



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

ENVIRONMENTAL PRODUCT DECLARATION



Of steel structure for Tangenvika Bridge

Programme:
Programme operator:
EPD registration number:
Publication date:
Valid until:

The International EPD® System, www.environdec.com
EPD International AB
S-P-09436
2023-05-25
2028-05-23

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com
Accountabilities for PCR, LCA and independent, third-party verification	
Product Category Rules (PCR)	
ISO standard ISO 21930 and CEN standard EN 15804 serve as the core Product Category Rules (PCR)	
Product category rules (PCR): PCR 2019:14 Construction products, version 1.2.5	
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A Pena, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .	
Life cycle assessment (LCA)	
LCA accountability: Keller Geoteknikk AS	
Third-party verification	
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by accredited Certification Body	
Third-party verifier: CERTIQUALITY S.r.l., Via G. Giardino, 4 - 20123 Milano	
The certification body is accredited by: ACCREDIA, n° 003H REV.17	
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

<u>Owner of the EPD:</u>	Keller Geoteknikk AS Hovfaret 13, 0275 Oslo, Norway T: +47 919 21 296 - E-mail: info.no@keller.com
<u>Contact:</u>	Wojciech Szczepinski wojciech.szczepinski@keller.com
<u>Description of the organisation:</u>	Keller Geoteknikk AS is a leader in geotechnical solutions. It has experience in nearly all markets throughout the construction industry and understands the unique challenges and requirements associated with each one: commercial, industrial, infrastructure, power, institutional/public and residential sectors
<u>Name and location of production site:</u>	Keller has its products manufactured by Jiangyin Ronggang Pipeline Manufacturing Co. LTD at the plant located in Jiangyin (China).

Product information

<u>Product name:</u>	Steel structure for Tangenvika Bridge
<u>Product identification:</u>	The product covered by the EPD is a set of structural steel elements marked CE and compliant with the EN 10219-1, EN 1090 EXC3, EN 10204 3.2 and EN 10025-2 standards with a steel grade of S355J2.
<u>Product description:</u>	<p>The product covered by the EPD is a steel structure made up of the following structural elements:</p> <ul style="list-style-type: none">▪ 75 steel piles of 1016x28x20000 mm▪ 64 steel piles of 1016x40x20000 mm▪ 208 steel piles of 1430x34x20000 mm▪ 60 pile tips of 1430x34x20000 mm <p>All the above elements are designed by Keller and manufactured in Jiangyin (China) by the outsourcer Jiangyin Ronggang Pipeline Manufacturing Co. LTD for the construction of Tangenvika Bridge, located in Norway. The other elements of the bridge, e.g., concrete, reinforcing bars, etc., are not the subject of this study.</p>

UN CPC code: 421 Structural metal products and parts thereof

Geographical scope: Norway

LCA study performed by:



