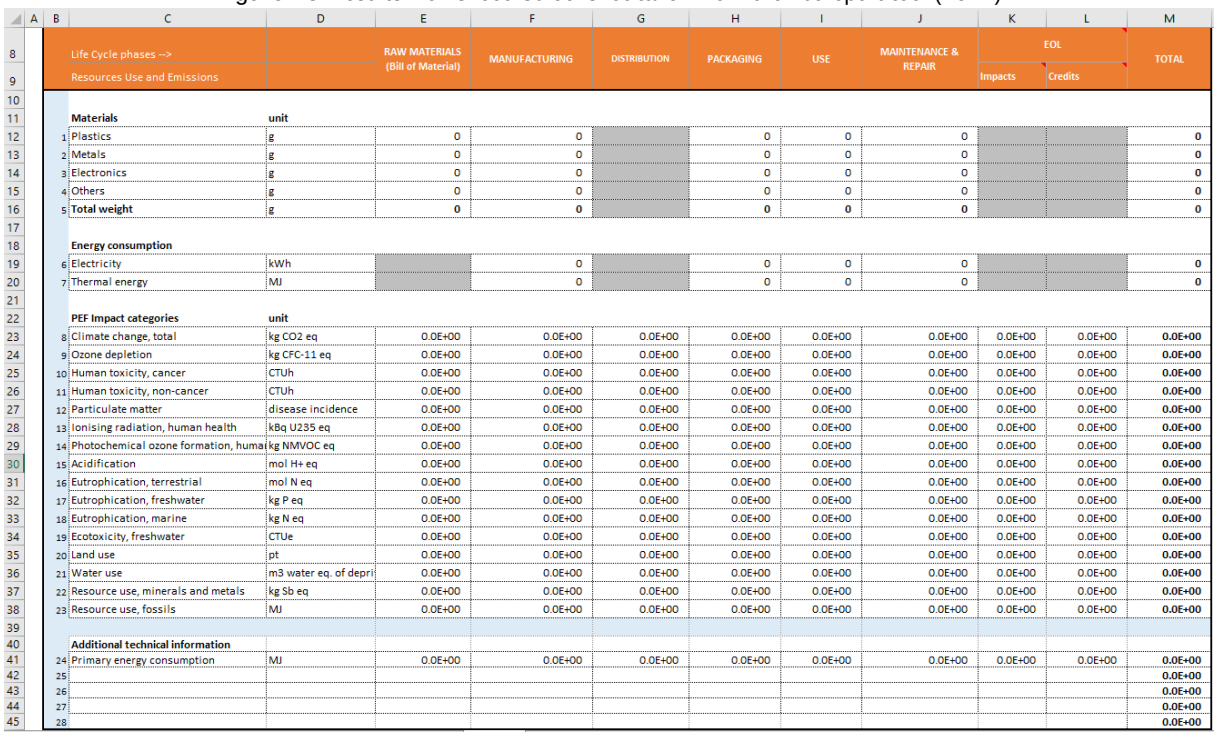
- CREDITS from avoided primary materials:

$$-(\mathbf{1}-\boldsymbol{A})\boldsymbol{R_2}\times\boldsymbol{E_V}^*$$

Equation 2

Please refer to chapter 1.6 for further information on the implementation of the CFF within the Ecoreport tool.

Figure 15: Results worksheet. Screenshot taken from the Ecoreport tool (2024)



	Life Cycle phases -->		RAW MATERIALS (Bill of Material)	MANUFACTURING	DISTRIBUTION	PACKAGING	USE	MAINTENANCE & REPAIR	EOL		TOTAL
	Resources Use and Emissions								Impacts	Credits	
	Materials	**unit**									
1	Plastics	g	0	0		0	0	0			0
2	Metals	g	0	0		0	0	0			0
3	Electronics	g	0	0		0	0	0			0
4	Others	g	0	0		0	0	0			0
5	**Total weight**	g	**0**	**0**		**0**	**0**	**0**			0
	Energy consumption										
6	Electricity	kWh		0		0	0	0			0
7	Thermal energy	MJ		0		0	0	0			0
	PEF Impact categories	**unit**									
8	Climate change, total	kg CO2 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
9	Ozone depletion	kg CFC-11 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
10	Human toxicity, cancer	CTUh	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
11	Human toxicity, non-cancer	CTUh	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
12	Particulate matter	disease incidence	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
13	Ionising radiation, human health	kBq U235 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
14	Photochemical ozone formation, huma	kg NMVOC eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
15	Acidification	mol H+ eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
16	Eutrophication, terrestrial	mol N eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
17	Eutrophication, freshwater	kg P eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
18	Eutrophication, marine	kg N eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
19	Ecotoxicity, freshwater	CTUe	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
20	Land use	pt	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
21	Water use	m3 water eq. of depri	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
22	Resource use, minerals and metals	kg Sb eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
23	Resource use, fossils	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
	Additional technical information										
24	Primary energy consumption	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
25											**0.0E+00**
26											**0.0E+00**
27											**0.0E+00**
28											**0.0E+00**

Source: JRC elaboration

The second table (B49:M89) shows the results of the life cycle impacts per product per year of use. Figures of the first table are divided by the product lifetime.

From the first table in Results (B8:M45) and the inputs for LCC and EU Totals (worksheet "Inputs" line 357), the third table (B99:M136) shows the total environmental impact of all products sold in the most recent years which can be calculated over the coming years (up till and including the end-of-life). This table has the same structure as Figure 15 above and results are expressed by life cycle phase. The results of the first table are multiplied by the EU sales (in mln. units).

The following tables refer to the Total impact of the stock of products (Table 12), the summary of environmental impacts (Table 13), Life Cycle Costs (Table 14) and the inclusion of Societal Life Cycle Costas (Table 15).

Figure 16: Total Impact of Stock of Products. Screenshot taken from the Ecoreport tool (2024)

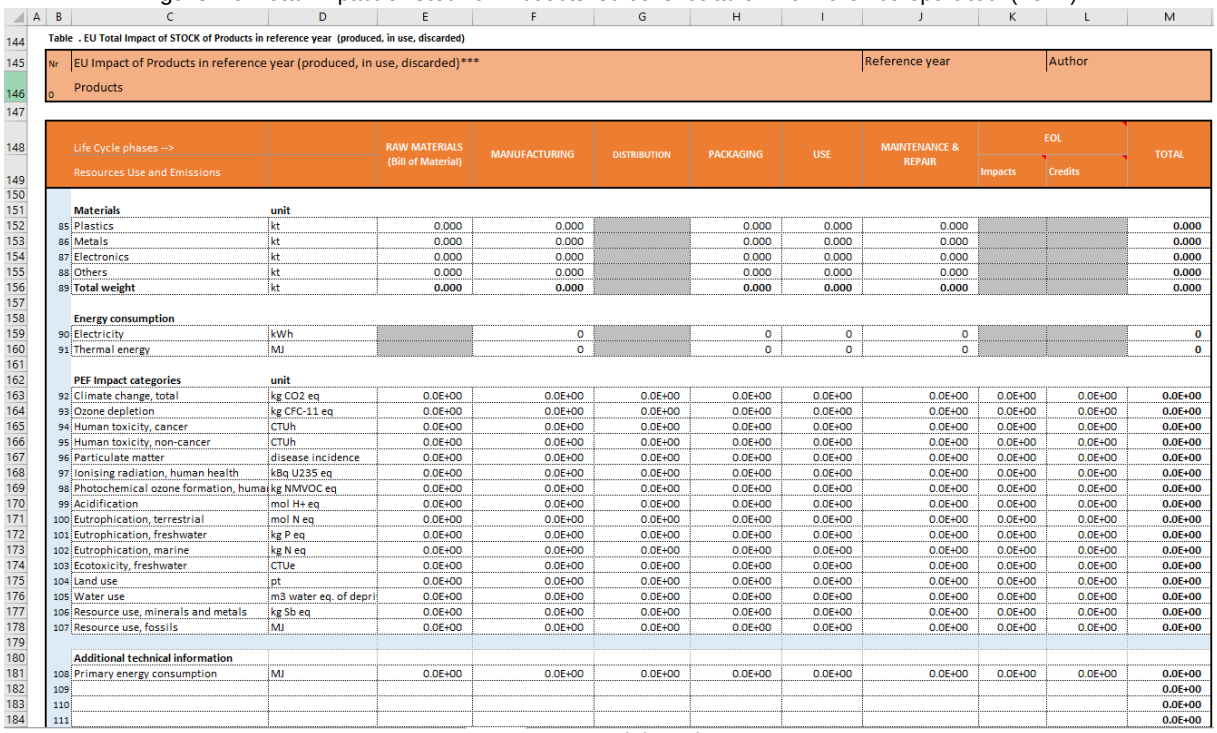


Table . EU Total Impact of STOCK of Products in reference year (produced, in use, discarded)

Nr	EU Impact of Products in reference year (produced, in use, discarded)***	Reference year	Author
0	Products		

	Life Cycle phases --> / Resources Use and Emissions		RAW MATERIALS (Bill of Material)	MANUFACTURING	DISTRIBUTION	PACKAGING	USE	MAINTENANCE & REPAIR	EOL		TOTAL
									Impacts	Credits	
	Materials	**unit**									
85	Plastics	kt	0.000	0.000		0.000	0.000	0.000			**0.000**
86	Metals	kt	0.000	0.000		0.000	0.000	0.000			**0.000**
87	Electronics	kt	0.000	0.000		0.000	0.000	0.000			**0.000**
88	Others	kt	0.000	0.000		0.000	0.000	0.000			**0.000**
89	**Total weight**	kt	**0.000**	**0.000**		**0.000**	**0.000**	**0.000**			**0.000**
	Energy consumption										
90	Electricity	kWh		0		0	0	0			0
91	Thermal energy	MJ		0		0	0	0			0
	PEF Impact categories	**unit**									
92	Climate change, total	kg CO2 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
93	Ozone depletion	kg CFC-11 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
94	Human toxicity, cancer	CTUh	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
95	Human toxicity, non-cancer	CTUh	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
96	Particulate matter	disease incidence	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
97	Ionising radiation, human health	kBq U235 eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
98	Photochemical ozone formation, huma	kg NMVOC eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
99	Acidification	mol H+ eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
100	Eutrophication, terrestrial	mol N eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
101	Eutrophication, freshwater	kg P eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
102	Eutrophication, marine	kg N eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
103	Ecotoxicity, freshwater	CTUe	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
104	Land use	pt	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
105	Water use	m3 water eq. of depri	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
106	Resource use, minerals and metals	kg Sb eq	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
107	Resource use, fossils	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
	Additional technical information										
108	Primary energy consumption	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	**0.0E+00**
109											**0.0E+00**
110											**0.0E+00**
111											**0.0E+00**

Source: JRC elaboration

Figure 17: Summary of environmental impacts. Screenshot taken from the Ecoreport tool (2024)

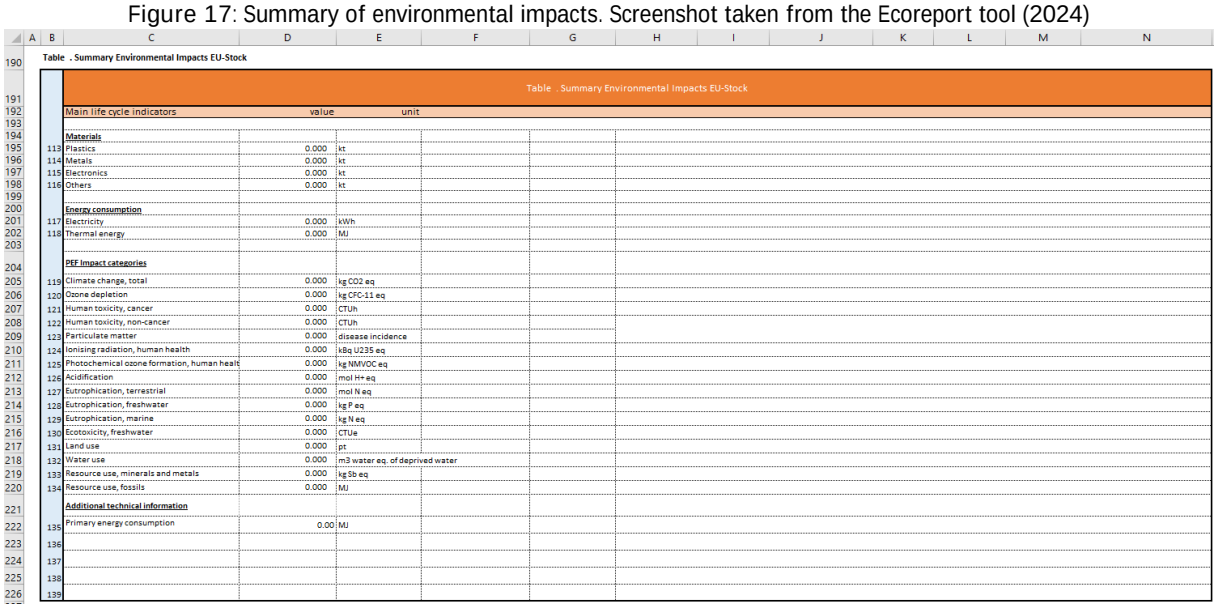


Table . Summary Environmental Impacts EU-Stock

	Table . Summary Environmental Impacts EU-Stock		
	Main life cycle indicators	value	unit
	Materials		
113	Plastics	0.000	kt
114	Metals	0.000	kt
115	Electronics	0.000	kt
116	Others	0.000	kt
	Energy consumption		
117	Electricity	0.000	kWh
118	Thermal energy	0.000	MJ
	PEF Impact categories		
119	Climate change, total	0.000	kg CO2 eq
120	Ozone depletion	0.000	kg CFC-11 eq
121	Human toxicity, cancer	0.000	CTUh
122	Human toxicity, non-cancer	0.000	CTUh
123	Particulate matter	0.000	disease incidence
124	Ionising radiation, human health	0.000	kBq U235 eq
125	Photochemical ozone formation, human healt	0.000	kg NMVOC eq
126	Acidification	0.000	mol H+ eq
127	Eutrophication, terrestrial	0.000	mol N eq
128	Eutrophication, freshwater	0.000	kg P eq
129	Eutrophication, marine	0.000	kg N eq
130	Ecotoxicity, freshwater	0.000	CTUe
131	Land use	0.000	pt
132	Water use	0.000	m3 water eq. of deprived water
133	Resource use, minerals and metals	0.000	kg Sb eq
134	Resource use, fossils	0.000	MJ
	Additional technical information		
135	Primary energy consumption	0.00	MJ

Source: JRC elaboration

Figure 18: Life Cycle costs. Screenshot taken from the Ecoreport tool (2024)

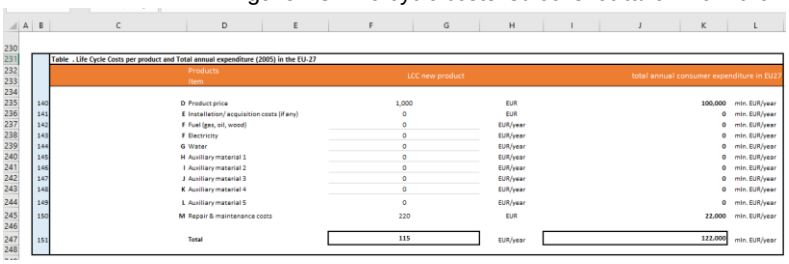


Table . Life Cycle Costs per product and Total annual expenditure (2005) in the EU-27

Item	LCC new product		total annual consumer expenditure in EU27	
D Product price	1,000	EUR	100,000	mln. EUR/year
E Installation/ acquisition costs (if any)	0	EUR	0	mln. EUR/year
F Fuel (gas, oil, wood)	0	EUR/year	0	mln. EUR/year
F Electricity	0	EUR/year	0	mln. EUR/year
G Water	0	EUR/year	0	mln. EUR/year
H Auxiliary material 1	0	EUR/year	0	mln. EUR/year
I Auxiliary material 2	0	EUR/year	0	mln. EUR/year
J Auxiliary material 3	0	EUR/year	0	mln. EUR/year
K Auxiliary material 4	0	EUR/year	0	mln. EUR/year
L Auxiliary material 5	0	EUR/year	0	mln. EUR/year
M Repair & maintenance costs	220	EUR	22,000	mln. EUR/year
Total	115	EUR/year	122,000	mln. EUR/year

Source: JRC elaboration

Figure 19 Inclusion of Societal Life Cycle costs. Screenshot taken from the Ecoreport tool (2024)

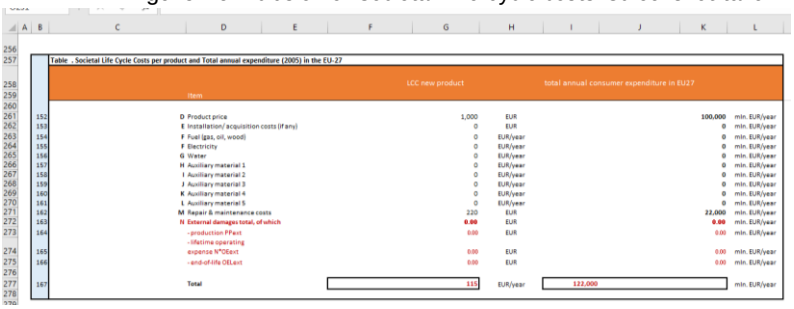


Table . Societal Life Cycle Costs per product and Total annual expenditure (2005) in the EU-27

Item	LCC new product		total annual consumer expenditure in EU27	
D Product price	1,000	EUR	100,000	mln. EUR/year
E Installation/ acquisition costs (if any)	0	EUR	0	mln. EUR/year
F Fuel (gas, oil, wood)	0	EUR/year	0	mln. EUR/year
F Electricity	0	EUR/year	0	mln. EUR/year
G Water	0	EUR/year	0	mln. EUR/year
H Auxiliary material 1	0	EUR/year	0	mln. EUR/year
I Auxiliary material 2	0	EUR/year	0	mln. EUR/year
J Auxiliary material 3	0	EUR/year	0	mln. EUR/year
K Auxiliary material 4	0	EUR/year	0	mln. EUR/year
L Auxiliary material 5	0	EUR/year	0	mln. EUR/year
M Repair & maintenance costs	220	EUR	22,000	mln. EUR/year
N External damages total, of which	0.00	EUR	0.00	mln. EUR/year
-production PPext	0.00	EUR	0.00	mln. EUR/year
-lifetime operating expenses NPOExt	0.00	EUR	0.00	mln. EUR/year
-end-of-life OELext	0.00	EUR	0.00	mln. EUR/year
Total	115	EUR/year	122,000	mln. EUR/year

Source: JRC elaboration

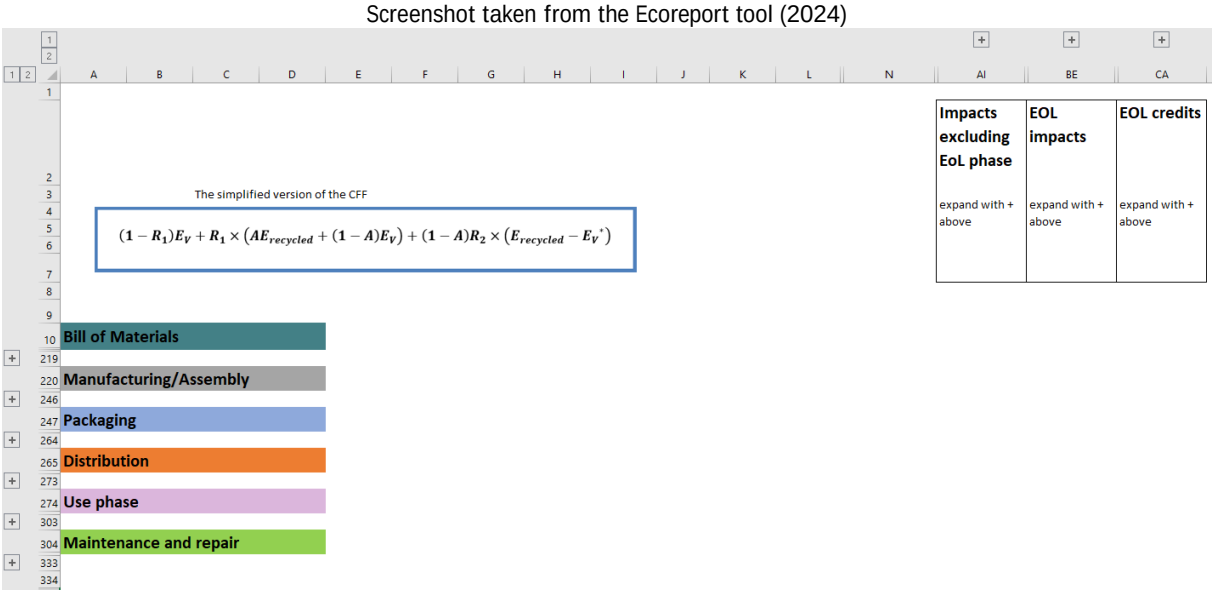
No changes are expected for these lines in potential future updates of the Ecoreport tool.

