Laston Italiana S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME

FOAMCEM
FOAMCEM-H
FOMITH
FOMITH-G

SITE

Via dell'Economia, 47 –
36100 Vicenza (VI)

In accordance with ISO 14025 and EN 15804:2012+ A2:2019/AC:2021

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration number	EPDLASTONFOAM_2025_rev.1.0
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GENERAL INFORMATION

EPD OWNER

Company Name	Laston Italiana S.p.A.
Registered office	Via dell'Economia, 47 – 36100 Vicenza (VI)
Contact for EPD information	Augusto Bevilacqua e-mail: info@laston-spa.com

PROGRAM OPERATOR

EPDItaly	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy

ABOUT THE EPD

Product Name	FOAMCEM, FOAMCEM-H, FOMITH, FOMITH-G
Site	Via dell'Economia, 47 – 36100 Vicenza (VI)
Brief description and technical information of the products	The FOAMCEM product family (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G) consists of liquid foaming agents obtained through controlled mixing of water with organic and inorganic raw materials, including protein derivatives, surfactants, resins and mineral salts. The products are designed for the production of lightweight cementitious and gypsum-based materials.
Product application area	Lightweight construction materials, including cellular concrete, foamed concrete, lightweight cementitious systems and gypsum-based prefabricated products. The products are intended for professional and industrial use (B2B).
Type of EPD	EPD specific
Product(s) reference standards	N/A
CPC Code https://unstats.un.org/unsd/classifications/Econ	3549

VERIFICATION INFORMATION

PCR	Core PCR: PCR per i PRODOTTI e SERVIZI da costruzione: ICMQ 001, Rev. 4 + Technical Guideline to CORE PCR ICMQ 001 Rev.0
EPDItaly Regulation	Regulations of the EPDItaly Programme Revision 7.1. 05/09/2025
Project Report LCA	*LCA Report_Laston italiana_Rev03 del 16/06/2026*
LCA Practitioners	Lorena Foschi lorena.foschi@ollum.it, Michele Caimi michele.caimi@ollum.it; Ollum S.r.l. Via Fratelli Lumiere 19, 52100, Arezzo
Independent Verification Statement	The PCR review was performed by ICMQ S.p.A. Independent verification of the declaration and data carried out in accordance with ISO 14025:2010. ☐ Internal ☑ External Third-party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n° 10 - 20124 Milan, Italy. Accredia
Statement Comparability	Environmental claims published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804: 2012 + A2: 2019.
Statement Responsibility	The EPD Owner relieves EPDItaly from any non-compliance with environmental legislation. The holder of the statement will be responsible for the information and supporting evidence. EPDItaly declines all responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment.

1. THE COMPANY

Laston Italiana S.p.A. is a company specialized in the formulation and production of chemical additives and solutions for the construction industry, with a particular focus on products for concrete and cementitious systems. The company develops and markets a wide range of additives, including foaming agents, plasticizers, and dedicated solutions for the production of lightweight and cellular concrete used in building and infrastructure applications.

Laston Italiana S.p.A. manages the entire production process, from raw material selection and development to finished product manufacturing, ensuring direct control over technical performance and formulation quality. Its products are designed to enhance the rheological and performance properties of cementitious mixtures, contributing to process optimization and improved final material performance in compliance with relevant industry standards.

The company philosophy is driven by innovation and applied research, with the aim of developing high value-added solutions that meet market requirements in terms of efficiency, reliability, and sustainability. In this context, Laston S.p.A. positions itself as a technical partner for construction industry operators, providing specialized support and high-performance products for both civil and industrial applications.

Main product groups include foaming agents for cellular concrete systems, additives for lightweight cementitious materials, and chemical formulations for construction applications.

Key application sectors include production of cellular and lightweight concrete, prefabricated concrete elements, thermal and acoustic insulation systems, and gypsum-based construction products.

2. THE PRODUCT

The four products included in this Environmental Product Declaration (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G) are considered within a single product group, as they share the same intended use, production technology, and application context.

All products are liquid foaming agents used in the production of cellular and lightweight cementitious materials. They are manufactured through similar blending processes involving water, surfactants and/or protein-based components, with variations limited to formulation adjustments and performance additives aimed at tailoring foam stability, density control, and compatibility with different mix designs.

The production process is therefore consistent across all products and consists of controlled mixing operations without significant chemical transformation. Differences between products are related exclusively to formulation composition and final performance characteristics, while the core manufacturing stages, energy requirements, and process technologies remain substantially equivalent.

Technical application parameters:

- Foaming agent dosage: 1-2% by mass of lightweight cellular concrete
- Density of cellular concrete: 300-500 kg/m³
- Foaming agent density: 1,01-1,13 kg/L
- Typical applications: screeds, roofs and terrace slopes, fillings, road sub-base

3.1 THE PRODUCTION PROCESS

The production process of the foaming agents developed by Laston Italiana S.p.A. (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G) consists primarily of liquid formulation through controlled mixing of chemical and organic components.

FOAMCEM is produced by sequential dosing of raw materials into an industrial mixing tank equipped with a mechanical agitator. The key step is the hydrolysis of protein-based raw materials in an alkaline environment assisted by steam: the mixture is heated to approximately 80–100°C until hydrolysis is complete, releasing peptides and amino acids that provide the foaming and stabilising properties. Once cooled, the remaining ingredients are added sequentially to complete the formulation.

FOAMCEM-H and FOMITH are produced by blending keratin hydrolysate with water and additional surfactants using mechanical agitation, with no significant chemical reactions involved.

FOMITH-G is prepared by manual mixing using a handheld mixer, typical of small-scale production that does not require controlled process conditions.

3.2 COMPOSITION

3.1.1 FOAMCEM

Product components	%
Water	51%
Protein-based raw materials	24%
Additives	18%
Solvent	2%
Packaging (IBC)	5%
Total	**100%**

Biogenic material in the product, kg C/product or declared unit	Biogenic material in the packaging, kg C/product or declared unit
1,94E-01	0

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO2.

