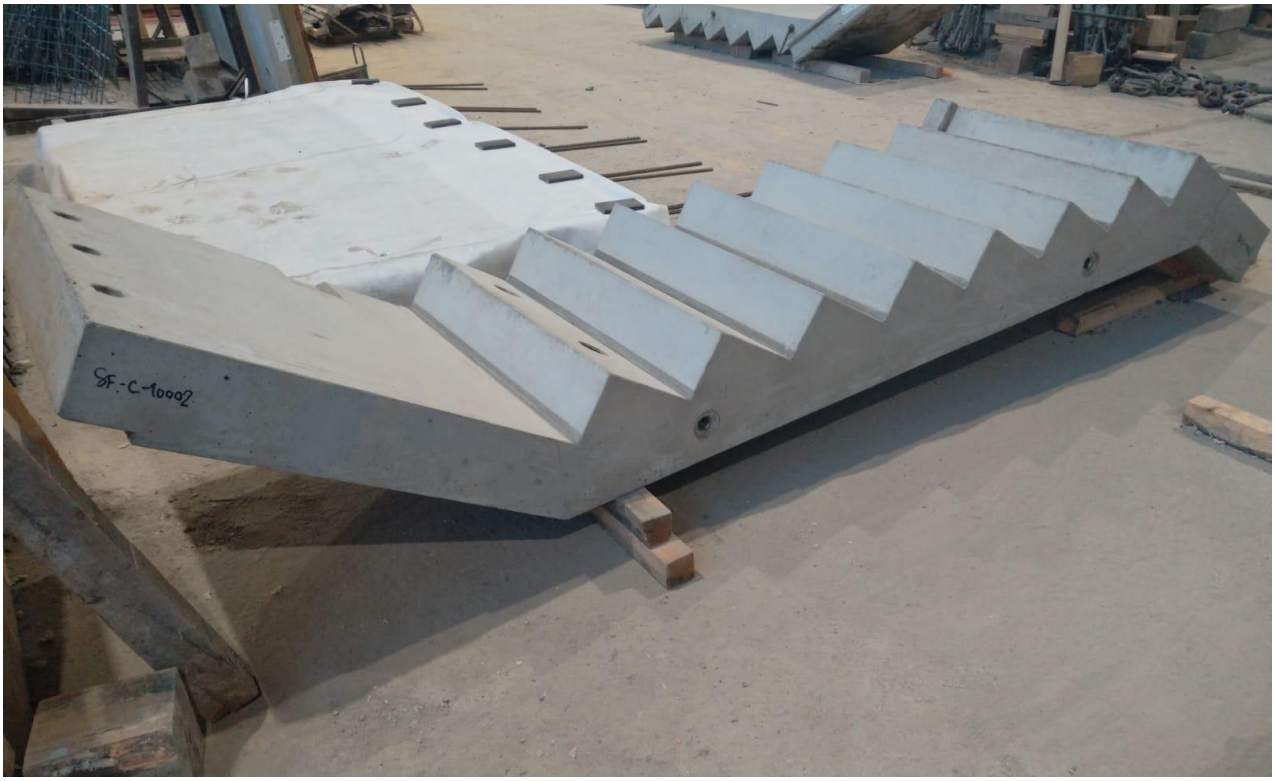
Environmental Product Declaration

as per ISO 14025 and EN 15804+A2

Owner of the declaration:	AS BMGS
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Registration number:	EPD-BMGS-312-EN
Issue date:	23.08.2023
Valid to:	23.08.2028

Structural stairs and landings



1. General information

AS BMGS

Programme operator
Kiwa-Ecobility Experts
Kiwa GmbH
Voltastr. 5
13355 Berlin
Germany

Registration number
EPD-BMGS-312-EN

This declaration is based on the Product Category Rules
EN 16757:2022 Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and concrete elements

Issue date
23.08.2023

Valid to
23.08.2028

Frank Huppertz
(Head of Kiwa-Ecobility Experts)

Prof. Dr. Frank Heimbecher
(Chairman of the independent expert committee – Ecobility Experts)

Precast concrete elements

Owner of the declaration
AS BMGS
Tvaika iela 27
LV-1005 Riga
Latvia

Declared product / declared unit
1 ton of a precast concrete element

Scope
The EPD (type: Cradle to gate with options, modules C1-C4 and module D (A1-A5, C, D) is about custom made precast concrete elements – stairs and landings, manufactured in Riga, Latvia. The calculation is based on 1 metric ton of a precast concrete element with a share of 3,05m% reinforcing steel.

