Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Welded and surface treated steel structures made of BOF steel

Registration number:	EPD-Kiwa-EE-190381-EN
Issue date:	21-02-2025
Valid until:	21-02-2030
Declaration owner:	SIA BELMAST
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Welded and surface treated steel structures made of BOF steel

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-190381-EN

1.3 VALIDITY

Issue date: 21-02-2025

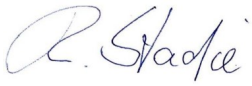
Valid until: 21-02-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: SIA BELMAST

Address: Višķu iela 21Z, LV-5410 Daugavpils, Latvia

E-mail: belmast@belmast.lv

Website: https://www.belmast.lv/

Production location: SIA BELMAST

Address production location: Visku iela 21Z, LV-5410 Daugavpils, Latvia

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Elisabeth Amat Guasch, Greenize

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts (Kiwa-EE) – PCR A General Product Category Rules (2022-02-14)

Kiwa-Ecobility Experts (Kiwa-EE) – PCR B Product Category Rules for steel construction products (2020-03-13, draft)

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of

1 General information

the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Welded and surface treated steel structures made of BOF steel' with the calculation identifier ReTHiNK-90381.

2 Product

2.1 PRODUCT DESCRIPTION

Established in 2000, SIA Belmast has evolved into a leading manufacturer of steel structures, employing over 100 professionals. The company specializes in the production of steel frames and other steel structures for civil and industrial engineering projects. With uncompromised commitment to quality, Belmast delivers reliable solutions tailored to diverse construction needs.

Welded and surface-treated (primed and painted) steel structures are tailored components used in a wide range of applications, including both load-bearing and non-load-bearing designs. These steel structures are fabricated using Basic Oxygen Furnace (BOF) steel, which is produced by converting molten iron into steel through the addition of oxygen, resulting in steel with specific properties. This EPD refers to steel structures made exclusively from Basic Oxygen Furnace (BOF) steel.

The steel structures are manufactured according to EN 1090-2, up to EXC 3, and are CE marked.

UN CPC code: 421 Structural metal products and parts thereof.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The products are prefabricated elements for building industry (e.g. columns, beams, trusses, connections) or various auxiliary instalments, e.g. telecommunications towers and masts, and other construction elements.

The harmonized standard for steel structures is EN 1090-2 (certification under system 2+).

Steel structures are manufactured in accordance with the requirements of the harmonized standard EN 1090-2, up to EXC 3. The finished products are CE marked. According to the Construction Products Regulation CPR (EU) No. 305/2011, the essential properties of products are declared in the CE marking and Declaration of Performance (DoP).

Factory production control ensures the quality of the products. Regular quality measures including, but not limited to, inspections and testing of raw materials, manufacturing equipment, cutting and welding processes, coating thickness and final inspection of the final product. Proofs of the final products are documented.

Additional certifications: ISO 9001, ISO 14001. Proofs are available on the webpage https://www.belmast.lv and in the global IAF CertSearch database https://www.iafcertsearch.org/.

Market: Latvia, Sweden, Finland and other European countries.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The generic life cycle of the products can be considered as 50 years. The RSL of the construction limits the lifetime of steel structures. It should be noted that Use stage with modules B1-B5 is not declared.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Regulation (EU) No. 305/2011 is used to describe the declared performances. The harmonized standard for steel structures is EN 1090-1.

The main technical data and declared characteristics are developed in accordance with the relevant harmonized product standard. Performance data of the products in accordance with the Declaration of Performance which is delivered with the product.

Technical data – Painted steel structures

Characteristic	Value	Unit
Type		
Steel material grade (main)	S355 (according to EN 10025)	-
Dimensions	Vary based on specific project requirements	-
Paint system (thickness of coating)	60 – 360 (as per EN ISO 12944-5)	µm

Base materials

Name	Value	Unit
Steel material*	98,33	%
Welding consumables	0,59	%
Coating (primer, paint)	1,08	%

2 Product

*Note: * Steel material delivered to SIA BELMAST is an average of 37% hollow sections, 17% plates and 46% beams (hot-rolled steel, with a secondary content up to 17,5%).*

2.5 SUBSTANCES OF VERY HIGH CONCERN

The products do not contain any substance included in the list of Substances of Very High Concern with concentrations higher than 0,1% in weight.

