ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	ARGE: European Federation of Associations of Lock and Builders Hardware Manufacturers
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARG-20160190-IBG1-EN
ECO EPD Ref. No.	ECO-00000449
Issue date	28.09.2021
Valid to	13.09.2022

Padlocks

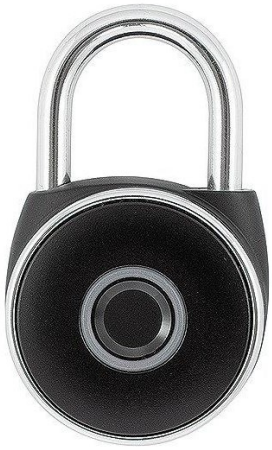
ARGE: European Federation of Associations of Lock and Builders Hardware Manufacturers

(This EPD is valid only for products listed below supplied by HOPPE UK LTD who is an ARGE EPD license holder)

ARRONE®
The complete range.

Product Lines:

AR85 Series
AR90 Series



Signed on behalf of:

HOPPE UK LTD _____ **Date** 28.09.2021

Full name Jonathan Walker

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Door & Hardware Federation
Registered in England No. 2537077
VAT No. 240 1122 34

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www.bau-umwelt.com / https://epd-online.com

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1. General Information

Name of the manufacturer

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-ARG-20160190-IBG1-EN

This Declaration is based on the Product Category Rules:
Building Hardware products, 07.2014
(PCR tested and approved by the SVR)

Issue date
28.09.2021

Valid to
13.09.2022

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Name of the product

Owner of the Declaration
ARGE; European Federation of Associations of Lock and Builders Hardware Manufacturers
Offerstraße 12, 42551 Velbert
Germany

Declared product / Declared unit
1 kg of padlocks

Scope:
This ARGE EPD covers padlocks and padlock fittings operated by means of a key, and used for securing buildings. The reference product used to calculate the impact this product group has on the environment is a padlock composed primarily of steel, zinc-based alloy and brass. This product is the only one assessed for this EPD and serves as reference to cover all products within this family. This product has been determined in accordance with ARGE and the market share as the most representative product of the family.

The owner of the declaration shall be liable for the underlying information and evidence, but the ARGE programme holder (IBU) cannot be held responsible for manufacturer's information, life cycle assessment data or evidence.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Dr. Frank Werner
(Independent verifier appointed by SVR)

2. Product

2.1 Product description
This ARGE EPD covers external locking devices used to secure doors to frames.

2.2 Application
Padlocks are used as a single product to secure doors without the need for an integral locking mechanism.

2.3 Technical Data
Ideally, products should comply with a suitable technical specification. /EN 12320/ is an example of such a specification and some products will comply with this. The relevant grading structure is shown in the following table:

Name	Value	Unit
Category of use	1	Grade
Durability	0,1	Grade
Corrosion resistance	1 - 6	Grade
Safety	1 - 6	Grade

2.4 Placing on the market / Application rules
Since /EN 12320/ is not a harmonized standard, it is not subject to the terms of the CPR and compliance with the standard is purely voluntary. National provisions however (e.g. Building Regulations) may still apply.

2.5 Delivery status
The products are sold by unit. Deliveries of a single unit might be possible but will be an exception. Regular deliveries will cover a larger amount of padlocks as they are put on the market as "B2B" products and not for a final customer.

2.6 Base materials / Ancillary materials
Composition of product analysed for this EPD:
The values given in the table below are for the product analysed for this EPD:

Name	Value	Unit
Steel	88.17	%
Zinc-based alloy	5.97	%
Brass	3.05	%
Chromium steel	2.13	%
Nylon 6	0.64	%

The product contains no substances cited on the REACH list of hazardous substances.

Steel is produced by combining iron with carbon as well as other elements depending on the desired characteristics. Steel components are made d by pressing, cold forming or turning from solid bar.
Zinc-based alloy is an alloy of zinc aluminium, magnesium and copper Zinc-based alloy components are by pressure die-casting.
Brass is an alloy of zinc and copper. Brass components are made by pressing, cold forming or hot stamping.
Nylon 6 is a polymer synthesized by ring-opening polymerization of caprolactam. Sub-components made of Nylon 6 are made by injection moulding.