Kiwa-Ecobility Experts shall not be liable with respect to manufacturer information, life cycle assessment data and evidence.

Verification
The standard EN 15804+A2:2019 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025:2006

☐internal ☒external

Elisabet Amat Guasch
(External verifier)

2. Product

2.1 Product description

The products – structural stairs and landings – are precast concrete elements in which the reinforcing steel constitutes the main reinforcement of the composite slab. The products are produced in various sizes and shapes with concrete compressive strength class of C30/37 to C40/50 (normative minimum concrete compressive strength class is C25/30).

2.2 Application

The precast concrete stairs and associated landings are intended to be used as the structural system of a building or other structures (including industrial and storage buildings, public buildings etc.).

2.3 Placing on the market / Application rules

The harmonized standard EN 13369 (Common rules for precast concrete products) together with supplementary Swedish requirements and product-specific standard EN 14843 (Precast concrete products - Stairs) apply for the production of the products. The CE mark is applied to the finished products. Producer is authorized to use Nordcerts registered BBC mark.

Additional certifications: the production of AS BMGS of precast concrete elements is certified in accordance with the requirements of management system standards ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 50001:2018.

Market: Scandinavian countries – Sweden, Norway, Denmark and Finland. The Swedish market is used for modelling A4-A5 and C1-C4.

2.4 Technical Data

Technical Data – Precast concrete stairs

Name	Value		Unit
Compressive strength	C30/37 – C40/50		N/mm2
Reinforcing steel	B500B	B500C	-
Ultimate tensile strength Re	500	500	N/mm2
Tensile yield strength Rm	540	575-675	N/mm2
Durability of product	50 years		
Tolerances Svensk Betong	"Toleranser för betongelement" 2020		Class A; B

Length – up to 10 m, width – up to 4 m, height – up to 1,5 m. Average weight around 10 t.

2. 5 Base materials / Ancillary

Name	Value	Unit
Cement	13,47	m%
Aggregates	77,26	m%
Water	6,14	m%
Admixture	0,08	m%
Steel*	3,05	m%

*Post-consumer recycled content 29,55% (based on the documentation of the background process).

Neither the product itself nor the packaging contains biogenic carbon, so the biogenic carbon content at the factory gate is 0 kg.

2.5 Manufacturing

The manufacturing contains the following processes:

- Delivery of raw materials;

- Preparation of the molds (plywood formwork, cutting and laying of the probation steel elements, placeholders etc.);
- Concrete mixing and filling into the molds, curing;
- Removal of the formwork, finishing, storage.

