

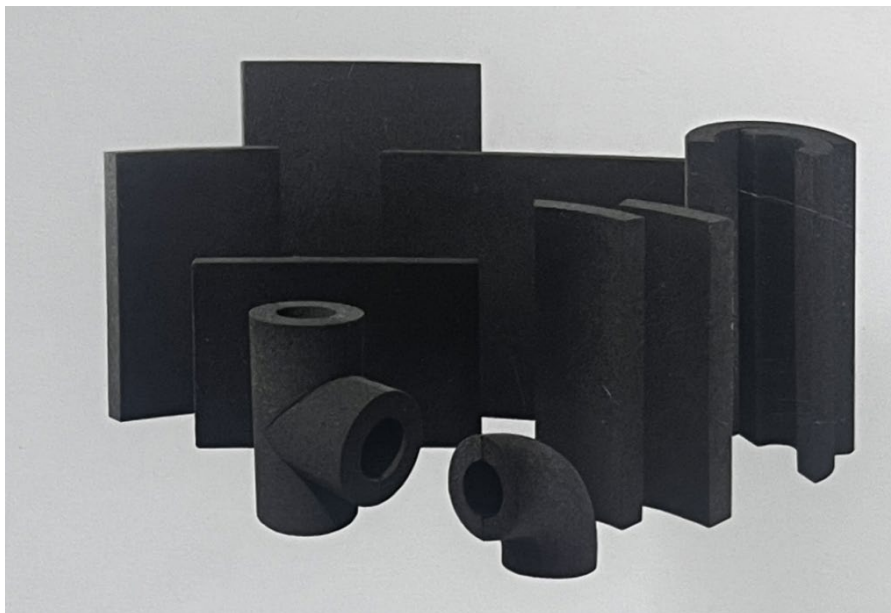
Environmental Product Declaration

Average EPD

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

Cellular Glass Foam

Zhejiang Zhenshen Insulation Technology Co. Ltd



Programme

EPD Square | www.epdsquare.com

Programme operator

EPD Square, s.r.o.

EPD Registration number

SQ 00-028

Publication date

30.05.2025

Valid until

29.05.2030

General information

Product

Cellular Glass Foam

Program operator

EPD Square, s.r.o.
Lermontovova 3,
811 05 Bratislava, Slovak Republic
Email: info@epdsquare.com

Registration number

SQ 00-028

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Owner of the declaration

Zhejiang Zhenshen Import and Export Co. Ltd
Contact person: Vince
Email: trading1@zhenshen.cn

Manufacturer

Zhejiang Zhenshen Insulation Technology Corp.Ltd
Wangdian Industrial Function Park, Xiuzhou District,
Jaxing, Zhejiang, China
Email: trading1@zhenshen.cn

Place of production

Wangdian Industrial Function Park, Xiuzhou District,
Jaxing, Zhejiang, China

Product Category Rules (PCR)

The CEN standard EN 15804+A2 serves as the core PCR.
In addition, EPD Square PCR v1.0, 2024 is used.

Declared unit

1m³

Mass per DU

143.6 kg

UN CPC code

37990

Geographical scope

World

Year of study

Jan 2024- Dec 2024

Comparability

EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in the context of the building.

EPD author

Sarah Curpen, Silvia Vilčeková, EPD Clarity, s.r.o.

Verification type

Independent verification of the declaration and data, according to ISO14025:2006

Internal: ☐

External: ☒

Verified by

Daniel Satola, Daniel Satola Consulting

Insert Signature Verifier

Satola Daniel

The owner of the declaration shall be liable for the underlying information and evidence.

EPD Square shall not be liable with respect to manufacturer, life cycle assessment data and evidence.

System boundaries

Cradle to gate with modules C1–C4 and module D. The LCA was carried out considering the product stage A1-A3, modules C1–C4, module D.