2.7 Manufacture

The production of a padlock normally follows a 3-step procedure:
1. Preparation of semi-finished components (as indicated in 2.6). This step might include a surface treatment on the factory site or by an external manufacturer.
2. Preassembly of assembly modules (on-site factory)
3. Final assembly (on-site factory)
Individual parts of the padlock are assembled manually.

2.8 Environment and health during manufacturing

Regular measurements of air quality and noise levels are performed by ARGE member manufacturers. Resulting levels shall be within compulsory safety limits. In areas where employees are exposed to chemical products, prescribed safety clothes and technical safety devices shall be provided. Regular health checks are mandatory for employees on production sites.

2.9 Product processing/Installation

The installation of the product could vary depending on the type of door and the specific situation but products shall not require energy consumption for installation.

2.10 Packaging

The product assessed for this EPD is packaged in paper. The product is then packed by batch in a cardboard box and stacked on wooden pallets for transport to the customer.
Waste from product packaging is collected separately for waste disposal (including recycling).

2.11 Condition of use

Once installed, products shall require no servicing during their expected service lives. There shall be no consumption of water or energy linked to their use, and they shall not cause any emissions.

2.12 Environment and health during use

No environmental damage or health risks are to be expected during normal conditions of use.

2.13 Reference service life

The Reference Service Life is 10 years under normal working conditions. This corresponds to passing a mechanical endurance test of 10.000 cycles as specified in the /EN 12320/. The Reference Service Life is dependent on the actual frequency of use and environmental conditions. It is required that installation, as well as maintenance of the product, must be done in line with instructions provided by the manufacturer.

2.14 Extraordinary effects

Fire
There are no fire resistance requirements in /EN 12320/.so any fire resistance requirements would be a voluntary declaration by the manufacturer.

Water
The declared product is intended to be used on buildings under normal conditions (usually outdoors). It shall not emit hazardous substances in the event of flooding.

Mechanical destruction
Mechanical destruction of the declared product shall not materially alter its composition or have any adverse effect on the environment.

2.15 Re-use phase

Removal of padlocks and their fittings (for re-use or re-cycling) shall have no adverse effect on the environment.

2.16 Disposal

Padlocks and their fittings should be re-cycled wherever possible, providing that there is no adverse effect on the environment. The waste code in accordance with the /European Waste Code/ is 17 04 07.

2.17 Further information

Details of all types and variants to be shown on the manufacturers' websites listed on http://arge.org/members/members-directory.html

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit for all products covered by ARGE EPD is 1 kg (of product). Since individual products will rarely weigh exactly 1 kg it is necessary to establish the exact weight of the product then use this as a correction factor to determine the true values for 1 kg of product in the tables (Section 5).

Correction factor

Name	Value	Unit
Declared unit mass	1	kg
Mass of declared product	0.469	Kg
Correction factor	Divide by 0.469	

3.2 System boundary

This type of EPD covers “cradle-to-grave” requirements.

The analysis of the product life cycle includes the production and transport of the raw materials, manufacture of the product and the packaging materials, which are declared in modules A1-A3. Losses during production are considered as waste and are sent for recycling. No recycling processes are taken into account except transport and an electricity consumption for grinding the metals. When recycled metals are used as raw material, only their transformation process is taken into account: not the extraction of the raw material.
A4 module represents the transport of the finished product to the installation site.
There is no waste associated with the installation of the product. The A5 module therefore represents only the disposal of the product packaging.
Re-cycling requirements considered for this study, have no inputs or outputs in stages B1-B7.
The End-of-Life (EoL) stages are also considered. The transportation to the EoL disposal site is taken into account in module C2. Module C4 covers the disposal of the padlocks. Module C3 covers the recycling of the individual elements according to European averages, with the remaining waste divided between incineration and landfill. The same assumption as for waste to recycling in A3 is used here.
For end of life modules (C1 to C4) the system boundaries from the /XP P01-064/CN/ standard have been followed, see annex H.2 and H.6 of the standard document cited previously for figures and further details.