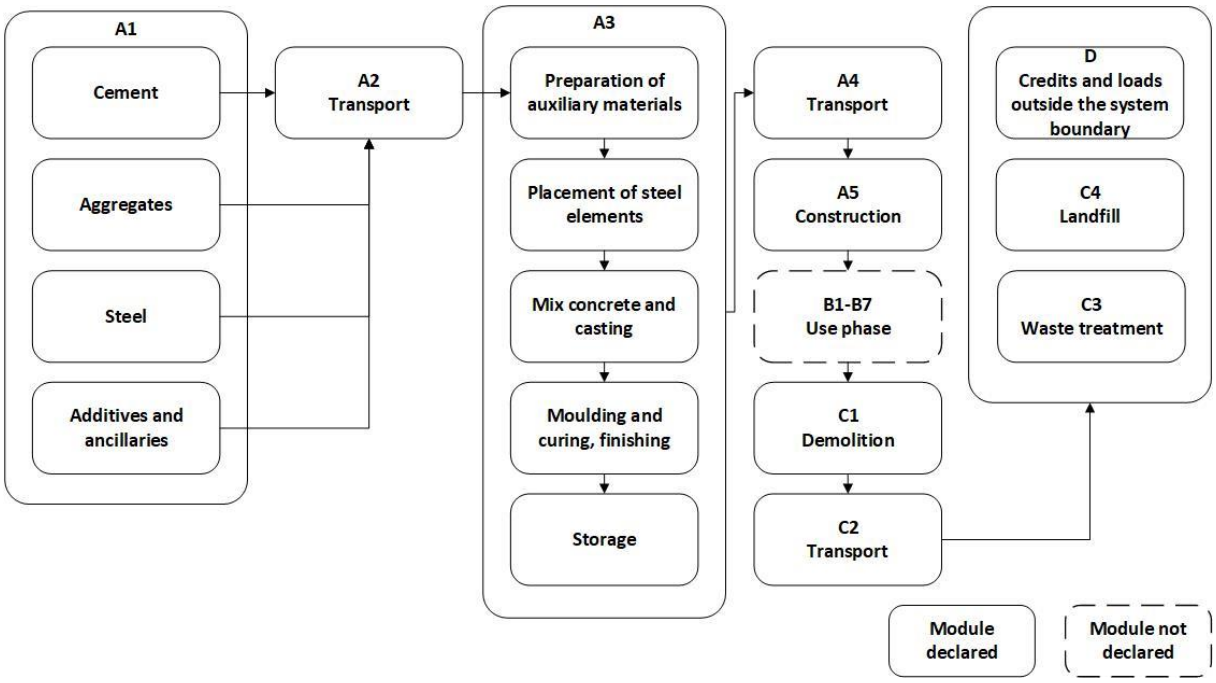


Figure 1: Overview of the production route of a precast concrete element (A1-A5, C1-C4, D)

2.6 Packaging

The only packaging is wood spacers and since they are re-used, they fall under cut-off rules and therefore are not included in the LCA calculations. The transportation does not cause any losses as products are secured properly.

2.7 Production waste

The data on generated production waste is recorded as accurately as possible. Thus, the generated production waste is allocated per declared unit. No loses for cement are assumed since filters are used to collect dust in the air of cement storage in silos. The captured cement dust is reused in production. No loses for inert materials are assumed too since materials are stored in open warehouses, which three sides are enclosed by a wall. The same assumptions are made for other components. There is no production waste for scrap metal, because reinforcement steel is delivered of the size as in the drawings (no cutting is made).

3. LCA: Calculation rules

3.1 Declared unit

The EPD refers to the declared product system of 1 metric ton of precast concrete element.

Name	Value	Unit
Declared unit	1	ton
Cement type*	CEM II/A-M(S-LL) 52,5N	-
Compressive strength class**	C30/37 – C40/50	-
Percentage of reinforcing steel	3,05	m%
Steel grade	B500B / B500C	-

* CEM II/A-M(S-LL) 52,5N is used for LCA calculations (data from specific EPD).
** Concrete mixes are produced according to recipes, in compliance with the strictest quality norms and standards in force, as well as the specific purposes for which a particular batch of concrete is intended.

3.2 System boundary

This EPD was created in accordance with EN 15804 requirements and includes the production stage, transportation to the site, construction process and the end-of-life stage. According to EN 15804 this corresponds to product phases A1-A5, C1-C4 and D (EPD type "Cradle to gate with options, modules C1-C4 and module D" (A1-A3, C, D and additional modules A4 and A5)).

The production process of a precast concrete element begins with the preparation of molds. This includes assembly of the molds depending on the dimensions of the element, cleaning of the molds and application of mold oil (release agent). After that, the reinforcing steel parts are placed according to the technical drawing of the element. Wet concrete (site-mixed) is then poured into the molds and vibrated into place, and the surface is treated. After casting, the element is covered and cured. After curing, it is removed from the mold and taken out of the factory. Eventually, it is transported to the construction site.

Production stage

A1: This stage considers the extraction and processing of raw materials as well as energy consumption. All installed raw materials of the products were analyzed, and the masses were determined.

A2: The raw materials are transported to the production plant. In this case, the model includes road or road and maritime transportation of each raw material. Supplier information regarding the transport distances and vehicle type were provided by AS BMGS or chosen from relevant market profiles. Where no precise information on secondary materials, secondary fuels and waste is not available, secondary content is indicated based on the documentation of the background processes.

A3: This stage includes the manufacture of products. It also considers the energy consumption and waste generated at the production plant. The processes that are considered at the production site are: preparation of the molds (OSB formwork, cutting and laying of the probation steel elements, placeholders); concrete mixing and filling into the molds, curing; removal of the formwork, finishing, and storage. The national electricity mix of Latvia was taken into account.

Assembly stage

A4: This stage includes transport from the production stockyard to the construction site where the prefabricated product shall be installed.

A5: Installation is modelled as assembly of a typical concrete product in a building. Fossil fuel for lifting machinery and ancillary materials are included.