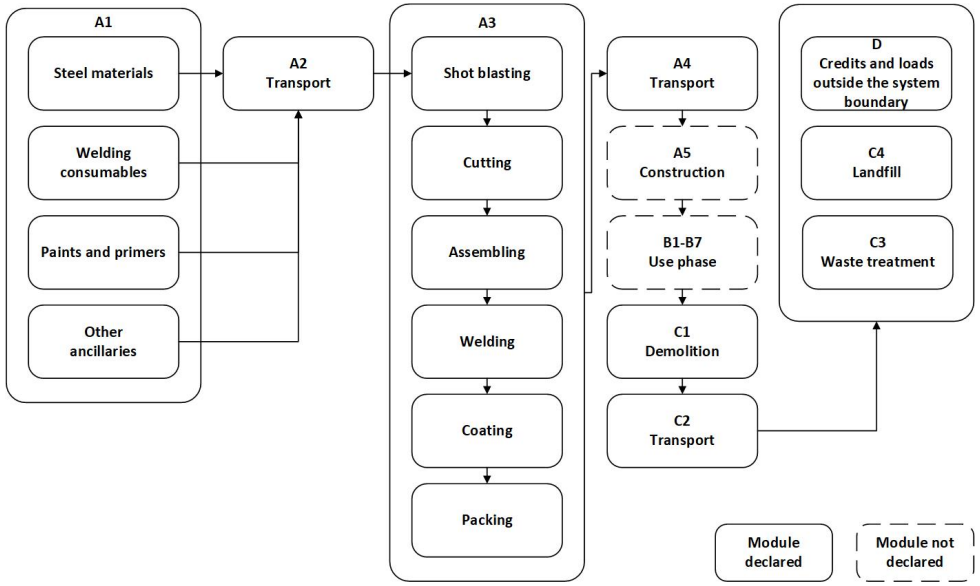
2.6 DESCRIPTION PRODUCTION PROCESS

Steel structures of industrial and civil objects are made according to the developed drawings. In a typical steel structure manufacturing process, the individual components such as carbon steel material (hot-rolled steel plates, profiles, bars, sections), welding consumables, coating materials (primers and paints) and other auxiliary materials are delivered to the production facility. The manufacturing contains the following steps:

- Extraction and delivery of raw materials;
- Shot blasting;
- Cutting;
- Assembling;
- Welding;
- Coating;
- Storage;
- Transportation (delivery of finished products).

All the raw materials are mainly delivered by inland transport, e.g. trucks or railways. Until the materials are actually used in production, they are stored in the warehouse. The following processes are performed in the production facility: shot blasting, cutting of plates, profiles, bars and sections, assembly, welding, priming and painting of structures (the paint layer depends on the customer's requirements) and packaging for deliveries

All inputs, including raw materials, primary products, energy, and auxiliary materials as well as the accumulated waste are considered in the assessment. The use of the final product is not within the manufacturer's sphere of influence. Therefore, modules B1-7 have not been considered.



3 Calculation rules

3.1 DECLARED UNIT

1 kg of steel structures

1 kg

Reference unit: kilogram (kg)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	kg
Conversion factor to 1 kg	1.000000	kg

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options, modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD is representative for Welded and surface treated steel structures made of BOF steel, products of SIA Belmast. The results of this EPD are representative for Latvia.

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

3 Calculation rules

Construction process stage (A4)

Transportation to the construction site is considered in this LCA. Riga, Latvia is considered as the main delivery scenario, results are given in the Section 5 Results. Information and results on other scenarios are included in the Section 6 Interpretation of results.

Construction process stage (A5)

The installation process excluded as SIA Belmast is not responsible for this process.

Use stage (B1-B3)

The Use stage was excluded from the assessment, as it does not contribute to the environmental impacts and overall performance evaluation of the product throughout its life cycle.