Modules declared and geographical scope

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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	✓	✓	✓	MND	✓	MND	MND	MND	MND	MND	MND	MND	✓	✓	✓	✓	✓
Geography	CN	CN	CN	MND	world	MND	MND	MND	MND	MND	MND	MND	world	world	world	world	world

Modules not declared = MND

Description of Organization

ZES is the biggest cellular glass producer in Asia and the most competitive insulation contractor in China. For many years, ZES has kept a long-term relationship with major industrial players in China, covering more than half of the domestic market share of cold insulation. ZES is also playing actively in the global market, with its service to major oil & gas owners and EPC contractors worldwide.

Product information

Product name

Cellular Glass Foam

Product description

Cellular glass is a kind of inorganic thermal insulation material with equally closed cell structure. It is mainly made of glass powder, added with certain amount of foaming agent, foamed in high-temperature tunnel furnace and then annealed in cooling furnace. It well reserves the chemical stability of stability of inorganic glass. As a result, it has the following features: low density, low thermal conductivity, vapour impermeability, no water absorption, incombustibility, protection from mould and rat eating, high mechanical strength but easy to cut and able to bear all kinds of chemical erosion except the hydrofluoric acid.

Product application

Tank base bearing and insulation for big volume tank
Low temperature and cryogenic piping, vessel, tank and equipment.
Underground and aboveground steam piping and chilled water piping.
Chilled or hot water supplying piping.
Offing oil platform.
Heating piping and equipment
Insulation & Acid-resist lining system for chimney in power plant.
Insulation & energy-saving for building.

Technical Specifications

Density 110-200 (± 10 kg/m³)
Thermal conductivity 0.036- 0.056(W/m·K) @10°C
Water absorption by vol ≤ 0.5 (Vol%)
Compressive strength 0.5-2.4 Mpa
Compliant with ASTM C552 /EN 13167/ EN 14305

This EPD is valid for ZES cellular glass grade ZES 500, ZES 800, ZES 1000, ZES1200, ZES 1400, ZES 1600, ZES 2400

More details on the application of ZES cellular glass can be found under www.zhenshen.cn.