FOAMCEM is a liquid foaming agent designed for the production of cellular concrete. It is based on an aqueous system containing protein-derived substances and functional additives, which enable foam generation and stabilization within cementitious matrices. The product is manufactured through controlled industrial mixing processes without intentional chemical synthesis of the final formulation.

3.1.2 FOAMCEM-H/FOMITH

Product components	Weight (kg)
Water	65%
Surfactant	22%
Keratin hydrolysate	7%
Packaging (IBC)	6%
Total	**100%**

Biogenic material in the product, kg C/product or declared unit	Biogenic material in the packaging, kg C/product or declared unit
1,80E-02	0

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO2.

FOAMCEM-H and FOMITH are derivative formulations of FOAMCEM. They are produced using the same manufacturing technology and process structure, with modifications limited to the inclusion of specific additives aimed at adjusting foam performance, stability, and compatibility with different cementitious applications. All products share the same functional role as foaming agents for lightweight concrete systems.

3.1.3 FOMITH-G

Product components	Weight (kg)
Water	69%
Surfactant	21%
Functional additives	4%
Packaging (IBC)	6%
Total	**100%**

Biogenic material in the product, kg C/product or declared unit	Biogenic material in the packaging, kg C/product or declared unit
2,48E-03	0

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO2.

FOMITH-G belongs to the same product family and is based on a surfactant system combined with functional additives designed to extend its applicability to low-density cellular concrete, lightweight aggregate systems, and gypsum-based products.

3.3 ACTUAL SERVICE LIFE

The use stage modules (B1-B7) were not included within the scope of this study; therefore, no Reference Service Life (RSL) has been declared. The actual service life of the product depends on the specific application and on the service life of the building or building component in which it is incorporated.

4 SCOPE AND TYPE OF EPD

This is a product-specific Environmental Product Declaration (EPD), developed in compliance with ISO 14025 and EN 15804:2012+A2, within the EPDItaly programme. The study is based on a life cycle assessment (LCA) methodology in accordance with ISO 14040 and ISO 14044 standards.

The present study is developed as a "cradle to grave with options" EPD. The system boundaries include the mandatory modules A1–A3 (product stage), C1–C4 (end-of-life stage), and module D (benefits and loads beyond the system boundary). In addition, the optional modules A4 and A5 are included in the system boundaries, while the optional use phase modules B1–B7 are not declared.

The reference year is set at 2025, considering the current technological level. The results were generated using SimaPro 10.2 modeling software, using Ecoinvent 3.11 database and JRC EF 3.1 characterization factors.

Representativeness	Scope
Spatial	Italy
Year	2025

4.1 DECLARED UNIT

The declared unit is 1 kilogram of foaming agent (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G), used in the production of lightweight cellular concrete and cementitious systems for building applications, with thermal insulation and structural lightening functions.

The technical parameters for each product are reported in the following table.

Technical parameter	FOAMCEM	FOAMCEM-H	FOMITH	FOMITH-G
Foaming agent dosage *(% by mass of lightweight cellular concrete)*	1-2%	1-2%	1-2%	1-2%
Density of cellular concrete	300-500 kg/m³	300-500 kg/m³	300-500 kg/m³	300-500 kg/m³
Foaming agent density	1.13 kg/L	1.01 kg/L	1.01 kg/L	1.01 kg/L

4.2 DATABASE AND LCA SOFTWARE USED

Ecoinvent 3.11 – allocation, cut-off by classification – Unit; SimaPro 10.2

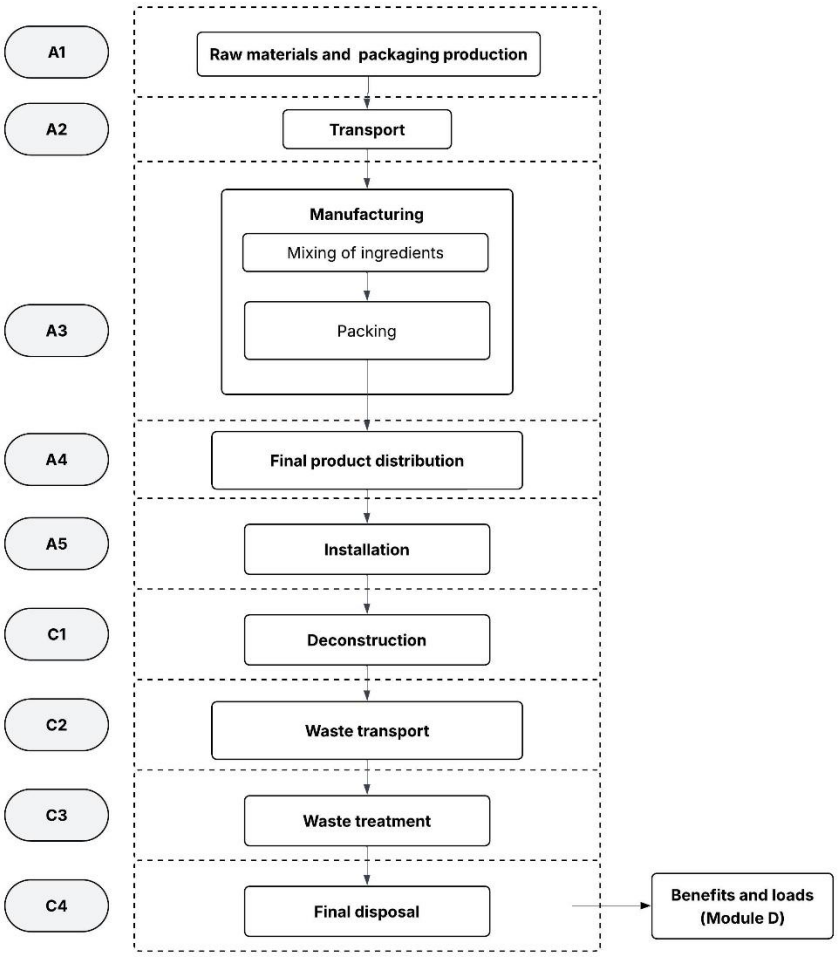
4.3 PRINCIPLE OF MODULARITY AND ENVIRONMENTAL RESPONSIBILITY (PPP)

In the LCA study, the principle of modularity was adopted, which allows the product life cycle to be broken down into different phases, assigning specific environmental impacts to each of them. This approach facilitates a clear attribution of environmental responsibilities at every stage of the production process, ensuring greater transparency and traceability of data.