1.6 **“Calculations” worksheet**

Novelties
- The EoL modelling has been updated according to the EF method by using a simplified version of the Circular Footprint Formula (CFF)
- This worksheet contains the results per single input item that can be used for more specific analysis.

All the calculations performed in the Ecoreport tool are implemented in this worksheet. The cells are locked and protected. Not editable by the user.
When opening the worksheet, all the tables are grouped. To expand the content it is sufficient to click on the various “+” that are used to group both lines and columns to make easier the navigation through the sheet.

Figure 20: Calculations worksheet. Grouped lines and columns to be expanded to visualise the calculation tables. Screenshot taken from the Ecoreport tool (2024)



Source: JRC elaboration

The coloured cells listed on the left-hand side of the table report the data entered in the input boxes in "Inputs" (please see section 1.1). To ungroup the lines contained the information entered in input, the user shall click + for:

- Bill of Materials (line 219)
- Manufacturing/Assembly (line 248)
- Packaging (line 268)
- Distribution (line 277)
- Use phase (line 307)
- Maintenance and repair (line 339)

It is also possible to find, at the bottom of each table, resource consumption grouped by categories (i.e. plastics, metals, electronics and others).

Next to the inputs there are the three tables reporting the results per impact category. To see these tables please ungroup them by using the "+" button on columns AI, BE and CA.
The impacts for materials and components used throughout the life cycle of the product are calculated with a simplified version of the CFF.
A simplified version of the CFF is implemented to keep the EoL modelling ease and lean. Among the adopted simplifications, the contribution to the CFF related to the "energy recovery" and disposal in landfill is not implemented in the Ecoreport tool, to simplify the modelling, and also considering their minor contribution to the life cycle impact of Energy related Products.

The simplified version of the CFF (material part only)[25]:

$$(1-R_1)E_V + R_1 \times (AE_{recycled} + (1-A)E_V) + (1-A)R_2 \times (E_{recycled} - E_V^*)$$

Equation 3

R1 (recycled content): it is the proportion of material in the input to the production that has been recycled from a previous system

[25] The definitions of the simplified CFF presented in this section have been adapted from the EF method to suit the specific context of this application.

R2 (recycling output rate): it is the proportion of the material in the product that will be recycled (or a component to be reused) in a subsequent system. R2 shall therefore consider the inefficiencies in the collection and recycling processes. R2 shall be measured at the output of the recycling plant.[26]
A (allocation factor) [27]: allocation factor of burdens and credits between supplier and user of recycled materials
Ev: specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin material.
Ev*: specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin material assumed to be substituted by recyclable materials. It will be set by default equal to Ev.
$E_{recycled}$: specific emissions and resources consumed (per functional unit) arising from the recycling process of the recycled material (or reused component), including collection, sorting and transportation process.

For multi-material components such as electronics (e.g. populated printed wiring board) Ev* is calculated considering the fraction of copper and precious metals (i.e. gold, palladium, platinum and silver) obtained from the recycling of electronic components. Ev* represents the avoided impact of producing primary copper and precious metals from electronic scraps. This fraction of copper and precious metals (material credit - k) is retrieved from the EF datasets of EoL of electronics. Material credit values are stored in the "CFF parameters – Annex C, see section 0). Ev* is calculated as the material credit of copper and precious metals multiplied by the impact values of the primary production of copper and precious metals Ev. $Ev^*_{electronics}$ is automatically calculated for each dataset in the Ecoreport tool.

$$E^*_{v_{electronics}} = \sum_{m=Cu,Ag,Au,Pd,Pt} k_m * E_{v_m}$$

Equation 4

The calculations of the impacts are split in this worksheet in three components:

1. Impacts of life cycle stages (ungroup the table in column AI) considering:

    a. Impacts related to materials and components used throughout the life cycle of the product, including impacts of recycled materials accounted via the CFF:

$$(\mathbf{1} - \boldsymbol{R_1})\boldsymbol{E_V} + \boldsymbol{R_1} \times (\boldsymbol{AE_{recycled}} + (\mathbf{1} - \boldsymbol{A})\boldsymbol{E_V})$$

Equation 5

    b. Impacts of manufacturing processes, distribution, energy and water consumption, fugitive emissions of refrigerants and direct emissions

2. EoL Impacts associated to recycling processes of materials and components (ungroup the table in column BE):

$$(\mathbf{1} - \boldsymbol{A})\boldsymbol{R_2} \times \boldsymbol{E_{recycled}}$$

Equation 6

3. EoL Credits obtained for avoided primary materials (ungroup the table in column CA):

$$-(\mathbf{1} - \boldsymbol{A})\boldsymbol{R_2} \times \boldsymbol{E_V}^*$$

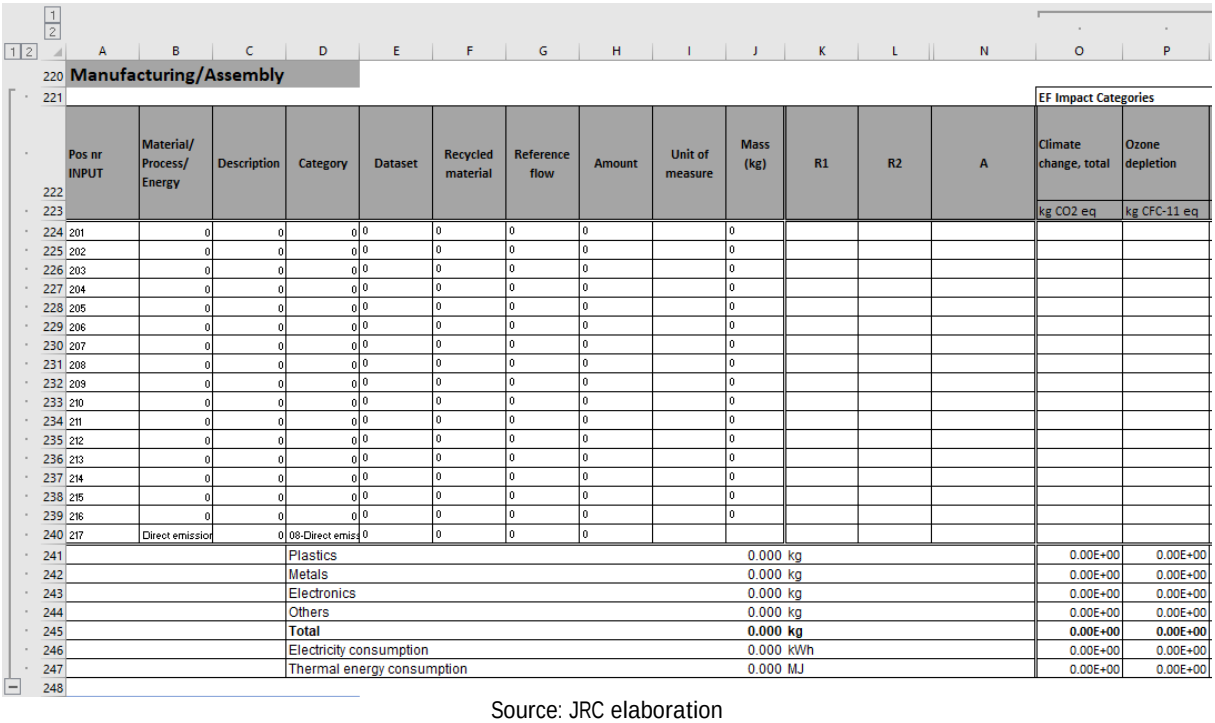
Equation 7

When calculating the results for the point 2 "EoL Impacts associated to recycling processes of materials and components" a conversion of the LCIA results for EoL of electronics $E_{recycled}$ is needed because referring to a different reference flow (1 kg of electronic scrap) than the corresponding primary production Ev (e.g. 1 item).

[26] For this analysis, reuse of a product as a whole is not addressed in the R2 parameter. Reuse of a product shall be considered when assessing the lifetime of the product (see Chapter 2 of this document).
[27] The "A" factor in the CFF allows to allocate impacts and/or benefits between the use of recycled materials as input (i.e. recycled content) and recycling at the end-of-life (i.e. recycling output rate).

The conversion factors are retrieved from the EF3.1 datasets and stored in the "Ecoreport tool_database" worksheet column K.

Figure 21: expanded Manufacturing/Assembly table. Screenshot taken from the Ecoreport tool (2024)



	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P
220	**Manufacturing/Assembly**														
221														EF Impact Categories	
222	Pos nr INPUT	Material/ Process/ Energy	Description	Category	Dataset	Recycled material	Reference flow	Amount	Unit of measure	Mass (kg)	R1	R2	A	Climate change, total	Ozone depletion
223														kg CO2 eq	kg CFC-11 eq
224	201	0	0	0	0	0	0	0		0					
225	202	0	0	0	0	0	0	0		0					
226	203	0	0	0	0	0	0	0		0					
227	204	0	0	0	0	0	0	0		0					
228	205	0	0	0	0	0	0	0		0					
229	206	0	0	0	0	0	0	0		0					
230	207	0	0	0	0	0	0	0		0					
231	208	0	0	0	0	0	0	0		0					
232	209	0	0	0	0	0	0	0		0					
233	210	0	0	0	0	0	0	0		0					
234	211	0	0	0	0	0	0	0		0					
235	212	0	0	0	0	0	0	0		0					
236	213	0	0	0	0	0	0	0		0					
237	214	0	0	0	0	0	0	0		0					
238	215	0	0	0	0	0	0	0		0					
239	216	0	0	0	0	0	0	0		0					
240	217	Direct emissior	0	08-Direct emiss	0	0	0	0							
241				Plastics						0.000	kg			0.00E+00	0.00E+00
242				Metals						0.000	kg			0.00E+00	0.00E+00
243				Electronics						0.000	kg			0.00E+00	0.00E+00
244				Others						0.000	kg			0.00E+00	0.00E+00
245				**Total**						**0.000**	**kg**			**0.00E+00**	**0.00E+00**
246				Electricity consumption						0.000	kWh			0.00E+00	0.00E+00
247				Thermal energy consumption						0.000	MJ			0.00E+00	0.00E+00
248															

Source: JRC elaboration

No changes are expected for these lines in potential future updates of the Ecoreport tool in case the CFF is used to calculate the impacts.

1.7 "Ecoreport tool_database" worksheet

Novelties
- Updated and expanded list of datasets
- Updated list of impact categories aligned to the EF method.
- Virgin and correspondent datasets on recycling are provided for materials and components. This is valid both for EF datasets and new datasets included by the user (see chapter 1.4)
- Automatic listing of datasets by categories, i.e. plastics, metals, etc.

This worksheet is used just to consult the database, both datasets from the EF database (section 0) and those introduced by the user (section 1.4). Not editable by the user. The datasets selected for the Ecoreport tool are chosen among the most representative for the "average" EU context. In case of materials/components mainly produced in third countries, a global average is generally selected. The location for each dataset is reported in table A.1 in the Annex I. The user can include new datasets (for other locations) in the tool following the instructions as reported in section 1.4
The worksheet is locked and protected as some cells contain formulas to automatically sort the list of datasets. This is the source from which both "Inputs" and "Calculations" worksheets withdraw data and information.

No changes are expected for these lines in potential future updates of the Ecoreport tool. Future updates of EF datasets will be implemented in the spreadsheet "EF3_1 datasets" see section 0.

1.8 CRMs worksheet

Novelties
- Sequential screening of critical raw materials (CRMs) contained in the product under scrutiny. Based on numerical results of the 2023 Criticality Assessment (potentially updated within future 3-yearly criticality assessment reviews)
- Shortlist of 68 combinations of CRMs and the corresponding applications relevant for Energy related Products

The user shall consult this worksheet to perform the sequential screening approach as described in Annex II of the review of MEErP report 2024. The user does not have to enter any data in this worksheet.
In this worksheet are reported two tables with relevant information of critical raw materials based on the results of the 2023 Criticality Assessment[28].
From line 2 to line 90 – The table shows some of the information provided by the EC criticality assessments, and in particular, the main uses of CRMs and their End-of-Life Recycling Input rate – EoL-RIR[29] (not exhaustive list of applications) (please see Table A3.1 in Annex 3).
Column B – The user can click on the names of the CRMs to be directed to the relevant chapter of the 2023 Factsheets on critical raw materials[30] to get more information about the material.
From line 94 – The second table shows 68 combinations of CRMs and the corresponding applications relevant for Energy related Products (please find the table A3.2 in Annex3). This table is filtered and it is the result of a short-listing exercise (please see the box below on instructions for future updates). The short-listing exercise should be re-run for each preparatory study, considering specific elements, components and/or expertise related to the product group. To do that, please deactivate the filter in cell J95.

Approach: It is suggested to always start from the results of the latest criticality assessment and use them for an initial screening, also considering specific aspects and expertise related to the product group under scrutiny.

Step 1: shortlist the CRMs that are potentially in the product group under investigation, using the two tables in the worksheet and any other additional information related to the product group;

Step 2: when possible, collect quantitative data on the BoM of the shortlisted CRMs;

Step 3: look at information available in provided tables (on Substitution, RR, RIR, etc.) to define a possible strategy. Possible strategies could include:

- Declare quantity when data is not available or of low quality, and/or
- Extend lifetime, especially in the case of low substitutability, and/or
- Improve recyclability and/or use recycled materials, especially in the case of low substitutability;

Some general rules / checklist to be considered in deriving requirements:

- When RR and EOL-RIR are low it might be that information is not available and it could be relevant to declare quantity
- If RR is low, then check if recycling technology is available or if the product group is an exception (data on recycling is usually an average across all product groups)
- If RR is high, but EoL-RIR is low, demand is probably growing, so it is unlikely that recycled materials can be available in adequate quantities. So, rather than recommending higher recycled content, a more adequate measure could then be an extension of lifetime.

Instructions for future updates (for developers):

[28] https://op.europa.eu/en/publication-detail/-/publication/57318397-fdd4-11ed-a05c-01aa75ed71a1

[29] End of life recycling input rate (EOL-RIR) is 'the input of secondary material to the EU from old scrap to the total input of material (primary and secondary)'. In the EC criticality assessments recycling rates and EOL-RIR refer only to functional recycling. https://op.europa.eu/en/publication-detail/-/publication/860168b9-78c1-11e7-b2f2-01aa75ed71a1 . EoL-RIR considers the contribution of recycled materials from end of life products to raw materials demand (in the same sector with the same functions). R2 differs from EoL-RIR because it considers the output rate after recycling and not if the material will contribute to the raw materials demand.

[30] https://scrreen.eu/crms-2023/

- Update according to future 3-yearly criticality assessment reviews:

Consider only the critical raw materials as identified in future lists.
1) The initial criterion is to filter by NACE-2 sectors and screen out sectors (and the corresponding applications) of low interest for MEErP (e.g. phosphates used as animal feed, or all CRMs used in sector "C19 - Manufacture of coke and refined petroleum products").
2) The second criterion consists in identifying materials which are predominantly used in a single application (high share), which is particularly helpful to identify "high concentrations" of CRMs (e.g. 60% of indium is used in flat panel displays)
3) Information about recycling, i.e. EoL-Recycling input Rate (EoL-RIR) and End of Life Recycling Rate (EoL-RR), can suggest mitigation strategies, e.g. recycle more, or extend life. Therefore, attention was focused on CRMs uses for which a big gap between EoL-RIR and EoL-RR was detected

It is worth of noticing that the EOL-RIR and EOL-RR are average values across all the applications. It is envisaged that future preparatory studies could try to get more precise data for the application under scrutiny

1.9 Background worksheets for developers

"EF3_1 + User's datasets" worksheet

Novelties
- New worksheet included to list together Environmental Footprint and user's datasets

This worksheet is used to combine the datasets from the "EF3_1 datasets" and ""New datasets_user" worksheets. The cells are locked and protected. Not editable by the user.

No changes are expected for these lines in potential future updates of the Ecoreport tool.

"EF3_1 datasets" worksheet

Novelties
- New worksheet to introduce datasets from the EF database.
- Updated and expanded list of datasets
- Updated list of impact categories aligned to the EF method and "Primary energy consumption" as an additional technical information.
- Virgin and correspondent datasets on recycling are provided for materials and components.

