SOLMAX

Environmental
Product
Declaration

According to EN15804+A2 (+indicators A1)

This declaration is for:
GEOLUX® Albedo enhancement solution

Provided by:
Solmax

MRPI® registration:
1.1.00767.2025

Program operator:
Stichting MRPI®
Publisher:
Stichting MRPI®
www.mrpi.nl

Date of first issue:
30-1-2025
Date of this issue:
30-1-2025
Expiry date:
30-1-2030

ECO PLATFORM EPD VERIFIED

Nationale MILIEUDATABASE

MRPI milieu relevante product informatie

COMPANY INFORMATION

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MRPI® REGISTRATION

1.1.00767.2025

DATE OF THIS ISSUE

30-1-2025

EXPIRY DATE

30-1-2030

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Tim Mol, Ecoreview. The LCA study has been done by Darryl Kofi Safo, Solmax. The certificate is based on an LCA-dossier according to EN15804+A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®

Kingsfordweg 151

1043 GR

Amsterdam

PRODUCT

GEOLUX® Albedo enhancement solution

DECLARED UNIT / FUNCTIONAL UNIT

1 m2

DESCRIPTION OF PRODUCT

GEOLUX® provides a maximized level of Solar Energy Reflectance to increase the ground albedo to approximately 75%, resulting in an optimum increase in the power gained from bifacial solar panels.

VISUAL PRODUCT

MORE INFORMATION

https://www.geoluxsolutions.com/

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION
	CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration an data according to EN15804+A2 (+indicators A1) Internal: External: X
	Third party verifier: Tim Mol, Ecoreview
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION (PART 1)

GEOLUX was developed by building on Solmax's 40-year experience of engineering high quality materials designed to protect the environment from aggressive waste and chemicals in the harshest climates, and combining with an ultra-high reflective finish. This combination gives long-term performance and durability, with a service life in excess of 30 years whilst maintaining a highly reflective surface. Once GEOLUX is installed, you will never need to replace it until it is recycled or re-used at the end of your project.

Solmax have undertaken advanced UV aging testing (NF EN 12224- 2000) with repeated Solar Energy Reflectance Testing (ASTM E903-20) showing to date consistent levels of reflectivity as GEOLUX is subjected to UV aging.

DETAILED PRODUCT DESCRIPTION (PART 2)

Manufacturing process

GEOLUX is manufactured through an extrusion process. This begins with the polyolefin resin and various additives that make up the formulation being introduced into an extruder and melted at high temperatures. The molten polymeric material is forced through a die, which shapes the geomembranes into a continuous sheet and its desired thickness and width. The sheet solidifies as it is rapidly cooled and can then be wound onto winding cores for packaging.

Component (> 1%)	(%)
Polyethylene resin	Confidential
Colour masterbatch	Confidential

