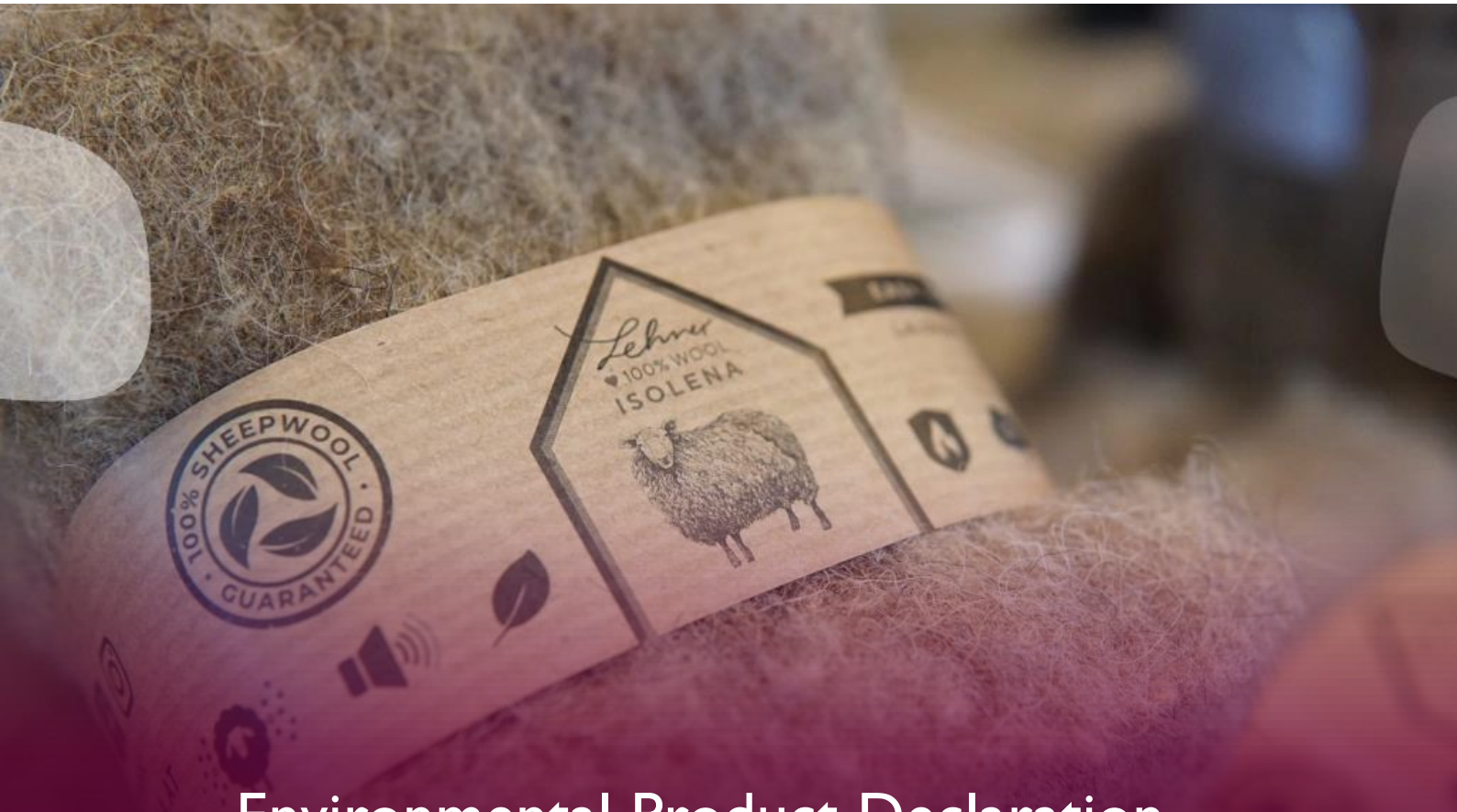

Environmental Product Declaration

In accordance with the EN 15804 +A2 and the NMD Bepalingsmethode, v1.1

ISOLENA Optimal

Scope of the declaration

Type of the EPD is Cradle to grave, including modules A-D

According to the EN 15804 +A2 and the NMD Bepalingsmethode, version 1.1

The LCA was carried out by Agrodome B.V. (NL)

Based on production data from ISOLENA Naturfaservliese GmbH (AUT)

Release Date: 1 March 2023
Validity for: 5 years

Functional unit: 1 m²

Goal and target group

Goal

The declaration covers the environmental effects throughout the lifetime of the product Isolena Optimal.