This worksheet is used to enter EF datasets for future updates. Not editable by the user. In Annex 1 there is the complete list of EF datasets included in the Ecoreport tool.

Instructions for future updates (for developers):

- Update of the Ecoreport tool database:

1) Check if the PEF impact categories of the new EF package to be used for the update are the same and correspond to the names listed in the worksheet "Impact categories" (see chapter 1.3);
2) Associate to all the datasets the corresponding category (e.g. 01-Plastics, 02-Metals) by typing category names in column F. You can find the list of categories in the worksheet "Lists", column I.
3) Import the LCIA values of the latest available EF datasets by copying and pasting in the worksheet.

- Update of the additional information "Primary Energy Consumption":

1) Primary energy factors (applied to the consumption of electricity and heat, as introduced in the Ecoreport tool for the use phase, manufacturing, packaging, maintenance and repair) estimated according to the Energy Efficiency Directive 2018/2002 for datasets on thermal energy and electricity from renewable sources and electricity mix.

2) For the datasets on materials (as included in the background Ecoreport tool database), the primary energy consumption would be assimilated to the "Resource use, fossil" consumption.

"CFF parameters - Annex C" worksheet

Novelties
- New worksheet to store the parameters to calculate the Circular Footprint Formula

This worksheet stores the relevant information and values to be used in the application of the Circular Footprint Formula as reported in the documentation for EF studies[31].
For materials not recycled, R1 and R2 are set equal to 0.
Regarding the datasets on materials and components included by the user, the Ecoreport tool will automatically set R1="n.a.", R2="n.a." and A=0.5. The user shall introduce the CFF parameters in the "input" spreadsheet when including the dataset as an input (see section 1.1.1).

Instructions for future updates (for developers):
Update of the CFF parameters for EF datasets:
The table in the worksheet is automatically linked with the datasets included in the Ecoreport tool database. It is important to update the list of datasets in the "EF3_1 datasets" worksheet first and then the CFF parameters in this worksheet. To update the parameters is sufficient to enter the values of A, R1 and R2 in the columns G H and I respectively.
CFF parameters for datasets included by the users are provided by default as (A=0.5, R1=n.a., R2=n.a.). The user shall insert the CFF parameters values for these datasets in the worksheet "Inputs" within the dedicated CFF box.

"Lists" worksheet

Novelties
- Mapping between virgin and recycling datasets of the same material/component (also for datasets included by the user).

All the information gathered in this worksheet are used to create all the drop-down menus in the Ecoreport tool. In principle this worksheet has not to be modified; only for future updates of the underlying database (please see the box below).

In the case that a refrigerant is introduced in the worksheet "New dataset_user" (see instruction in section 1.4), then it is necessary to include also the Global Warming Potential (GWP) value to account for the fugitive emissions of refrigerants during the use phase (in accordance with what is already implemented in the previous version of the Ecoreport tool). In practice, after the new dataset on refrigerant is included in the worksheet "New datasets_user", the user shall add the name of the new dataset in the worksheet "Lists" cell G956 (or the first empty cell after the list of refrigerants) and type the GWP value (kg CO2eq/kg) in cell I956. The GWP values for refrigerants can be retrieved from the EF characterisation factors[32]. When GWP is not available, the input value must be duly justified and referenced. After this operation, the new dataset will appear in the list of refrigerants to be selected in the worksheet "Inputs" in cell F298 and the impact of fugitive emissions can be calculated.

[31] Available at: http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml
[32] Please find the list of EF characterisation factors in the excel file "EF-LCIAMethod_CF(EF-v3.1)", worksheet "lciamethods_CF" within the following .zip file, available at: https://eplca.jrc.ec.europa.eu/permalink/EF3_1/EF-v3.1.zip

Figure 22: "Lists" worksheet. How to include GWP for fugitive emissions of refrigerants (fictitious values). Screenshot taken from the Ecoreport tool (2024)

	C	D	E	F	G	H	I
946							GWP-100 (kg CO2 eq/kg)
947	Material	Refrigerants	212-Ammonia, as 100% NH3 production tec	212	Ammonia, as 100% NH3		0
948	Material	Refrigerants	214-carbon dioxide, liquid production techno	214	carbon dioxide, liquid pr		1
949	Material	Refrigerants	229-Refrigerants technology mix consumpti	229	Refrigerants technology		1430
950	Material	Refrigerants	233-tetrafluoroethane production technolog	233	tetrafluoroethane produ		1430
951	Material	Refrigerants	224-Refrigerant R290; propane	224	Refrigerant R290; propar		3
952	Material	Refrigerants	225-Refrigerant R404a; HFC blend	225	Refrigerant R404a; HFC b		3920
953	Material	Refrigerants	226-Refrigerant R407c; HFC blend	226	Refrigerant R407c; HFC b		1770
954	Material	Refrigerants	227-Refrigerant R410a; HFC blend	227	Refrigerant R410a; HFC b		2090
955	Material	Refrigerants	228-Refrigerant R600a; iso-butane	228	Refrigerant R600a; iso-b		3

Source: JRC elaboration

Instructions for future updates (for developers):

- Update of the EF datasets in the worksheet "EF3_1 datasets":

1) check and update the mapping between virgin and recycling datasets. Only columns U and W (virgin dataset name and recycling dataset name, respectively) need to be update. The other cells will be automatically filled in.
2) possibly keep the same categories as set in the Ecoreport tool (i.e. 01-plastics, 02-metals, 03-electronics and 04-others). The mapping of datasets and categories has to be done in the worksheet EF3_1 dataset (please see section 0)

- Update of auxiliary materials and refrigerants datasets

In future updates it might be considered to add more materials/components as auxiliaries and refrigerants that can be selected as consumables in the use phase (see section 1.1.5).
Auxiliaries: from line 898 to line 945 there is the list of auxiliaries that can be selected in the use phase. It is sufficient to copy the name of the datasets from the database in column G. The Ecoreport tool will automatically associate the ID number and put in the list.
Refrigerants: from line 947 down there is the list of refrigerants that can be selected in the use phase to calculate the impacts of fugitive emissions. It is sufficient to copy the name of the datasets from the database in column G and enter the GWP in column I.

Conclusions

The aim of this document is to provide a guidance to the users of the Methodology for Ecodesign of Energy-related Products (MEErP) and a manual for the user of the revised version of the Ecoreport tool.
Each spreadsheet of the Ecoreport tool is described to understand its content and its functionalities. In addition, this manual provides instructions to implement future updates by keeping the same structure and flexibility of the excel tool.

References

COWI, and VHK. 2011a. “Methodology for Ecodesign of Energy-Related Products MEErP 2011: Methodology Report. Part 1: Methods.”

———. 2011b. “Methodology for Ecodesign of Energy-Related Products MEErP 2011: Methodology Report. Part 2 - Environmental Policies & Data.”

European Commission. 2021. “JRC Report: Understanding Product Environmental Footprint and Organisation Environmental Footprint Methods, Doi:10.2760/11564, Available at: Https://Ec.Europa.Eu/Environment/Eussd/Smgp/Pdf/EF%20simple%20guide_v7_clen.Pdf .”

———. 2023. European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Grohol, M., Veeh, C., Study on the Critical Raw Materials for the EU 2023 – Final Report, Publications Office of the European Union, 2023, Https://Data.Euro. Publications Office of the European Union.

List of abbreviations and definitions

B2B	business to business
BoM	Bill of Materials
CF	characterization factor
CFCs	Chlorofluorocarbons
CFF	Circular Footprint Formula
CRM	Critical Raw Material
DQR	Data Quality Rating
EC	European Commission
EF	Environmental Footprint
EI	Environmental Impact
EoL	End of life
FU	Functional Unit
GER	Gross Energy Requirement
GHG	Greenhouse gas
GWP	Global warming potential
ILCD	International Reference Life Cycle Data System
ILCD-EL	International Reference Life Cycle Data System – Entry Level
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
JRC	Joint Research Centre
LC	Life Cycle
LCA	Life Cycle Assessment
LCDN	Life Cycle Data Network
LCI	Life cycle inventory
LCIA	Life cycle impact assessment
LCT	Life cycle thinking
LLCC	Least Life Cycle Cost
MEErP	Methodology for Ecodesign of Energy-related Products
MEEuP	Methodology for the Ecodesign of Energy-using Products
NACE	Nomenclature Générale des Activités Economiques dans les Communautés Européennes
OEF	Organisation Environmental Footprint
OEFSCR	Organisation Environmental Footprint Sector Rules
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PEF-RP	PEF study of the representative product
RC	Recycled Content
RF	reference flow
RIR	Recycling Input Rate

RR	Recycling Rate
RP	representative product
UNEP	United Nations Environment Programme
UUID	Universally Unique Identifier