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

Based on EN 15804+A4, the end-of-life system boundary of the product system is set, where outputs of the system under study, have reached the end-of-waste state. Thus, waste processing of the materials flows during any module of the product system (e.g. the production stage, end-of-life stage) are included up to the system boundary of the respective module. A product reaches its end-of-waste state when there is a market for the recovered product and when the recovered product fulfils the technical requirements for the specific purposes and meets the legislation and standards applicable to the product. Therefore producers of waste bear the burden of the waste treatment, based on the “polluter pays” principle. Consumers of recycled products receive them burden-free.

In the Module D the net impacts and substitution effects were calculated as stated in Annex D of EN 15804+A2.

Due to the recycling potential of metals, the end-of-life product is mainly converted into recycled raw materials (Module D). Loads and benefits of recycling, re-use and exported energy are part of module D. The benefits are calculated based on the primary content and the primary equivalent.

3.6 ALLOCATION

There are no co-products in the raw material supply and manufacturing phase, so no allocation methods were used at this stage (for co-products). The allocation of inputs and outputs, e.g. auxiliary materials, energy (utilities), waste have been done on the basis of production volumes. The Life Cycle Assessment was modelled with the R<THiNK software from NIBE. The background data is taken from Ecoinvent version 3.6 (2019) Allocation, cut-off library. Almost all consistent datasets contained in the Ecoinvent database is documented and can be viewed in the online Ecoinvent documentation. Allocation principles in the background are in compliance with the foreground. Specific information on allocations within the background data can be found in the Ecoinvent database version 3.6 (2019) document.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data collection was conducted according to the EN ISO 14044:2006, Chapter 4.3.2. According to the goal definition, all significant input and output flows that belong to the examined products are identified and quantified. The input and output flows are attributed to the process stages where they occur, raw material supply (Module A1), transport to manufacturer (Module A2) and manufacturing (Module A3), the input and output flows could be clearly assigned.

Data on average product composition, production waste and energy consumption reflect a 12-month reference period (09.2023-08.2024).

3.8 ESTIMATES AND ASSUMPTIONS

All installed raw materials of the products are analyzed, and the masses are determined following the allocation and cut-off requirements. Production-specific energy consumption were measured and provided by SIA BELMAST. Supplier information regarding mode of transport and distances also are provided by SIA BELMAST.

Production data is recorded to a high standard of accuracy and precision. Since the production process is similar for all of the products produced at the manufacturing site, the energy consumption, ancillary materials and production waste are attributed to the declared unit, taking into account production and consumption data of 12 month-period.

Production waste, e.g. metal scrap, paint/ primer and other production waste is collected separately. For metal scarp, 1% landfill and 99% recycling is assumed based on waste practices in Latvia. Scrap amount is appropriated based on steel raw material use. Solid paint and primer residuals, as well solvent, is sent to closest sanitary landfill (100%), conservative assumption since there is no state incineration policy.

3 Calculation rules

As the products are marketed internationally, no country-specific waste scenario was considered. Therefore, the waste scenarios of NMD (2022) were adopted.

Distribution packaging: wooden pallets, timber spacers/beams, PE foil (rarely) and PET stripes. The transportation does not cause any losses as products are secured properly. The packaging materials can be re-used or recycled.

Modules A1 to A3: The production stage includes materials, energy and waste flows only related to the production processes (e.g. energy and water use related to company management and sales activities are excluded where technically possible; production, manufacture, and construction of manufacturing capital goods and infrastructure, other processes which are not directly related to the production of steel structures).

Steel material is produced in BOF steelmaking processes, hot-rolled (with a secondary content up to 17,5%). Information is available form material certificates and/or suppliers' EPDs). This information was considered in the calculations. Customers are provided with related certificates proving traceability. For welding wire there is no precise information on secondary content, thus secondary content come from the documentation of the background processes.

Water use is declared only for technological processes (for the preparation of cooling emulsions); no waste scenario is assumed as no wastewater occurs.

A4: This stage includes transport from the production stockyard to the construction site where the prefabricated product shall be installed. Transport scenario is provided by SIA BELMAST, which includes consideration of transportation to a construction site located in Riga, Latvia (distance 226 km). Is it based on real market data. No product losses are assumed as it is secured properly. Information and results on other scenarios are included in the Section 6 Interpretation of results.