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LCA information

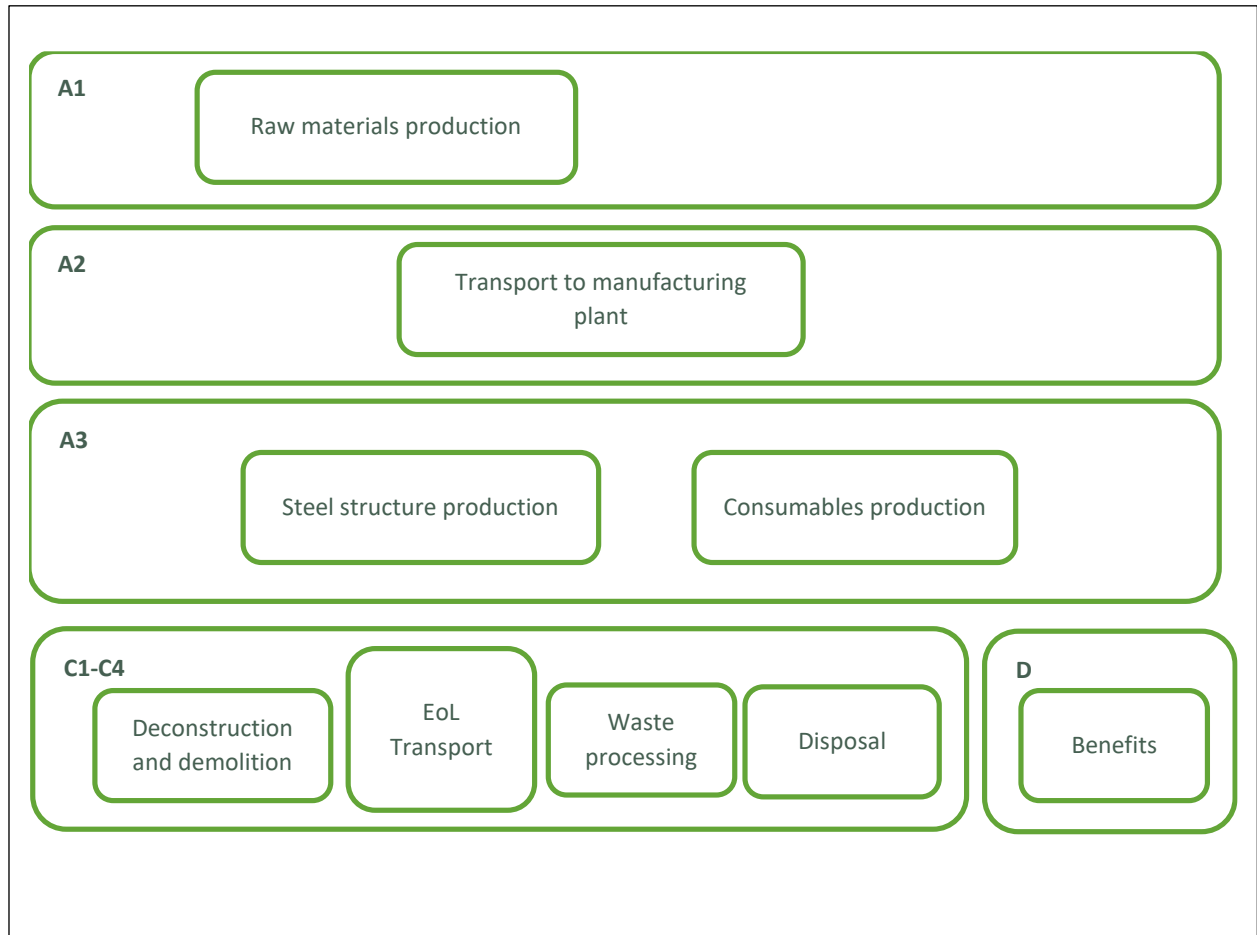
<u>Declared unit:</u>	1 steel structure
<u>Reference service life:</u>	Not applicable if modules B1-B7 are not declared/analysed
<u>Time representativeness:</u>	The reference year is 2021
<u>Database and LCA software used:</u>	Ecoinvent 3.8 and SimaPro 9.4.0.2
<u>Description of system boundaries:</u>	<p>Cradle-to-gate with options (A4) and modules C and module D:</p> <p>The <u>Upstream</u> phase (A1) includes the supply of raw materials and specifically:</p> <ul style="list-style-type: none">▪ Processes related to the production of steel plates;▪ production of electricity and steam. <p>The <u>Core</u> phase includes the following processes:</p> <ul style="list-style-type: none">▪ Transportation of raw materials, consumables and any supply products (A2);▪ production of steel piles and pile tips, consumables and treatment of waste deriving from production (A3). <p>The <u>Downstream</u> phase includes the following phases:</p> <ul style="list-style-type: none">▪ Distribution (A4);▪ dismantling and demolition (C1);▪ transportation of waste to the treatment process (C2);▪ waste treatment for reuse, recovery and/or recycling (C3);▪ disposal (C4). <p>Results also include module D, benefits and environmental loads beyond system boundaries.</p> <p>Since the product under study consists exclusively of low-alloyed steel, the assumption was made that, once the bridge is dismantled, all the steel will be recovered. For this reason, modules C3 and C4 have not been considered. The material selected by Ecoinvent already has a recycled content (due to scrap ferrous material) of 20%. Module D brings as many benefits to the life cycle of the steel structure as the fraction that has been recovered.</p>
<u>Data quality:</u>	Site-specific data relating to the production phase of steel piles and pile tips is for 2021 and was provided by Keller's Chinese outsourcer for the Jiangyin site. The upstream and downstream processes were modelled based on data from the Ecoinvent 3.8 database.
<u>Exclusions:</u>	Electricity consumption for lighting, natural gas consumption for heating, infrastructure and business travel were excluded from the assessment, as described by the PCR.
<u>Allocation rules:</u>	Energy consumption, production of auxiliaries and emissions into the air have been allocated in mass with