List of figures

List of tables

Annex 1

Table A.1: EF datasets selected for the Ecoreport tool (2024) database

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
01-Plastics	1	Acrylonitrile Butadiene Styrene (ABS) emulsion polymerisation, bulk polymerisation or combined processes production mix, at plant	EU+EFTA+UK	62453fcd-b0f7-47fc-80fb-08ca0d92fc62	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=62453fcd-b0f7-47fc-80fb-08ca0d92fc62	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	2	Aramid fiber low-temperature solution polymerisation of m-phenylene diamine with isophthaloyl chloride production mix, at plant petrochemical based	EU+EFTA+UK	d5e0198a-83a2-51b5-81b8-d0abc0a44a50	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=d5e0198a-83a2-51b5-81b8-d0abc0a44a50	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics	3	Blow moulding blow moulding production mix, at plant PET, HDPE and PP	EU+EFTA+UK	215dd4d8-52ad-4eee-bd63-7a6193f2b8d5	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=215dd4d8-52ad-4eee-bd63-7a6193f2b8d5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	4	Epoxy plastic polymerisation of liquid epoxy resins with a latent hardener (amine) production mix, at plant petrochemical based	GLO	55fd7fe5-628d-59ed-b234-e7b3c75d1ce1	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=55fd7fe5-628d-59ed-b234-e7b3c75d1ce1	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics	5	EPS Beads from styrene polymerization and foaming production mix, at plant 0.96- 1.04 g/cm3	EU+EFTA+UK	bd1d3154-8fca-43e8-a40a-1113c1135689	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bd1d3154-8fca-43e8-a40a-1113c1135689	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	6	Ethylene propylene dien elastomer (EPDM) copolymerization of ethylene and propylene production mix, at plant 69% ethylene, 38% propylene	EU+EFTA+UK	d7774f29-92ec-46b9-a624-514a6b52e559	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d7774f29-92ec-46b9-a624-514a6b52e559	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	7	HDPE granulates Polymerisation of ethylene production mix, at plant 0.91-0.96 g/cm3, 28 g/mol per repeating unit	EU+EFTA+UK	a3aefe5b-33c9-4f0c-87ec-d0291445cc61	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a3aefe5b-33c9-4f0c-87ec-d0291445cc61	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	8	Injection moulding plastic injection moulding production mix, at plant for PP, HDPE and PE	EU+EFTA+UK	ec9ca75e-abdb-4d2e-9e18-ca1f5709a76d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ec9ca75e-abdb-4d2e-9e18-ca1f5709a76d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	9	LDPE granulates Polymerisation of ethylene production mix, at plant 0.91-0.96 g/cm3, 28 g/mol per repeating unit	EU+EFTA+UK	d327f4a5-93a1-4ead-856c-aeb8b2f25080	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d327f4a5-93a1-4ead-856c-aeb8b2f25080	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	10	LLDPE granulates Polymerisation of ethylene production mix, at plant 0.87- 94 g/cm3, 28 g/mol per repeating unit	EU+EFTA+UK	ab2f06b2-6cc9-48ee-b878-b817afba6f3e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ab2f06b2-6cc9-48ee-b878-b817afba6f3e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	11	Nylon 6 fiber extrusion into fiber production mix, at plant 5% loss, 3,5 MJ electricity	EU+EFTA+UK	ac781150-2f08-4a46-903c-37ba33ebb6a0	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ac781150-2f08-4a46-903c-37ba33ebb6a0	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	12	Polyethylene terephthalate (PET), petrochemical based polymerisation of ethylene glycol and terephthalic acid production mix, at plant petrochemical based	GLO	00a5d0c8-becf-520a-b3fe-eb0710efa170	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=00a5d0c8-becf-520a-b3fe-eb0710efa170	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics	13	Polymethyl methacrylate (PMMA) granulate bulk polymerisation, from methyl methacrylate production mix, at plant 1.18 g/cm3	EU+EFTA+UK	56fad5e9-814f-4041-845c-fdf51f320fd6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=56fad5e9-814f-4041-845c-fdf51f320fd6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	14	Polycarbonate (PC) granulate Technology mix, dipenyl carbonate route and	GLO w/o EU+EFTA+UK	3cf61035-723e-4a02-8d59-2af89b0de9c2	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3cf6103	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
		phosgene route production mix, at plant 1.20–1.22 g/cm3				5-723e-4a02-8d59-2af89b0de9c2	
01-Plastics	15	Polyester resin esterification and polymerization, from propylene glycol, phthalic anhydride and styrene production mix, at plant 1.22- 1.38 g/cm3	GLO w/o EU+EFTA+UK	70b8b231-3e7e-4af7-ad78-4a40d8e36f0c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=70b8b231-3e7e-4af7-ad78-4a40d8e36f0c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	16	Polypropylene (PP), petrochemical based polymerisation of bio-fossil propylene production mix, at plant petrochemical based	GLO	eda0bd00-c41b-56c3-b3b4-a54ee8f426f5	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=eda0bd00-c41b-56c3-b3b4-a54ee8f426f5	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics	17	Polystyrene production, high impact polymerisation of styrene production mix, at plant 1.05 g/cm3	EU+EFTA+UK	42affac5-a207-4ec5-bd7d-2dffd85ff50e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=42affac5-a207-4ec5-bd7d-2dffd85ff50e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	18	Polytetrafluoroethylene granulate (PTFE) Mix polymerisation of tetrafluorethylene production mix, at plant 2.16 g/cm3	DE	da397fb2-4f6f-4fec-9d46-a5f2f693e2c9	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=da397fb2-4f6f-4fec-9d46-a5f2f693e2c9	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	19	polyurethane (PUR) coating reaction between toluene diisocyanate and a mixture of trimethylol propane and 1,3-butylene glycol production mix, at plant petrochemical based	GLO	05ba45f7-f42e-505d-8862-1dad6742540e	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=05ba45f7-f42e-505d-8862-1dad6742540e	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics	20	Polyurethane flexible foam reaction of toluene diisocyanate (TDI) with long-chain polyether polyol and foaming production mix, at plant 18- 53 kg/m3	EU+EFTA+UK	e57c0e72-bab3-49ab-a24a-db58478362bc	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e57c0e72-bab3-49ab-a24a-db58478362bc	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	21	Polyurethane rigid foam from methylene diisocyanate (MDI) and polyols production mix, at plant 18- 53 kg/m3	EU+EFTA+UK	130205a5-881a-4725-a328-ba5e76475f7b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=130205a5-881a-4725-a328-ba5e76475f7b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	22	PVC granulates, low density polymerisation of vinyl chloride production mix, at plant 62 g/mol per repeating unit	EU+EFTA+UK	13c6a030-b42c-46be-acd2-6c81bcaa8355	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=13c6a030-b42c-46be-acd2-6c81bcaa8355	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	23	Polyvinyl fluoride polymerisation of vinyl fluoride production mix, at plant 1.77 g/cm3	GLO	c2b707af-8e61-463f-af31-5d503a9b9dd7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c2b707af-8e61-463f-af31-5d503a9b9dd7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	24	Polyvinylidenchloride granulate from vinylidene dichloride production mix, at plant 1.63 g/cm3	EU+EFTA+UK	78d96730-7ba9-41b8-ae06-36320d9c0b13	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=78d96730-7ba9-41b8-ae06-36320d9c0b13	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	25	Polyvinylidene fluoride (PVDF) polymerisation of vinyl fluoride production mix, at plant 1.76 g/cm3	GLO	351a289a-2c61-4958-bea4-92b58266b3fc	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=351a289a-2c61-4958-bea4-92b58266b3fc	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	26	Silicone, high viscosity hydrolysis and methanolysis of dimethyldichloro silane production mix, at plant >30 000 centi Poise	EU+EFTA+UK	5a98603a-4819-4322-a5ca-8b345265ccda	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=5a98603a-4819-4322-a5ca-8b345265ccda	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics	27	Styrene acrylonitrile (SAN)	EU+EFTA+UK	1c05e5a9-ce39-4f5b-aa7d-98a4d6f6cc5c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1c05e5a9-ce39-4f5b-aa7d-98a4d6f6cc5c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	28	High density polyethylene (HDPE), recycled washing, drying, shredding, pelletizing production mix, at plant Erec/ErecEoL, efficiency 98%	GLO	9ca85eff-c3cb-5ffc-b07a-03ca5a318e20	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=9ca85eff-c3cb-5ffc-b07a-03ca5a318e20	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics_recycl	29	Low density polyethylene (LDPE), recycled washing, drying, shredding, pelletizing	GLO	d113373a-a678-5f7b-999c-d7aafaeb1d18	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.x	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
		production mix, at plant Erec/ErecEoL, efficiency 90.3%				html?uuid=d113373a-a678-5f7b-999c-d7aafaeb1d18	
01-Plastics_recycl	30	Mechanical recycling of polyolefins (PO) granulation, pelletization production mix, at plant 91,2% recycling rate	EU+EFTA+UK	6b5ef6be-e581-4f2d-8627-c24a5e54e2b8	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6b5ef6be-e581-4f2d-8627-c24a5e54e2b8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	31	Nylon fibre, recycled, mechanical, post-consumer washing, drying, shredding, drum rotating spinning production mix, at plant Erec/ErecEoL, efficiency 90%	GLO	8ddd75a1-a151-5b56-9cb9-951477266998	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=8ddd75a1-a151-5b56-9cb9-951477266998	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics_recycl	32	Plastic granulate secondary (low metal contamination) from post-consumer waste, via washing, granulation, pelletization production mix, at plant 90% recycling rate	EU+EFTA+UK	e9efe475-dd46-47b5-a960-fe39f3a34d3e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e9efe475-dd46-47b5-a960-fe39f3a34d3e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	33	Polycarbonate (PC), recycled, post-consumer chemical recycling, depolymerisation, hydrolysis production mix, at plant Erec/ErecEoL, efficiency 80%	GLO	b6f7ec74-ca05-5058-b4d2-b9ae828d4330	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=b6f7ec74-ca05-5058-b4d2-b9ae828d4330	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics_recycl	34	polyethylene terephthalate (PET), recycled, semi-mechanical, post-consumer washing, drying, shredding, pelletizing production mix, at plant Erec/ErecEoL, efficiency 80%	GLO	a05cde18-97bb-5086-a401-9cf42e7bbe1e	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=a05cde18-97bb-5086-a401-9cf42e7bbe1e	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics_recycl	35	Polypropylene, recycled, post-consumer washing, drying, shredding, pelletizing production mix, at plant Erec/ErecEoL, efficiency 90%	GLO	637779a3-5c48-55b2-a42b-3e29f96325e1	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=637779a3-5c48-55b2-a42b-3e29f96325e1	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
01-Plastics_recycl	36	Recycling plastic Acrylonitrile-butadiene-styrene (ABS), waste management, technology mix	EU+EFTA+UK	38ed8079-ee3b-477a-ab6a-312629743693	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=38ed8079-ee3b-477a-ab6a-312629743693	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	37	Recycling plastic (PVC), waste management, technology mix, at plant	EU+EFTA+UK	2d0b5358-ae2b-4eb8-8a28-71c327be94a6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2d0b5358-ae2b-4eb8-8a28-71c327be94a6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	38	Recycling plastic Styrene Acrylonitrile (SAN), waste management, technology mix	EU+EFTA+UK	76fb4277-d67f-4769-b3c1-5b033dbba214	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=76fb4277-d67f-4769-b3c1-5b033dbba214	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	39	Recycling of post-industrial waste EPDM rubber	EU+EFTA+UK	f2af7266-4641-417a-abf6-ec3165085229	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f2af7266-4641-417a-abf6-ec3165085229	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	40	Recycling of post-consumer waste polypropylene (PP) collection, sorting, transport, washing, granulation, pelletization production mix, at plant 48,9% recycling rate	EU+EFTA+UK	2ec1afd9-7d95-4b64-8120-c362bb0c8bee	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2ec1afd9-7d95-4b64-8120-c362bb0c8bee	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
01-Plastics_recycl	41	Polyethylene terephthalate (PET) granulate secondary ; no metal fraction from post-consumer waste, via washing, granulation, pelletization production mix, at plant 90% recycling rate	EU+EFTA+UK	49a42d24-84be-42d5-8fe4-48efad0f4487	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=49a42d24-84be-42d5-8fe4-48efad0f4487	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	42	Aluminium casting primary production, aluminium casting single route, at plant 2.7 g/cm3	EU+EFTA+UK	7fd72403-e0ef-4ebe-b0cf-c6b03365a564	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=7fd72403-e0ef-4ebe-b0cf-c6b03365a564	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals	43	Aluminium die-casting secondary production, aluminium casting single route, at plant 2.7 g/cm3	EU+EFTA+UK	104038e4-98ae-4696-9568-36abcdbbed3a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=104038e4-98ae-4696-9568-36abcdbbed3a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	44	Aluminium extrusion primary production, aluminium extrusion single route, at plant 2.7 g/cm3	EU+EFTA+UK	1739a600-8e46-4595-ba49-867b8d6f9a11	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1739a600-8e46-4595-ba49-867b8d6f9a11	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	45	Aluminium foil primary production single route, at plant 2.7 g/cm3	EU+EFTA+UK	32a92520-3814-4311-b18b-28ca2790eb3f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=32a92520-3814-4311-b18b-28ca2790eb3f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	46	Aluminium ingot (copper main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	6b52a816-6007-4a54-a38f-d0e5733daf7f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6b52a816-6007-4a54-a38f-d0e5733daf7f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	47	Aluminium ingot (magnesium main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	ef68e9e4-56ee-4c05-b567-65e27d8bcc07	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ef68e9e4-56ee-4c05-b567-65e27d8bcc07	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	48	Aluminium ingot (manganese main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	5ad00e36-649c-471e-9b7c-a855b20e6f5f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=5ad00e36-649c-471e-9b7c-a855b20e6f5f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	49	Aluminium ingot (silicon and magnesium main solutes) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	2483d13b-837b-4394-80d2-55f0c6f14be2	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2483d13b-837b-4394-80d2-55f0c6f14be2	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	50	Aluminium ingot (silicon main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	d7b25114-1487-4a08-8ab3-bdff59d5e701	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d7b25114-1487-4a08-8ab3-bdff59d5e701	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	51	Aluminium ingot (zinc main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	dcebdc16-7179-435d-856f-7553175d8795	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=dcebdc16-7179-435d-856f-7553175d8795	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	52	Aluminium ingot mix (high purity) primary production, aluminium casting single route, at plant 2.7 g/cm3, >99% Al	EU+EFTA+UK	84edb17a-79de-4cd7-8340-02b289b30312	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=84edb17a-79de-4cd7-8340-02b289b30312	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	53	Aluminium sheet rolling primary production, aluminium deep- drawing single route, at plant 2.7 g/cm3	EU+EFTA+UK	54efe586-87f5-405a-b279-9ee4c88424d7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=54efe586-87f5-405a-b279-9ee4c88424d7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	54	Antimony technology mix, primary production production mix, at plant 99.5% Antimony	CN	9dc58350-3c53-4f41-b4c1-f8e0d9777ca7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9dc58350-3c53-4f41-b4c1-f8e0d9777ca7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	55	Brass anode furnace and casting, from copper and zinc, primary production single route, at plant 8.41- 8.86 g/cm3	EU+EFTA+UK	f398e770-adec-4859-b0f6-f71133290525	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f398e770-adec-4859-b0f6-f71133290525	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	56	Brass Die-Casting die casting, from copper and zinc, primary production production mix, at plant 8.41- 8.86 g/cm3	GLO	27545ed7-ae93-4860-bc4e-fc328535af05	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=27545ed7-ae93-4860-bc4e-fc328535af05	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	57	Brass fittings casting single route, at plant containing copper and zinc	EU+EFTA+UK	875714f6-25f1-44c8-992a-c43798500c4e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=875714f6-25f1-44c8-992a-c43798500c4e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	58	Cast iron electric arc furnace route, from steel scrap, secondary production single route, at plant > 2,06 % carbon content	EU+EFTA+UK	fc79eceb-8dc2-4614-85d3-9d7bd31431b7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fc79eceb-8dc2-4614-85d3-9d7bd31431b7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals	59	Coating powder, exterior production technology mix production mix, at plant 100% active substance	GLO	b4cc24db-1d7b-413c-a2fa-3cf0927b9ce5	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=b4cc24db-1d7b-413c-a2fa-3cf0927b9ce5	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
02-Metals	60	Cobalt hydro- and pyrometallurgical processes production mix, at plant >99% Co	GLO	e93c862f-0b02-4fbe-b1ed-35ff9b3ef87b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e93c862f-0b02-4fbe-b1ed-35ff9b3ef87b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	61	Copper Cathode, production mix	EU+EFTA+UK	170d5a2f-91b7-4cb6-9d9b-6ebf4edf9d3d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=170d5a2f-91b7-4cb6-9d9b-6ebf4edf9d3d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	62	Copper fittings stamping and bending of copper tubes single route, at plant 8.92 g/cm3	EU+EFTA+UK	893b38ee-a723-4030-a61a-a096fa2da80a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=893b38ee-a723-4030-a61a-a096fa2da80a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	63	Copper sheet melting and mechanical treatment (fabrication) single route, at plant 8.92 g/cm3	EU+EFTA+UK	b9dee95b-91e1-4062-a33b-d1e347b42cd7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b9dee95b-91e1-4062-a33b-d1e347b42cd7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	64	Copper tube melting and mechanical treatment (fabrication) single route, at plant 8.92 g/cm3	EU+EFTA+UK	974f7584-e2ea-440f-ad86-c1768b1c73b8	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=974f7584-e2ea-440f-ad86-c1768b1c73b8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	65	Copper Wire Drawing wire drawing single route, at plant 8.92 g/cm3	EU+EFTA+UK	077d8da4-0f01-404f-87c6-e1408f97eed6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=077d8da4-0f01-404f-87c6-e1408f97eed6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	66	Deep drawing of steel parts deep drawing single route, at plant multi- level process	EU+EFTA+UK	af421a59-e641-4bc7-bb6e-7b8f6705e4d9	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=af421a59-e641-4bc7-bb6e-7b8f6705e4d9	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	67	Drawing of steel pipe slab casting, rolling, pickling, thermal treatment single route, at plant 1m length	EU+EFTA+UK	3f36f7bd-4bf4-46fc-aba8-4650e286ae6c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3f36f7bd-4bf4-46fc-aba8-4650e286ae6c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	68	Ferrite (iron ore) iron ore mining and processing production mix, at plant 5.00 g/cm3	GLO	04c5a093-92dd-41c3-ac5e-531a4f134b88	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=04c5a093-92dd-41c3-ac5e-531a4f134b88	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	69	Ferromolybdenum separation, leaching, roasting production mix, at plant 70- 90% molybdenum content	GLO	82666932-b7c3-4d13-a64b-4c26139c7f1c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=82666932-b7c3-4d13-a64b-4c26139c7f1c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	70	Ferronickel mining, ore beneficiation production mix, at plant 32 % nickel	GLO	32bccf4c-5988-4bcb-8643-06c63a942a82	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=32bccf4c-5988-4bcb-8643-06c63a942a82	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	71	Flat glas, tempering tempering of glass production mix, at plant 2500 kg/m3	EU+EFTA+UK	f338371e-3cab-48d0-b742-43e6c7e88d11	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f338371e-3cab-48d0-b742-43e6c7e88d11	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	72	Flat glass, uncoated cut, Pilkington process, from sand and soda ash production mix, at plant 2500 kg/m3	EU+EFTA+UK	1a111a30-e039-4dba-aa2c-bfa63b1e3d0c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1a111a30-e039-4dba-aa2c-bfa63b1e3d0c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	73	Forging of steel parts forging single route, at plant 1 kg forged part	EU+EFTA+UK	8a9752d1-2693-4d6b-b04a-6e4baa99461b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=8a9752d1-2693-4d6b-b04a-6e4baa99461b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	74	Gallium technology mix production mix, at plant 5.9 g/cm3	GLO	cca70324-2c82-4594-a8ea-c7623609d290	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=cca70324-2c82-4594-a8ea-c7623609d290	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals	75	Gold (primary route) primary route, underground mining and leaching production mix, at plant 19.32 g/cm3	GLO	2d117ffa-5858-4764-9075-faa12d1b5b87	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2d117ffa-5858-4764-9075-faa12d1b5b87	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	76	Lead (primary) primary production, mining and processing production mix, at plant 11.3 g/cm3	EU+EFTA+UK	0ef25147-4212-45ba-9a65-55663095ef5a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0ef25147-4212-45ba-9a65-55663095ef5a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	77	Magnesium Pidgeon Process, primary production production mix, at plant 1.74 g/cm	GLO	f1145ced-7227-470a-8de0-d13eed955140	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f1145ced-7227-470a-8de0-d13eed955140	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	78	Manganese mining, separation, calcination, electrolysis production mix, at plant 7.21 g/cm3	GLO	a7592c31-fe68-4cb6-b001-a69f835880d3	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a7592c31-fe68-4cb6-b001-a69f835880d3	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	79	Molybdenum mining & concentration flotation, roasting, reduction production mix, at plant 10.28 g/cm3	GLO	d6a4da9a-5268-4866-bcc6-9db30a30785a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d6a4da9a-5268-4866-bcc6-9db30a30785a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	80	Nickel mining and processing production mix, at plant 8.9 g/cm3, update available	GLO	49bca533-7001-4aea-b404-35e7b7ac2a31	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=49bca533-7001-4aea-b404-35e7b7ac2a31	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	81	Palladium primary production, mining and processing production mix, at plant 11.99 g/cm3	GLO	d860a8a2-53ab-4d1e-857e-b6e4bf3c7df5	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d860a8a2-53ab-4d1e-857e-b6e4bf3c7df5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	82	Platinum primary production production mix, at plant 21.45 g/cm3 , 195.08 g/mol	GLO	03acd011-7a07-460d-8371-e56d30dac737	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=03acd011-7a07-460d-8371-e56d30dac737	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	83	Rare earth concentrate mining, concentration, roasting, refining production mix, at plant concentrated	CN	2ecbd77e-30ec-4b66-aa9a-4a6757c9899f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2ecbd77e-30ec-4b66-aa9a-4a6757c9899f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	84	Silver mining, concentration, roasting, refining production mix, at plant 10.49 g/cm3	GLO	a42fec17-6b63-4eb0-ab7e-9ac74a6a5277	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a42fec17-6b63-4eb0-ab7e-9ac74a6a5277	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	85	Stainless steel cold rolled hot rolling production mix, at plant stainless steel	ROW	468733f6-fc88-4da5-b9ff-e548059234c5	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=468733f6-fc88-4da5-b9ff-e548059234c5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	86	Stainless steel hot rolled hot rolling production mix, at plant stainless steel	ROW	bd2602fa-abc7-4a57-b3f9-d6a012d29b1e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bd2602fa-abc7-4a57-b3f9-d6a012d29b1e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	87	Steel cold rolled coil blast furnace route single route, at plant carbon steel	EU+EFTA+UK	3f445970-7d74-4d19-8be7-f9fba0b454b4	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3f445970-7d74-4d19-8be7-f9fba0b454b4	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	88	Steel electrogalvanized coil steel sheet electrogalvanization single route, at plant 1.5 mm sheet thickness, 0.02 mm zinc thickness	EU+EFTA+UK	aa9abf29-c5a0-452a-8258-0c0836472cf6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=aa9abf29-c5a0-452a-8258-0c0836472cf6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	89	Steel hot dip galvanised steel sheet hot dip galvanization single route, at plant 1.5 mm sheet thickness, 0.02 mm zinc thickness	EU+EFTA+UK	bb359e8c-46a7-4ff6-ab15-601dfdfd1024	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bb359e8c-46a7-4ff6-ab15-601dfdfd1024	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	90	Steel sheet cold rolling - thickness 2.5mm steel cold rolling process single route, at plant thickness 2.5 mm	DE	a0cfb69f-37c2-4d9c-813f-848c3dd592ee	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a0cfb69f-37c2-4d9c-813f-848c3dd592ee	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals	91	Steel sheet stamping and bending stamping and bending single route, at plant 5% loss	GLO	94876d30-88b3-49cd-a886-0c13bb8dac85	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=94876d30-88b3-49cd-a886-0c13bb8dac85	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	92	Steel wire drawing wire drawing single route, at plant carbon steel	EU+EFTA+UK	a1485843-b8e8-4df7-93c4-1fae077bb2f0	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a1485843-b8e8-4df7-93c4-1fae077bb2f0	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	93	Talcum powder grinded and purified, filler, production including underground mining and beneficiation production mix, at plant 1 to 15 microns grain size	EU+EFTA+UK	fef58712-248e-474f-94f4-5d9e21c21ac7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fef58712-248e-474f-94f4-5d9e21c21ac7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	94	Tin sand extraction and processing, reduction production mix, at plant 118.71 g/mol	GLO	0795f215-cb48-40b4-93c6-60959611df98	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0795f215-cb48-40b4-93c6-60959611df98	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	95	Tin plated chromium steel sheet steel sheet tin plating single route, at plant chromium steel	EU+EFTA+UK	4e5586f7-a6f1-4e02-bc03-414a121f409c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4e5586f7-a6f1-4e02-bc03-414a121f409c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	96	Welded pipe Steel rolling, galvanizing, welding single route, at plant 1 meter of welded pipe	EU+EFTA+UK	c51687d7-a7ef-4ca0-9144-26bba037a9f3	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c51687d7-a7ef-4ca0-9144-26bba037a9f3	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	97	Zamak zinc production, alloying single route, at plant 4% aluminium	GLO	a2b4ff64-04a3-4a2a-a3d0-cce1126d449b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a2b4ff64-04a3-4a2a-a3d0-cce1126d449b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	98	Zinc technology mix, primary production consumption mix, to consumer 7.14 g/cm3	GLO	b5bae392-e96c-4e66-9259-9ab045fe7a86	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b5bae392-e96c-4e66-9259-9ab045fe7a86	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	99	Brass, recycled, post-consumer die casting, from copper and zinc, primary production production mix, at plant 8.41-8.86 g/cm3	GLO	0d12c664-5f41-4eb0-8006-d283535c33c6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0d12c664-5f41-4eb0-8006-d283535c33c6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	100	Brass, recycled, pre-consumer die casting, from copper and zinc, primary production production mix, at plant 8.41- 8.86 g/cm3	GLO	06a98f4a-919e-4bda-89c3-99e738a45a39	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=06a98f4a-919e-4bda-89c3-99e738a45a39	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	101	Gold, recycled, post-consumer collection, transport, dismantling, shredding, separation, remelting production mix, at plant 19.32 g/cm3, recycling efficiency 98%	GLO	de1ccf0e-437d-4dee-a938-358653fa7c50	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=de1ccf0e-437d-4dee-a938-358653fa7c50	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	102	Gold, recycled, pre-consumer collection, transport, dismantling, shredding, separation, remelting production mix, at plant 19.32 g/cm3, recycling efficiency 98%	GLO	cca3b3bd-d602-4bc6-874a-9150477bb597	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=cca3b3bd-d602-4bc6-874a-9150477bb597	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	103	Palladium, recycled, post-consumer collection, transport, dismantling, shredding, separation, remelting production mix, at plant 11.99 g/cm3	GLO	06746218-1220-4a3f-9aa0-92db40315434	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=06746218-1220-4a3f-9aa0-92db40315434	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	104	Antimony, recycled (post consumer, from lead acid batteries)	EU+EFTA+UK	37222eac-7457-4f21-b8e0-525ef0ef3c8d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=37222eac-7457-4f21-b8e0-525ef0ef3c8d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	105	Cobalt, recycled (4,77 kg Co-Sulphate heptahydrate as 1 kg Co-Metal content)	EU+EFTA+UK	9b575763-7820-46ae-a1e4-cc3d23cab7d8	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9b575763-7820-46ae-a1e4-cc3d23cab7d8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals_recycl	106	Magnesium, recycled (pre consumer, remelting)	EU+EFTA+UK	1a327839-b24f-471f-bd26-f317b65ac546	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1a327839-b24f-471f-bd26-f317b65ac546	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	107	Magnesium, recycled (post consumer, from dismantled cars)	EU+EFTA+UK	4b5b10ef-1834-474d-87b4-ddc83efb24af	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4b5b10ef-1834-474d-87b4-ddc83efb24af	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	108	Manganese, recycled (3,08 kg Mn-Sulphate as 1 kg Mn-Metal content)	EU+EFTA+UK	1ac2ecfb-82df-42ce-b5b0-9db7046be379	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1ac2ecfb-82df-42ce-b5b0-9db7046be379	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	109	Molybdenum, recycled (pre consumer, remelting in EAF)	EU+EFTA+UK	3c1d1160-9a78-48c1-a6be-bc9a6e9e9148	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3c1d1160-9a78-48c1-a6be-bc9a6e9e9148	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	110	Nickel, recycled (4,48 kg Ni-Sulphate hexahydrate represent 1 kg Ni-Content)	EU+EFTA+UK	3cbe82b6-8448-4743-8473-32f727affa3a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3cbe82b6-8448-4743-8473-32f727affa3a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	111	Platinum, recycled, post-consumer from automotive catalyst scrap	GLO	4f0e2261-e2db-49fc-a84c-2e7ff6a3101b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4f0e2261-e2db-49fc-a84c-2e7ff6a3101b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	112	Platinum Recycled (post-consumer mix of electronic scrap and automotive catalyst recycling)	GLO	cab59b64-38d6-4785-9aef-2197a1a96c56	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=cab59b64-38d6-4785-9aef-2197a1a96c56	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	113	Tin, recycled (re-refined, from electronic scrap)	EU+EFTA+UK	89d89f43-56bf-4e47-84f5-0a4873ea295d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=89d89f43-56bf-4e47-84f5-0a4873ea295d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	114	Zinc, recycled (post consumer, refining of EAF dust)	EU+EFTA+UK	e0507248-1c43-4667-b912-1725af6d053f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e0507248-1c43-4667-b912-1725af6d053f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	115	Zinc, recycled (pre consumer, remelting)	EU+EFTA+UK	f8939b1f-543d-45d8-9109-ca543a3a96bc	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f8939b1f-543d-45d8-9109-ca543a3a96bc	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	116	Recycling glass, waste management, technology mix, at plant collection, sorting, transport, recycling production mix, at plant glass waste, efficiency 95%	RAF	25d927a6-022d-4797-aee5-c5918da38e91	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=25d927a6-022d-4797-aee5-c5918da38e91	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	117	Secondary aluminium ingot (copper main solute) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	4c724aff-1851-469d-8596-0768517ec1cb	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4c724aff-1851-469d-8596-0768517ec1cb	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	118	Secondary aluminium ingot (magnesium main solute) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	9ef4b4a1-70ae-446c-a8ce-228941646c98	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9ef4b4a1-70ae-446c-a8ce-228941646c98	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	119	Secondary aluminium ingot (manganese main solute) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	a44f2af0-f15b-4d46-89a6-5deb49e9f166	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a44f2af0-f15b-4d46-89a6-5deb49e9f166	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	120	Secondary aluminium ingot (silicon and magnesium main solutes) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	edd2f643-26e0-4f05-9bd9-0e219cc46934	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=edd2f643-26e0-4f05-9bd9-0e219cc46934	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	121	Secondary aluminium ingot (silicon main solute) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	3018c133-7b95-412d-b6b8-050c958b52ea	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3018c133-7b95-412d-b6b8-050c958b52ea	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals_recycl	122	Secondary aluminium ingot (zinc main solute) secondary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	EU+EFTA+UK	241958ff-c238-48e0-a451-a1adbd82889c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=241958ff-c238-48e0-a451-a1adbd82889c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	123	Recycling of aluminium into aluminium ingot - from post-consumer collection, transport, pretreatment, remelting production mix, at plant aluminium waste, efficiency 90%	EU+EFTA+UK	c7f28f2a-f262-49ad-ba96-0cab313b186f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c7f28f2a-f262-49ad-ba96-0cab313b186f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	124	Secondary Copper Cathode (including scrap LCI input) copper scrap smelting and refining single route, at plant 8.92 g/cm3	EU+EFTA+UK	af91267f-51b4-42d0-a2ff-9c71bcb3d578	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=af91267f-51b4-42d0-a2ff-9c71bcb3d578	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	125	Secondary lead secondary production, melting of lead scrap single route, at plant 11.3 g/cm3	EU+EFTA+UK	48593494-8642-49f5-9de8-69fca2a9abd7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=48593494-8642-49f5-9de8-69fca2a9abd7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	126	Secondary steel slab electric arc furnace route, from steel scrap, secondary production single route, at plant carbon steel	EU+EFTA+UK	39694291-c8b5-49d1-9fe8-e67e4aade7d7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=39694291-c8b5-49d1-9fe8-e67e4aade7d7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	127	Silver, recycled technology mix production mix, at plant 10.49 g/cm3	GLO	9d57e00e-5599-4c0a-80a6-2eed727013e2	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9d57e00e-5599-4c0a-80a6-2eed727013e2	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	128	Steel cast part alloyed electric arc furnace route, from steel scrap, secondary production single route, at plant carbon steel	EU+EFTA+UK	77aa35c5-7007-4621-8115-cb8cfa77690d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=77aa35c5-7007-4621-8115-cb8cfa77690d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	129	Zamak, recycled, pre-consumer casting single route, at plant Zn Al alloy	GLO	4cfe384c-7316-4307-963c-972394e5316e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4cfe384c-7316-4307-963c-972394e5316e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals_recycl	130	Zamak, recycled, post-consumer casting single route, at plant Zn Al alloy	GLO	35716593-222f-4c37-9f5b-e3a65123defd	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=35716593-222f-4c37-9f5b-e3a65123defd	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	131	Assembly line THT/SMD technology mix production mix, at plant THT/SMD (1TP,1SP,1CS,1WO,1Rf) throughput 600/h	GLO	ff22c97e-ac21-4ae0-a1c8-cf7d5d19c977	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ff22c97e-ac21-4ae0-a1c8-cf7d5d19c977	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	132	Cable, high current technology mix production mix, at plant high current, 1m, 13 g/m	EU+EFTA+UK	8d9c3fa7-68a0-42cf-bef6-b630bea088c5	1 m (0.013 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=8d9c3fa7-68a0-42cf-bef6-b630bea088c5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	133	Cable, three-conductor cable technology mix production mix, at plant three-conductor cable, 1m, 60 g/m	EU+EFTA+UK	32ba7329-537c-4012-9319-f8bc53218856	1 m (0.060 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=32ba7329-537c-4012-9319-f8bc53218856	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	134	Capacitor ceramic technology mix production mix, at plant capacitor, mlcc, 6 mg	GLO	94c2d153-5e96-4493-959e-02f2f923bd01	1 item (0.000006 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=94c2d153-5e96-4493-959e-02f2f923bd01	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	135	Capacitor SMD technology mix production mix, at plant SMD capacitor, 12.5 g	GLO	185cde3a-679d-4f91-bd38-2e8c1c3d6689	1 item (0.0125 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=185cde3a-679d-4f91-bd38-2e8c1c3d6689	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	136	Capacitor, electrolyte technology mix production mix, at plant electrolyte, hight <2 cm, 9.5 g	GLO	f0da722b-ad7b-452f-b6b7-e6e5ba3290ef	1 item (0.0095 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f0da722b-ad7b-452f-b6b7-e6e5ba3290ef	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	137	Capacitor, film type technology mix production mix, at plant film type, 31.6 g	GLO	d399c7c2-7bc4-465f-82c7-6490130293d2	1 item (0.0316 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d399c7c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
						2-7bc4-465f-82c7-6490130293d2	