Module A5: excluded.

Modules B2 to B7: excluded.

Modules C1 to C4, D: As the products are marketed internationally, no country-specific waste scenario was considered. Therefore, the waste scenarios of NMD (2022) were adopted.

Module C1: This module concerns the removal of a steel structure. The demolition process (C1) consumes energy in the form of diesel fuel used by building machines (e.g. lifting cranes, mobile rough terrain crane, forklift). According to Erlandsson, M. and Pettersson D., (2015) energy consumption of a demolition process is, on average 12 kWh/t.

It is assumed that 100% of the steel constructions at the end of the service life, during the demolition phase, are collected as separate construction waste.

Modules C2 to C4 and D: It is assumed that steel structures are separated after demolition. A waste scenario according to the Dutch National Environmental Database (NMD) is applied:

- Steel, construction profiles: 94% of steel material is recycled, 5% reused and 1% landfilled.

All of end-of-life product is assumed to be sent to the closest facilities (C2).

The data on generated production waste is also recorded separately for each waste flow as accurately as possible. Thus, the generated production waste is stated per declared unit.

In general, the inputs and outputs were attributed to the process/module in which they occur. That means:

- Environmental impacts caused by manufacturing or production waste (transport, incineration, waste processing, landfill and benefits through material and energy recovery) are assigned to module A3.
- Environmental impacts caused in the end-of-life stage are assigned to module C2 (transport), C3 (waste processing), C4 (disposal) and D (benefits through material and energy recovery).

3.9 DATA QUALITY

All relevant process data was collected in the operational data survey. The data relating to the production stage of the product was determined by SIA BELMAST and refers to the production site in Daugavpils, Latvia. Data for processes beyond the manufacturer's control were assigned from available EPD or generic data from databases (since suppliers' EPDs were not available for every material or were not developed according to EN 15804+A2).

To ensure the comparability of the results, only consistent background data from the Ecoinvent database V3.6, released in 2019, was used in the LCA (e.g. data records on energy, transport, auxiliary and operating materials).

The database is regularly checked and thus complies with the requirements of ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804. The quantities of raw materials, consumables and supplies used as well as the energy consumption have been recorded and averaged over the entire year of manufacturing operation.

The cut-off on the background is according to the background processes documentation (information on cut-off within the background data can be found in the Ecoinvent database version 3.6 (2019) document).

3 Calculation rules

The general rule has been that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer cannot influence or choose, were backed up with generic data.

Overall, the data quality can be described as good for all three representativeness categories (geographical, technical and time). Data quality was calculated using the Data Quality level and criteria according to the PEF approach (Annex E.2 of EN 15804+A2). The DQRs range from 1,67 to 2,67 for the most abundant inputs in terms of mass.

3.10 POWER MIX

No Guarantees of Origin are included, residual national electricity grid mix (Latvia) is used.

The residual mix of the country is calculated based on the domestic residual mix. The domestic residual mix represents the sum of all domestic electricity production considering imports and export outside the calculation area and issued and expired attributes. The shares have been calculated based on statistics from AIB (2022) following the methodology of grexel (2020).

Source: Ecoinvent v.3.9.1 database.

4 Scenarios and additional technical information

4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD.

	Value and unit
Vehicle type used for transport	Lorry (Truck) 16-32t, EURO6 | market for (EU)
Fuel type and consumption of vehicle	not available
Distance	226 km
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.2 DE-CONSTRUCTION, DEMOLITION (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
Diesel, burned in machine (incl. emissions)	0.001	l

4.3 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
Steel, construction profiles (NMD: ID 70),	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)

4 Scenarios and additional technical information

Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.4 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
Steel, construction profiles (NMD: ID 70),	DE	0	1	0	94	5

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Steel, construction profiles (NMD: ID 70),	0.000	0.010	0.000	0.940	0.050
Total	**0.000**	**0.010**	**0.000**	**0.940**	**0.050**

4.5 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
Steel, construction profiles (NMD: ID 70),	0.846	0.000
Total	**0.846**	**0.000**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER KILOGRAM