In practice, the end-of-life has been modelled as follows:
- When material is sent for recycling, generic transport and electric consumption of a shredder is taken into account (corresponding to the process “Grinding, metals”). Only then, is the material considered to have attained the “end-of-waste” state.
- Each type of waste is modelled as transport to the treatment site with a distance of 30 km (source: /FD P01-015/). Parts sent for recycling include an electricity consumption (grinding) and a flow (“Materials for recycling, unspecified”).
Four scenarios for the end-of-life of the products have been declared for this EPD:
- 1 100% of the product going to landfill
- 2 100% of the product going to incineration
- 3 100% of the product going to recycling
- 4 mixed scenario consisting of the previous three scenarios, values depend on of the amount of waste going to recycling.
Module D has not been declared.

3.3 Estimates and assumptions

The LCA data of the declared product has been calculated using the production data of 1 ARGE member company. This company has been chosen by ARGE as being representative by means of its production processes and its market share. The product is chosen to be as representative as possible.

3.4 Cut-off criteria

The cut -off criteria considered are 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows per module shall be a maximum of 5% of energy usage and mass.
For this study, all input and output flows have been considered at 100%, including raw materials as per the product composition provided by the manufacturer and packaging of raw materials as well as the final product. Energy and water consumptions have also been considered at 100% according to the data provided. With the approach chosen, no significant environmental impacts are known to have been cut-off.

3.5 Background data

For life cycle modelling of the considered product, all relevant background datasets are taken from the ecoinvent 3.1 – Alloc Rec database. The life cycle analysis software used is SimaPro (V8.1), developed by PRé Consulting.

3.6 Data quality

The time factor and life cycle inventory data used for this study comes from the ARGE manufacturer’s site. Data sets are based on 1-year averaged data (time period: January 2013 to December 2013).
In the absence of collected data, generic data from the ecoinvent V3 database. This is updated regularly and is representative of current processes (the entire database having been updated in 2014).

3.7 Period under review

The data of the Life Cycle Assessment (LCA) is based on the annual production data of an ARGE member company during 2013.
Other values, e.g. for the processing of the base materials, are taken from the/ ecoinvent v3/.1 Alloc Rec where the dataset age varies for each dataset, see ecoinvent documentation for more information.

3.8 Allocation

The products covered by this EPD are produced in numerous sites. The product assessed for the calculation of this EPD is produced by one manufacturer on one site. All data was provided by this manufacturer of the products per unit, and then divided by the mass of the product to give a value per kg of product produced.

The assumptions relating to the EoL of the product are described in the section System Boundaries.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared are created according to /EN 15804/ and the building context, and the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	0.0045	l/100km
Transport distance	3500	km
Capacity utilisation (including empty runs)	36	%

Installation into the building (A5)

Name	Value	Unit
Material loss	0.144	kg

Reference service life

Name	Value	Unit
Reference service life (condition of use: see §2.13)	12	a

End of life (C1-C4)

Name	Value	Unit
Collected separately (Mixed scenario)	1	kg
Recycling (Mixed scenario)	0.796	kg
Energy recovery (Mixed scenario)	0.094	kg
Landfilling (Mixed scenario)	0.11	kg
Incineration (100% incineration scenario) Scenario 1	1	kg
Landfilling (100% Landfill scenario) Scenario 2	1	kg
Recycling (100% recycling scenario) Scenario 3	1	kg

It is assumed that a 16-32 ton truck is used to transport the product over the (up to) 30 km distance between the dismantling site and the next treatment site (source: FD P01-015).

Reuse, recovery and/or recycling potentials (D), relevant scenario information

As Module D has not been declared, materials destined for recycling have been accounted for in the indicator “Materials for recycling” however no benefit has been allocated.

5. LCA: Results

In Table 1 "Description of the system boundary", the declared modules are indicated with an "X"; all modules that are not declared within the EPD but where additional data are available are indicated with "MND". Those data can also be used for building assessment scenarios. The values are declared with three valid digits in exponential form.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg of padlock