In addition, the PPP (Polluter Pays Principle) has been complied with, according to which the entity causing an environmental impact is also the one responsible for the related mitigation or repair costs. This principle ensures that environmental costs are not passed on to the community, but are correctly attributed to those who generated them, promoting greater responsibility and incentivizing the adoption of more sustainable practices throughout the supply chain.

4.4 SYSTEM BOUNDARIES

The system boundary implemented in this LCA follows a "cradle to gate with options" approach, in accordance with EN 15804:2012+A2. The life cycle stages included in the study are grouped into product stage (A1–A3), construction process stage (A4–A5), end-of-life stage (C1–C4), and Module D (benefits and loads beyond the system boundary), as required by the reference PCR.



- The **product stage** (A1–A3, "cradle to gate") includes:
- Raw material supply (A1): The raw materials include the main constituent substances of the product composition. Packaging materials associated with raw material supply are also considered. This module includes upstream processes related to the production of raw materials, fuels and purchased electricity used within the manufacturing system.

  The electricity mix has been modelled using the dataset *Electricity, medium voltage {IT}| electricity, medium voltage, residual mix | Cut-off, U*, with a GWP-total emission factor of 0.683 kg CO_2 eq/kWh

- Transport of raw materials to the manufacturing site (A2). For the coding of the transport processes in A2, the data provided by Laston Italiana S.p.A. (quantity of material and suppliers) were used to calculate the kg-kilometres (kg*km) used for the transport of the various raw materials. Two modes of transport were considered: lorry and container ship.
- Manufacturing processes at the production facility (A3). This stage accounts for water consumption, emissions to air, as well as waste generation and related treatment and transport processes within the production system. Most of these flows have been allocated to 1 kg of product on a mass basis according to the annual production volumes of the products. Some flows, such as specific emissions to air, have been directly attributed to the respective product.

- The **construction process stage** (A4–A5) includes:
- the transport of the finished product (A4): transport to the construction site has been modelled similarly to A2, using the total weight of the finished product including its packaging and the

specific distribution scenarios provided by Laston Italiana S.p.A. Distances and transport routes have been used to calculate the relevant transport activity in kgkm.

- the installation activities at the construction site (A5)
  The foaming agent is used for the production of lightweight cellular concrete through dilution with water and foam generation (e.g. foam generators), which requires electricity for mixing, generation, and pumping. An installation scenario was modelled assuming a foam generator with a power of 2.3 kW and a production capacity of 13 m³/h.
  Considering a 1% dilution and a density of 1.01 kg/L, the corresponding foaming agent flow is 131.3 kg/h, resulting in a specific energy consumption of approximately 0.0175 kWh/kg. Water consumption was also included, with 99 L of water required per kg of foaming agent.

  Packaging waste (IBC containers) was modelled using EUROSTAT end-of-life scenarios for steel and plastic fractions, including landfill, incineration, and recycling.

- The **use stage** (B1–B7) is not declared in this study.

- The **end-of-life stage** (C1–C4) includes demolition (C1), transport (C2), waste treatment (C3), and disposal (C4). As the foaming agent is fully embedded in the cementitious matrix, the end-of-life was modelled based on the behaviour of lightweight cellular concrete, using scenarios consistent with construction and demolition waste.
  Demolition was modelled using construction machinery with a diesel consumption of 0.044 MJ/kg. Transport to end-of-life was set at 100 km using EURO 5 lorry transport.

  Waste treatment (C3-C4) was modelled considering the Italian end-of-life scenario for inert construction waste, with a total recycling rate of 95% – combining 93% recycling via sorting plant and 2% backfilling – and 5% landfill. The processes considered are the following:
  - Recycling (93%): Waste cement in concrete and mortar {Europe without Switzerland}| treatment of waste cement in concrete and mortar, sorting plant | Cut-off, U
  - Backfilling (2%): Waste cement in concrete and mortar {Europe without Switzerland}| treatment of waste cement in concrete and mortar, collection for final disposal | Cut-off, U
  - Landfill (5%): Waste concrete {Europe without Switzerland}| treatment of waste concrete, inert material landfill | Cut-off, U

- **Module D** reports the potential environmental benefits beyond the system boundary associated with the recycling of packaging materials used for product distribution.

  No benefits related to the recovery or recycling of lightweight cellular concrete containing the foaming agent were considered. Since the foaming agent loses its physical identity and function within the cementitious matrix, no direct link can be established between the product and any secondary materials generated at the end of life of the construction element. Therefore, no credits associated with the substitution of virgin aggregates were assigned.

  Module D was modelled considering only the recyclable fractions of the product packaging (IBC), consisting of steel and high-density polyethylene (HDPE). Based on the adopted EUROSTAT end-of-life scenarios, the recycled material flows were quantified and the corresponding environmental benefits were calculated considering the potential substitution of equivalent virgin materials beyond the system boundary.

	Product stage			Construction process stage		Use							End of life				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction/Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/Demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

4.4.1 ALLOCATION RULES

In this study, allocation has been applied exclusively to the manufacturing phase, and only for flows that could not be directly attributed to the declared unit of 1 kg of foaming agent.

Electricity consumption is the only flow for which mass-based allocation was applied. Prior to allocation, the electricity share attributable to FOMITH-G was isolated and directly assigned, as its production involves a separate manual mixing process using a handheld mixer – an activity distinct from the other production lines – for which specific primary data were available. The remaining electricity consumption was then allocated on a mass basis across the total annual production, excluding FOMITH-G production.