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	2.15E+0	2.85E-1	1.22E-1	2.56E+0	3.78E-2	3.61E-3	6.48E-3	5.55E-2	5.28E-5	-1.21E+0
GWP-f	kg CO_2 eq.	2.16E+0	2.85E-1	1.39E-1	2.58E+0	3.78E-2	3.61E-3	6.48E-3	5.55E-2	5.27E-5	-1.22E+0
GWP-b	kg CO_2 eq.	-2.62E-3	1.52E-4	-1.66E-2	-1.91E-2	2.03E-5	1.00E-6	2.99E-6	5.98E-5	1.04E-7	1.24E-2
GWP-luluc	kg CO_2 eq.	7.97E-4	1.00E-4	1.49E-4	1.05E-3	1.34E-5	2.84E-7	2.37E-6	7.73E-6	1.47E-8	8.30E-4
ODP	kg CFC 11 eq.	1.15E-7	6.47E-8	1.32E-8	1.93E-7	8.59E-9	7.79E-10	1.43E-9	1.18E-8	2.17E-11	-3.14E-8
AP	mol H+ eq.	9.20E-3	1.09E-3	5.56E-4	1.08E-2	1.08E-4	3.77E-5	3.76E-5	5.73E-4	5.00E-7	-4.77E-3
EP-fw	kg P eq.	2.95E-4	2.25E-6	1.21E-5	3.10E-4	3.02E-7	1.31E-8	6.53E-8	3.57E-7	5.90E-10	-4.39E-5
EP-m	kg N eq.	1.86E-3	3.03E-4	1.31E-4	2.29E-3	2.15E-5	1.67E-5	1.32E-5	2.50E-4	1.72E-7	-8.82E-4
EP-T	mol N eq.	2.03E-2	3.36E-3	1.46E-3	2.51E-2	2.40E-4	1.83E-4	1.46E-4	2.75E-3	1.90E-6	-1.03E-2
POCP	kg NMVOC eq.	1.72E-2	1.06E-3	4.87E-4	1.87E-2	9.20E-5	5.02E-5	4.17E-5	7.55E-4	5.51E-7	-6.90E-3
ADP-mm	kg Sb-eq.	1.48E-5	7.74E-6	1.85E-6	2.44E-5	1.04E-6	5.53E-9	1.64E-7	9.41E-8	4.82E-10	-7.93E-7
ADP-f	MJ	2.27E+1	4.30E+0	2.21E+0	2.92E+1	5.71E-1	4.96E-2	9.77E-2	7.74E-1	1.47E-3	-8.74E+0
WDP	m3 world eq.	6.15E-1	1.20E-2	4.22E-2	6.70E-1	1.62E-3	6.65E-5	3.50E-4	1.34E-3	6.60E-5	-2.24E-1

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP minerals&metals) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
PM	disease incidence	1.36E-7	1.95E-8	8.81E-9	1.64E-7	2.40E-9	1.00E-9	5.83E-10	1.50E-8	9.72E-12	-7.27E-8
IR	kBq U235 eq.	3.44E-2	1.88E-2	7.78E-3	6.09E-2	2.50E-3	2.13E-4	4.09E-4	3.45E-3	6.04E-6	1.88E-2
ETP-fw	CTUe	4.79E+1	3.45E+0	1.25E+0	5.26E+1	4.60E-1	2.99E-2	8.71E-2	4.70E-1	9.55E-4	-4.07E+1
HTP-c	CTUh	8.26E-9	9.67E-11	4.00E-10	8.76E-9	1.28E-11	1.05E-12	2.83E-12	1.64E-11	2.21E-14	-5.51E-10
HTP-nc	CTUh	5.65E-8	3.73E-9	1.30E-8	7.32E-8	4.85E-10	2.57E-11	9.53E-11	4.04E-10	6.79E-13	2.22E-7
SQP	Pt	4.40E+0	2.97E+0	6.22E+0	1.36E+1	3.99E-1	6.33E-3	8.47E-2	1.16E-1	3.09E-3	-1.92E+0