Target audience

The EPD can be used for building or building part level assessments by designers, architects, constructors, developers etc. The EPD is made business-to-business communication and can be used for business-to-consumer communication purposes. The background EPD report is third party verified.

Product description

The sheep wool for ISOLENA Optimal sheep wool insulation is obtained from sheep serving as the natural custodians of alpine meadows. This sheep wool is not suitable for clothing or other uses, but is suitable for high-grade insulation material.

Apart from thermal insulation, sheep wool can also be used for acoustic insulation.

The wool is washed and treated without the use of pesticides or salts. By means of the IONIC PROTECT® treatment method, the wool is protected against moths. This method preserves the properties of the sheep wool. The efficacy is tested and confirmed in the laboratory (EAD/CUAP test).

Optimal sheep wool insulation is suited for fitting in roofs, walls, ceilings, facades, timber frame construction and solid and cross layer timber (CLT) constructions. Besides (monumental) residential housing and non-residential constructions, the wool is also applied in tiny houses, boats and campers.

Optimal sheep wool insulation comes in 60 cm wide rolls and is available in different thicknesses.

Function of the product

Optimal sheep wool insulation can be used as thermal and or acoustic insulation for walls, floors and roofs, in both new buildings or renovation projects. To achieve a comfortable indoor climate.

Composition of ISOLENA Optimal sheep wool insulation

Material	Share
Sheepwool of extensively kept sheep	100 %

Table 1: Composition ISOLENA Optimal sheep wool insulation

Technical data ISOLENA Optimal sheep wool insulation

Name	Value
Thickness element at R = 3,5 m^2k/W	135 mm
Weight ISOLENA Optimal sheepwool insulation	2,43 kg/m^2
Density	18 kg/m^3
Thermal conductivity λ	0,0385 W/mK

Vapour diffusion resistance factor μ	1
Specific heat capacity c	1760 J/kgK
Length-related flow resistance according to EN 29053	r = 4,1 kPa s/m^2
Fire resistance class according to EN 13501-1	D-s2, d0; CH: RF3
Mould growth intensity according to EN ISO 846	0
Wool protection	IONIQ PROTECT®

Table 2: Technical data ISOLENA Optimal sheep wool insulation

Environment and health during use phase

ISOLENA Optimal sheep wool insulation does not contain concentrations of substances or materials listed in the "Candidate List of Substances of Very High Concern for authorisation".

Sheep wool is vapour-permeable, moisture-regulating, does not burn and purifies the air. Sheep wool can absorb 1/3 of its own weight in moisture without losing insulation value.

Environmental certificates

The sheep wool for ISOLENA Optimal sheepwool insulation has the natureplus seal of approval, license number: **0103-1006-099-1**.

Biogenic carbon storage

Biogenic carbon storage during the lifetime of the product Isolena Optimal is ca. 50% C of the weight (Boogman 2022).

LCA calculation rules

Functional unit

One square meter of sheep wool insulation, with a lifespan of 75 years, with a thickness of 135 mm, a density of 18 kg/m^3 and an insulation value of 3,5 m^2k/W.

Name	Value	Unit
Functional Unit	1,00	m^2
Weight	2,43	kg/FU

Reference Service Life

The lifespan of the product, as declared by the manufacturer, is 75 years when correctly applied as an insulation material. No maintenance is needed.

Comparability

A comparison or evaluation of EPD data is only possible if all datasets have been made in accordance with EN 15804 and the same product-related standard properties and modules have been taken into account.

System boundaries

The LCA study was created for 'Cradle to Grave A1-D' according to the modules below. All declared values relate to the specified functional unit. The functional unit of the European standard EN 15804 +A2 and the NMD - Bepalingsmethode 'Milieuprestatie Bouwwerken'are identical.
The environmental performance of building materials is categorized in four modules corresponding to different lifecycle phases in the building material; Modules A (production of materials and construction), B (use phase), C (end-of-life phase of the building) and D (loads and benefits outside the system boundary); see Figure 1.

Product stage			Construction installation stage		Use stage							End of life stage					Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	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
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒		☒

Figure 1: Calculated modules Isolena Optimal sheep wool insulation

For this LCA study, all modules A1-3, A4, A5, B, C and D have been examined, except B6 and B7.