Use stage

B1 to B7: The use of the final product is not within the manufacturer's sphere of influence. Therefore, modules B1-7 have not been considered.

End of life stage

C1: Deconstruction module concerns the deconstruction of the concrete element, whereby no environmental impact (emissions to air, soil or water) was assumed. According to the current state of the art, the demolition of concrete and reinforced concrete structures is mainly carried out with longfront excavators equipped with demolition clamps.

C2: Transport module concerns transportation to waste processing. All of end-of-life product is assumed to be sent to the closest facilities (C2).

Transport to waste processing (C2)

Name	Vehicle type	Distance
Truck*	Lorry (Truck), unspecified (default) | market group for (GLO)	Landfill:100 km; Incineration: 150 km (energy recovery on site 0); Recycling: 50 km; Re-Use: 0 km

* For all transports, the environmental profile of a non-specific truck transport was used (conservative assumption): The vehicle operates with diesel, and it provides a fleet average that includes different lorry classes as well as EURO classes. This transport used an average load factor, including empty return trips.

C3 and C4: At the end-of-life, in the demolition phase 100% of a concrete element is assumed to be collected as separate construction waste. The waste is assigned to the material-specific disposal route (C3) – waste processing (for reuse, recovery and/or recycling) or (C4) - landfill.

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type	1000	kg
Collected as mixed construction waste	0,00	kg
Re-use	0,00	kg
Recycle	988,78	kg
Energy recovery	0,00	kg
Landfilling	11,22	kg

D: The benefits beyond life cycle has been modelled based on the output flows from module C3. This includes materials recovered from the waste flow.

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. The effect of CO_2 absorption through the carbonization process is not taken into account in the LCA. The reference year to collect all input data is 2022. The geographical reference area is Europe or Global and can be seen in the system description boundary table.

3.3 Estimates and assumptions

All installed raw materials of the products were analyzed, and the masses were determined following the allocation and cut-off requirements. Production-specific energy consumption were measured and provided by AS BMGS. Supplier information regarding the transport distances were provided by AS BMGS. The raw material data for each of the product produced is recorded to a high standard of accuracy and precision. The energy consumption, ancillary materials and production waste is allocated according to the annual production of the declared unit to the total annual production at the factory.

3.4 Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the EN 15804 and applicable PCR. The study does not exclude any hazardous materials or substances included in the Candidate List of Substances of Very High Concern (SVHCs) for authorization with concentrations higher than 0.1% weight by weight. All material flows that contribute to more than 1% of the total mass, energy or environmental impact of the system have been considered in the LCA. It can be assumed that the neglected processes in total contributed less than 5% to the considered impact categories.

The product stage includes materials, energy and waste flows only related to 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 concrete elements).

3.5 Background Data

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" database. Geographical reference space of the background data is Europe or Global. Almost all consistent datasets contained in the Ecoinvent database are documented and can be viewed in the online Ecoinvent documentation. The reference year to collect all input data is 2022. The geographical reference area is Europe or Global and can be seen in the system description boundary table.

3.6 Data quality

In the operating data survey all relevant process-specific data has been collected. The data relating to the manufacturing phase of the precast concrete element was determined by AS BMGS and refers to production site in Riga, Tvaika street 27. The data relating to the manufacturing construction phase are determined also by BMGS and refers to the finished construction project in Sweden.

Secondary data was taken from the Ecoinvent 3.6 (2019) database. 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 general rule was followed 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.

3.7 Period Under review

All process-specific data was collected for the manufacturing year 2022. The quantities of raw and ancillary materials as well as energy consumption have been recorded and averaged over the entire operating year 2022.

3.8 Allocation

There are no co-products in the raw material supply phase, so no allocation methods were used at this stage. There are no allocations during the manufacturing phase at the plant. Appropriation or attribution of inputs and outputs, e.g. auxiliary materials, energy (utilities), waste has been done on the basis of production volumes in 2022 (reference year).

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.

3.9 Calculation methods

For life cycle assessment, the calculation methods described in ISO 14040 have been applied. The evaluation is based on the phases in the system boundaries.

3.10 Mix of electricity and CO_2-Certificates

The electricity mix (medium voltage) was chosen, using the country-specific market dataset (Latvia) from the background database. Reference year of the dataset 2019, reference year of the electricity mix is at least 2012. The Ecoinvent profile used for the gridmix includes the imported energy and excludes the exported energy.