For all other flows such as water consumption, waste generation, direct emissions, and natural gas consumption direct attribution was applied based on product-specific primary data, without resorting to mass-based allocation.

4.4.2 CUT-OFF RULES

In accordance with the reference PCR, Life Cycle Inventory (LCI) data shall cover at least 95% of the total mass and energy flows for each process (e.g., upstream processes). Similarly, at least 95% of the potential environmental impact for each process shall be included.

In this study, no cut-off rules have been applied to production data, use, waste management, auxiliary materials, or any other life cycle stages, as all flows are considered relevant to the overall environmental impact and complete data are available.

4.4.3 ASSUMPTIONS

Some raw materials for FOAMCEM-H, FOMITH, and FOMITH-G are supplied in returnable IBC containers. As these packaging units are returned to the supplier following use, their disposal is excluded from the system boundaries.

4.4.4 EXCLUSION CRITERIA

As defined by the reference PCR, which refers to the EN 15804 standard, the following parameters may be excluded from the study if they are not directly attributable to the production of the reference products:

- capital goods such as buildings, machinery, tools, and infrastructure
- packaging for internal transport, such as boxes and containers used to move parts and components internally for assembly purposes
- administrative activities such as business travel, marketing, and advertising

4.5 DATA QUALITY

The data used in the LCA study include both primary, secondary data and proxy data. The primary data were obtained directly from Laston Italiana S.p.A. This data is under the control and management of the company (e.g., bills, invoices, transport documents, weighing records). Secondary data comes from a variety of sources, including selected generic data from international databases. Proxy data come from sources other than databases, used to create scenarios and fill in any information gaps.

The data quality assessment was conducted in accordance with EN 15804:2012+A2:2019, Annex E, Table E.1, which defines the criteria for evaluating the temporal, geographical, and technological representativeness of the datasets used.

LCA Module	Type of data	Temporal representativeness	Geographical representativeness	Technological representativeness
Production stage (A1-A3)	Primary data	Good	Good	Very Good
Distribution Stage (A4)	Primary data	Good	Good	Good
Installation Stage (A5)	Specific data for packaging waste; Generic data for installation materials and energy	Good	Good	Good
Use & Maintenance Stage (B)	ND	ND	ND	ND
End of Life Stage (C1-C4)	Generic data for transport to treatment	Good	Good	Good
	Specific data for EoL and disposal scenarios	Good	Fair	Good
Resource recovery stage (D)	Generic data for avoided products	Good	Good	Good

Product	Weighted DQR
FOAMCEM	2,08
FOAMCEM-H	2,02
FOMITH	2,03
FOMITH-G	2,06

Overall quality: **Very Good**

The data quality assessment reported in the table above is overall good and consistent across all four declared products (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G), with weighted DQR values ranging between 2,06 and 2,08. No datasets classified as "poor" or "very poor" are included in the study. In addition, no dataset rated as "fair" or lower contributes more than 30% to the results of any core environmental indicator.

Generic datasets were sourced from the Ecoinvent database, version 3.11 (allocation, cut-off by classification), accessed via SimaPro 10.2. No EPD-based datasets or other external data sources were used.

5 RESULTS

In this section, the results of the study for the products covered by the declaration (FOAMCEM, FOAMCEM-H, FOMITH and FOMITH-G) are presented, divided by different impact parameters and by the phases of the study that constituted the LCA. Environmental impacts were calculated using the EN 15804 + A2, Cumulative Energy Demand (LHV), Selected LCI results, and EDIP 2003 methods, as indicated in the SimaPro Methods library. These methodologies are used to calculate environmental impact categories, resource use and waste/output flows produced, as required by the Core PCR for construction products and services ICMQ 001, Rev. 4 and the standard EN 15804:2012+A2:2019/AC:2021.

4.1 FOAMCEM

ENVIRONMENTAL IMPACTS

Impact indicators	**Nomenclatures**	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Climate change total	GWP – Total	kg CO2 eq	2,85E-01	8,00E-02	4,00E-01	5,52E-02	6,37E-02	4,43E-03	1,90E-02	2,29E-02	3,13E-04	-1,12E-01
Climate change - Fossil	GWP – Fossil	kg CO2 eq	2,86E-01	7,99E-02	4,00E-01	5,52E-02	6,25E-02	4,43E-03	1,90E-02	2,28E-02	3,13E-04	-1,12E-01
Climate change - Biogenic	GWP - Biogenic	kg CO2 eq	-2,17E-02	3,12E-05	8,45E-03	3,78E-05	1,16E-03	8,97E-07	1,30E-05	8,10E-05	7,10E-01	-3,11E-04
Climate change - Land use and LU change	GWP – Luluc	kg CO2 eq	2,03E-02	3,23E-05	3,74E-04	1,83E-05	6,07E-05	4,53E-07	6,30E-06	9,91E-06	1,78E-07	-6,67E-05
Ozone depletion	ODP	kg CFC11 eq	5,25E-08	1,53E-09	6,86E-09	1,20E-09	7,12E-10	6,58E-11	4,15E-10	5,56E-10	8,72E-12	-3,07E-09
Acidification	AP	mol H+ eq	1,43E-03	9,95E-04	8,73E-04	1,77E-04	2,03E-04	3,96E-05	6,11E-05	1,77E-04	2,19E-06	-3,97E-04
Eutrophication, freshwater	EP - freshwater	kg P eq	1,16E-04	4,53E-06	1,30E-04	3,77E-06	2,27E-05	1,43E-07	1,30E-06	1,52E-05	2,74E-08	-4,10E-05
Eutrophication, marine	EP – marine	kg N eq	3,87E-04	2,62E-04	2,00E-04	5,96E-05	4,28E-05	1,84E-05	2,06E-05	5,81E-05	8,41E-07	-8,82E-05
Eutrophication, terrestrial	EP - terrestrial	mol N eq	3,20E-03	2,90E-03	2,02E-03	6,49E-04	4,02E-04	2,02E-04	2,24E-04	6,30E-04	9,19E-06	-9,04E-04
Photochemical ozone formation	POCP	kg NMVOC eq	9,90E-04	8,74E-04	9,60E-04	2,69E-04	1,33E-04	6,04E-05	9,26E-05	2,13E-04	3,32E-06	-4,99E-04
Resource use, minerals and metals	ADP - minerals&metals[2]	kg Sb eq	2,71E-06	2,03E-07	1,24E-06	1,86E-07	2,52E-07	1,58E-09	6,41E-08	6,13E-08	4,58E-10	-6,80E-07
Resource use, fossils	ADP – fossil[2]	MJ	5,13E+00	1,08E+00	4,75E+00	7,82E-01	7,08E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,43E+00
Water use	WDP[2]	m3 depriv.	2,29E-01	3,63E-03	1,19E-01	3,03E-03	4,25E+00	1,23E-04	1,05E-03	-1,00E-01	3,34E-04	-4,99E-02