03-Electronics	138	Capacitor, Tantalum technology mix production mix, at plant tantalum capacitor, 0.5 g	GLO	7dc035e5-2f28-4d38-b1b1-ffec2b7a4642	1 item (0.0005 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=7dc035e5-2f28-4d38-b1b1-ffec2b7a4642	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	139	Connector for printed wiring board (PWB) technology mix production mix, at plant 1 PWB connector, 0.005kg	GLO	fe2c5f9c-cf1a-41cb-a898-15b97ca08e3b	1 item (0.005 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fe2c5f9c-cf1a-41cb-a898-15b97ca08e3b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	140	Connector Peripheral Component Interconnect (PCI) bus technology mix production mix, at plant 1 PCI bus connector, 0.00255 kg	GLO	0378db1c-665b-4f00-a7c0-550806c01948	1 item (0.00255 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0378db1c-665b-4f00-a7c0-550806c01948	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	141	Controller board	GLO	ad39fe01-4bcd-4a24-aebd-eb6d97d5ba5c	1 m2 (3.08 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ad39fe01-4bcd-4a24-aebd-eb6d97d5ba5c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	142	Cylindrical connector, brass body technology mix production mix, at plant brass body, 0.015 kg	GLO	07f127ca-d6d2-41db-bcf1-57cb5796a8b6	1 item (0.015 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=07f127ca-d6d2-41db-bcf1-57cb5796a8b6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	143	Diode Metal electrode leadless face (mMELF) front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 40 mg	GLO	3b8852f8-83dc-447e-a7d6-dcb6a5e8a6b9	1 item (0.000040 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3b8852f8-83dc-447e-a7d6-dcb6a5e8a6b9	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	144	Flat chip resistor technology mix production mix, at plant 1 piece of resistor flat chip 1206 (9.2mg)	GLO	0ce7601b-80b7-41ee-b8a5-3a4e0b6750d6	1 item (0.0000092 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0ce7601b-80b7-41ee-b8a5-3a4e0b6750d6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	145	Glass SMD diode front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 130 mg	GLO	e47c5956-0f9b-48ba-9bf7-e85a90c10145	1 item (0.000130 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e47c5956-0f9b-48ba-9bf7-e85a90c10145	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	146	Gluing of SMD for printed wiring board gluing of SMD components production mix, at plant gluing SMDs on 1m2 PWB	GLO	68c0ac18-2d46-4f41-b307-4eb2b12d9597	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=68c0ac18-2d46-4f41-b307-4eb2b12d9597	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	147	Gold finishing for printed wiring board (PWB) chemical-electrolytic AuNi finishing production mix, at plant double-sided finishing	GLO	e1a6d643-a88c-43bc-93cd-b98abe57b214	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e1a6d643-a88c-43bc-93cd-b98abe57b214	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	148	Hard disk drive, for desktop computer technology mix production mix, at plant 1 piece of HDD	GLO	f9a7caf7-08b2-4111-bd11-ae9ccc6472b5	1 item (0.63 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f9a7caf7-08b2-4111-bd11-ae9ccc6472b5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	149	Hot Air Level (HAL) finishing for printed wiring board (PWB) Hot Air Level (HAL or HASL) finishing production mix, at plant double-sided finishing	GLO	9329afe8-27ae-45b5-8b33-5aebde257393	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9329afe8-27ae-45b5-8b33-5aebde257393	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	150	Laser cutting of steel parts laser cutting production mix, at plant 1 meter cut	GLO	fc8ebe71-a852-4cc1-8fba-f640b8bbd02d	1 m	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fc8ebe71-a852-4cc1-8fba-f640b8bbd02d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	151	Light Emitting Diode (LED) front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 5 mm, 350 mg	GLO	b8db9314-f3c3-4762-88fb-2b4e34410ca6	1 item (0.000350 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b8db9314-f3c3-4762-88fb-2b4e34410ca6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
03-Electronics	152	Light Emitting Diode (LED), high power front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 5 mm, 350 mg	GLO	be133d91-3593-416d-b7cc-ad58ff08fb1f	1 item (0.000350 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=be133d91-3593-416d-b7cc-ad58ff08fb1f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	153	Light Emitting Diode (LED), low power front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 59 mg	GLO	197b3c3e-31dd-40e9-8c40-97290f3a6da0	1 item (0.000059 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=197b3c3e-31dd-40e9-8c40-97290f3a6da0	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	154	Liquid Crystal Display (LCD)	EU+EFTA+UK	32364481-e668-485b-bbcc-5d1d4dbf8047	1 m2 (7.82 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=32364481-e668-485b-bbcc-5d1d4dbf8047	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	155	Medium power transistor semiconductor front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 4.8 g	GLO	904f54c8-1288-4df2-a17c-4856f543e886	1 item (0.0048 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=904f54c8-1288-4df2-a17c-4856f543e886	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	156	Monocrystalline silicon for photovoltaics Czochralski technique production mix, at plant 1 kg monocrystalline silicon	GLO	46f58824-854c-4435-a4f0-12f989965611	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=46f58824-854c-4435-a4f0-12f989965611	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	157	Nickel plating electrolytic nickel plating production mix, at plant 1 m2 electroplated	GLO	3b5af6ee-2fd6-4fae-b319-2373257a3c87	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3b5af6ee-2fd6-4fae-b319-2373257a3c87	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	158	Photovoltaic slanted-roof installation, CdTe panel or laminate photovoltaic installation production mix, at plant 3 kilowatt peak	GLO	3802f1a3-f8bd-4393-81f2-952b076c56f4	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3802f1a3-f8bd-4393-81f2-952b076c56f4	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	159	Photovoltaic slanted-roof installation, CIS panel or laminate photovoltaic installation production mix, at plant 3 kilowatt peak	GLO	4c30be4d-46d9-4785-b48f-71defee4e73d	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4c30be4d-46d9-4785-b48f-71defee4e73d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	160	Photovoltaic slanted-roof installation, micro-Si panel or laminate photovoltaic installation production mix, at plant 3 kilowatt peak	GLO	cd945134-4e64-462d-86e1-f543f973993d	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=cd945134-4e64-462d-86e1-f543f973993d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	161	Photovoltaic slanted-roof installation, mono-Si panel or laminate photovoltaic installation production mix, at plant 3 kilowatt peak	GLO	b9f5eb07-d186-4403-a31c-44a5def409fa	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b9f5eb07-d186-4403-a31c-44a5def409fa	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	162	Photovoltaic slanted-roof installation, multi-Si panel or laminate photovoltaic installation production mix, at plant 3 kilowatt peak	GLO	97d796d5-525b-4021-9de9-a01d854ab4f8	1 m2	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=97d796d5-525b-4021-9de9-a01d854ab4f8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	163	Plastic axial diode, Semiconductor front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 1.12 g	GLO	67e2af35-e651-4849-a9f8-0d6abfbac4eb	1 item (0.00112 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=67e2af35-e651-4849-a9f8-0d6abfbac4eb	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	164	Printed wiring board (PWB) (2-layer) via the subtractive method (as opposed to additive method) production mix, at plant 2-layer, 1.32 kg	GLO	0dbdfd1d-39e5-42d8-803d-c2c7bb424bf1	1 m2 (1.32 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0dbdfd1d-39e5-42d8-803d-c2c7bb424bf1	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	165	Printed wiring board (PWB) (8-layer) via the subtractive method (as opposed to additive method) production mix, at plant 8-layer, 3.08 kg	GLO	b0ce123a-e1d8-471f-9522-1ee270fe714a	1 m2 (3.08 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b0ce123a-e1d8-471f-9522-1ee270fe714a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	166	Power supply Unit (PSU) technology mix production mix, at plant 0.27 kg	GLO	bad46284-969e-4cbd-9ba8-ef3312f4662b	1 item (0.27 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bad46284-969e-4cbd-9ba8-ef3312f4662b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
03-Electronics	167	SMD coil technology mix production mix, at plant 1 piece of Coil miniature wound SDR1006 (1.16g) D9.8 x 5.8	GLO	1191080d-950e-41c1-84bc-ec39f7658560	1 item (1.16 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1191080d-950e-41c1-84bc-ec39f7658560	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	168	Solder Paste (SnAg3.5Cu0.7) technology mix production mix, at plant 1 kg of solder paste	GLO	2aa39bad-2974-4bad-8bed-1d0517e0d546	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2aa39bad-2974-4bad-8bed-1d0517e0d546	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	169	Standard transformer for Printed Wiring Board (PWB) technology mix production mix, at plant 1 piece of transformer for PWB, 0.08 kg	GLO	4122ceab-12a5-4c69-9f3c-b1ef72dbec8a	1 item (0.08 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4122ceab-12a5-4c69-9f3c-b1ef72dbec8a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	170	Switch < 1 Ampere technology mix production mix, at plant < 1 Ampere, 79 mg	GLO	894f55b7-f04e-493e-a71e-b9ace62668cb	1 item (0.000079 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=894f55b7-f04e-493e-a71e-b9ace62668cb	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	171	Switch > 1 Ampere technology mix production mix, at plant > 1 Ampere, 242 mg	GLO	fd6b420f-ece9-4f83-96ad-f4b93aa1c99e	1 item (0.000242 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fd6b420f-ece9-4f83-96ad-f4b93aa1c99e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	172	Switch Mode Transformer (SMT), low voltage technology mix production mix, at plant 80g of low voltage transformer	GLO	32a5181c-86b3-46e4-a16e-19e18a3bc965	1 item (0.080 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=32a5181c-86b3-46e4-a16e-19e18a3bc965	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	173	Toner module, laser printer, black and white production of toner module, laser printer, black and white production mix, at plant 1 piece, 2.36 kg	GLO	ed2a5aa0-fab4-496d-9aab-c8404863ba30	1 item (2.36 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ed2a5aa0-fab4-496d-9aab-c8404863ba30	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	174	Toner module, laser printer, colour production of toner module, laser printer, colour production mix, at plant 1 piece, 2.36 kg	GLO	ac24889a-ffe9-440c-b6e3-f96921911113	1 item (2.36 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ac24889a-ffe9-440c-b6e3-f96921911113	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics	175	VGA plug technology mix production mix, at plant VGA steel plug, 0.0191 kg	GLO	dfe10685-81de-4fde-b895-849523ac5994	1 item (0.0191 kg)	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=dfe10685-81de-4fde-b895-849523ac5994	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	176	End of life of cable, high current Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	8f8c1f72-d2ac-4e98-b7ba-434641c726be	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=8f8c1f72-d2ac-4e98-b7ba-434641c726be	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	177	End of life of cable, three-conductor cable Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	a5a214db-7522-4f31-903e-b7366549f61f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=a5a214db-7522-4f31-903e-b7366549f61f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	178	End of life of capacitor ceramic Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	8deaf1ec-f7d2-4e58-95d9-278adeb27e0e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=8deaf1ec-f7d2-4e58-95d9-278adeb27e0e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	179	End of life of Capacitor SMD Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	e876837f-7797-4a5e-9b94-cc563317f8a1	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e876837f-7797-4a5e-9b94-cc563317f8a1	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
03-Electronics_recycl	180	End of life of Capacitor, electrolyte Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	c2b2914e-1986-456e-a3ea-0e79b529e7d6	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c2b2914e-1986-456e-a3ea-0e79b529e7d6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	181	End of life of Capacitor, film type Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	34473c55-cfdf-4f44-a218-bf4e5608b325	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=34473c55-cfdf-4f44-a218-bf4e5608b325	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	182	End of life of Capacitor, Tantalum Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	e7b92428-2be6-400b-bc52-fe4469ad078c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e7b92428-2be6-400b-bc52-fe4469ad078c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	183	End of life of Connector for printed wiring board (PWB) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	f018b6be-67ae-4b5c-ae9f-6b1d8aaf7a6b	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f018b6be-67ae-4b5c-ae9f-6b1d8aaf7a6b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	184	End of life of Connector Peripheral Component Interconnect (PCI) bus Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	55844bf9-84ad-482d-b0ee-80a40c84e73a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=55844bf9-84ad-482d-b0ee-80a40c84e73a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	185	End of life of Cylindrical connector, brass body Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	3ae3551a-4e2d-4c8f-8710-598cff1f6264	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=3ae3551a-4e2d-4c8f-8710-598cff1f6264	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	186	End of life of Diode Metal electrode leadless face (mMELF) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	56ac849c-ba6d-4758-aaf1-aad10cf44dda	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=56ac849c-ba6d-4758-aaf1-aad10cf44dda	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	187	End of life of flat chip resistor Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	f1de74ac-ea24-4493-a981-5e771dcf1476	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f1de74ac-ea24-4493-a981-5e771dcf1476	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	188	End of life of Glass SMD diode Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	0e8a7b8e-66e4-4a38-9e50-6fc9a144e895	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0e8a7b8e-66e4-4a38-9e50-6fc9a144e895	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
03-Electronics_recycl	189	End of life of Hard disk drive, for desktop computer Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	d4f21981-26d4-4fea-b96a-818bcdde4cb8	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d4f21981-26d4-4fea-b96a-818bcdde4cb8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	190	End of life of Light Emitting Diode (LED) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	179c3c2e-14bc-4881-8556-5854e17179e1	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=179c3c2e-14bc-4881-8556-5854e17179e1	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	191	End of life of Light Emitting Diode (LED), high power Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	c0cdfe2d-83f4-4057-b904-76ce16b5a467	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c0cdfe2d-83f4-4057-b904-76ce16b5a467	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	192	End of life of Light Emitting Diode (LED), low power Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	bdf06adc-c8c0-4f42-b835-70f350a34d2a	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bdf06adc-c8c0-4f42-b835-70f350a34d2a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	193	End of life of Medium power transistor semiconductor Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	78403360-c44a-40dd-88e7-2952693d1dc7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=78403360-c44a-40dd-88e7-2952693d1dc7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	194	End of life of Plastic axial diode, Semiconductor Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	8eda88c3-963d-441d-b175-b054cb4f5509	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=8eda88c3-963d-441d-b175-b054cb4f5509	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	195	End of life of Populated Printed wiring board (PWB) (2-layer) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	45cf20e5-ae90-4d4f-a7a7-2d9102874bf7	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=45cf20e5-ae90-4d4f-a7a7-2d9102874bf7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	196	End of life of Populated Printed wiring board (PWB) (8-layer) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	24342861-7818-410f-ad68-616f686b2949	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=24342861-7818-410f-ad68-616f686b2949	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	197	End of life of Power supply Unit (PSU) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	bbea04a9-8f0f-40fb-8522-da8e9aed1bc9	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bbea04a9-8f0f-40fb-8522-da8e9aed1bc9	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	198	End of life of SMD coil Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant	EU+EFTA+UK	710df215-51c2-49ed-9054-3231838d13ab	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=710df21	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
		recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV				5-51c2-49ed-9054-3231838d13ab	
03-Electronics_recycl	199	End of life of Solder paste Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	6727b87c-e94b-49e3-8a98-17d0f7e7865f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6727b87c-e94b-49e3-8a98-17d0f7e7865f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	200	End of life of Standard transformer for Printed Wiring Board (PWB) Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	c97bf506-f917-4652-8cce-bc4328e55c96	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c97bf506-f917-4652-8cce-bc4328e55c96	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	201	End of life of Switch < 1 Ampere Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	4a159bda-7bf7-464c-891d-ae1162a9e413	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4a159bda-7bf7-464c-891d-ae1162a9e413	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	202	End of life of Switch > 1 Ampere Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	b2136300-7fb5-46b8-848f-fc62ffbc4cff	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b2136300-7fb5-46b8-848f-fc62ffbc4cff	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	203	End of life of Switch Mode Transformer (SMT), low voltage Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	63df4f93-7d1c-41a7-95a9-b8a3ba6f50b8	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=63df4f93-7d1c-41a7-95a9-b8a3ba6f50b8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	204	End of life of TFT LCD display panel, color Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	72dac319-433f-4861-8bed-0feeac4be255	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=72dac319-433f-4861-8bed-0feeac4be255	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	205	End of life of VGA plug Recycling of copper and precious metals (Ag, Au, Pd, Pt) from electronics production mix, at plant recycling processes: 95- 98% efficiency, scrap incineration: 11.0 MJ/kg NCV	EU+EFTA+UK	5da97634-5a86-4b67-b4f8-a584fe0b7a11	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=5da97634-5a86-4b67-b4f8-a584fe0b7a11	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	206	Recycling of controller board	EU+EFTA+UK	48f6b72e-4c15-4d30-bb5e-2e53d218f057	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=48f6b72e-4c15-4d30-bb5e-2e53d218f057	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	207	Recycling of copper from electronic and electric waste collection, transport, dismantling, shredding, separation, remelting production mix, at plant copper electronic waste, 95% efficiency	EU+EFTA+UK	1827dd93-8b53-4b5c-8430-01d10d51e86c	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1827dd93-8b53-4b5c-8430-01d10d51e86c	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	208	Recycling of gold from electronic and electric scrap collection, transport, dismantling, shredding, separation,	EU+EFTA+UK	27f18feb-4aa7-4c49-a495-6849945890bf	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=27f18feb-4aa7-4c49-a495-6849945890bf	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
		remelting production mix, at plant gold electronic waste, efficiency 98%					
03-Electronics_recycl	209	Recycling of palladium, from electronic and electric scrap collection, transport, dismantling, shredding, separation, remelting production mix, at plant palladium electronic waste, efficiency 98%	EU+EFTA+UK	012626e4-62d9-4ac9-b1dd-9d9a42a611c5	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=012626e4-62d9-4ac9-b1dd-9d9a42a611c5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	210	Recycling of silver, from electronic and electric scrap collection, transport, dismantling, shredding, separation, remelting production mix, at plant silver electronic waste, efficiency 98%	EU+EFTA+UK	502a8a4f-c7bc-4d3c-87ce-44c3aad3e332	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=502a8a4f-c7bc-4d3c-87ce-44c3aad3e332	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	211	Recycling of Toner module, laser printer, b/w	EU+EFTA+UK	f3ff1cb4-b51d-496a-a36f-9182fa277665	1 item	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f3ff1cb4-b51d-496a-a36f-9182fa277665	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
03-Electronics_recycl	212	Recycling of Toner module, laser printer, colour	EU+EFTA+UK	4c7adc5d-5464-4b08-8ccd-a1ef70eb08a6	1 item	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4c7adc5d-5464-4b08-8ccd-a1ef70eb08a6	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	213	Ammonia, as 100% NH3 production technology mix production mix, at plant 100% active substance	EU+EFTA+UK	b347c43a-c0c4-4249-9e55-263cae14065a	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=b347c43a-c0c4-4249-9e55-263cae14065a	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	214	Bitumen at refinery from crude oil production mix, at refinery 38.7 MJ/kg net calorific value	EU+EFTA+UK	09d54c40-dd77-46cf-b9bd-e196a40402d1	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=09d54c40-dd77-46cf-b9bd-e196a40402d1	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	215	carbon dioxide, liquid production technology mix production mix, at plant 100% active substance	EU+EFTA+UK	f418d090-af36-4aac-a593-206e9cc3141c	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=f418d090-af36-4aac-a593-206e9cc3141c	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	216	Concrete, production mix, at plant aggregates mixing production mix, at plant C20/25	GLO	c43e6703-303c-43a1-8e54-03cd595ff62f	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=c43e6703-303c-43a1-8e54-03cd595ff62f	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	217	Corrugated board, uncoated "virgin" Kraft Pulping Process, pulp pressing and drying production mix, at plant flute thickness 0.8- 2.8 mm, R1=0%	EU+EFTA+UK	574bdb1e-2ed3-46f1-bd14-bb76f739bb71	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=574bdb1e-2ed3-46f1-bd14-bb76f739bb71	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	218	detergent dish production production mix 1 kg of detergent dish	EU+EFTA+UK	123dd059-035e-57ed-bb77-8d60f38ff148	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=123dd059-035e-57ed-bb77-8d60f38ff148	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	219	detergents washing machine production production mix 1 kg of detergents washing machine	EU+EFTA+UK	8636b807-4217-5ac5-b280-e2a6101b0926	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=8636b807-4217-5ac5-b280-e2a6101b0926	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	220	electric boiler production 1 unit	EU+EFTA+UK	b8ee34b3-baa6-5b5a-9eb5-db5be51b6618	1 item	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=b8ee34b3-baa6-5b5a-9eb5-db5be51b6618	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	221	gas boiler production, 10 kwh 1 unit	EU+EFTA+UK	f160cc5e-f41c-5595-baff-0d1fae284b4c	1 item	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=f160cc5e-f41c-5595-baff-0d1fae284b4c	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	222	glass fiber technology mix production mix, at plant 1 kg	EU+EFTA+UK	46a1dbcc-5493-5cfe-99bc-80edcb1a27a3	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=46a1dbcc-5493-5cfe-99bc-80edcb1a27a3	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
04-Others	223	Kraft paper, uncoated Kraft Pulping Process, pulp pressing and drying production mix, at plant <120 g/m2	EU+EFTA+UK	03dea8f0-44e0-4bf3-a862-bb572c9d5f5e	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=03dea8f0-44e0-4bf3-a862-bb572c9d5f5e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	224	oil boiler production, 10 kw 1 unit	EU+EFTA+UK	60673a9c-4135-5362-8f80-662e50225918	1 item	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=60673a9c-4135-5362-8f80-662e50225918	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	225	Refrigerant R290; propane	EU+EFTA+UK	dad5f670-8764-49ae-b356-45d12288785d	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=dad5f670-8764-49ae-b356-45d12288785d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	226	Refrigerant R404a; HFC blend	EU+EFTA+UK	6f8ace40-5893-4025-b193-ea27404cfad4	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6f8ace40-5893-4025-b193-ea27404cfad4	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	227	Refrigerant R407c; HFC blend	EU+EFTA+UK	9f8c0031-790e-4d4c-8163-97227bef03fb	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9f8c0031-790e-4d4c-8163-97227bef03fb	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	228	Refrigerant R410a; HFC blend	EU+EFTA+UK	22b77a3b-8433-4330-bd7a-cb29997888a5	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=22b77a3b-8433-4330-bd7a-cb29997888a5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	229	Refrigerant R600a; iso-butane	EU+EFTA+UK	ebfb4abc-38df-42fc-b1eb-c05f79fcfbb2	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ebfb4abc-38df-42fc-b1eb-c05f79fcfbb2	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	230	Refrigerants technology mix consumption mix, at consumer Global market mix for refrigerants utilised in refrigeration and air conditioning systems.	GLO	69ff806a-232c-5d1d-b146-99fd931aa45a	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=69ff806a-232c-5d1d-b146-99fd931aa45a	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	231	regeneration salt dish production production mix 1 kg of regeneration salt dish	EU+EFTA+UK	b7035e6e-bee2-53bf-8534-414696968b3a	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=b7035e6e-bee2-53bf-8534-414696968b3a	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	232	rinsing agent dish production production mix 1 kg of rinsing agent dish	EU+EFTA+UK	0f961681-a96e-591e-8730-39f5f8115f25	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=0f961681-a96e-591e-8730-39f5f8115f25	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	233	Tap water average technology mix consumption mix, at consumer Technology mix for supply of drinking water to users	EU+EFTA+UK	ba873cc8-64d8-5d2e-b88f-6e69193541cc	1 m^3	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=ba873cc8-64d8-5d2e-b88f-6e69193541cc	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	234	tetrafluoroethane production technology mix production mix, at plant 100% active substance	GLO	acfe37e4-37e8-4d95-8354-157f09f6e37c	1 kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=acfe37e4-37e8-4d95-8354-157f09f6e37c	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	235	vacuum cleaner bag production 100% virgin kraft paper production mix 1 piece vacuum cleaner bag	EU+EFTA+UK	d987f8bf-223f-5d07-8370-e35fd8049372	1 item	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=d987f8bf-223f-5d07-8370-e35fd8049372	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	236	wood boiler production, 10 kw 1 unit	EU+EFTA+UK	ad8d821d-feda-5d80-8f6f-912783d7f3f1	1 item	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=ad8d821d-feda-5d80-8f6f-912783d7f3f1	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others_recycl	237	End of life of beverage cartons collection, transport, cleaning production mix, at plant 1kg of cardboard waste disposed	EU+EFTA+UK	4b75bb92-fa95-4abd-9c30-4ea81f9c1235	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4b75bb92-fa95-4abd-9c30-4ea81f9c1235	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
04-Others_recycl	238	Recycling paper and cardboard, waste management, technology mix, at plant collection, sorting, transport, recycling production mix, at plant paper waste, efficiency 90,9%	EU+EFTA+UK	308685e7-15fe-417e-a016-1f6060a0ff10	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=308685e7-15fe-417e-a016-1f6060a0ff10	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	239	Electricity from hydro power technology mix of run-off-river, storage and pump storage production mix, at power plant 1kV - 60kV	EU+EFTA+UK	ce479816-e2dd-44b6-aa54-15350277492e	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ce479816-e2dd-44b6-aa54-15350277492e	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	240	Electricity from nuclear technology mix of BWR and PWR production mix, at power plant 1kV - 60kV	EU+EFTA+UK	aae44b5f-5b2e-4c1e-ab2c-90fde474a9f8	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=aae44b5f-5b2e-4c1e-ab2c-90fde474a9f8	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	241	Electricity from photovoltaics	EU+EFTA+UK	02d676a4-68dd-42dc-a264-82c6aaa5189b	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=02d676a4-68dd-42dc-a264-82c6aaa5189b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	242	Electricity from wind power technology mix of onshore and offshore production mix, at plant 1kV - 60kV	EU+EFTA+UK	f6726ad2-d040-451b-8e10-51d4be9ed969	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=f6726ad2-d040-451b-8e10-51d4be9ed969	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	243	Electricity grid mix 1kV-60kV technology mix consumption mix, to consumer 1kV - 60kV	EU+EFTA+UK	34960d4d-af62-43a0-aa76-adc5fcf57246	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=34960d4d-af62-43a0-aa76-adc5fcf57246	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
05-Electricity	244	Electricity from biomass (solid) mix of direct and CHP, technology mix regarding firing and flue gas cleaning production mix, at power plant 1kV - 60kV	EU+EFTA+UK	b292e936-e4bb-428d-b79b-1ed63f455e07	1 kWh	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=b292e936-e4bb-428d-b79b-1ed63f455e07	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	245	Thermal energy from biogas technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	EU+EFTA+UK	0a223e9c-94c2-4acb-917c-4bb5c1fdc92b	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=0a223e9c-94c2-4acb-917c-4bb5c1fdc92b	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	246	Thermal energy from hard coal technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	ROW	1fd7e5fd-0464-46be-b289-52e4d074f4bb	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1fd7e5fd-0464-46be-b289-52e4d074f4bb	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	247	Thermal energy from heavy fuel oil (HFO) technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	ROW	2e7f9cb1-2d86-4ff8-9600-d022f39171aa	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=2e7f9cb1-2d86-4ff8-9600-d022f39171aa	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	248	Thermal energy from light fuel oil (LFO) technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	EU+EFTA+UK	e7510ad9-4bfa-4113-94b0-426e5f430c98	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=e7510ad9-4bfa-4113-94b0-426e5f430c98	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	249	Thermal energy from LPG technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	EU+EFTA+UK	ade98dea-0c74-4ebb-94ef-f9686eb0ddc5	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=ade98dea-0c74-4ebb-94ef-f9686eb0ddc5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	250	Thermal energy from natural gas technology mix regarding firing and flue gas cleaning production mix, at heat plant MJ, 100% efficiency	ROW	6db46295-201a-47d1-af8f-c2a7bee43946	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6db46295-201a-47d1-af8f-c2a7bee43946	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
06-Thermal energy	251	Thermal energy from wood wood powerplant production mix, at power plant 1 MJ	GLO	bebd00f2-0ea8-4c91-86b8-873a70529c49	1 MJ	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=bebd00f2-0ea8-4c91-86b8-873a70529c49	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
07-Boiler	252	10 kw central heating (ch) boiler production, fuelled by natural gas 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	2f327fc3-b54f-5d69-bebc-30641fdc857a	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=2f327fc3-b54f-5d69-bebc-30641fdc857a	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
07-Boiler	253	10 kw central heating (ch) boiler production, fuelled by natural gas, condensing boiler 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	14f0e136-75c3-596e-8f7b-913ed2b62149	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=14f0e136-75c3-596e-8f7b-913ed2b62149	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
07-Boiler	254	10 kw central heating (ch) boiler production, fuelled by oil 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	f4ccd535-fed5-5483-a408-6ea4e032cfce	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=f4ccd535-fed5-5483-a408-6ea4e032cfce	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
07-Boiler	255	10 kw central heating (ch) boiler production, fuelled by oil, condensing boiler 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	208b6f54-c964-55f4-ba1f-5ffd6b7754e0	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=208b6f54-c964-55f4-ba1f-5ffd6b7754e0	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
07-Boiler	256	10 kw central heating (ch) boiler production, fuelled by wood logs 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	dc0906bc-8e69-5b15-b919-84c7996d8610	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=dc0906bc-8e69-5b15-b919-84c7996d8610	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
07-Boiler	257	10 kw central heating (ch) boiler production, fuelled by wood pellets 10 kW Capacity lifespan 20 y production mix 1 MJ of thermal energy	EU+EFTA+UK	31ffe103-bbdc-526b-9b93-470242fa0213	1 MJ	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=31ffe103-bbdc-526b-9b93-470242fa0213	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
09-Transport	258	Articulated lorry transport, Euro 5, Total weight <7.5 t diesel driven, Euro 5, cargo consumption mix, to consumer up to 7,5t gross weight / 3,3t payload capacity	EU+EFTA+UK	87e3b2fe-8c95-4b0d-b33c-974f376b555d	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=87e3b2fe-8c95-4b0d-b33c-974f376b555d	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	259	Articulated lorry transport, Euro 5, Total weight >32 t diesel driven, Euro 5, cargo consumption mix, to consumer more than 32t gross weight / 24,7t payload capacity	EU+EFTA+UK	972e93a2-d95b-47cd-86c0-dedb5726ee88	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=972e93a2-d95b-47cd-86c0-dedb5726ee88	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	260	Articulated lorry transport, Euro 5, Total weight 12-14 t diesel driven, Euro 5, cargo consumption mix, to consumer 12-14t gross weight / 9,3t payload capacity	EU+EFTA+UK	9b5997d8-785c-48a1-8afe-bdec3bb066d9	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9b5997d8-785c-48a1-8afe-bdec3bb066d9	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	261	Articulated lorry transport, Euro 5, Total weight 14-20 t diesel driven, Euro 5, cargo consumption mix, to consumer 14 - 20t gross weight / 11,4t payload capacity	EU+EFTA+UK	41910909-0576-48eb-92e7-003a8a5afff5	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=41910909-0576-48eb-92e7-003a8a5afff5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	262	Articulated lorry transport, Euro 5, Total weight 20-26 t diesel driven, Euro 5, cargo consumption mix, to consumer 20 - 26t gross weight / 17,3t payload capacity	EU+EFTA+UK	cb96e354-4f9d-4db0-a2fe-00593667cef2	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=cb96e354-4f9d-4db0-a2fe-00593667cef2	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	263	Articulated lorry transport, Euro 5, Total weight 28-32 t diesel driven, Euro 5, cargo consumption mix, to consumer 28 - 32t gross weight / 22t payload capacity	EU+EFTA+UK	d1cc752c-bc10-49cf-b455-0e236965fd64	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=d1cc752c-bc10-49cf-b455-0e236965fd64	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	264	Articulated lorry transport, Euro 5, Total weight 7,5-12 t diesel driven, Euro 5, cargo consumption mix, to consumer 7,5 t - 12t gross weight / 5t payload capacity	EU+EFTA+UK	9b6594de-5438-41ea-8b76-41d1ee85d3ba	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9b6594de-5438-41ea-8b76-41d1ee85d3ba	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	265	Barge technology mix, diesel driven, cargo consumption mix, to consumer 1500 t payload capacity	EU+EFTA+UK	4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=4cfacea0-cce4-4b4d-bd2b-223c8d4c90ae	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
09-Transport	266	Cargo plane technology mix, kerosene driven, cargo consumption mix, to consumer 65 t payload	GLO	1cc5d465-a12a-43da-aa86-a9c6383c78ac	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=1cc5d465-a12a-43da-aa86-a9c6383c78ac	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
10-Fuels	267	Diesel at filling station region mix based on GDP from crude oil and bio components consumption mix, at filling station 23% RAS without CN, 18% CN, 29% RNA, 14% EU, 4% RSA, 3% RAF	GLO	5e535a9b-1b46-4ab8-ae24-d60485575060	1 kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=5e535a9b-1b46-4ab8-ae24-d60485575060	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	268	Freight train, electricity traction electricity driven, cargo consumption mix, to consumer average train, gross tonne weight 1000t / 726t payload capacity	EU+EFTA+UK	dbde67a3-af4f-4d60-9568-4e0ef6eaaf07	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=dbde67a3-af4f-4d60-9568-4e0ef6eaaf07	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	269	Transoceanic ship, bulk heavy fuel oil driven, cargo consumption mix, to consumer 100.000- 200.000 dwt payload capacity, ocean going	GLO	82b202c3-826c-4053-b49f-bc6ef737420a	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=82b202c3-826c-4053-b49f-bc6ef737420a	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
09-Transport	270	Transoceanic ship, containers heavy fuel oil driven, cargo consumption mix, to consumer 27.500 dwt payload capacity, ocean going	GLO	6ca61112-1d5b-473c-abfa-4accc66a8a63	1 tkm	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6ca61112-1d5b-473c-abfa-4accc66a8a63	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
10-Fuels	271	Natural gas mix technology mix consumption mix, to consumer medium pressure level (< 1 bar)	EU+EFTA+UK	6af14cd2-fd8b-408c-a149-849b0d10c195	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=6af14cd2-fd8b-408c-a149-849b0d10c195	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
10-Fuels	272	Light fuel oil at refinery from crude oil production mix, at refinery 0.1 wt.% sulphur	EU+EFTA+UK	386821c2-309d-4019-8972-04a072082ef5	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=386821c2-309d-4019-8972-04a072082ef5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
10-Fuels	273	hardwood forestry technology mix production mix, at forest measured as solid wood under bark	EU+EFTA+UK	3e339f63-ae9e-5223-82b4-3c2acc029c64	1kg	https://lcdn.blonkconsultants.nl/datasetdetail/process.xhtml?uuid=3e339f63-ae9e-5223-82b4-3c2acc029c64	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
10-Fuels	274	softwood forestry technology mix production mix, at forest measured as solid wood under bark	EU+EFTA+UK	4784d49e-d4b3-5702-b16e-fc67a880d145	1kg	https://lcdn.blonkconsultants.nl/datasetdetail/process.xhtml?uuid=4784d49e-d4b3-5702-b16e-fc67a880d145	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	275	Calcium carbonate production; technology mix; production mix, at plant; 100% active substance	EU+EFTA+UK	616b719c-0787-4329-a076-318e7adad458	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=616b719c-0787-4329-a076-318e7adad458	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	276	calcium chloride production; technology mix; production mix, at plant; 100% active substance	EU+EFTA+UK	ac62e78c-bd8b-403c-bf8c-23502a5283d3	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=ac62e78c-bd8b-403c-bf8c-23502a5283d3	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	277	Calcium hydroxide production; technology mix; production mix, at plant; 100% active substance	EU+EFTA+UK	dd4fea62-2c80-4483-bf74-24dcfba43756	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=dd4fea62-2c80-4483-bf74-24dcfba43756	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
02-Metals	278	Chromium oxide production; technology mix; production mix, at plant; 100% active substance	EU+EFTA+UK	a2eb13ad-a9cb-4f62-8794-c6723cd7b0f1	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=a2eb13ad-a9cb-4f62-8794-c6723cd7b0f1	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
02-Metals	279	Ferrochromium; primary production, ore mining and beneficiation; production mix, at plant; 60 % chrome, high carbon 6%	EU+EFTA+UK	5c5643bc-6944-4b96-acbf-4fdd9504aa64	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=5c5643bc-6944-4b96-acbf-4fdd9504aa64	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/