3.11 Comparability

EPD of construction products may not be comparable if they do not comply with the requirements of EN 15804. Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are considered.

3.12 Reference Service Life (RSL)

The concrete composition limits given in EN 206 are specified for an intended service life of at least 50 years under the respective exposure classes/ environmental conditions.

4. LCA: Scenarios and additional technical information

Module A4: This stage includes transport from the production stockyard to the construction site where the prefabricated product shall be installed. Basic scenario transportation from AS BMGS production site in Latvia to customer in Sweden, Stockholm, with distance radius around 100 km. Transportation is calculated based on data form manufacturer and the scenario with the parameters described in the following table. The transportation does not cause losses as products are secured properly.

Transport from production place to the construction site (A4)

Parameter	Vehicle type	Distance
Truck*	Lorry >32t, EURO5	280 km**
Maritime	Ferry/ Transoceanic freight ship, containers	270 km

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

** Total distance by truck: from Riga factory to the port located in Ventspils city (180 km) and from the port in Sweden to the construction site (100 km)

Module A5: Installation is modelled as assembly of a typical concrete product in a building. Fossil fuel for lifting machinery and ancillary materials are included.

Mostly the erection of the elements is performed directly from the trailers without putting them in a temporary storage at the construction site. It is assumed that there is negligible waste during assembly. The energy required for the installation process as well as the ancillary materials are calculated based on the data, which comes from the KVINSTA project implemented in 2020. The values for the precast element assembly process are provided by AS BMGS.

Assembly (A5)

Name	Value	Unit
Auxiliary*	15,0	kg
Water consumption	2,1	kg
Fuel	1,44	l

* Auxiliary material cement is included.

Modules B1 to B7: For concrete components, maintenance and repair measures are generally not necessary during the reference service life, so that no environmental burdens arise in these modules. In addition, no energy or water is consumed.

C1 Demolition: Based on Bozdağ, Ö., Seçer, M. (2007) energy consumption of a demolition process is on the average 10 kWh/m^2 and an average mass of a reinforced concrete building is about 1000 kg/m^2. Therefore, energy consumption demolition is 10 kWh/1000 kg. The source of energy is diesel fuel used by work machines and based on the statements above can be assumed being 1,009 l (with NCV 42,49 GJ/t).

C2 – C4 and D: It is assumed that concrete and reinforcement material are separated after deconstruction. For the both waste groups, waste scenarios according to the Dutch National Environmental Database NMD (2022) is applied:

- Concrete (i.a. elements, brickwork, reinforced concrete): 99% of concrete is recycled and then reused as aggregate.
- Steel, reinforcement: 95% of reinforcing steel is marketed as scrap metal.

The effect of CO2 absorption through the carbonization process in the use and end-of-life phase is not assessed here and taken into account in the LCA. According to the PCR for concrete and concrete elements (EN 16757), carbonation is not mandatory to be reported.

5. LCA: Results

This Life cycle assessment is made for EPD type “Cradle to gate with options, modules C1-C4 and module D”. The Environmental Product Declaration analyses the Production stage (A1-A3), the Construction process stage (A4-A5), the End-of-life stage (C1-C4) and the Benefits and loads beyond the system boundary (D).

Description of the system boundary																
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manu-facturer to place of use	Construction-installation process	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	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography																
EU	EU	LV	EU	EU	MND	MND	MND	MND	MND	MND	MND	EU	EU	EU	EU	EU
X=Module declared | MND=Module not declared																

All major materials, production energy use and waste are included for phases A1, A2, A3, A4, A5, C1, C2, C3 and C4. Use stage B1-B7 is not relevant for this type of product and is not declared.