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C2/2	C2/3	C3	C3/1	C3/2	C3/3	C4	C4/1	C4/2	C4/3
GWP	[kg CO_2-Eq.]	5.56E+0	5.89E-1	1.36E-2	0.00E+0	5.05E-3	5.05E-3	5.05E-3	5.05E-3	5.95E-3	0.00E+0	0.00E+0	8.66E-3	3.56E-3	5.23E-1	4.97E-1	0.00E+0
ODP	[kg CFC11-Eq.]	4.32E-7	1.08E-7	3.60E-10	0.00E+0	9.26E-10	9.26E-10	9.26E-10	9.26E-10	6.38E-10	0.00E+0	0.00E+0	9.30E-10	2.59E-11	4.02E-9	3.43E-9	0.00E+0
AP	[kg SO_2-Eq.]	3.75E-2	2.39E-3	1.41E-5	0.00E+0	2.05E-5	2.05E-5	2.05E-5	2.05E-5	2.47E-5	0.00E+0	0.00E+0	3.60E-5	1.30E-6	2.58E-4	1.24E-4	0.00E+0
EP	[kg $(PO_4)^{3-}$-Eq.]	7.89E-3	4.06E-4	6.29E-6	0.00E+0	3.48E-6	3.48E-6	3.48E-6	3.48E-6	2.77E-6	0.00E+0	0.00E+0	4.04E-6	2.49E-6	7.52E-5	5.94E-4	0.00E+0
POCP	[kg ethene-Eq.]	3.90E-3	2.68E-4	3.22E-6	0.00E+0	2.30E-6	2.30E-6	2.30E-6	2.30E-6	1.36E-6	0.00E+0	0.00E+0	1.98E-6	5.83E-7	1.60E-5	1.41E-4	0.00E+0
ADPE	[kg Sb-Eq.]	7.29E-4	1.95E-6	4.10E-9	0.00E+0	1.67E-8	1.67E-8	1.67E-8	1.67E-8	2.42E-9	0.00E+0	0.00E+0	3.53E-9	2.45E-10	4.69E-8	2.47E-8	0.00E+0
ADPF	[MJ]	7.50E+1	8.97E+0	3.31E-2	0.00E+0	7.69E-2	7.69E-2	7.69E-2	7.69E-2	9.12E-2	0.00E+0	0.00E+0	1.33E-1	2.26E-3	3.73E-1	2.80E-1	0.00E+0

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 kg of padlock

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C2/2	C2/3	C3	C3/1	C3/2	C3/3	C4	C4/1	C4/2	C4/3
PERE	[MJ]	7.43E+0	1.12E-1	2.06E-3	0.00E+0	9.61E-4	9.61E-4	9.61E-4	9.61E-4	1.18E-2	0.00E+0	0.00E+0	1.72E-2	1.16E-4	1.14E-2	2.11E-2	0.00E+0
PERM	[MJ]	2.21E+0	0.00E+0	-1.40E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	9.63E+0	1.12E-1	-1.40E+0	0.00E+0	9.61E-4	9.61E-4	9.61E-4	9.61E-4	1.18E-2	0.00E+0	0.00E+0	1.72E-2	1.16E-4	1.14E-2	2.11E-2	0.00E+0
PENRE	[MJ]	8.99E+1	9.13E+0	3.95E-2	0.00E+0	7.82E-2	7.82E-2	7.82E-2	7.82E-2	1.34E-1	0.00E+0	0.00E+0	1.95E-1	2.58E-3	3.86E-1	3.53E-1	0.00E+0
PENRM	[MJ]	4.87E-1	0.00E+0	-6.97E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	9.04E+1	9.13E+0	-3.02E-2	0.00E+0	7.82E-2	7.82E-2	7.82E-2	7.82E-2	1.34E-1	0.00E+0	0.00E+0	1.95E-1	2.58E-3	3.86E-1	3.53E-1	0.00E+0
SM	[kg]	5.75E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	5.93E-2	1.72E-3	2.77E-5	0.00E+0	1.48E-5	1.48E-5	1.48E-5	1.48E-5	4.49E-5	0.00E+0	0.00E+0	6.54E-5	5.06E-6	1.17E-3	3.42E-4	0.00E+0

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg of padlock

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C2/2	C2/3	C3	C3/1	C3/2	C3/3	C4	C4/1	C4/2	C4/3
HWD	[kg]	8.26E-1	5.64E-3	3.13E-4	0.00E+0	4.83E-5	4.83E-5	4.83E-5	4.83E-5	4.21E-4	0.00E+0	0.00E+0	6.14E-4	8.60E-4	2.66E-1	1.24E-3	0.00E+0
NHWD	[kg]	5.17E+0	4.68E-1	2.54E-2	0.00E+0	4.01E-3	4.01E-3	4.01E-3	4.01E-3	1.90E-3	0.00E+0	0.00E+0	2.77E-3	3.84E-3	1.45E-2	1.00E+0	0.00E+0
RWD	[kg]	3.22E-4	6.13E-5	2.23E-7	0.00E+0	5.25E-7	5.25E-7	5.25E-7	5.25E-7	7.23E-7	0.00E+0	0.00E+0	1.05E-6	1.44E-8	1.35E-6	2.65E-6	0.00E+0
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	1.99E-1	0.00E+0	9.94E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.86E-1	0.00E+0	0.00E+0	1.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	1.43E-3	0.00E+0	3.28E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.48E-3	1.39E+0	0.00E+0	0.00E+0
EET	[MJ]	2.90E-3	0.00E+0	6.82E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.18E-3	2.85E+0	0.00E+0	0.00E+0