[2] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

ADDITIONAL IMPACT CATEGORY INDICATORS

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Particulate matter emissions	PM	Disease incidence	1,27E-08	4,97E-09	1,10E-08	4,41E-09	2,09E-09	1,13E-09	1,52E-09	1,05E-08	5,04E-11	-6,47E-09
*Ionizing radiation, human health**	IRP	kBq U235 eq.	3,36E-02	1,02E-03	2,76E-02	9,33E-04	1,17E-02	2,46E-05	3,22E-04	1,15E-03	4,59E-06	-6,40E-03
*Eco-toxicity - freshwater***	ETP-fw	CTUe	3,59E+00	1,22E-01	3,88E+00	1,04E-01	1,27E-01	3,13E-03	3,58E-02	1,36E-01	5,54E-04	-4,96E-01
*Human toxicity, cancer effect **	HTP-c	CTUh	6,18E-10	1,47E-11	3,48E-10	9,36E-12	3,88E-11	4,50E-13	3,23E-12	6,34E-12	5,64E-14	-8,50E-11
*Human toxicity, non-cancer effects **	HTP-nc	CTUh	2,96E-09	5,40E-10	2,39E-09	4,88E-10	1,78E-09	7,08E-12	1,68E-10	3,14E-10	1,27E-12	-1,33E-09
*Land use related impacts/Soil quality **	SQP	dimensionless	2,88E+00	4,59E-01	1,31E+00	4,62E-01	1,68E-01	3,83E-03	1,59E-01	5,80E-01	1,51E-02	-3,08E-01

*Disclaimer 1 - This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.
**Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

USE OF RESOURCES

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	9,29E-01	1,41E-02	3,94E-01	1,24E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-9,78E-02
Renewable primary energy resource as material utilization	PERM	MJ	7,13E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	PERT	MJ	1,00E+00	1,41E-02	3,94E-01	1,24E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-9,78E-02
Non-renewable primary energy as energy carrier	PENRE	MJ	3,69E+00	1,08E+00	3,37E+00	7,82E-01	7,08E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,43E+00
Non-renewable primary energy as material utilization	PENRM	MJ	1,44E+00	0,00E+00	1,38E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	5,13E+00	1,08E+00	4,75E+00	7,82E-01	7,08E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,43E+00
Use of secondary material	SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Use of renewable secondary fuels	RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	FW	m3	6,32E-03	1,17E-04	2,74E-03	9,77E-05	9,93E-02	4,07E-06	3,37E-05	-2,13E-03	7,95E-06	-9,52E-04

WASTE PRODUCED

Parameter/indicator	**Nomenclatures**	**Head**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	HWD	Kg	4,32E-04	2,22E-05	2,00E-04	1,98E-05	4,07E-04	5,40E-07	6,81E-06	8,73E-05	1,12E-07	-6,60E-05
Non-hazardous waste disposed	NHWD	Kg	2,78E-02	3,54E-02	3,99E-02	3,75E-02	7,56E-03	3,89E-05	1,29E-02	8,20E-01	5,00E-02	-8,44E-03
Radioactive waste disposed	RWD	Kg	8,84E-06	2,52E-07	7,08E-06	2,30E-07	3,01E-06	6,03E-09	7,93E-08	2,91E-07	1,12E-09	-1,62E-06

OUTPUT FLOWS

Parameter/indicator	**Nomenclatures**	**Head**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	MFR	Kg	0,00E+00	0,00E+00	6,41E-03	0,00E+00	4,82E-02	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
Materials for energy recovery	MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,54E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy	EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy	EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

FOAMCEM-H

ENVIRONMENTAL IMPACTS

Impact indicators	Nomenclatures	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Climate change total	GWP – Total	kg CO2 eq	2,56E-01	1,07E-02	3,84E-01	1,71E-02	6,59E-02	4,43E-03	1,90E-02	2,29E-02	3,13E-04	-1,23E-01
Climate change - Fossil	GWP – Fossil	kg CO2 eq	2,61E-01	1,07E-02	3,85E-01	1,71E-02	6,46E-02	4,43E-03	1,90E-02	2,28E-02	3,13E-04	-1,23E-01
Climate change - Biogenic	GWP - Biogenic	kg CO2 eq	-9,41E-03	7,32E-06	-1,19E-03	1,17E-05	1,21E-03	8,97E-07	1,30E-05	8,10E-05	6,59E-02	-3,42E-04
Climate change - Land use and LU change	GWP – Luluc	kg CO2 eq	6,32E-03	3,53E-06	7,77E-04	5,67E-06	6,07E-05	4,53E-07	6,30E-06	9,91E-06	1,78E-07	-7,33E-05
Ozone depletion	ODP	kg CFC11 eq	1,08E-08	2,33E-10	8,08E-09	3,74E-10	7,14E-10	6,58E-11	4,15E-10	5,56E-10	8,72E-12	-3,38E-09
Acidification	AP	mol H+ eq	1,24E-03	3,42E-05	1,75E-03	5,50E-05	2,04E-04	3,96E-05	6,11E-05	1,77E-04	2,19E-06	-4,36E-04
Eutrophication, freshwater	EP - freshwater	kg P eq	8,04E-05	7,28E-07	2,04E-04	1,17E-06	2,28E-05	1,43E-07	1,30E-06	1,52E-05	2,74E-08	-4,51E-05
Eutrophication, marine	EP – marine	kg N eq	2,45E-04	1,15E-05	3,54E-04	1,85E-05	4,32E-05	1,84E-05	2,06E-05	5,81E-05	8,41E-07	-9,68E-05
Eutrophication, terrestrial	EP - terrestrial	mol N eq	2,13E-03	1,25E-04	3,44E-03	2,01E-04	4,05E-04	2,02E-04	2,24E-04	6,30E-04	9,19E-06	-9,93E-04
Photochemical ozone formation	POCP	kg NMVOC eq	1,22E-03	5,19E-05	1,43E-03	8,34E-05	1,34E-04	6,04E-05	9,26E-05	2,13E-04	3,32E-06	-5,48E-04
Resource use, minerals and metals	ADP - minerals&metals[2]	kg Sb eq	1,90E-06	3,60E-08	2,14E-06	5,77E-08	2,53E-07	1,58E-09	6,41E-08	6,13E-08	4,58E-10	-7,46E-07
Resource use, fossils	ADP – fossil[2]	MJ	5,56E+00	1,51E-01	7,72E+00	2,43E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Water use	WDP[2]	m3 depriv.	1,25E-01	5,87E-04	2,97E+01	9,42E-04	4,25E+00	1,23E-04	1,05E-03	-1,00E-01	3,34E-04	-5,48E-02