Geographical scope

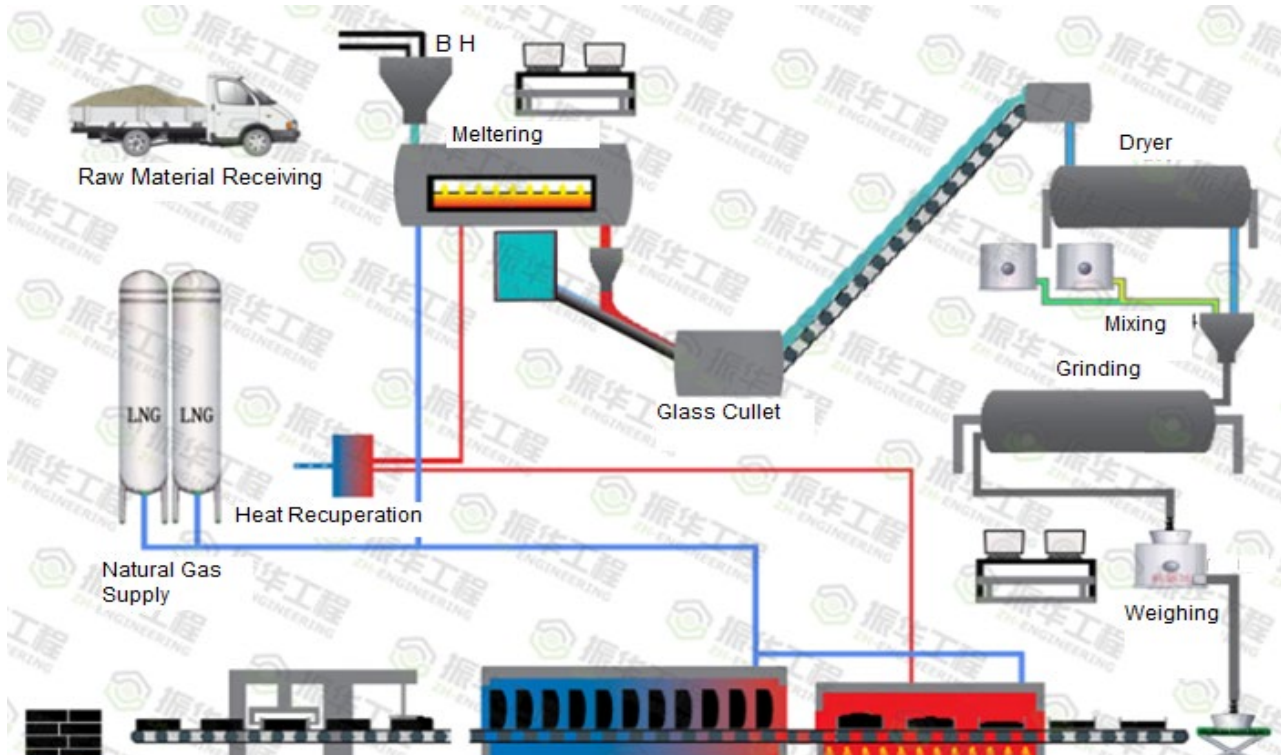
World

Product contents information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Sand	30.4	0	0
Glass	54.8	100	0
Feldspar	25.5	0	0
Sodium Bicarbonate	18.4	0	0
Others	14.5	0	0
TOTAL	144	38	0
Packaging materials	Weight, kg	Weight-% (versus the product)	
Plastic Film	0.0360	0.025	
Plywood Pallet	1.45	1.00	
TOTAL	1.49	1.03	

Manufacturing process

The production of cellular foam glass involves recycling glass cullet, which is finely ground and mixed with a foaming agent. This mixture is heated in a high-temperature furnace, causing the foaming agent to release gases that create a uniform, closed-cell structure. The material is then cooled in a controlled manner, cut into panels or blocks, dried, and surface-treated if necessary.



Life cycle assessment

Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass. Additives are not included in this study as their mass is less than 5% of total inputs. The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

In accordance with EN 15804+A2 cut-off criteria, additives used in the manufacturing process, which account for 1% of the total mass input, have been excluded from the Life Cycle Assessment (LCA). The justification for this exclusion is as follows:

Mass Contribution: The total mass of additives is below the 5% threshold defined in EN 15804+A2, which allows for the omission of inputs that contribute less than 5% to the total mass of the system.

Environmental Relevance: The environmental impact of these additives is expected to be negligible compared to the primary raw materials (sand, chrome shavings, water) and energy consumption. Their exclusion is unlikely to significantly influence the overall LCA results or conclusions.

Data Availability and Effort Justification: Given their minor contribution, the effort required to collect detailed data on the production and environmental impact of these additives would be disproportionate to their expected effect on the results.

Compliance with EN 15804+A2: The exclusion follows the cut-off rules of EN 15804+A2, which state that omitted inputs must not exceed 5% of energy use, mass, or environmental impact and should not alter the overall conclusions of the LCA.

Allocation, estimations, and assumptions

Allocation is based on annual production rate and made with high accuracy and precision. The values for 1 m³ of the products which are used within this study are calculated by considering the total product weight per annual production. In the production plant, several kinds of products are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to the ratio of the annual production of the declared product to the total annual production at the factory, the annual total energy consumption, packaging materials and the generated waste per the declared product are allocated. Subsequently, the produced products output fixed to 1 m³ and the corresponding amount of product is used in the calculations.

Database(s) and LCA software

This EPD has been created using One Click LCA Pre-Verified EPD Generator. Ecoinvent v3.10.1 and One Click LCA databases were used as sources of environmental data.

LCA Scenarios and additional technical information

Scenarios included in the LCA are based on realistic scenarios which are currently in use and are representative for one of the most likely scenario alternatives.

Life cycle stages A2 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by transportation companies to serve the needs of other clients.