Allocations

There are no allocations of co-products from the sheep wool.

Assumptions, omissions and deviations

It is assumed that no maintenance is needed when installed in the building.

The energy consumption of the Belgium Laundry that is used in the calculations is outdated, new (green) energy sources are implemented in the factory, but there were no recent data available during the study.

The wool is considered to be a by-product from the sheep farming for grazing, milk and meat production. The economic value of the sheep wool for insulation is much lower than the economic value related to the meat and milk production. See also sensitivity analysis.

Production process ISOLENA Optimal sheep wool insulation

The next page shows the flowchart of the production process of ISOLENA Optimal sheep wool insulation. This flowchart lists the entire production process starting with the operations needed to extract the sheep wool by shearing.

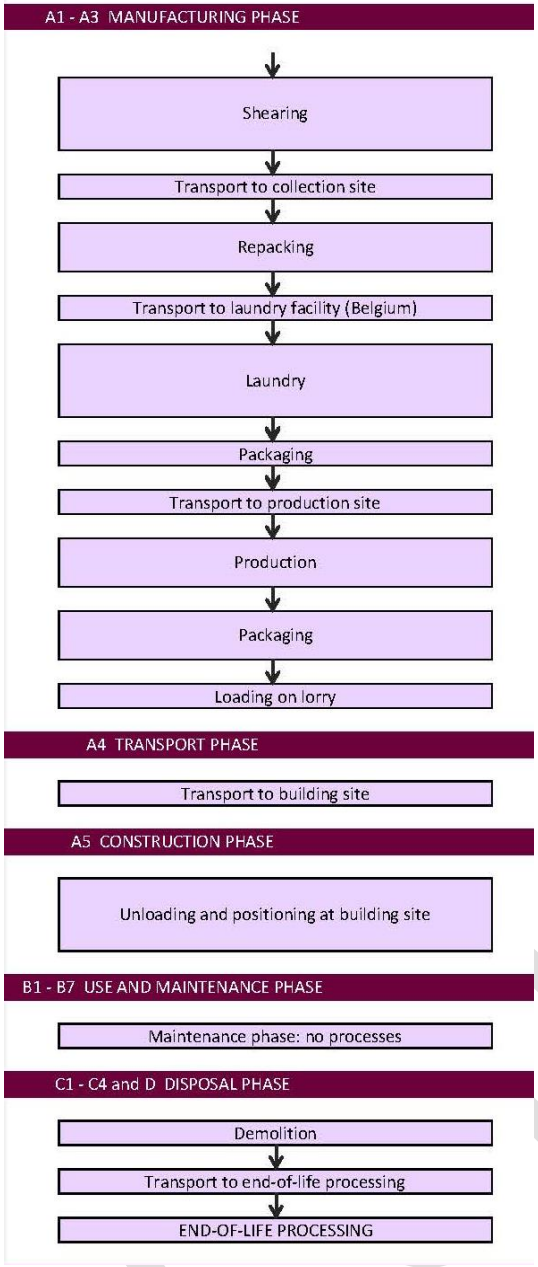

Figure 2: Flowchart ISOLENA Optimal sheep wool insulation

Explanation Flowcharts and Life Cycle per phase

Production phase (A1-3)

The wool comes from sheep that serve as the natural custodians of alpine pastures. The sheep are sheared annually and the wool is taken to a collection point in the valley. From there, the wool is transported by lorry to the laundry facility in Belgium (BE-4600 Verviers), where the wool is washed with soda and water. The clean wool then returns by lorry to the factory in Austria, where further production takes place.

In an automated process, the clean wool is prepared into thin layers and treated with ionised plasma, which makes the keratin fibres unfit for consumption by moths and other insects. This process is typical for Isolena and patented: IONIQ PROTECT®. The product is then further processed into insulation material

in the desired thickness, it is rolled up, packed in cardboard and plastic film and transported to the warehouse.

Construction process phase (A4-5)

Transport to the building site (A4)

The finished product is transported from the production site in Austria to the Netherlands. For the transport movement from Austria to the Netherlands, no empty return is applied. The default from the determination method version 1.1 is used for the transport to the building site, in this case Waizenkirchen, Austria to Utrecht, the Netherlands. For the process 'Transport, freight, lorry >32 metric ton, euro5 {RER}| market for transport, freight, lorry >32 metric ton, EURO5 | Cut-off, U' is used.