Category	id	Dataset name	Location (GLO=global average data)	UUID	Reference flow	Permanent data set URI	Data provider
02-Metals	280	titanium dioxide production; technology mix; production mix, at plant; 100% active substance	EU+EFTA+UK	06fa4d7a-939c-4c42-b177-6b5bb45aaf94	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=06fa4d7a-939c-4c42-b177-6b5bb45aaf94	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
02-Metals	281	Titanium; technology mix; production mix, at plant; 4.50 g/cm3, 47.87 g/mol	GLO	9f921a7f-36a6-4d3b-914f-0e52082d43a1	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=9f921a7f-36a6-4d3b-914f-0e52082d43a1	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	282	Silicon mix production; technology mix; production mix, at plant; 100% active substance	GLO	9eb924c8-7614-4a83-9062-7a22e4a45770	1kg	https://ecoinvent.lca-data.com/datasetdetail/process.xhtml?uuid=9eb924c8-7614-4a83-9062-7a22e4a45770	ecoinvent association, Blonk consultants and Pre sustainability , © 2023; www.ecoinvent.org
04-Others	283	Pallet, wood (100x120); sawing, piling, nailing; single route, at plant; 30 kg/piece, nominal loading capacity of 1000kg	EU+EFTA+UK	fedca7cf-97df-4d02-a3d3-8e53bb5ee8b7	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=fedca7cf-97df-4d02-a3d3-8e53bb5ee8b7	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
04-Others	284	Plywood box; attaching veneer layers; production mix, at plant; 5% moisture	EU+EFTA+UK	15f2b285-fd84-49e7-b922-ec63ab9f8ad5	1kg	http://lcdn.thinkstep.com/Node/showProcess.xhtml?uuid=15f2b285-fd84-49e7-b922-ec63ab9f8ad5	Sphera Managed LCA Content, © 2023; https://sphera.com/life-cycle-assessment-lca-database/
02-Metals	285	Strontium chromate; From sodium dichromate from acidification of sodium chromate; , at plant	GLO	70efb244-2373-4b09-a899-9604e589a95c	1kg	https://lcdn-cepe.org/datasetdetail/process.xhtml?uuid=70efb244-2373-4b09-a899-9604e589a95c	CEPE, The European Council of the Paint, Printing ink, and Artists' Colours Industry, © 2023; https://www.cepe.org/