Module A5: The packaging waste is considered in A5. 9% of the plastic packaging is recycled and 12% incinerated with energy recovery. 32% of the wooden pallets are recycled and 30% is incinerated with energy recovery. The remaining plastic packaging is landfilled. The remaining wooden pallet are also landfilled.

Module C1: The impacts of the disassembly stage are assumed zero, since the consumption of energy and natural resources for disassembling the end-of-life product is negligible. The product is removed manually. **Module C2:** Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is assumed as lorry which is the most common. Transportation of product back to manufacturing site is taken as the conservative 100 km based on the estimate provided manufacturer (see A2 transportation distance).

Module C3: 38.3% of the product is recycled and sorted.

Module C4: 61.7% of the product ends at a landfill without prior treatment.

D: The benefits of the re-used product are considered.

Manufacturing energy scenario

Electricity data source and quality	Consumption mix w/o renewables, China, 2021, AIB
Electricity kg CO ₂ e / kWh	1.15
Heating data source and quality	Heat production, at heat pump 30kW, allocation exergy, ecoinvent 3.10.1
District heating kg CO ₂ e / kWh	0.0493
Diesel in machinery	Diesel combusted in building machine, ecoinvent 3.10.1
Diesel kg CO ₂ e / kWh	3.38
Heating (Natural Gas)	Natural gas (Industrial furnace>100kW), ecoinvent 3.10.1
Natural Gas kg CO ₂ e / kWh	2.35
Cooling energy	Cooling energy, from natural gas, at cogen unit with absorption chiller 100kW
Cooling kg CO ₂ e / kWh	0.0692
Electricity Photovoltaic	Electricity production, photovoltaic, 570kWp open ground installation, multi-Si
Electricity kg CO ₂ e / kWh	0.0825

End of Life (C1, C2, C3, C4)

	Value	Unit
Collected separately	0	kg
Collected as mixed construction waste	0	kg
Reuse	88.6	kg
Recycling	0	kg
Energy recovery	0	kg
To landfill	55.0	kg

Benefits and loads beyond boundary system (D)

Benefits and loads beyond the boundary system are considered. The benefits from re-using glass foam are accounted for. The net amount of virgin material exiting the system is calculated. Given that 38% of the product is made from recycled glass, the remaining percentage is considered as substitute for virgin material in the next production cycle.

LCA results

Results are presented per 1 m³ (Declared Unit) of the product.

Core environmental impact indicators – EN 15804+A2, PEF 3.1

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	2.3E+02	2.5E+00	0.0E+00	1.0E+00	4.8E-02	9.9E-01	-1.0E+02
GWP-fossil	kg CO2 eq.	2.3E+02	8.6E-02	0.0E+00	1.0E+00	6.4E-01	9.8E-01	-1.0E+02
GWP-biogenic	kg CO2 eq.	-1.8E+00	2.4E+00	0.0E+00	2.3E-04	-5.9E-01	-2.7E-04	-1.4E-01
GWP-LULUC	kg CO2 eq.	7.6E-02	7.6E-05	0.0E+00	4.5E-04	6.0E-04	2.6E-03	-1.4E-01
ODP	kg CFC11 eq.	7.2E-06	8.3E-10	0.0E+00	1.5E-08	3.7E-09	2.1E-08	-1.3E-06
AP	mol H ⁺ eq.	1.6E+00	2.8E-04	0.0E+00	2.8E-03	2.8E-03	5.4E-03	-4.4E-01
EP-freshwater	kg P eq.	8.0E-01	1.3E-05	0.0E+00	7.8E-05	1.3E-04	8.1E-05	-2.9E-02
EP-marine	kg N eq.	1.9E-01	3.0E-04	0.0E+00	8.1E-04	1.7E-03	2.0E-03	-1.0E-01
EP-terrestrial	mol N eq.	3.2E+00	1.1E-03	0.0E+00	8.8E-03	9.7E-03	2.2E-02	-1.1E+00
POCP	kg NMVOC eq.	5.6E-01	3.8E-04	0.0E+00	4.1E-03	4.0E-03	7.8E-03	-3.5E-01
ADP-M&M	kg Sb eq.	3.0E-03	1.4E-07	0.0E+00	3.1E-06	1.8E-06	2.6E-06	-3.8E-04
ADP-fossil	MJ	2.8E+03	7.2E-01	0.0E+00	1.4E+01	5.1E+00	1.8E+01	-1.4E+03
WDP	m ³	1.1E+03	2.0E-02	0.0E+00	6.9E-02	4.3E-01	7.0E-02	-2.1E+01