respect to the total quantity of steel processed in the Jiangyin plant.

More information:

www.keller-geoteknikk.no/en/

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage		
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential		
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
Modules declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X		
Geography	CN	CN	CN	CN/EU									EU	EU	EU	EU	CN		
Specific data used	>95%					-	-	-	-	-	-	-	-	-	-	-	-	-	
Variation – products	0%					-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%					-	-	-	-	-	-	-	-	-	-	-	-	-	-

X Module declared; ND: Module not declared

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Steel S355J2	7.372.740	20	0
TOTALE	7.372.740	20	0

The product covered by this EPD does not contain dangerous substances from the candidate list of SVHC for Authorisation.

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Indicator	Units	A1	A2	A3	Tot. A1-A3	A4	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	2,01E+07	7,15E+04	3,23E+05	2,05E+07	1,39E+06	3,98E+05	2,65E+04	0,00E+00	0,00E+00	-2,91E+07
GWP-biogenic	kg CO ₂ eq.	3,48E+04	1,74E+01	2,11E+03	3,69E+04	3,41E+02	6,33E+02	8,29E+00	0,00E+00	0,00E+00	-1,10E+06
GWP-luluc	kg CO ₂ eq.	1,34E+04	1,16E+00	4,87E+02	1,39E+04	2,23E+01	1,12E+01	2,11E-01	0,00E+00	0,00E+00	-2,60E+04
GWP-total	kg CO ₂ eq.	2,01E+07	7,15E+04	3,26E+05	2,05E+07	1,39E+06	3,99E+05	2,65E+04	0,00E+00	0,00E+00	-3,03E+07
ODP	kg CFC 11 eq.	9,00E-01	1,49E-02	1,32E-02	9,28E-01	2,91E-01	8,91E-02	6,18E-03	0,00E+00	0,00E+00	-1,49E+00
AP	mol H ⁺ eq.	1,01E+05	2,46E+03	1,96E+03	1,05E+05	4,51E+04	4,29E+03	8,90E+01	0,00E+00	0,00E+00	-1,32E+05
EP-freshwater	kg P eq.	1,01E+04	3,17E-01	1,24E+02	1,02E+04	7,43E+00	2,90E+00	1,06E-01	0,00E+00	0,00E+00	-1,27E+04
EP-marine	kg N eq.	1,92E+04	6,06E+02	5,44E+02	2,04E+04	1,11E+04	1,92E+03	2,82E+01	0,00E+00	0,00E+00	-2,80E+04
EP-terrestrial	mol N eq.	2,03E+05	6,74E+03	5,64E+03	2,15E+05	1,24E+05	2,11E+04	3,09E+02	0,00E+00	0,00E+00	-2,68E+05
POCP	kg NMVOC eq.	9,33E+04	1,71E+03	1,44E+03	9,65E+04	3,15E+04	5,77E+03	8,46E+01	0,00E+00	0,00E+00	-1,15E+05
ADP-minerals&metals*	kg Sb eq.	5,54E+02	7,85E-04	8,70E-03	5,54E+02	2,15E-02	2,08E-02	1,13E-03	0,00E+00	0,00E+00	-4,67E+02
ADP-fossil*	MJ	2,05E+08	9,23E+05	4,24E+06	2,10E+08	1,80E+07	5,59E+06	3,69E+05	0,00E+00	0,00E+00	-3,17E+08
WDP*	m ³	7,94E+06	1,67E+02	2,77E+05	8,21E+06	2,56E+03	2,06E+03	6,17E+01	0,00E+00	0,00E+00	-8,64E+06
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Additional environmental impact indicators (particulate matter, ionizing radiation - human health, eco-toxicity (freshwater), human toxicity - cancer and non-cancer effects, land use) have been calculated but are not declared in the EPD.