Source: JRC elaboration

Annex 2

Table A2.1: CFF parameters as stored in the worksheet "CFF parameters_Annex C" in the Ecoreport tool (2024).

Category	id	Datasets	A	R1	R2
01-Plastics	1	Acrylonitrile Butadiene Styrene (ABS) emulsion polymerisation, bulk polymerisation or combined processes production mix, at plant	50%	0%	0%
01-Plastics	2	Aramid fiber low-temperature solution polymerisation of m-phenylene diamine with isophthaloyl chloride production mix, at plant petrochemical based	50%	0%	0%
01-Plastics	4	Epoxy plastic polymerisation of liquid epoxy resins with a latent hardener (amine) production mix, at plant petrochemical based	50%	0%	0%
01-Plastics	5	EPS Beads from styrene polymerization and foaming production mix, at plant 0.96- 1.04 g/cm3	50%	0%	0%
01-Plastics	6	Ethylene propylene dien elastomer (EPDM) copolymerization of ethylene and propylene production mix, at plant 69% ethylene, 38% propylene	50%	0%	0%
01-Plastics	7	HDPE granulates Polymerisation of ethylene production mix, at plant 0.91-0.96 g/cm3, 28 g/mol per repeating unit	50%	0%	0%
01-Plastics	9	LDPE granulates Polymerisation of ethylene production mix, at plant 0.91-0.96 g/cm3, 28 g/mol per repeating unit	50%	0%	0%
01-Plastics	10	LLDPE granulates Polymerisation of ethylene production mix, at plant 0.87-94 g/cm3, 28 g/mol per repeating unit	50%	0%	0%
01-Plastics	11	Nylon 6 fiber extrusion into fiber production mix, at plant 5% loss, 3,5 MJ electricity	50%	0%	0%
01-Plastics	12	Polyethylene terephthalate (PET), petrochemical based polymerisation of ethylene glycol and terephthalic acid production mix, at plant petrochemical based	50%	0%	0%
01-Plastics	13	Polymethyl methacrylate (PMMA) granulate bulk polymerisation, from methyl methacrylate production mix, at plant 1.18 g/cm3	50%	0%	0%
01-Plastics	14	Polycarbonate (PC) granulate Technology mix, dipenyl carbonate route and phosgene route production mix, at plant 1.20–1.22 g/cm3	50%	0%	0%
01-Plastics	15	Polyester resin esterification and polymerization, from propylene glycol, phthalic anhydride and styrene production mix, at plant 1.22- 1.38 g/cm3	50%	0%	0%
01-Plastics	16	Polypropylene (PP), petrochemical based polymerisation of bio-fossil propylene production mix, at plant petrochemical based	50%	0%	0%
01-Plastics	17	Polystyrene production, high impact polymerisation of styrene production mix, at plant 1.05 g/cm3	50%	0%	0%
01-Plastics	18	Polytetrafluoroethylene granulate (PTFE) Mix polymerisation of tetrafluorethylene production mix, at plant 2.16 g/cm3	50%	0%	0%
01-Plastics	20	Polyurethane flexible foam reaction of toluene diisocyanate (TDI) with long-chain polyether polyol and foaming production mix, at plant 18- 53 kg/m3	50%	0%	0%
01-Plastics	21	Polyurethane rigid foam from methylene diisocyanate (MDI) and polyols production mix, at plant 18- 53 kg/m3	50%	0%	0%
01-Plastics	22	PVC granulates, low density polymerisation of vinyl chloride production mix, at plant 62 g/mol per repeating unit	50%	0%	0%
01-Plastics	23	Polyvinyl fluoride polymerisation of vinyl fluoride production mix, at plant 1.77 g/cm3	50%	0%	0%
01-Plastics	24	Polyvinylidenchloride granulate from vinylidene dichloride production mix, at plant 1.63 g/cm3	50%	0%	0%
01-Plastics	25	Polyvinylidene fluoride (PVDF) polymerisation of vinyl fluoride production mix, at plant 1.76 g/cm3	50%	0%	0%
01-Plastics	26	Silicone, high viscosity hydrolysis and methanolysis of dimethyldichloro silane production mix, at plant >30 000 centi Poise	50%	0%	0%
01-Plastics	27	Styrene acrylonitrile (SAN)	50%	0%	0%
02-Metals	46	Aluminium ingot (copper main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	47	Aluminium ingot (magnesium main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	48	Aluminium ingot (manganese main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	49	Aluminium ingot (silicon and magnesium main solutes) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	50	Aluminium ingot (silicon main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	51	Aluminium ingot (zinc main solute) primary production, aluminium casting and alloying single route, at plant 2.7 g/cm3	20%	30%	85%
02-Metals	52	Aluminium ingot mix (high purity) primary production, aluminium casting single route, at plant 2.7 g/cm3, >99% Al	20%	30%	85%
02-Metals	54	Antimony technology mix, primary production production mix, at plant 99.5% Antimony	20%	0%	0%
02-Metals	55	Brass anode furnace and casting, from copper and zinc, primary production single route, at plant 8.41- 8.86 g/cm3	20%	n.a.	n.a.
02-Metals	58	Cast iron electric arc furnace route, from steel scrap, secondary production single route, at plant > 2,06 % carbon content	20%	n.a.	n.a.
02-Metals	59	Coating powder, exterior production technology mix production mix, at plant 100% active substance	20%	n.a.	n.a.

Category	id	Datasets	A	R1	R2
02-Metals	60	Cobalt hydro- and pyrometallurgical processes production mix, at plant >99% Co	20%	n.a.	n.a.
02-Metals	61	Copper Cathode, production mix	20%	0%	0%
02-Metals	68	Ferrite (iron ore) iron ore mining and processing production mix, at plant 5.00 g/cm3	20%	0%	0%
02-Metals	70	Ferronickel mining, ore beneficiation production mix, at plant 32 % nickel	20%	n.a.	n.a.
02-Metals	72	Flat glass, uncoated cut, Pilkington process, from sand and soda ash production mix, at plant 2500 kg/m3	20%	0%	0%
02-Metals	74	Gallium technology mix production mix, at plant 5.9 g/cm3	20%	n.a.	n.a.
02-Metals	75	Gold (primary route) primary route, underground mining and leaching production mix, at plant 19.32 g/cm3	20%	n.a.	n.a.
02-Metals	76	Lead (primary) primary production, mining and processing production mix, at plant 11.3 g/cm3	20%	0%	0%
02-Metals	77	Magnesium Pidgeon Process, primary production production mix, at plant 1.74 g/cm	20%	n.a.	n.a.
02-Metals	78	Manganese mining, separation, calcination, electrolysis production mix, at plant 7.21 g/cm3	20%	n.a.	n.a.
02-Metals	79	Molybdenum mining & concentration flotation, roasting, reduction production mix, at plant 10.28 g/cm3	20%	n.a.	n.a.
02-Metals	80	Nickel mining and processing production mix, at plant 8.9 g/cm3, update available	20%	n.a.	n.a.
02-Metals	81	Palladium primary production, mining and processing production mix, at plant 11.99 g/cm3	20%	n.a.	n.a.
02-Metals	82	Platinum primary production production mix, at plant 21.45 g/cm3 , 195.08 g/mol	20%	n.a.	n.a.
02-Metals	83	Rare earth concentrate mining, concentration, roasting, refining production mix, at plant concentrated	20%	n.a.	n.a.
02-Metals	84	Silver mining, concentration, roasting, refining production mix, at plant 10.49 g/cm3	20%	n.a.	n.a.
02-Metals	85	Stainless steel cold rolled hot rolling production mix, at plant stainless steel	20%	0%	85%
02-Metals	86	Stainless steel hot rolled hot rolling production mix, at plant stainless steel	20%	0%	85%
02-Metals	87	Steel cold rolled coil blast furnace route single route, at plant carbon steel	20%	0%	85%
02-Metals	88	Steel electrogalvanized coil steel sheet electrogalvanization single route, at plant 1.5 mm sheet thickness, 0.02 mm zinc thickness	20%	0%	85%
02-Metals	89	Steel hot dip galvanised steel sheet hot dip galvanization single route, at plant 1.5 mm sheet thickness, 0.02 mm zinc thickness	20%	0%	85%
02-Metals	90	Steel sheet cold rolling - thickness 2.5mm steel cold rolling process single route, at plant thickness 2.5 mm	20%	0%	85%
02-Metals	93	Talcum powder grinded and purified, filler, production including underground mining and beneficiation production mix, at plant 1 to 15 microns grain size	20%	n.a.	n.a.
02-Metals	94	Tin sand extraction and processing, reduction production mix, at plant 118.71 g/mol	20%	n.a.	n.a.
02-Metals	97	Zamak zinc production, alloying single route, at plant 4% aluminium	20%	n.a.	n.a.
02-Metals	98	Zinc technology mix, primary production consumption mix, to consumer 7.14 g/cm3	20%	n.a.	n.a.
03-Electronics	132	Cable, high current technology mix production mix, at plant high current, 1m, 13 g/m	50%	0%	50%
03-Electronics	133	Cable, three-conductor cable technology mix production mix, at plant three-conductor cable, 1m, 60 g/m	50%	0%	50%
03-Electronics	134	Capacitor ceramic technology mix production mix, at plant capacitor, mlcc, 6 mg	50%	0%	50%
03-Electronics	135	Capacitor SMD technology mix production mix, at plant SMD capacitor, 12.5 g	50%	0%	50%
03-Electronics	136	Capacitor, electrolyte technology mix production mix, at plant electrolyte, hight <2 cm, 9.5 g	50%	0%	50%
03-Electronics	137	Capacitor, film type technology mix production mix, at plant film type, 31.6 g	50%	0%	50%
03-Electronics	138	Capacitor, Tantalum technology mix production mix, at plant tantalum capacitor, 0.5 g	50%	0%	50%
03-Electronics	139	Connector for printed wiring board (PWB) technology mix production mix, at plant 1 PWB connector, 0.005kg	50%	0%	50%
03-Electronics	140	Connector Peripheral Component Interconnect (PCI) bus technology mix production mix, at plant 1 PCI bus connector, 0.00255 kg	50%	0%	50%
03-Electronics	141	Controller board	50%	0%	50%
03-Electronics	142	Cylindrical connector, brass body technology mix production mix, at plant brass body, 0.015 kg	50%	0%	50%
03-Electronics	143	Diode Metal electrode leadless face (mMELF) front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 40 mg	50%	0%	50%
03-Electronics	144	Flat chip resistor technology mix production mix, at plant 1 piece of resistor flat chip 1206 (9.2mg)	50%	0%	50%
03-Electronics	145	Glass SMD diode front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 130 mg	50%	0%	50%
03-Electronics	148	Hard disk drive, for desktop computer technology mix production mix, at plant 1 piece of HDD	50%	0%	50%
03-Electronics	151	Light Emitting Diode (LED) front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 5 mm, 350 mg	50%	0%	50%