GWP-total: Global Warming Potential; ***GWP-fossil:*** Global Warming Potential fossil fuels; ***GWP-biogenic:*** Global Warming Potential biogenic; ***GWP-LULUC:*** Global Warming Potential land use and land use change; ***ODP:*** Depletion potential of the stratospheric ozone layer; ***AP:*** Acidification potential, Accumulated Exceedance; ***EP-freshwater:*** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional requirements" for indicator given as PO4 eq. ***EP-marine:*** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; ***EP-terrestrial:*** Eutrophication potential, Accumulated Exceedance; ***POCP:*** Formation potential of tropospheric ozone; ***ADP-M&M:*** Abiotic depletion potential for non-fossil resources (minerals and metals); ***ADP-fossil:*** Abiotic depletion potential for fossil resources; ***WDP:*** Water deprivation potential, deprivation weighted water consumption

Additional (optional) environmental impact indicators – EN 15804+A2, PEF

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.0E-05	4.9E-09	0.0E+00	8.7E-08	1.2E-06	1.2E-07	-4.2E-06
IRP	kBq U235 eq.	5.7E+00	1.9E-03	0.0E+00	1.2E-02	2.6E-02	1.3E-02	-8.7E+00
ETP-fw	CTUe	4.3E+03	2.5E-01	0.0E+00	2.2E+00	8.2E+01	4.2E+00	-2.8E+02
HTP-c	CTUh	5.4E-08	2.6E-11	0.0E+00	1.7E-10	1.4E-09	2.2E-10	-1.7E-08
HTP-nc	CTUh	2.1E-06	1.4E-09	0.0E+00	9.2E-09	1.2E-08	8.0E-09	-5.4E-07
SQP	Dimensionless	9.7E+02	6.7E-01	0.0E+00	1.1E+01	6.0E+00	2.4E+01	-6.0E+02

PM: Particulate matter emissions; *IRP*: Ionising radiation, human health; *ETP-fw*: Ecotoxicity (freshwater); *ETP-c*: Human toxicity, cancer effects; *HTP-nc*: Human toxicity, non-cancer effects; *SQP*: Land use related impacts / soil quality

Use of Natural Resources

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
RPEE	MJ	1.8E+02	-2.1E+01	0.0E+00	2.0E-01	4.3E-01	2.2E-01	-1.6E+02
RPEM	MJ	1.6E+01	-1.6E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
TPE	MJ	1.9E+02	-3.7E+01	0.0E+00	2.0E-01	4.3E-01	2.2E-01	-1.5E+02
NRPE	MJ	2.7E+03	-5.0E-01	0.0E+00	1.4E+01	5.1E+00	1.8E+01	-1.4E+03
NRPM	MJ	3.8E+01	-2.4E+00	0.0E+00	0.0E+00	-2.2E+01	-1.4E+01	1.5E+00
TRPE	MJ	2.8E+03	-2.9E+00	0.0E+00	1.4E+01	-1.7E+01	4.0E+00	-1.4E+03
SM	kg	3.1E+01	5.1E-04	0.0E+00	6.3E-03	4.3E-03	6.2E-03	9.8E+00
RSF	MJ	5.2E-01	5.1E-06	0.0E+00	8.0E-05	3.8E-05	9.6E-05	-8.9E-01
NRSF	MJ	3.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
W	m ³	4.2E+00	-1.9E-03	0.0E+00	2.0E-03	8.6E-03	1.0E-02	-5.8E-01