Processing and construction on the construction site (A5)

At the construction site the insulation is fitted; for this only hand tools are used. In the calculation 5% material loss is applied. The packaging materials (cardboard and PE foil) are disposed of together with other building materials

Use phase (B1-7)

ISOLENA Optimal sheep wool insulation has a lifespan of 75 years when correctly applied as insulation material in a building. This period is equal to the Dutch standard for residential buildings. During this period, no additional maintenance is needed.

End-of-life phase (C1-4)

Disassembly and demolition (C1)

Disassembly and demolition takes place manually, there is no industrial process.

Transport (C2)

Transport phase assumptions: the default value according to the bepalingsmethode 1.1 is used. This is 50 km to sorting installation and 100 km from demolition or sorting location to processing location. For the process 'Transport, freight, lorry >32 metric ton, euro5 {RER}| market for transport, freight, lorry >32 metric ton, EURO5 | Cut-off, U' is used.

Waste treatment (C3-C4)

For waste processing there are no standard processes available. The distribution below and the scenarios chosen have been taken into account based upon the fact that sheep wool is an organic product.
Waste scenario for the wool … % incineration % landfill

Benefits and burdens outside the system boundary (D)

The benefits and burdens outside the system boundary relate to combustion in which energy use is avoided. The efficiency of heat and electricity recovery from waste material is 31% for heat and 18% for electricity, according to the fixed values in the NMD bepalingsmethode.

Environmental indicators per FU (m^2) EN 15804 +A1, Isolena Optimal

Potential Environmental Impacts	Production		Construction process stage		Use stage					End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material A2 Transport A3 manufacturing		A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
ADPE (kg Sb-eq)	4,09E-05		7,16E-06	3,71E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,25E-06	1,45E-06	3,80E-08	-3,02E-06
ADPF (kg SB-eq)	2,18E-02		2,06E-03	9,74E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,60E-04	2,48E-04	4,08E-05	-2,17E-03
GWP (kg CO2-eq)	5,73E+00		2,80E-01	1,64E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,89E-02	6,97E-02	2,52E-02	-3,02E-01
ODP (kg CFC 11-eq)	2,63E-07		4,97E-08	5,37E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,67E-09	4,88E-09	8,77E-10	-6,92E-08
POCP (kg C2H4-eq)	1,93E-03		1,69E-04	9,37E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,95E-05	2,43E-05	7,90E-06	-6,65E-04
AP (kg SO2-eq)	8,27E-03		1,23E-03	9,75E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,15E-04	3,45E-04	2,34E-05	-4,22E-03
EP (kg (PO4)3-eq)	1,37E-03		2,42E-04	2,47E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,22E-05	1,23E-04	9,64E-06	-1,38E-03
HTP (kg 1,4-DB-eq)	9,90E-01		1,18E-01	1,64E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,06E-02	4,38E-02	2,19E-03	-3,65E-01
FAETP (kg 1,4-DB-eq)	2,36E-02		3,45E-03	8,74E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,01E-04	1,92E-03	3,56E-05	-7,59E-03
MAETP (kg 1,4-DB-eq)	7,67E+01		1,24E+01	2,99E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,16E+00	1,04E+01	1,46E-01	-1,04E+01
TETP (kg 1,4-DB-eq)	3,96E-03		4,17E-04	4,90E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,28E-05	1,71E-04	7,10E-06	-2,32E-03

ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; GWP = Global warming Potential; ODP = Ozone Depletion Potential; POCP = Photochemical Ozone Creation; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; HTP = Human Toxicity Potential : FAETP = Fresh Aquatic Ecotoxicity Potential ; MAETP = Marine Aquatic Ecotoxicity Potential; TETP = Terrestrial Ecotoxicity Potential