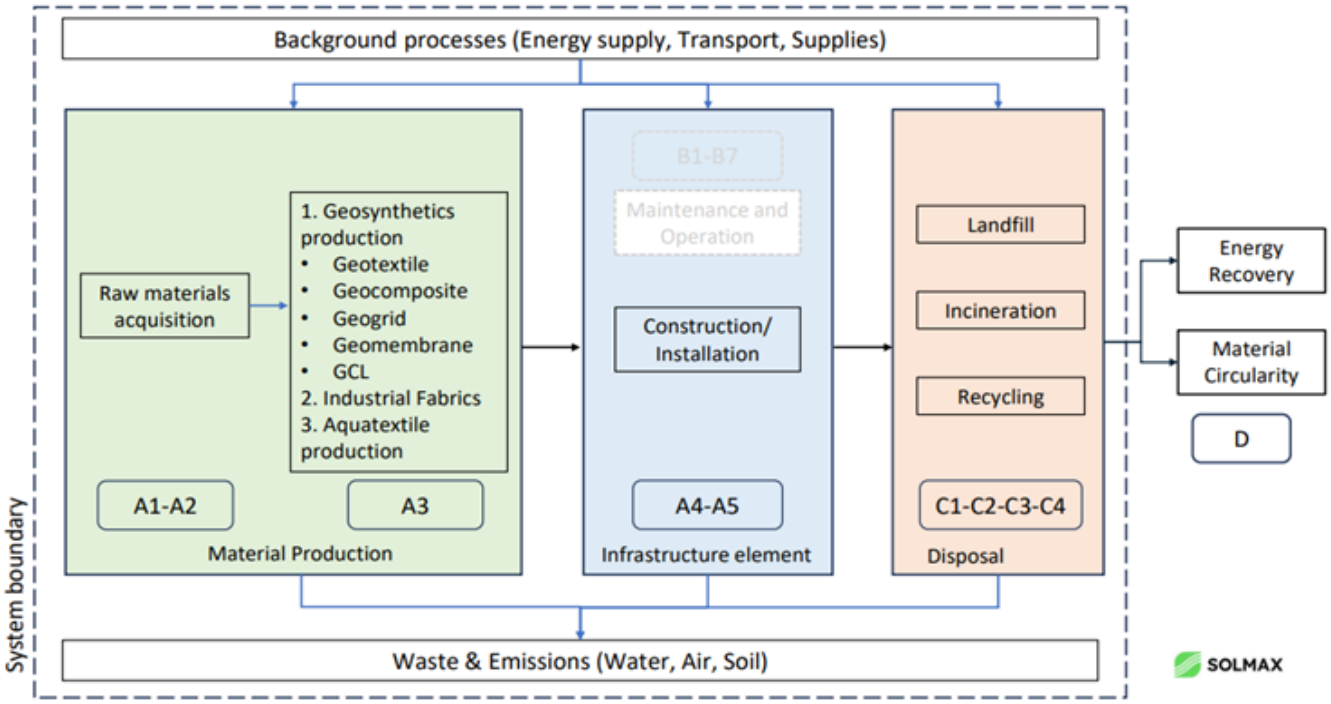
SCOPE AND TYPE

The geographical location is the EMEA and the product is manufactured in 6th of October, Egypt.
Solmax Geosynthetics S.A.E.
Street No. 28
The 4th Industrial Zone
The 6th of October City
Egypt
The product has various potential applications as a construction material or as a component in construction materials. Background database used for the calculations is Ecoinvent version 3.6 in combination with the Ecochain Helix 4.3.1 LCA software. The EPD is a Cradle-to-Grave EPD.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to 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	X	X	X	X	X	X	X	X	X	X	X	X

X = Modules Assessed

ND = Not Declared



REPRESENTATIVENESS

In this study a specific product is considered, produced at a specific production site.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADPE	kg Sb eq.	7,80E-05	1,45E-06	9,68E-07	8,04E-05	1,65E-06	4,19E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,15E-08	3,72E-07	8,10E-07	0,00E+00	-1,53E-06
ADPF	MJ	1,09E+02	1,27E+00	1,25E+01	1,23E+02	1,72E+00	6,32E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,26E-01	2,22E-01	5,97E-01	0,00E+00	-4,05E+01
GWP	kg CO2 eq.	3,61E+00	9,12E-02	6,88E-01	4,39E+00	1,28E-01	4,03E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,37E-02	1,46E-02	3,20E+00	0,00E+00	-2,04E+00
ODP	kg CFC11 eq.	1,08E-07	1,54E-08	3,17E-08	1,55E-07	2,12E-08	9,38E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,01E-09	2,58E-09	4,16E-09	0,00E+00	-2,27E-07
POCP	kg ethene eq.	2,94E-03	9,05E-05	2,28E-04	3,26E-03	1,43E-04	1,74E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-05	8,78E-06	2,20E-05	0,00E+00	-3,72E-04
AP	kg SO2 eq.	1,41E-02	1,46E-03	5,08E-03	2,07E-02	2,51E-03	1,19E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,75E-04	6,40E-05	3,52E-04	0,00E+00	-1,58E-03
EP	kg (PO4) 3 eq.	1,42E-03	1,76E-04	4,00E-04	1,99E-03	2,90E-04	1,25E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,94E-05	1,26E-05	1,28E-04	0,00E+00	-2,15E-04

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB eq.	8,39E-01	4,53E-02	1,34E-01	1,02E+00	6,65E-02	7,13E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,77E-03	6,13E-03	1,11E-01	0,00E+00	-1,18E-01
FAETP	kg DCB eq.	5,16E-02	9,69E-04	3,30E-03	5,59E-02	1,29E-03	4,83E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,26E-04	1,79E-04	3,63E-02	0,00E+00	-1,36E-03
MAETP	kg DCB eq.	8,90E+01	3,99E+00	1,81E+01	1,11E+02	5,57E+00	8,95E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,34E-01	6,43E-01	5,31E+01	0,00E+00	-5,59E+00
TETP	kg DCB eq.	3,01E-03	1,43E-04	1,67E-03	4,82E-03	2,04E-04	2,76E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,15E-05	2,17E-05	1,68E-04	0,00E+00	-3,86E-04
ECI	euro	3,51E-01	1,68E-02	7,38E-02	4,41E-01	2,61E-02	3,43E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,24E-03	1,75E-03	1,79E-01	0,00E+00	-1,25E-01
ADPF	kg Sb eq.	5,26E-02	6,11E-04	6,00E-03	5,92E-02	8,30E-04	3,04E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,57E-04	1,07E-04	2,87E-04	0,00E+00	-1,95E-02