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

Results of the LCA – Environmental impact: 1 metric t of precast concrete structural stairs											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804)											
ADP-f	MJ	9,46E+02	1,64E+02	1,75E+02	4,28E+02	1,25E+02	4,55E+01	1,03E+02	4,48E+01	1,65E+00	-2,49E+02
ADP-mm	kg Sb-eqv.	1,12E-03	2,79E-04	8,98E-05	4,53E-04	5,18E-05	5,07E-06	1,73E-04	7,30E-06	5,41E-07	-2,23E-04
AP	mol H+ eqv.	5,47E-01	5,36E-02	3,78E-02	1,90E-01	8,18E-02	3,46E-02	3,96E-02	2,74E-02	5,61E-04	-1,39E-01
EP-fw	kg P eqv.	3,68E-03	8,50E-05	2,57E-04	2,04E-04	1,66E-04	1,20E-05	6,88E-05	5,96E-05	6,62E-07	-1,15E-03
EP-m	kg N eqv.	1,59E-01	1,80E-02	1,22E-02	5,25E-02	3,04E-02	1,53E-02	1,39E-02	1,16E-02	1,93E-04	-2,88E-02
EP-T	mol N eqv.	1,75E+00	1,98E-01	1,26E-01	5,82E-01	3,40E-01	1,68E-01	1,54E-01	1,28E-01	2,13E-03	-3,35E-01
GWP-b	kg CO2 eqv.	8,90E-02	6,08E-03	2,28E+00	1,77E-02	1,96E-01	9,20E-04	3,15E-03	1,09E-02	1,17E-04	2,77E-01
GWP-f	kg CO2 eqv.	1,53E+02	1,08E+01	1,15E+01	2,80E+01	1,75E+01	3,31E+00	6,82E+00	3,27E+00	5,91E-02	-3,25E+01
GWP-luluc	kg CO2 eqv.	4,19E-02	3,71E-03	1,14E-02	9,19E-03	2,62E-03	2,61E-04	2,50E-03	5,35E-04	1,65E-05	1,66E-02
GWP-total	kg CO2 eqv.	1,53E+02	1,08E+01	1,38E+01	2,80E+01	1,77E+01	3,31E+00	6,83E+00	3,28E+00	5,92E-02	-3,22E+01
ODP	kg CFC 11 eqv.	5,86E-06	2,48E-06	1,60E-06	6,49E-06	1,61E-06	7,14E-07	1,51E-06	5,65E-07	2,43E-08	-1,10E-06
POCP	kg NMVOC eqv.	5,78E-01	5,74E-02	4,53E-02	1,73E-01	9,17E-02	4,61E-02	4,39E-02	3,50E-02	6,18E-04	-1,89E-01
WDP	m3 world eqv.	9,29E+03	4,69E-01	1,24E+02	1,33E+00	1,04E+00	6,10E-02	3,68E-01	1,36E-01	7,40E-02	-6,42E+01
Additional environmental impact indicators (EN 15804)											
ETP-fw	CTUe	2,37E+03	1,32E+02	1,80E+02	3,36E+02	1,30E+02	2,74E+01	9,18E+01	3,15E+01	1,07E+00	-1,03E+03
HTP-c	CTUh	3,90E-07	3,63E-09	3,26E-08	9,21E-09	3,35E-09	9,59E-10	2,98E-09	9,08E-10	2,48E-11	-6,72E-09
HTP-nc	CTUh	3,62E-06	1,44E-07	3,06E-07	3,75E-07	1,31E-07	2,36E-08	1,00E-07	2,38E-08	7,61E-10	5,41E-06
IR	kBq U235 eqv.	2,49E+00	7,19E-01	3,14E-01	1,87E+00	5,52E-01	1,95E-01	4,31E-01	1,73E-01	6,77E-03	2,79E-01
PM	disease incidence	6,95E-06	8,07E-07	3,84E-07	2,38E-06	1,52E-06	9,17E-07	6,14E-07	6,77E-07	1,09E-08	-2,15E-06
SQP	Pt	3,96E+02	1,24E+02	1,05E+03	4,58E+02	3,39E+01	5,81E+00	8,92E+01	7,08E+00	3,46E+00	-1,10E+02

ADP-e=Depletion of abiotic resources-elements | **ADP-f**=Depletion of abiotic resources-fossil fuels | **AP**=Acidification of soil and water | **EP-fw** =Eutrophication, freshwater | **EP-m**=Eutrophication marine | **EP-T**=Eutrophication, terrestrial | **GWP-b**=Global warming potential - Biogenic | **GWP-f**=Global warming potential - Fossil | **GWP-luluc**=Global warming potential - Land use and land use change |**GWP-total**=Global warming potential |**ODP**=Ozone layer depletion |**POCP**=Photochemical oxidants creation | **WDP**=Water use | **ETP-fw**=Ecotoxicity, freshwater | **HTP-c**=Human toxicity, cancer | **HTP-nc**=Human toxicity, non-cancer | **IR**=Ionising radiation, human health | **PM**=Particulate Matter | **SQP**=Land use