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2

5 Results

ILCD classification	Indicator	Disclaimer
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	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 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.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	1.26E+0	6.09E-2	9.13E-1	2.23E+0	8.17E-3	2.68E-4	1.22E-3	9.86E-3	1.19E-5	2.18E-1
PERM	MJ	3.58E-3	0.00E+0	3.19E-1	3.23E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	1.26E+0	6.09E-2	1.23E+0	2.56E+0	8.17E-3	2.68E-4	1.22E-3	9.86E-3	1.19E-5	2.18E-1
PENRE	MJ	1.85E+1	4.56E+0	2.16E+0	2.52E+1	6.06E-1	5.27E-2	1.04E-1	8.21E-1	1.56E-3	-9.09E+0
PENRM	MJ	1.09E-2	0.00E+0	1.73E-2	2.82E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	1.85E+1	4.56E+0	2.18E+0	2.53E+1	6.06E-1	5.27E-2	1.04E-1	8.21E-1	1.56E-3	-9.09E+0
SM	Kg	1.44E-1	0.00E+0	7.07E-3	1.51E-1	0.00E+0	0.00E+0	0.00E+0	9.40E-1	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	4.21E-5	0.00E+0	5.67E-6	4.78E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	1.45E-2	4.54E-4	1.23E-3	1.62E-2	6.11E-5	2.56E-6	1.19E-5	6.41E-5	1.57E-6	-4.29E-3

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

5 Results

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	Kg	3.76E-4	1.13E-5	3.03E-5	4.17E-4	1.50E-6	1.35E-7	2.48E-7	2.04E-6	2.20E-9	-1.45E-4
NHWD	Kg	5.07E-1	2.06E-1	3.57E-2	7.49E-1	2.78E-2	5.88E-5	6.20E-3	9.90E-4	1.00E-2	-1.15E-1
RWD	Kg	4.58E-5	2.93E-5	7.57E-6	8.27E-5	3.89E-6	3.45E-7	6.42E-7	5.37E-6	9.67E-9	5.80E-6

HWD=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.00E-2	0.00E+0	0.00E+0
MFR	Kg	1.56E-2	0.00E+0	3.87E-2	5.43E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	Kg	7.93E-6	0.00E+0	2.82E-7	8.21E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	-2.15E-3	-2.15E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	MJ	0.00E+0	0.00E+0	-1.25E-3	-1.25E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy, Thermic | **EEE**=Exported Energy, Electric

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER KILOGRAM

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per kilogram:

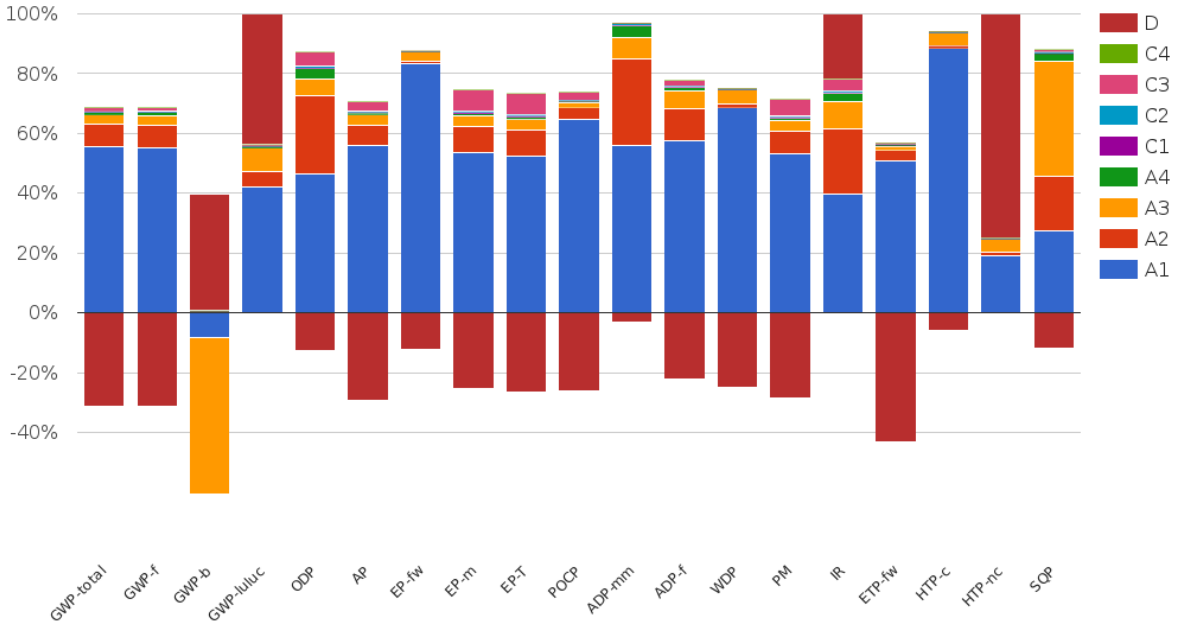
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	8.535e-5	kg C
Biogenic carbon content in accompanying packaging	0.01036	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.038	kg CO2 (biogenic)