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	3,76E+00	9,20E-02	6,50E-01	4,50E+00	1,29E-01	4,16E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	1,47E-02	3,21E+00	0,00E+00	-2,07E+00
GWP-fossil	kg CO2 eq.	3,75E+00	9,19E-02	6,93E-01	4,54E+00	1,29E-01	4,04E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	1,47E-02	3,20E+00	0,00E+00	-2,06E+00
GWP-biogenic	kg CO2 eq.	6,65E-03	5,06E-06	-4,36E-02	-3,69E-02	-9,45E-06	1,17E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,21E-06	6,78E-06	7,66E-03	0,00E+00	-6,30E-03
GWP-luluc	kg CO2 eq.	1,62E-03	4,95E-05	3,99E-04	2,07E-03	7,65E-05	1,10E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,50E-06	5,38E-06	2,14E-05	0,00E+00	-1,00E-04
ODP	kg CFC11 eq.	1,19E-07	1,93E-08	3,68E-08	1,75E-07	2,66E-08	1,07E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,03E-09	3,24E-09	4,84E-09	0,00E+00	-2,57E-07
AP	mol H+ eq.	1,70E-02	1,84E-03	5,98E-03	2,48E-02	3,16E-03	1,44E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,45E-04	8,51E-05	4,94E-04	0,00E+00	-2,00E-03
EP-fresh water	kg PO4 eq.	8,96E-05	6,34E-07	3,14E-05	1,22E-04	7,59E-07	6,26E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,33E-07	1,48E-07	7,51E-07	0,00E+00	-4,10E-06
EP-marine	kg N eq.	2,79E-03	4,78E-04	8,22E-04	4,09E-03	7,99E-04	2,64E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,07E-04	3,00E-05	2,17E-04	0,00E+00	-5,53E-04
EP-terrestrial	mol N eq.	3,16E-02	5,31E-03	9,23E-03	4,62E-02	8,88E-03	2,93E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,18E-03	3,31E-04	2,36E-03	0,00E+00	-6,09E-03
POCP	kg NMVOC eq.	1,25E-02	1,40E-03	2,50E-03	1,64E-02	2,32E-03	9,86E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,24E-04	9,44E-05	5,87E-04	0,00E+00	-2,12E-03
ADP-minerals & metals	kg Sb eq.	7,80E-05	1,45E-06	9,68E-07	8,04E-05	1,65E-06	4,19E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,15E-08	3,72E-07	8,10E-07	0,00E+00	-1,53E-06
ADP-fossil	MJ, net calorific value	1,04E+02	1,27E+00	9,97E+00	1,16E+02	1,74E+00	5,94E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,28E-01	2,21E-01	5,59E-01	0,00E+00	-3,65E+01
WDP	m3 world eq. Deprived	1,79E+00	3,23E-03	9,86E-02	1,89E+00	3,77E-03	9,58E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,76E-04	7,92E-04	1,08E-02	0,00E+00	-2,36E-01

GWP-total	=	Global Warming Potential total
GWP-fossil	=	Global Warming Potential fossil fuels
GWP-biogenic	=	Global Warming Potential biogenictotal
GWP-luluc	=	Global Warming Potential land use and land use change
ODP	=	Depletion potential of the stratospheric ozone layer
AP	=	Acidification Potential, Accumulated Exceedence
EP-freshwater	=	Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine	=	Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial	=	Eutrophication Potential, Accumulated Exceedence
POCP	=	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals & metals	=	Abiotic Depletion Potential for non-fossil resources [1]
ADP-fossil	=	Abiotic Depletion for fossil resources potential [1]
WDP	=	Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [1]:

- 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 experience with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease inci-dence	1,40E-07	5,37E-09	1,43E-08	1,60E-07	6,24E-09	8,78E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,44E-09	1,32E-09	3,12E-09	0,00E+00	-8,37E-09
IRP	kBq U235 eq.	5,05E-02	5,40E-03	1,09E-02	6,69E-02	7,39E-03	3,91E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,39E-03	9,27E-04	1,25E-03	0,00E+00	-1,31E-02
ETP-fw	CTUe	5,49E+01	9,81E-01	1,17E+01	6,75E+01	1,26E+00	3,56E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,17E-01	1,97E-01	1,02E+00	0,00E+00	-2,63E+00
HTP-c	CTUh	1,59E-09	4,65E-11	1,91E-10	1,83E-09	6,79E-11	1,06E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,13E-11	6,40E-12	1,38E-10	0,00E+00	-1,54E-10
HTP-nc	CTUh	3,91E-08	9,54E-10	8,52E-09	4,85E-08	1,16E-09	2,81E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,12E-10	2,16E-10	4,77E-09	0,00E+00	-2,46E-09
SQP	-	6,42E+00	6,47E-01	1,10E+00	8,16E+00	6,62E-01	4,81E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,34E-02	1,92E-01	3,05E-01	0,00E+00	-2,52E+00

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans, cancer [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

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.

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 experience with the indicator.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 en A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	2,17E-05	2,22E-06	6,85E-05	9,24E-05	2,53E-06	5,00E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,05E-07	5,61E-07	3,61E-06	0,00E+00	-4,19E-05
NHWD	kg	3,10E-01	4,26E-02	5,96E-02	4,12E-01	3,97E-02	2,82E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,98E-04	1,40E-02	4,25E-02	0,00E+00	-1,72E-02
RWD	kg	4,61E-05	8,61E-06	1,38E-05	6,85E-05	1,18E-05	4,28E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,23E-06	1,45E-06	1,61E-06	0,00E+00	-1,80E-05
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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,07E-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	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,83E-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	0,00E+00	0,00E+00	0,00E+00
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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,39E+01
ETE	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,05E+00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	1,73E+00	4,21E-03	7,03E-01	2,43E+00	0,00E+00	1,24E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,62E-03	0,00E+00	0,00E+00	0,00E+00	-4,53E-01
PERM	MJ	0,00E+00	8,13E-03	0,00E+00	8,13E-03	1,51E-02	2,30E-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	2,77E-03	1,93E-02	0,00E+00	0,00E+00
PERT	MJ	1,73E+00	1,23E-02	7,03E-01	2,44E+00	1,51E-02	1,26E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,62E-03	2,77E-03	1,93E-02	0,00E+00	-4,53E-01
PENRE	MJ	1,12E+02	6,63E-01	1,07E+01	1,23E+02	0,00E+00	6,20E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,49E-01	0,00E+00	0,00E+00	0,00E+00	-4,03E+01
PENRM	MJ	0,00E+00	6,89E-01	0,00E+00	6,89E-01	1,84E+00	1,71E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,35E-01	6,03E-01	0,00E+00	0,00E+00
PENRT	MJ	1,12E+02	1,35E+00	1,07E+01	1,24E+02	1,84E+00	6,38E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,49E-01	2,35E-01	6,03E-01	0,00E+00	-4,03E+01
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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NSRF	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	4,42E-02	1,12E-04	2,78E-03	4,71E-02	1,31E-04	2,40E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,03E-05	2,70E-05	4,35E-04	0,00E+00	-3,38E-03

PERE = Use of renewable primary energy excluding renewable primary energy 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 resources excluding non-renewable 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 materials
RSF = Use of renewable secondary fuels
NSRF = Use of non-renewable secondary fuels
FW = Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
BCCpa	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,87E-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	0,00E+00	0,00E+00	-1,62E-02

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Cut off rules
All primary data of the production processes were considered. No materials or processes have been excluded from the study.

Data quality
Data flows have been modeled as realistically as possible. Data quality assessment is based on the principle that the primary data used for processes occurring at the production site must be of higher quality than background data of other processes. Where this is not available, other reference data is selected from appropriate sources.

Data collection period
The dataset is representative for the production processes used in 2023.

Methodology and reproducibility
The process descriptions and quantities in this study are reproducible in accordance to the reference standards that have been used. The references of all sources, both primary and public sources and literature, have been documented. In addition, to facilitate the reproducibility of this LCA, a full set of data records has been generated.