[2] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

ADDITIONAL IMPACT CATEGORY INDICATORS

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Particulate matter emissions	PM	Disease incidence	1,06E-08	8,53E-10	2,14E-08	1,37E-09	2,10E-09	1,13E-09	1,52E-09	1,05E-08	5,04E-11	-7,10E-09
*Ionizing radiation, human health**	IRP	kBq U235 eq.	2,48E-02	1,80E-04	1,01E-01	2,90E-04	1,18E-02	2,46E-05	3,22E-04	1,15E-03	4,59E-06	-7,03E-03
*Eco-toxicity - freshwater***	ETP-fw	CTUe	1,46E+00	2,00E-02	1,41E+00	3,22E-02	1,28E-01	3,13E-03	3,58E-02	1,36E-01	5,54E-04	-5,44E-01
*Human toxicity, cancer effect **	HTP-c	CTUh	1,78E-10	1,81E-12	3,58E-10	2,91E-12	3,89E-11	4,50E-13	3,23E-12	6,34E-12	5,64E-14	-9,33E-11
*Human toxicity, non-cancer effects **	HTP-nc	CTUh	2,22E-09	9,43E-11	1,33E-08	1,51E-10	1,79E-09	7,08E-12	1,68E-10	3,14E-10	1,27E-12	-1,46E-09
*Land use related impacts/Soil quality **	SQP	dimensionless	1,41E+00	8,94E-02	2,01E+00	1,44E-01	1,71E-01	3,83E-03	1,59E-01	5,80E-01	1,51E-02	-3,38E-01

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USE OF RESOURCES

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	4,98E-01	2,39E-03	9,93E-01	3,83E-03	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Renewable primary energy resource as material utilization	PERM	MJ	5,70E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	PERT	MJ	5,03E-01	2,39E-03	9,93E-01	3,83E-03	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Non-renewable primary energy as energy carrier	PENRE	MJ	4,12E+00	1,51E-01	6,21E+00	2,43E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Non-renewable primary energy as material utilization	PENRM	MJ	1,44E+00	0,00E+00	1,52E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	5,56E+00	1,51E-01	7,72E+00	2,43E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Use of secondary material	SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Use of non-renewable secondary fuels	NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	FW	m3	3,54E-03	1,89E-05	6,94E-01	3,03E-05	9,93E-02	4,07E-06	3,37E-05	-2,13E-03	7,95E-06	-1,05E-03

WASTE PRODUCED

Parameter/indicator	**Nomenclatures**	**Head**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	HWD	Kg	2,36E-04	3,82E-06	3,90E-04	6,13E-06	4,43E-04	5,40E-07	6,81E-06	8,73E-05	1,12E-07	-7,24E-05
Non-hazardous waste disposed	NHWD	Kg	1,82E-02	7,25E-03	4,40E-02	1,16E-02	7,82E-03	3,89E-05	1,29E-02	8,20E-01	5,00E-02	-9,27E-03
Radioactive waste disposed	RWD	Kg	6,35E-06	4,45E-08	2,59E-05	7,14E-08	3,01E-06	6,03E-09	7,93E-08	2,91E-07	1,12E-09	-1,78E-06

OUTPUT FLOWS

Parameter/indicator	**Nomenclatures**	**Head**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	MFR	Kg	5,13E-04	0,00E+00	0,00E+00	0,00E+00	5,29E-02	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
Materials for energy recovery	MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,18E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy	EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy	EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