6 Interpretation of results



The graph illustrates the impact of various factors on the x-axis, representing different indicator factors, while the legends denote the modules on the y-axis. This data serves as a roadmap for manufacturing process enhancement and building of sustainable product life cycle emphasizing the importance of optimizing raw material use, efficient energy and other ancillary material utilization.

Module A, specifically A1 (Raw Materials) and A2 (Transportation of Raw Materials), stands out as the primary contributor to environmental impacts, highlighting the substantial influence of raw materials extraction and processing, fuel and energy use, and of other ancillaries. Module D, focusing on product recycling and reuse, also holds significant impact. Simultaneously potential credits come mainly from the material recovery of steel materials.

6 Interpretation of results

This section provides additional results for other A4 scenarios

Module A4 includes transportation from the production warehouse to the construction site where the prefabricated product will be installed. Two additional delivery scenarios were calculated with the parameters described in the following tables.

Transportation from the production to a construction site (A4) – Sweden scenario

Parameter	Vehicle type	Distance
Truck	Lorry (Truck) 16-32t, EURO6 | market for (EU)*	510 km**
Maritime	Ferry/ Transoceanic freight ship, containers*	283 km***

** Data for transport is calculated for an average load factor, including empty return trips;*

*** Total distance by truck: from the manufacturing site (Daugavpils, Latvia) to the terminal located in Ventspils, Latvia (450 km) and from the port in Nynashamn, Sweden, to a construction site in Stockholm, Sweden (60 km);*

**** Total distance by ferry: Ventspils – Nynashamn.*

Transportation from the production to a construction site (A4) – Finland scenario

Parameter	Vehicle type	Distance
Truck	Lorry (Truck) 16-32t, EURO6 | market for (EU)*	510 km**
Maritime	Ferry/ Transoceanic freight ship, containers*	82 km***

** Data for transport is calculated for an average load factor, including empty return trips;*

*** Total distance by truck: from the manufacturing site (Daugavpils, Latvia) to the terminal located in Tallinn, Estonia (500 km) and from the port in Helsinki, Finland, to a construction site in Helsinki, Finland (10 km);*

**** Total distance by ferry: Tallinn – Helsinki.*

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams of transportation of declared unit of steel structures to *Stockholm, Sweden, and Helsinki, Finland.*

Core environmental impact indicators (EN 15804+A2)

6 Interpretation of results

Abbr.	Unit	A4 Sweden	A4 Finland
AP	mol H+ eqv.	3,33E-04	2,70E-04
GWP-total	kg CO2 eqv.	8,79E-02	8,60E-02
GWP-b	kg CO2 eqv.	4,50E-05	4,55E-05
GWP-f	kg CO2 eqv.	8,79E-02	8,59E-02
GWP-luluc	kg CO2 eqv.	3,22E-05	3,09E-05
EP-m	kg N eqv.	7,02E-05	5,47E-05
EP-fw	kg P eqv.	6,91E-07	6,83E-07
EP-T	mol N eqv.	7,84E-04	6,12E-04
ODP	kg CFC 11 eqv.	1,99E-08	1,95E-08
POCP	kg NMVOC eqv.	2,70E-04	2,26E-04
ADP-f	MJ	1,32E+00	1,30E+00
ADP-mm	kg Sb-eqv.	2,37E-06	2,36E-06
WDP	m3 world eqv.	3,69E-03	3,66E-03