Additional mandatory impact category indicators

Indicator	Units	A1	A2	A3	Tot. A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq.	2,01E+07	7,15E+04	3,25E+05	2,05E+07	1,39E+06	3,98E+05	2,65E+04	0,00E+00	0,00E+00	-3,01E+07

Resources use indicators

Indicator	Units	A1	A2	A3	Tot. A1-A3	A4	C1	C2	C3	C4	D
PERE	MJ	8,94E+06	1,23E+03	3,72E+05	9,31E+06	2,39E+04	9,53E+04	5,66E+02	0,00E+00	0,00E+00	-1,83E+07
PERM	MJ	1,06E+06	3,24E+02	3,74E+04	1,09E+06	6,29E+03	5,07E+03	1,51E+02	0,00E+00	0,00E+00	-5,14E+05
PERT	MJ	9,99E+06	1,55E+03	4,09E+05	1,04E+07	3,02E+04	1,00E+05	7,17E+02	0,00E+00	0,00E+00	-1,88E+07
PENRE	MJ	2,05E+08	9,27E+05	3,77E+03	2,06E+08	1,80E+07	5,58E+06	3,69E+05	0,00E+00	0,00E+00	-3,17E+08
PENRM	MJ.	1,33E+05	9,18E-01	1,48E+01	1,33E+05	2,02E+01	4,81E+03	1,03E+00	0,00E+00	0,00E+00	-1,50E+05
PENRT	MJ	2,05E+08	9,27E+05	3,79E+03	2,06E+08	1,80E+07	5,59E+06	3,69E+05	0,00E+00	0,00E+00	-3,17E+08
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m ³	2,05E+05	3,58E+00	7,67E-02	2,05E+05	8,95E+01	3,81E+02	1,01E+00	0,00E+00	0,00E+00	-2,47E+05
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

Waste and output flows indicators

Waste indicators

Indicator	Units	A1	A2	A3	Tot. A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,36E+03	5,58E-01	1,54E+00	1,37E+03	1,33E+01	1,44E+01	9,70E-01	0,00E+00	0,00E+00	-1,54E+03
Non-hazardous waste disposed	kg	3,40E+06	4,40E+01	1,32E+04	3,41E+06	1,12E+03	3,70E+02	1,52E+01	0,00E+00	0,00E+00	-4,08E+06
Radioactive waste disposed	kg	3,34E+02	6,64E+00	9,12E+00	3,50E+02	1,29E+02	4,06E+01	2,64E+00	0,00E+00	0,00E+00	-6,66E+02

Output flow indicators

Indicator	Units	A1	A2	A3	Tot. A1-A3	A4	C1	C2	C3	C4	D
Components for re-use	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
Material for recycling	kg	0,00E+00	0,00E+00	1,50E+05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Differences versus previous versions

This is the first version of the EPD.

References

EN ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

EN ISO 14040:2006+A1:2020, Environmental management - Life cycle assessment - Principles and framework

EN ISO 14044:2006+A1:2018+A2:2020, Environmental management - Life cycle assessment - Requirements and guidelines

General Programme Instructions for the International EPD[®] System. Version 4.0.

PCR 2019:14 Construction products; version 1.2.5 valid until 2024-12-20

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

LCA Report of the steel structure for the Tangenvika Bridge rev.00 2023-05-02, performed by S.C.F. International S.r.l.