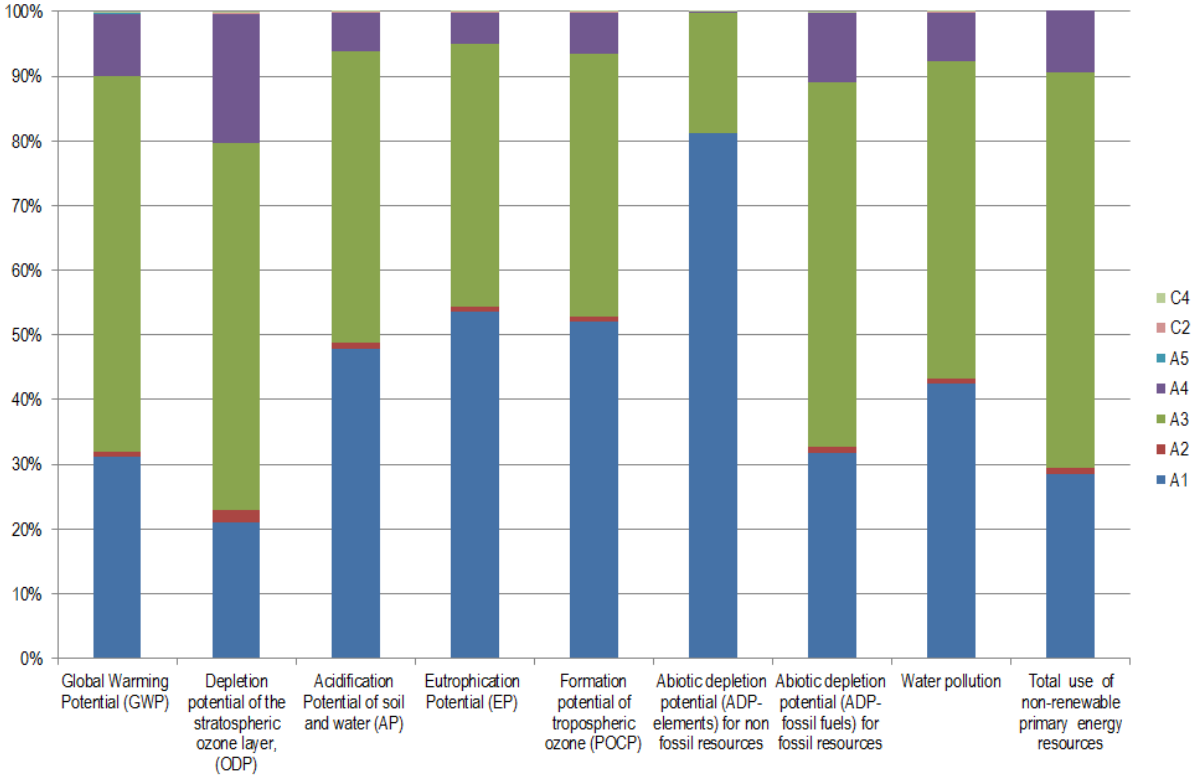
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

Other end of life scenarios have been calculated in order to build specific end of life scenario at the building level:

- scenario 1: the product is considered to be 100% incinerated
- scenario 2: the product is considered to be 100% landfilled
- scenario 3: the product is considered to be 100% recycled

6. LCA: Interpretation

Raw material extraction (A1) and production (A3) phases are the main contributors to all indicators. Their impacts come from steel extraction and transformation (turning process). Transport phase (A4) to building site is a non-negligible contributor to the impacts, especially for ODP indicator.



7. Requisite evidence

No testing results are required by the PCR part B.

8. References

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