Resource use and environmental information: 1 metric t of precast concrete structural stairs											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9,20E+01	2,29E+00	1,07E+02	5,20E+00	3,57E+00	2,46E-01	1,29E+00	1,50E+00	1,34E-02	2,22E+00
PERM	MJ	9,24E-02	0,00E+00	7,51E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	9,21E+01	2,29E+00	1,82E+02	5,20E+00	3,57E+00	2,46E-01	1,29E+00	1,50E+00	1,34E-02	2,22E+00
PENRE	MJ	9,85E+02	1,75E+02	1,74E+02	4,55E+02	1,33E+02	4,83E+01	1,09E+02	4,76E+01	1,75E+00	-2,60E+02
PENRM	MJ	4,57E+00	0,00E+00	1,62E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	9,90E+02	1,75E+02	1,90E+02	4,55E+02	1,33E+02	4,83E+01	1,09E+02	4,76E+01	1,75E+00	-2,60E+02
SM	Kg	2,02E+01	0,00E+00	3,35E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,89E+01	0,00E+00	0,00E+00
RSF	MJ	5,95E+01	0,00E+00	7,74E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	2,90E+02	0,00E+00	3,77E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	1,32E+00	1,75E-02	1,07E-01	4,68E-02	3,51E-02	2,34E-03	1,25E-02	8,98E-03	1,76E-03	-1,48E+00
HWD	Kg	2,31E-02	4,26E-04	4,82E-04	9,89E-04	2,41E-04	1,24E-04	2,61E-04	9,94E-05	2,47E-06	-3,51E-03
NHWD	kg	1,82E+01	8,76E+00	1,97E+00	3,45E+01	1,44E+00	5,39E-02	6,53E+00	2,95E+00	1,12E+01	-3,33E+00
RWD	kg	3,07E-03	1,12E-03	3,91E-04	2,93E-03	7,90E-04	3,16E-04	6,76E-04	2,60E-04	1,08E-05	-5,58E-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
MFR	kg	1,43E-02	0,00E+00	1,17E+01	0,00E+00	1,69E+01	0,00E+00	0,00E+00	9,60E+02	0,00E+00	0,00E+00
MER	kg	4,23E-02	0,00E+00	5,50E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	2,14E-01	0,00E+00	-2,07E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	1,41E-02	0,00E+00	-1,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water | **HWD**=hazardous waste disposed | **NHWD**=non-hazardous waste disposed | **RWD**=radioactive waste disposed | **CRU**=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

6. LCA: Interpretation

The following figure shows the influence of the different life stages for the structural stairs. Since the Global Warming Potential biogen (GWP-b) and Global Warming Potential resulting from land use and land use change (GWP-luluc) have a minor impact, only the total Global Warming Potential (GWP-total) is displayed.

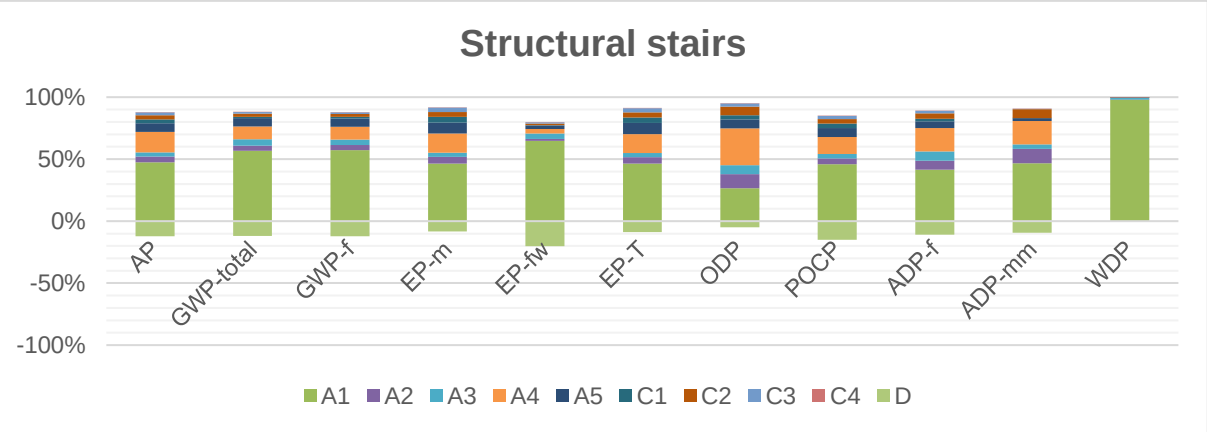


Figure 2: Influence of the modules on the environmental core indicators

As shown in the figure, the most of the environmental impact is attributed to raw material processing phase (A1), followed by the transportation of the finished product (A4, Sweden scenario) and production (A3). Potential credits come mainly from the material recovery of concrete and reinforcement steel.