4.2 FOMITH

ENVIRONMENTAL IMPACTS

Impact indicators	Nomenclatures	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Climate change total	GWP – Total	kg CO2 eq	2,56E-01	1,07E-02	3,84E-01	4,76E-02	6,59E-02	4,43E-03	1,90E-02	2,29E-02	3,13E-04	-1,23E-01
Climate change - Fossil	GWP – Fossil	kg CO2 eq	2,61E-01	1,07E-02	3,85E-01	4,76E-02	6,46E-02	4,43E-03	1,90E-02	2,28E-02	3,13E-04	-1,23E-01
Climate change - Biogenic	GWP - Biogenic	kg CO2 eq	-9,41E-03	7,32E-06	-1,19E-03	3,26E-05	1,21E-03	8,97E-07	1,30E-05	8,10E-05	6,59E-02	-3,42E-04
Climate change - Land use and LU change	GWP – Luluc	kg CO2 eq	6,32E-03	3,53E-06	7,77E-04	1,57E-05	6,07E-05	4,53E-07	6,30E-06	9,91E-06	1,78E-07	-7,33E-05
Ozone depletion	ODP	kg CFC11 eq	1,08E-08	2,33E-10	8,08E-09	1,04E-09	7,14E-10	6,58E-11	4,15E-10	5,56E-10	8,72E-12	-3,38E-09
Acidification	AP	mol H+ eq	1,24E-03	3,42E-05	1,75E-03	1,53E-04	2,04E-04	3,96E-05	6,11E-05	1,77E-04	2,19E-06	-4,36E-04
Eutrophication, freshwater	EP - freshwater	kg P eq	8,04E-05	7,28E-07	2,04E-04	3,25E-06	2,28E-05	1,43E-07	1,30E-06	1,52E-05	2,74E-08	-4,51E-05
Eutrophication, marine	EP – marine	kg N eq	2,45E-04	1,15E-05	3,54E-04	5,14E-05	4,32E-05	1,84E-05	2,06E-05	5,81E-05	8,41E-07	-9,68E-05
Eutrophication, terrestrial	EP - terrestrial	mol N eq	2,13E-03	1,25E-04	3,44E-03	5,59E-04	4,05E-04	2,02E-04	2,24E-04	6,30E-04	9,19E-06	-9,93E-04
Photochemical ozone formation	POCP	kg NMVOC eq	1,22E-03	5,19E-05	1,43E-03	2,32E-04	1,34E-04	6,04E-05	9,26E-05	2,13E-04	3,32E-06	-5,48E-04
Resource use, minerals and metals	ADP - minerals&metals[2]	kg Sb eq	1,90E-06	3,60E-08	2,14E-06	1,60E-07	2,53E-07	1,58E-09	6,41E-08	6,13E-08	4,58E-10	-7,46E-07
Resource use, fossils	ADP – fossil[2]	MJ	5,56E+00	1,51E-01	7,72E+00	6,74E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Water use	WDP[2]	m3 depriv.	1,25E-01	5,87E-04	2,97E+01	2,62E-03	4,25E+00	1,23E-04	1,05E-03	-1,00E-01	3,34E-04	-1,23E-01

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ADDITIONAL IMPACT CATEGORY INDICATORS

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Particulate matter emissions	PM	Disease incidence	1,06E-08	8,53E-10	2,14E-08	3,80E-09	2,10E-09	1,13E-09	1,52E-09	1,05E-08	5,04E-11	-7,10E-09
*Ionizing radiation, human health**	IRP	kBq U235 eq.	2,48E-02	1,80E-04	1,01E-01	8,04E-04	1,18E-02	2,46E-05	3,22E-04	1,15E-03	4,59E-06	-7,03E-03
*Eco-toxicity - freshwater***	ETP-fw	CTUe	1,46E+00	2,00E-02	1,41E+00	8,94E-02	1,28E-01	3,13E-03	3,58E-02	1,36E-01	5,54E-04	-5,44E-01
*Human toxicity, cancer effect **	HTP-c	CTUh	1,78E-10	1,81E-12	3,58E-10	8,07E-12	3,89E-11	4,50E-13	3,23E-12	6,34E-12	5,64E-14	-9,33E-11
*Human toxicity, non-cancer effects **	HTP-nc	CTUh	2,22E-09	9,43E-11	1,33E-08	4,20E-10	1,79E-09	7,08E-12	1,68E-10	3,14E-10	1,27E-12	-1,46E-09
*Land use related impacts/Soil quality **	SQP	dimensionless	1,41E+00	8,94E-02	2,01E+00	3,99E-01	1,71E-01	3,83E-03	1,59E-01	5,80E-01	1,51E-02	-3,38E-01

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USE OF RESOURCES

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	4,98E-01	2,39E-03	9,93E-01	1,06E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Renewable primary energy resource as material utilization	PERM	MJ	5,70E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	PERT	MJ	5,03E-01	2,39E-03	9,93E-01	1,06E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Non-renewable primary energy as energy carrier	PENRE	MJ	4,12E+00	1,51E-01	6,21E+00	6,74E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Non-renewable primary energy as material utilization	PENRM	MJ	1,44E+00	0,00E+00	1,52E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	5,56E+00	1,51E-01	7,72E+00	6,74E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Use of secondary material	SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	FW	m3	3,54E-03	1,89E-05	6,94E-01	8,42E-05	9,93E-02	4,07E-06	3,37E-05	-2,13E-03	7,95E-06	-1,05E-03

WASTE PRODUCED

Parameter/indicator	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	Kg	2,36E-04	3,82E-06	3,90E-04	1,70E-05	4,43E-04	5,40E-07	6,81E-06	8,73E-05	1,12E-07	-7,24E-05
Non-hazardous waste disposed	NHWD	Kg	1,82E-02	7,25E-03	4,40E-02	3,23E-02	7,82E-03	3,89E-05	1,29E-02	8,20E-01	5,00E-02	-9,27E-03
Radioactive waste disposed	RWD	Kg	6,35E-06	4,45E-08	2,59E-05	1,98E-07	3,01E-06	6,03E-09	7,93E-08	2,91E-07	1,12E-09	-1,78E-06

OUTPUT FLOWS

Parameter/indicator	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	MFR	Kg	5,13E-04	0,00E+00	0,00E+00	0,00E+00	5,29E-02	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
Materials for energy recovery	MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,18E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy	EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy	EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