Category	id	Datasets	A	R1	R2
03-Electronics	152	Light Emitting Diode (LED), high power front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 5 mm, 350 mg	50%	0%	50%
03-Electronics	153	Light Emitting Diode (LED), low power front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 59 mg	50%	0%	50%
03-Electronics	154	Liquid Crystal Display (LCD)	50%	0%	50%
03-Electronics	155	Medium power transistor semiconductor front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 4.8 g	50%	0%	50%
03-Electronics	156	Monocrystalline silicon for photovoltaics Czochralski technique production mix, at plant 1 kg monocrystalline silicon	50%	0%	50%
03-Electronics	163	Plastic axial diode, Semiconductor front-end and back-end processing of the wafer, including Czochralski method of silicon growing production mix, at plant 1.12 g	50%	0%	50%
03-Electronics	164	Printed wiring board (PWB) (2-layer) via the subtractive method (as opposed to additive method) production mix, at plant 2-layer, 1.32 kg	50%	0%	50%
03-Electronics	165	Printed wiring board (PWB) (8-layer) via the subtractive method (as opposed to additive method) production mix, at plant 8-layer, 3.08 kg	50%	0%	50%
03-Electronics	166	Power supply Unit (PSU) technology mix production mix, at plant 0.27 kg	50%	0%	50%
03-Electronics	167	SMD coil technology mix production mix, at plant 1 piece of Coil miniature wound SDR1006 (1.16g) D9.8 x 5.8	50%	0%	50%
03-Electronics	168	Solder Paste (SnAg3.5Cu0.7) technology mix production mix, at plant 1 kg of solder paste	50%	0%	50%
03-Electronics	169	Standard transformer for Printed Wiring Board (PWB) technology mix production mix, at plant 1 piece of transformer for PWB, 0.08 kg	50%	0%	50%
03-Electronics	170	Switch < 1 Ampere technology mix production mix, at plant < 1 Ampere, 79 mg	50%	0%	50%
03-Electronics	171	Switch > 1 Ampere technology mix production mix, at plant > 1 Ampere, 242 mg	50%	0%	50%
03-Electronics	172	Switch Mode Transformer (SMT), low voltage technology mix production mix, at plant 80g of low voltage transformer	50%	0%	50%
03-Electronics	173	Toner module, laser printer, black and white production of toner module, laser printer, black and white production mix, at plant 1 piece, 2.36 kg	50%	0%	50%
03-Electronics	174	Toner module, laser printer, colour production of toner module, laser printer, colour production mix, at plant 1 piece, 2.36 kg	50%	0%	50%
03-Electronics	175	VGA plug technology mix production mix, at plant VGA steel plug, 0.0191 kg	50%	0%	50%
04-Others	213	Ammonia, as 100% NH3 production technology mix production mix, at plant 100% active substance	50%	n.a.	n.a.
04-Others	214	Bitumen at refinery from crude oil production mix, at refinery 38.7 MJ/kg net calorific value	50%	n.a.	n.a.
04-Others	215	carbon dioxide, liquid production technology mix production mix, at plant 100% active substance	50%	n.a.	n.a.
04-Others	216	Concrete, production mix, at plant aggregates mixing production mix, at plant C20/25	50%	n.a.	n.a.
04-Others	217	Corrugated board, uncoated "virgin" Kraft Pulping Process, pulp pressing and drying production mix, at plant flute thickness 0.8- 2.8 mm, R1=0%	50%	n.a.	n.a.
04-Others	218	detergent dish production production mix 1 kg of detergent dish	50%	n.a.	n.a.
04-Others	219	detergents washing machine production production mix 1 kg of detergents washing machine	50%	n.a.	n.a.
04-Others	220	electric boiler production 1 unit	50%	n.a.	n.a.
04-Others	221	gas boiler production, 10 kwh 1 unit	50%	n.a.	n.a.
04-Others	222	glass fiber technology mix production mix, at plant 1 kg	50%	n.a.	n.a.
04-Others	223	Kraft paper, uncoated Kraft Pulping Process, pulp pressing and drying production mix, at plant <120 g/m2	50%	n.a.	n.a.
04-Others	224	oil boiler production, 10 kw 1 unit	50%	n.a.	n.a.
04-Others	225	Refrigerant R290; propane	50%	n.a.	n.a.
04-Others	226	Refrigerant R404a; HFC blend	50%	n.a.	n.a.
04-Others	227	Refrigerant R407c; HFC blend	50%	n.a.	n.a.
04-Others	228	Refrigerant R410a; HFC blend	50%	n.a.	n.a.
04-Others	229	Refrigerant R600a; iso-butane	50%	n.a.	n.a.
04-Others	230	Refrigerants technology mix consumption mix, at consumer Global market mix for refrigerants utilised in refrigeration and air conditioning systems.	50%	n.a.	n.a.
04-Others	231	regeneration salt dish production production mix 1 kg of regeneration salt dish	50%	n.a.	n.a.
04-Others	232	rinsing agent dish production production mix 1 kg of rinsing agent dish	50%	n.a.	n.a.
04-Others	233	Tap water average technology mix consumption mix, at consumer Technology mix for supply of drinking water to users	50%	n.a.	n.a.
04-Others	234	tetrafluoroethane production technology mix production mix, at plant 100% active substance	50%	n.a.	n.a.
04-Others	235	vacuum cleaner bag production 100% virgin kraft paper production mix 1 piece vacuum cleaner bag	50%	n.a.	n.a.
04-Others	236	wood boiler production, 10 kw 1 unit	50%	n.a.	n.a.

Source: JRC elaboration

Annex 3

Table A3.1: 2023 List of CRMs for the EU - Study on the Critical Raw Materials for the EU 2023 – Final Report, Annex 1 Critical Raw Materials overview

Raw materials	EoL-RIR	Selected Uses
Aluminium/ bauxite	32%	Lightweight structures
		High-tech engineering
Antimony	28%	Flame retardants
		Defence applications
		Lead-acid batteries
Arsenic	0%	Semiconductors Alloys
Baryte	0%	Medical applications
		Radiation protection
		Chemical applications
Beryllium	0%	Electronic and Communications Equipment
		Automotive, aero-space and defence components
Bismuth	0%	Pharmaceuticals
		Medical applications
		Low-melting point alloys
		Solid rocket propellant
Boron/Borates	1%	High performance glass
		Fertilisers
		Permanent magnets
Cobalt	22%	Batteries
		Super alloys
		Catalysts
		Magnets
Coking coal	0%	Coke for steel
		Carbon fibres
		Battery electrodes
Copper	17%	Electrical infrastructure
Feldspar	1%	Glass including fibreglass
		Ceramics
Fluorspar	1%	Steel and iron making Refrigeration and air-conditioning
		Aluminium making and other metallurgy
Gallium	0%	Semiconductors
		Photovoltaic cells
Germanium	2%	Optical fibres and Infrared optics
		Satellite solar cells
		Polymerisation catalysts
Hafnium	0%	Super alloys
		Nuclear control rods
		Refractory ceramics
Helium	2%	Controlled atmospheres
		Semiconductors
		MRI
Lithium	0%	Batteries
		Glass and ceramics
		Steel and aluminium metallurgy
Magnesium	13%	Lightweight alloys for automotive, electronics, packaging or construction
		Desulphurisation agent in steelmaking
Manganese	9%	Steel-making
		Batteries
Natural Graphite	3%	Batteries

Raw materials	EoL-RIR	Selected Uses
		Refractories for steelmaking
Nickel	16%	Batteries
		Steel making
		Automotive
Niobium	0%	High-strength steel and super alloys for transportation and infrastructure
		High-tech applications (capacitors, superconducting magnets, etc.)
Phosphate rock	17%	Mineral fertilizer
		Phosphorous compounds
Phosphorus	0%	Chemical applications
		Defence applications
Scandium	0%	Solid Oxide Fuel Cells
		Lightweight alloys
Silicon metal	0%	Semiconductors
		Photovoltaics
		Electronic components
		Silicones
Strontium	0%	Ceramic magnets
		Aluminium alloys
		Medical applications
		Pyrotechnics
Tantalum	0%	Capacitors for electronic devices
		Super alloys
Titanium metal	19%	Lightweight high-strength alloys for e.g. aeronautics, space and defence
		Medical applications
Tungsten	42%	Alloys e.g. for aeronautics, space, defence, electrical technology
		Mill, cutting and mining tools
Vanadium	1%	High-strength-low-alloys for e.g. aeronautics, space, nuclear reactors
		Chemical catalysts
Platinum Group Metals	10%	Chemical and automotive catalysts
		Fuel Cells
		Electronic applications
Heavy Rare Earth Elements	4%	Permanent Magnets for electric motors and electricity generators Lighting Phosphors Catalysts Batteries Glass and ceramics
Light Rare Earth Elements	3%	

Source: (European Commission 2023)

Table A3.2: Short list of 68 combinations of CRMs and specific application derived from the proposed methodology (draft*) in the Ecoreport tool (2024). * All these initial recommendations (in violet columns) are to be re-checked and/or completed when running a preparatory study, taking into account specific aspects of the product group and using adequate expertise.

B	C	D	E	I	J	L	N	O	P
Material	Application	Share	NACE-2 sector	EOL-RIR	EOL-RR	High priority	RECYCLE MORE or ADD RECYCLED CONTENT	DECLARE Q.TY	EXTEND LIFE
Aluminium/Bauxite	Construction	21%	C25 - Manufacture of fabricated metal products, except machinery and equipment	32%	69%	x	x		
Aluminium/Bauxite	Packaging	15%	C25 - Manufacture of fabricated metal products, except machinery and equipment	32%	69%	x	x		
Aluminium/Bauxite	High tech engineering	11%	C28 - Manufacture of machinery and equipment n.e.c.	32%	69%	x	x		
Aluminium/Bauxite	Consumer durables	5%	C25 - Manufacture of fabricated metal products, except machinery and equipment	32%	69%	x	x		
Antimony	Flame retardants	43%	C20 - Manufacture of chemicals and chemical products	28%	N/A	x			
Antimony	Lead-acid batteries	32%	C27 - Manufacture of electrical equipment	28%	N/A	x	x	x	x
Arsenic	Electronics	1%	C26 - Manufacture of computer, electronic and optical products	0%	<1%	x	x	x	x
Beryllium	Aerospace and Defence	17%	C30 - Manufacture of other transport equipment	0%	0%	x		x	
Beryllium	Consumer Electronics	12%	C26 - Manufacture of computer, electronic and optical products	0%	0%	x		x	
Beryllium	Telecommunication Infrastructure	11%	C26 - Manufacture of computer, electronic and optical products	0%	0%	x		x	
Boron/Borates	Magnets	0%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	0%	x	x	x	x
Cerium	Batteries	2%	C27 - Manufacture of electrical equipment	1%	0%	x	x	x	x
Cobalt	Magnets	7%	C25 - Manufacture of fabricated metal products, except machinery and equipment	22%	32%	x	x	x	x
Cobalt	Batteries	3%	C27 - Manufacture of electrical equipment	22%	32%	x	x	x	x
Copper	Building construction, Electrical power	21%	C27 - Manufacture of electrical equipment	17%	28%	x	x		
Copper	Building construction, plumbing	10%	C28 - Manufacture of machinery and equipment n.e.c.	17%	28%	x	x		
Copper	Manufacture, Industrial, Electrical	6%	C27 - Manufacture of electrical equipment	17%	28%	x	x		
Copper	Manufacture, other, cooling	3%	C28 - Manufacture of machinery and equipment n.e.c.	17%	28%	x	x		
Copper	Infrastructure, Telecommunications	3%	C27 - Manufacture of electrical equipment	17%	28%	x	x		x
Copper	Manufacture, other, electronic	2%	C26 - Manufacture of computer, electronic and optical products	17%	28%	x	x		
Copper	Building construction, Architecture	2%	C28 - Manufacture of machinery and equipment n.e.c.	17%	28%	x	x		
Copper	Building construction, Communications	1%	C27 - Manufacture of electrical equipment	17%	28%	x	x		
Copper	Building construction, building plant	>0%	C32 - Other manufacturing	17%	28%	x	x		
Dysprosium	Magnets	100%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	0%	x	x	x	x
Erbium	Lighting	26%	C27 - Manufacture of electrical equipment	1%	N/A	x		x	
Europium	Lighting	10%	C27 - Manufacture of electrical equipment	1%	N/A	x		x	
Gadolinium	Magnets	10%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	N/A	x	x	x	x
Gadolinium	Lighting	0%	C27 - Manufacture of electrical equipment	1%	N/A	x		x	
Gadolinium	Magnetic Resonance Imaging - MRI	40%	C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	1%	N/A	x		x	x
Gallium	Integrated circuits	70%	C26 - Manufacture of computer, electronic and optical products	0%	0%	x		x	
Gallium	Lighting	25%	C27 - Manufacture of electrical equipment	0%	0%	x		x	
Gallium	CIGS solar cells	5%	C26 - Manufacture of computer, electronic and optical products	0%	0%	x			
Germanium	Infrared optics	52%	C26 - Manufacture of computer, electronic and optical products	2%	12%	x		x	
Germanium	Optical fibers	23%	C27 - Manufacture of electrical equipment	2%	12%	x		x	
Germanium	Satellite solar cells	12%	C26 - Manufacture of computer, electronic and optical products	2%	12%	x			
Helium	Semiconductors, optic fibres	8%	C26 - Manufacture of computer, electronic and optical products	2%	0%	x			
Iridium	Electronics	26%	C26 - Manufacture of computer, electronic and optical products	12%	20-30%	x	x	x	x
Lanthanum	Batteries	3%	C27 - Manufacture of electrical equipment	1%	0%	x	x	x	x
Lithium	Batteries	12%	C27 - Manufacture of electrical equipment	0%	0%	x	x	x	x

B	C	D	E	I	J	L	N	O	P
Material	Application	Share	NACE-2 sector	EOL-RIR	EOL-RR	High priority	RECYCLE MORE or ADD RECYCLED CONTENT	DECLARE Q.TY	EXTEND LIFE
Magnesium	Packaging	23%	C25 - Manufacture of fabricated metal products, except machinery and equipment	13%	N/A	x			
Manganese	Building and construction	43%	C25 - Manufacture of fabricated metal products, except machinery and equipment	9%	>50%	x	x		
Manganese	Domestic appliances	2%	C27 - Manufacture of electrical equipment	9%	>50%	x			
Natural Graphite	Batteries	8%	C27 - Manufacture of electrical equipment	3%	N/A	x	x	x	x
Neodymium	Magnets	80%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	1%	x	x	x	x
Neodymium	Batteries	4%	C27 - Manufacture of electrical equipment	1%	N/A	x	x	x	x
Nickel	Building and construction	10%	C25 - Manufacture of fabricated metal products, except machinery and equipment	16%	42%	x	x		
Nickel	Electro and electronics (electronic)	6%	C26 - Manufacture of computer, electronic and optical products	16%	42%	x	x	x	x
Nickel	Electro and electronics (electrical)	6%	C27 - Manufacture of electrical equipment	16%	42%	x			
Nickel	Batteries (portable, mobility, e-bikes, industrial)	1%	C27 - Manufacture of electrical equipment	16%	42%	x	x	x	x
Palladium	Electronics	4%	C26 - Manufacture of computer, electronic and optical products	12%	47%	x	x	x	x
Phosphorus	Plastics additives	21%		0%	N/A	x		x	
Phosphorus	Lithium-ion batteries	0%		0%	N/A	x	x	x	x
Platinum	Electronics	2%	C26 - Manufacture of computer, electronic and optical products	12%	60-70%	x	x	x	x
Platinum	Fuel Cells	1%	C27 - Manufacture of electrical equipment	12%	60-70%	x	x	x	x
Praseodymium	Magnets	80%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	1%	x	x	x	x
Praseodymium	Batteries	4%	C27 - Manufacture of electrical equipment	1%	N/A	x	x	x	x
Rhodium	Electronics	0%	C26 - Manufacture of computer, electronic and optical products	12%	62%	x	x	x	x
Ruthenium	Electronics	37%	C26 - Manufacture of computer, electronic and optical products	12%	N/A	x	x	x	x
Samarium	Magnets	97%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	N/A	x	x	x	x
Scandium	Solid Oxide Fuel Cells	100%	C27 - Manufacture of electrical equipment	0%	N/A	x	x	x	x
Silicon metal	Electronic applications	2%	C26 - Manufacture of computer, electronic and optical products	0%	0%	x	x	x	x
Strontium	Magnets	40%	C25 - Manufacture of fabricated metal products, except machinery and equipment	0%	<1%	x	x	x	x
Tantalum	Capacitors	36%	C26 - Manufacture of computer, electronic and optical products	1%	40%	x		x	
Tantalum	Sputtering targets	11%	C26 - Manufacture of computer, electronic and optical products	1%	40%	x			
Terbium	Magnets	90%	C25 - Manufacture of fabricated metal products, except machinery and equipment	1%	1%	x	x	x	x
Terbium	Lighting	10%	C27 - Manufacture of electrical equipment	1%	N/A	x	x	x	x
Titanium metal	Medical equipment	25%	C28 - Manufacture of machinery and equipment n.e.c.	1%	N/A	x			
Tungsten	Lighting and electronic uses	6%	C27 - Manufacture of electrical equipment	42%	22%	x	x		x

Source: JRC elaboration

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:
— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
— at the following standard number: +32 22999696,
— via the following form: european-union.europa.eu/contact-eu/write-us_en.

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

Open data from the EU

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

Science for policy

The Joint Research Centre (JRC) provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society

EU Science Hub
joint-research-centre.ec.europa.eu

Publications Office
of the European Union