Table 3 Environmental indicators per FU (m^2) EN 15804 +A1, Isolena Optimal

Core Environmental Indicators per FU (m^2) EN 15804 +A2, Isolena Optimal

Potential Environmental Impacts	Production	Construction process stage		Use stage					End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material A2 Transport A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
CC total (kg CO2 eq)	7,24E+00	2,83E-01	2,84E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,93E-02	-4,32E+00	3,73E-02	-3,30E-01
CC fossil (kg CO2 eq)	2,97E+00	2,83E-01	1,63E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,93E-02	7,35E-02	3,61E-03	-3,07E-01
CC biogenic (kg CO2 eq)	4,26E+00	1,31E-04	1,21E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,28E-05	-4,40E+00	3,37E-02	-2,07E-02
CC luluc (kg CO2 eq)	2,85E-03	1,04E-04	1,42E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,81E-05	1,46E-05	1,74E-06	-2,31E-03
ODP (kg CFC 11 eq)	3,06E-07	6,24E-08	5,47E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,09E-08	5,60E-09	1,10E-09	-7,18E-08
AP (mol H+ eq)	1,05E-02	1,64E-03	1,29E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,86E-04	4,74E-04	3,08E-05	-6,62E-03
EP – freshwater (kg P eq)	5,07E-05	2,85E-06	5,92E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,97E-07	1,06E-06	7,41E-08	-2,07E-05
EP – marine (kg N eq)	2,99E-03	5,78E-04	4,59E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,01E-04	2,06E-04	1,99E-05	-1,93E-03
EP – terrestrial (mol N eq)	3,15E-02	6,37E-03	4,70E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,11E-03	2,07E-03	1,14E-04	-3,17E-02
POCP (kg NMVOC eq)	1,08E-02	1,82E-03	1,23E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,17E-04	5,16E-04	4,06E-05	-5,60E-03
ADP Elements (kg Sb eq)	4,09E-05	7,16E-06	3,71E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,25E-06	1,45E-06	3,80E-08	-3,02E-06
ADP fossil fuels (MJ)	4,42E+01	4,26E+00	1,84E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,44E-01	4,66E-01	8,39E-02	-4,30E+00
WDP (m^3 water eq deprived)	3,60E+00	1,53E-02	1,16E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,66E-03	2,84E-02	3,60E-03	-3,36E-02

CC total = Climate Change total; CC fossil = Climate Change fossil; CC biogenic= Climate Change biogenic; CC-luluc = Climate Change land use and land use change; ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; WDP = water use (Water (user) deprivation potential, deprivation-weighted water consumption)

Table 4 Core Environmental Indicators per FU (m^2) EN 15804 +A2, Isolena Optimal

Additional Environmental Indicators per FU (m^2) EN 15804 +A2, Isolena Optimal

Potential Environmental Impacts	Production	Construction process stage		Use stage					End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material A2 Transport A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
PM (disease incidence)	1,25E-07	2,54E-08	1,21E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,43E-09	4,89E-09	5,82E-10	-8,86E-08
IRHH (kg U235 eq)	1,09E-01	1,79E-02	6,65E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,12E-03	1,17E-03	3,28E-04	-1,08E-02
ETF (CTUe)	3,83E+01	3,80E+00	2,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,63E-01	3,14E+00	8,42E-02	-6,34E+01
HTCE (CTUh)	1,24E-09	1,23E-10	5,02E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,15E-11	1,75E-10	2,32E-12	-7,33E-10
HTnCE (CTUh)	4,02E-08	4,16E-09	1,53E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,25E-10	7,68E-09	9,01E-11	-2,65E-08
Land Use Related impacts (dimensionless)	3,96E+02	3,70E+00	1,08E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,45E-01	3,25E-01	1,99E-01	-2,49E+02

PM = Particulate Matter; IRHH = Ionizing Radiation – human health effects; ETF = Ecotoxicity – freshwater; HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects;

Table 5 Additional Environmental Indicators per FU (m^2) EN 15804 +A2, Isolena Optimal

Parameters describing resource use per FU (m^2) EN 15804 +A2, Isolena Optimal

Potential Environmental Impacts	Production	Construction process stage		Use stage					End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material A2 Transport A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
PERE (MJ, net calorific value)	3,74E+00	5,34E-02	-1,04E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,31E-03	-8,83E+00	1,48E-03	-5,20E+01
PERM (MJ, net calorific value)	8,19E+00	0,00E+00	1,06E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,84E+00	0,00E+00	0,00E+00
PERT (MJ, net calorific value)	1,19E+01	5,34E-02	1,39E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,31E-03	1,53E-02	1,48E-03	-5,20E+01
PENRE (MJ, net calorific value)	3,98E+01	4,53E+00	-1,58E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,89E-01	5,01E-01	8,92E-02	-4,65E+00
PENRM (MJ, net calorific value)	7,61E+00	0,00E+00	1,77E+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
PENRT (MJ, net calorific value)	4,74E+01	4,53E+00	1,96E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,89E-01	5,01E-01	8,92E-02	-4,65E+00
SM (kg)	4,22E-04	0,00E+00	3,64E-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
RSF (MJ, net calorific value)	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
NRSF (MJ, net calorific value)	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 (m^3 water eq)	8,71E-02	5,19E-04	3,68E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,06E-05	1,08E-03	8,76E-05	-8,08E-04