Allocation
In accordance with the respective methodologies, the allocation procedures in the background processes are deemed to be consistent.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 1)

Product stage (A1-A3)
The processes in A1-A3 consists of the extraction and processing of raw materials, transportation of the raw materials, the manufacturing process and product packaging. The required energy for production, external treatments, ancillary materials, packaging material and production emissions are included. Energy consumption was modelled based on a residual energy mix.

Transport to construction site (A4)
This life cycle stage details all impacts related to the transport of product to the construction site from production facility. The distance is determined by using the city of Utrecht as ship-to address for products that are manufactured outside of Netherlands. The following scenario is assumed for module A4 of this EPD.

Description	Value	Unit
Vehicle type used for transport	Lorry unspecified (truck) and sea freight (ship)	
Distance to construction site	6572	km

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 2)

Assembly (A5)
The life cycle stage details all impact related to the on-site activities in the construction stage. This also includes any waste produced and its disposal. The product is typically unrolled off suspended rolls manually, however there are impacts associated with the installation as the geomembrane must be welded together to form a continuous lining system (barrier), which is typically done by hot wedge welding and extrusion welding. Thus requires the consumption of electricity for the installation. The environmental impacts related to the disposal of packaging material are also considered.

Description	Value	Unit
Energy consumption during the installation (Electricity grid mix)	0,002	kWh
Output materials as results of losses during construction	5	%
Output materials as results of waste processing of used packaging.	0,020	kg
Distance to disposal site (Winding core)	60	km
Distance to disposal site (Plastic packaging)	92,5	km

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 3)

The environmental impacts related to the disposal of packaging material are considered in this Module. The disposal of plastic packaging (plastic caps sling) follows the “polyolefinen o.a. leidingen, folies” (ENG: polyolefins including pipes and films) waste stream. As for the winding core, the disposal follows the "pvc, leidingen" (ENG: pvc, pipes) waste stream. The table below presents the distances and waste processing percentages used to calculate the average transport distance for packaging materials.

Waste stream	Not removed (Stays underground)	Landfill	Incineration	Recycling	Re-use
Transport to disposal site	0 km	50 km	100 km	50 km	0 km
[57] polyolefinen o.a. leidingen, folies	0%	10%	85%	5%	0%
64] pvc, leidingen	0%	10%	20%	70%	0%

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 4)

Use Stage (B1-B7)
This life cycle stage details impacts related to the use phase over the entire life cycle.
There are no impacts associated with the entire use stage, as it was assumed that no activities for maintenance, repair, replacement, refurbishment nor other material and energy flows take place during the operational phase.

End of Life Stage (C1-C4)
The end of life stage accounts for the deconstruction/demolition and includes the impacts of transport to waste processing sites and the disposal of said waste. The deconstruction/demolition of waste product is done by the excavation of the subsoil. It is assumed that 0.03 m3 of soil must be moved per declared unit. The distribution ratio for waste disposal follows the “geotextiel en geogrids grondwerken” waste stream (ENG: geotextiles and geogrids for earth works). The assumed transport distance for the different types of waste processing are shown below. Similarly, the percentages per type of waste processing are displayed.

End-of-life stage	Not removed (Stays underground)	Landfill	Incineration	Recycling	Re-use
Transport to disposal site (C2)	0 km	50 km	100 km	50 km	0 km
Waste processing and disposal (C3-C4)	25%	0%	70%	5%	0%

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION (PART 5)

Benefits and Loads beyond the system boundary (D)
This life cycle stage covers the net benefits and loads arising from the reuse of products or the recycling or recovery of energy from waste materials. This study models the benefits and burdens of waste combustion using an electrical efficiency of 18% and thermal efficiency of 31%. As for the calculation of the avoided burden from material recycling, a quality factor of 67% is used.

Description	Total energy recovery (MJ)	Avoided burden (kg)
Reference product	21,92	0,050

DECLARATION OF SVHC

None of the substances contained in the product are listed in the "Candidate List of Substances of Very High Concern for authorisation", or they do not exceed the threshold with the European Chemicals Agency.

REFERENCES

[1] ‘ISO 14040: Environmental management - Life cycle assessment – Principles and Framework', International Organization for Standardization, ISO14040:2006.

[2] ‘ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO14044:2006.

[3] ‘ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO14025:2006.

[4] ‘NEN-EN 15804: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products', NEN-EN 15804:2012+A2:2019.

[5] ‘Bepalingsmethode Milieuprestatie Bouwwerken ', Stichting Nationale Milieudatabase, versie 1.1, maart 2022.

REMARKS

None