RPEE Renewable primary energy resources used as energy carrier; *RPEM* Renewable primary energy resources used as raw materials; *TPE* Total use of renewable primary energy resources; *NRPE* Non-renewable primary energy resources used as energy carrier; *NRPM* Non-renewable primary energy resources used as materials; *TRPE* Total use of non-renewable primary energy resources; *SM* Use of secondary materials; *RSF* Use of renewable secondary fuels; *NRSF* Use of non-renewable secondary fuels; *W* Use of net fresh water

End of life – Waste

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
HW	KG	7.7E+00	4.8E-03	0.0E+00	2.5E-02	4.4E-02	2.6E-02	-7.3E+00
NHW	KG	1.6E+02	3.3E+00	0.0E+00	4.6E-01	9.0E+00	5.2E-01	-1.7E+02
RW	KG	1.7E-03	4.7E-07	0.0E+00	3.0E-06	6.4E-06	3.2E-06	-2.1E-03

HW Hazardous waste disposed; *NHW* Non-hazardous waste disposed; *RW* Radioactive waste disposed

End of life – Output flows

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
CR	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	kg	3.5E+01	4.7E-01	0.0E+00	0.0E+00	8.9E+01	0.0E+00	0.0E+00
MER	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
EEE	MJ	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETE	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

CR Components for reuse; *MR* Materials for recycling; *MER* Materials for energy recovery; *EEE* Exported electric energy; *ETE* Exported thermal energy

Information describing biogenic carbon content at factory gate

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in the accompanying packaging	0.486	kg C

Specific data (GWP-GHG) and data variation for A1-A3

Specific data and data variation	Value-%
Specific data	60
Variation - product	Not relevant
Variation - site	Not relevant

Hazardous substances

☒ The product does not contain any REACH SVHC substances in amounts greater than 0.1 %.

Contact information

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Bibliography

ISO 14020:2000

Environmental labels and declarations – General principles

ISO 14025:2010

Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14044:2006

Environmental management - Life cycle assessment - Requirements and guidelines

EN 15804:2012+A2:2019

Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products

EPD Square PCR v.1.0, 2024

EPD Square, General Programme Instructions v.1, 2024

Ecoinvent database v3.10.1 (2024) and One Click LCA database

Annex

Environmental impacts – EN 15804+A1, CML/ISO 21930

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP	kg CO ₂ eq.	2.3E+02	1.2E-01	0.0E+00	1.0E+00	1.3E+00	9.8E-01	-1.0E+02
ODP	kg CFC11 eq.	5.6E-06	6.7E-10	0.0E+00	1.2E-08	3.1E-09	1.6E-08	-1.0E-06
AP	kg SO ₂ eq.	1.3E+00	2.1E-04	0.0E+00	2.2E-03	2.1E-03	4.0E-03	-3.5E-01
EP	kg PO ₄ eq.	2.3E-01	7.5E-05	0.0E+00	5.3E-04	9.2E-04	1.2E-03	-1.1E-01
POCP	kg C ₂ H ₄ eq.	5.5E-02	2.4E-05	0.0E+00	2.1E-04	1.3E-03	3.5E-04	-2.4E-02
ADP-M&M	kg Sb eq.	1.8E-03	1.4E-07	0.0E+00	3.0E-06	1.8E-06	2.6E-06	-3.4E-04
ADP-fossil	MJ	2.7E+03	6.8E-01	0.0E+00	1.4E+01	4.7E+00	1.7E+01	-1.2E+03

Environmental impacts – GWP-GHG

Indicator	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO ₂ e	2.3E+02	8.6E-02	0.0E+00	1.0E+00	6.4E-01	9.8E-01	-1.0E+02

GWP- GHG Global Warming Potential, greenhouse gases