4.3 FOMITH-G

ENVIRONMENTAL IMPACTS

Impact indicators	Nomenclatures	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Climate change total	GWP – Total	kg CO2 eq	2,60E-01	1,34E-02	3,96E-01	5,52E-02	6,59E-02	4,43E-03	1,90E-02	2,29E-02	3,13E-04	-1,23E-01
Climate change - Fossil	GWP – Fossil	kg CO2 eq	2,65E-01	1,34E-02	3,97E-01	5,52E-02	6,46E-02	4,43E-03	1,90E-02	2,28E-02	3,13E-04	-1,23E-01
Climate change - Biogenic	GWP - Biogenic	kg CO2 eq	-8,27E-03	9,17E-06	-9,61E-04	3,78E-05	1,21E-03	8,97E-07	1,30E-05	8,10E-05	9,11E-03	-3,42E-04
Climate change - Land use and LU change	GWP – Luluc	kg CO2 eq	4,77E-03	4,43E-06	8,00E-04	1,83E-05	6,07E-05	4,53E-07	6,30E-06	9,91E-06	1,78E-07	-7,33E-05
Ozone depletion	ODP	kg CFC11 eq	8,87E-09	2,92E-10	8,25E-09	1,20E-09	7,14E-10	6,58E-11	4,15E-10	5,56E-10	8,72E-12	-3,38E-09
Acidification	AP	mol H+ eq	1,39E-03	4,29E-05	1,81E-03	1,77E-04	2,04E-04	3,96E-05	6,11E-05	1,77E-04	2,19E-06	-4,36E-04
Eutrophication, freshwater	EP - freshwater	kg P eq	8,16E-05	9,13E-07	2,12E-04	3,77E-06	2,28E-05	1,43E-07	1,30E-06	1,52E-05	2,74E-08	-4,51E-05
Eutrophication, marine	EP – marine	kg N eq	2,40E-04	1,45E-05	3,67E-04	5,96E-05	4,32E-05	1,84E-05	2,06E-05	5,81E-05	8,41E-07	-9,68E-05
Eutrophication, terrestrial	EP - terrestrial	mol N eq	2,11E-03	1,57E-04	3,56E-03	6,49E-04	4,05E-04	2,02E-04	2,24E-04	6,30E-04	9,19E-06	-9,93E-04
Photochemical ozone formation	POCP	kg NMVOC eq	1,41E-03	6,51E-05	1,46E-03	2,69E-04	1,34E-04	6,04E-05	9,26E-05	2,13E-04	3,32E-06	-5,48E-04
Resource use, minerals and metals	ADP - minerals&metals[2]	kg Sb eq	2,43E-06	4,51E-08	2,20E-06	1,86E-07	2,53E-07	1,58E-09	6,41E-08	6,13E-08	4,58E-10	-7,46E-07
Resource use, fossils	ADP – fossil[2]	MJ	6,74E+00	1,90E-01	7,94E+00	7,82E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Water use	WDP[2]	m3 depriv.	1,40E-01	7,35E-04	3,14E+01	3,03E-03	4,25E+00	1,23E-04	1,05E-03	-1,00E-01	3,34E-04	-5,48E-02

[2] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

ADDITIONAL IMPACT CATEGORY INDICATORS

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Particulate matter emissions	PM	Disease incidence	1,17E-08	1,07E-09	2,21E-08	4,41E-09	2,10E-09	1,13E-09	1,52E-09	1,05E-08	5,04E-11	-7,10E-09
*Ionizing radiation, human health**	IRP	kBq U235 eq.	3,18E-02	2,26E-04	1,05E-01	9,33E-04	1,18E-02	2,46E-05	3,22E-04	1,15E-03	4,59E-06	-7,03E-03
*Eco-toxicity - freshwater***	ETP-fw	CTUe	1,20E+00	2,51E-02	1,45E+00	1,04E-01	1,28E-01	3,13E-03	3,58E-02	1,36E-01	5,54E-04	-5,44E-01
*Human toxicity, cancer effect **	HTP-c	CTUh	1,53E-10	2,27E-12	3,73E-10	9,36E-12	3,89E-11	4,50E-13	3,23E-12	6,34E-12	5,64E-14	-9,33E-11
*Human toxicity, non-cancer effects **	HTP-nc	CTUh	2,57E-09	1,18E-10	1,40E-08	4,88E-10	1,79E-09	7,08E-12	1,68E-10	3,14E-10	1,27E-12	-1,46E-09
*Land use related impacts/Soil quality **	SQP	dimensionless	1,38E+00	1,12E-01	2,06E+00	4,62E-01	1,71E-01	3,83E-03	1,59E-01	5,80E-01	1,51E-02	-3,38E-01

*Disclaimer 1 - This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.
**Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

USE OF RESOURCES

Parameter	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	5,30E-01	2,99E-03	1,03E+00	1,24E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Renewable primary energy resource as material utilization	PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources	PERT	MJ	5,30E-01	2,99E-03	1,03E+00	1,24E-02	1,01E-01	3,54E-04	4,26E-03	1,29E-02	6,96E-05	-1,07E-01
Non-renewable primary energy as energy carrier	PENRE	MJ	4,92E+00	1,90E-01	6,42E+00	7,82E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Non-renewable primary energy as material utilization	PENRM	MJ	1,81E+00	0,00E+00	1,52E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	6,73E+00	1,90E-01	7,94E+00	7,82E-01	7,09E-01	5,77E-02	2,70E-01	4,04E-01	7,66E-03	-2,67E+00
Use of secondary material	SM	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels	RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	FW	m3	3,94E-03	2,37E-05	7,34E-01	9,77E-05	9,93E-02	4,07E-06	3,37E-05	-2,13E-03	7,95E-06	-1,05E-03

WASTE PRODUCED

Parameter/indicator	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	Kg	2,54E-04	4,79E-06	4,05E-04	1,98E-05	4,43E-04	5,40E-07	6,81E-06	8,73E-05	1,12E-07	-7,24E-05
Non-hazardous waste disposed	NHWD	Kg	1,86E-02	9,09E-03	4,59E-02	3,75E-02	7,82E-03	3,89E-05	1,29E-02	8,20E-01	5,00E-02	-9,27E-03
Radioactive waste disposed	RWD	Kg	8,14E-06	5,58E-08	2,70E-05	2,30E-07	3,01E-06	6,03E-09	7,93E-08	2,91E-07	1,12E-09	-1,78E-06

OUTPUT FLOWS

Parameter/indicator	Nomenclatures	Head	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	CRU	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	MFR	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,29E-02	0,00E+00	0,00E+00	9,50E-01	0,00E+00	0,00E+00
Materials for energy recovery	MER	Kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,18E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy	EET	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electricity energy	EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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