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 = Net use of fresh water

Table 6 Parameters describing resource use per FU (m^2) EN 15804 +A2, Isolena Optimal

Environmental information describing output flows and waste categories per FU (m^2) EN 15804 +A2, Isolena Optimal

Potential Environmental Impacts	Production	Construction process stage		Use stage					End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material A2 Transport A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed (kg/FU)	5,47E-05	1,08E-05	3,44E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,88E-06	8,68E-07	1,29E-07	-1,07E-05
Non-hazardous waste disposed (kg)	1,42E+00	2,70E-01	6,28E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,72E-02	1,10E-01	3,36E-01	-9,42E-02
Radioactive waste disposed (kg)	1,24E-04	2,80E-05	6,77E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,88E-06	1,59E-06	4,99E-07	-1,64E-05
Components for reuse (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
Materials for recycling (kg)	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	4,12E-01
Materials for energy recovery (kg)	4,83E-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	0,00E+00	0,00E+00	0,00E+00	2,05E+00
Exported energy Heat (MJ)	1,39E+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	9,87E+00
Exported energy Energy (MJ)	2,40E+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	1,70E+01

Table 7 Environmental information describing output flows and waste categories per FU (m^2) EN 15804 +A2, Isolena Optimal

Representativeness of the production process

Purchase of raw materials

Because Isolena does not have fixed suppliers data from the Ecoinvent database, version 3.6 and the NMD database version 3.4 were used.

Data quality

Isolena has handed over the physical and digital documentation, as well as a material statement with the quantities of material required for the tested product.

Energy consumption of equipment and equipment required to manufacture the product under investigation is based on consumption figures for 2022.

With the exception of the manufacturing phase, standard values have been used where appropriate in accordance with Ecoinvent 3.6. or NMD. This applies in particular to transport distances, processing in the waste phase and the choice of means of transport. Return transports loaded/unloaded are as per the manufacturer's instructions. In the final processing phase, the transports were calculated according to the Bepalingsmethode version 1.1.

Production processes can change over time. The information used in this LCA of the production process of the product is based on measurements and observations from 2022 (energy, waste percentages, quantities net, production volume).

Accountability

The LCA study was conducted by Agrodome B.V. in 2022.

The data provided by ISOLENA have been extensively discussed with Agrodome B.V.

The final version of the LCA study has been submitted to LBP|Sight for external peer review.

The LCA is carried out according to EN 15804 +A1 and +A2 in compliance with the standards from the ISO 14000 series: 14025, 14040 and 14044. The LCA report has been tested against the Bepalingsmethode ‘Milieuprestatie Bouwwerken’, version 1.1 March 2022.

When calculating the environmental impact categories, Simapro, version 9.4.0.2 and environmental data from the NMD-basic processes database, version 3.6 October 2022 and in some cases, namely where no NMD-data were available, the Ecoinvent database, version 3.6.

When making calculations in Simapro, the long-term effects (emissions that can occur after 100 years) are not taken into account, in accordance with the Bepalingsmethode version 1.1. The effects of capital goods and infrastructural processes are included.

References

ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025
ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A1
EN 15804+A1: 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

Nationale Milieudatabase
Bepalingsmethode Milieuprestatie Bouwwerken, versie 1.1 March 2022.

Caroline van der Laan, Fred van der Burgh and Sissy Verspeek, 2023
Background report EPD, Life cycle analysis, Isolena Opimal, Agrodome B.V. Wageningen, the Netherlands

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Declaration Agrodome B.V.

LBP|SIGHT has reviewed this LCA report according to the Bepalingsmethode 'Milieuprestatie Bouwwerken' versie 1.1.
This LCA report is approved by René Kraaijenbrink, LBP|Sight, March 2023