Overall, the quality of the data can be considered as good overall. The primary data collection has been done thoroughly. Data quality was calculated using the Data Quality level and criteria according to the PEF approach (Annex E.2 of EN15804+A2). The DQRs range from 1,00 to 2,67 for the most abundant inputs in terms of mass.

7. Additional information: Norwegian requirements

Greenhouse gas emissions from the use of electricity mix in the manufacturing phase

Data source	Amount	Unit
Ecoinvent 3.6 (year 2019)	0,526	CO2-eqv/kWh

Dangerous substances disclaimer

☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list

☒ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.

☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.

☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Indoor environment

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonized test methods according to the provisions of the respective technical committees for European product standards are not available.

The product contains no dangerous substances on the REACH Candidate list or the Norwegian priority list, and a water-based release agent is used. Based on this it is assumed that the product has a negligible impact on the indoor environment.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

Carbon footprint

Carbon footprint has not been worked out for the product.

8. References

Bozdağ, Ö., Seçer, M., 2007 – Energy consumption of demolition process is on the average

CML-IA, 2013: Characterisation factors developed by Institute of Environmental Sciences (CML): University Leiden (NL) – http://www.cml.leiden.edu/software/data-cmlia.html

European Commission Joint Research Centre Institute for Prospective Technological Studies (JCR 2014): End-of-waste criteria for waste plastic for conversion, Seville, 2014, doi:10.2791/13033

Ecoinvent Database (2019): Version 3.6

European Federation of Concrete Admixtures Associations a.i.s.b.l. (EFCA) (2021) EPD-EFC-20210198-IBG1-EN Environmental Product Declaration Concrete admixtures – Plasticizers and Superplasticizers

Liebherr's Rental – https://www.liebherr-rental.co.uk/; accessed 7th of June 2023

NIBE, 2022: R<THiNK Online-EPD-Tool

Norwegian EPD foundation, Oslo, 2021: NPCR Part A Construction products and services, Version 2.0

Norwegian EPD foundation, Oslo, 2018: NPCR 020 Part B for Concrete and concrete elements, Version 2.0 (references to EN 15804+A2)

Kiwa-Ecobility Experts, Berlin, 2022: PCR A – General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1

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, accessed 7th of June 2023

Stichting Bouwkwaliteit (SBK 2019): Assessment Method - Environmental Performance Construction and Civil Engineering Works (GWW), Rijswijk, Version "3.0 January 2019" incl. amendments July 2019, Jan 2020

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

Stichting National Environmental Database (NMD), Rijswijk, 2019: verification protocol –inclusion data in the Dutch environmental database

SCHWENK Latvija, SIA (2022) NEPD-3757-2696-EN Environmental Product Declaration CEM II A-M (S-LL) 52.5 N

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

Standards and laws

EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations - Core rules for ,the product category of construction products

EN 16757:2022, Sustainability of construction works – Environmental product declarations -Product Category Rules for concrete and concrete elements

ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines

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

	Publisher Kiwa - Ecobility Experts Kiwa GmbH Voltastr.5, 13355 Berlin Germany	Mail Web	DE.Ecobility.Experts@kiwa.com https://www.kiwa.com/de/de/uber-kiwa/ecobility-experts/
	Programme operator Kiwa - Ecobility Experts Kiwa GmbH Voltastr.5, 13355 Berlin Germany	Mail Web	DE.Ecobility.Experts@kiwa.com https://www.kiwa.com/de/de/uber-kiwa/ecobility-experts/
	Author of the Life Cycle Assessment Inspecta Latvia AS Skanstes iela 54a LV-1013 Riga Latvia	Tel. Mail Web	+371 67 607 900 latvia@kiwa.com https://www.kiwa.com/lv
	Owner of the declaration BMGS AS Tvaika iela 27 LV-1005 Riga Latvia	Tel. Mail Web	+371 67 272 717 info@bmgs.lv https://www.bmgs.lv

Kiwa-Ecobility Experts - established member of