AP=Acidification (AP) | GWP-total=Global warming potential (GWP-total) | GWP-b=Global warming potential - Biogenic (GWP-b) | GWP-f=Global warming potential - Fossil (GWP-f) | GWPluluc=Global warming potential - Land use and land use change (GWP-luluc) | EP-m=Eutrophication marine (EP-m) | EP-fw=Eutrophication, freshwater (EP-fw) | EP-T=Eutrophication, terrestrial (EP-T) | ODP=Ozone depletion (ODP) | POCP=Photochemical ozone formation - human health (POCP) | ADP-f=Resource use, fossils (ADP-f) | ADP-mm=Resource use, minerals and metals (ADP-mm) | WDP=Water use (WDP)

Additional environmental impact indicators (EN 15804+A2)

Abbr.	Unit	A4 Sweden	A4 Finland
ETP-fw	CTUe	1,06E+00	1,04E+00
PM	disease incidence	5,50E-09	5,44E-09
HTP-c	CTUh	3,04E-11	2,93E-11
HTP-nc	CTUh	1,11E-09	1,10E-09
IR	kBq U235 eqv.	5,78E-03	5,67E-03
SQP	Pt	9,05E-01	9,02E-01

6 Interpretation of results

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | PM=Particulate Matter (PM) | HTP-c=Human toxicity, cancer (HTP-c) | HTP-nc=Human toxicity, non-cancer (HTP-nc) | IR=Ionising radiation, human health (IR) | SQP=Land use (SQP)

Parameters describing resource use (EN 15804+A2)

Abbr.	Unit	A4 Sweden	A4 Finland
PERE	MJ	1,87E-02	1,85E-02
PERM	MJ	0,00E+00	0,00E+00
PERT	MJ	1,87E-02	1,85E-02
PENRE	MJ	1,40E+00	1,38E+00
PENRM	MJ	0,00E+00	0,00E+00
PENRT	MJ	1,40E+00	1,38E+00
SM	kg	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00
FW	m3	1,40E-04	1,38E-04
HWD	kg	3,40E-06	3,38E-06
NHWD	kg	6,27E-02	6,26E-02
RWD	kg	9,01E-06	8,84E-06
CRU	kg	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00
EE	MJ	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00

Deliveries to Stockholm and Helsinki have a relatively longer distance than to Riga, thus the GWP total (kg CO2 eqv.) results for the A4 module for the Sweden and Finland scenarios increased by an average of 43% compared to the Riga scenario.

7 References

Ecoinvent Database
Version 3.6 (2019)

Erlandsson, M., Pettersson D., 2015
Klimatpaverkan for byggnader medolika energiprestandaer. IVL Svenska Miljoinstitutet

General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

PCR B Ecobility Experts
Product Category Rules for steel construction products (2020-03-13, draft)

REACH
REACH Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) https://echa.europa.eu/candidate-list-table

Stichting National Environmental Database (NMD), Rijswijk 2022
Environmental Performance Assessment Method for Construction Works, Version 1.1

Stichting National Environmental Database (NMD), Rijswijk 2022
Verification protocol – inclusion data in the Dutch environmental database, Version 1.1

United Nations, New York, 2015
Central Product Classification (CPC) Version 2.1

Standards

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

ISO 21930
ISO 21930:2007, Sustainability in building construction – Environmental declaration of building products

8 Contact information

Publisher	Operator	Owner of declaration

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin, DE

E-mail:
DE.Ecobility.Experts@kiwa.com
Website:
https://www.kiwa.com/de/en/themes/ecobility-experts/ecobility-experts-epd-program/

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin, DE

E-mail:
DE.Ecobility.Experts@kiwa.com
Website:
https://www.kiwa.com/de/en/themes/ecobility-experts/ecobility-experts-epd-program/

SIA BELMAST
Višķu iela 21Z
LV-5410 Daugavpils, Latvia, LV

E-mail:
belmast@belmast.lv
Website:
https://www.belmast.lv/

Kiwa-Ecobility Experts is established member of the ECO PLATFORM