Environmental Product Declaration for the concept of the NCC Composite bridge

According to EN 15804 and ISO 14025
Program operator: International EPD® System
Declaration owner: NCC AB

Reg. no. S-P-00627 UN CPC 53221 / CPV 45221110-6 Date 04/11/2014 Valid until 04/11/2017

The NCC Composite bridge is a composite bridge made of concrete and steel. It allows for bridges in spans of up to 100 meters.

The declared bridge is a concept bridge that is in the design stage and has not yet been built. The location of the bridge and therefore the site of the construction and groundwork as well as the final application and the equipment are not defined.

The NCC Composite bridge consists of a structure of steel girders supporting a slab of concrete. In contrast to a conventional composite bridge, the NCC Composite bridge is fixed in the abutments, which also allows for the dimension of the girders to be significantly reduced. The NCC Composite bridge may be carried out with stainless steel girders, which is the case for the declared bridge.

EPD INFORMATION

Functional unit:	1 m of concept bridge without defined application and location referring to per year of RSL
PCR:	Bridges and elevated highways 2013:23 VERSION 1.0, DATE 2013-12-20
RSL:	80 years according to TRVK Bro 11 (TRV 2011: 085)
Program operator:	The International EPD® System Box 210 60 SE-100 31 Stockholm Sweden info@environdec.com

DESCRIPTION OF THE PRODUCT

The NCC Composite bridge is exemplified in this EPD by a pedestrian and bicycle bridge with dimensions as given and with girders made of stainless steel. The example bridge is bridge 15-1787-1 in the project road 27 Viared-Kråkered in the Borås municipality, Sweden.

The example bridge is a one-span bridge with a span of 35 m, carrying a pedestrian and bicycle path. The partly prefabricated concrete deck acts compositely with two main girders of varying height.

The roadway is 5 m wide, and the average thickness of the concrete slab is 220 mm. Center distance between the girders is 3 m.

The bridge is designed according to the relevant standards. The complete list of standards can be found under references.

Figure 2 and 3 show construction drawings of the example bridge.

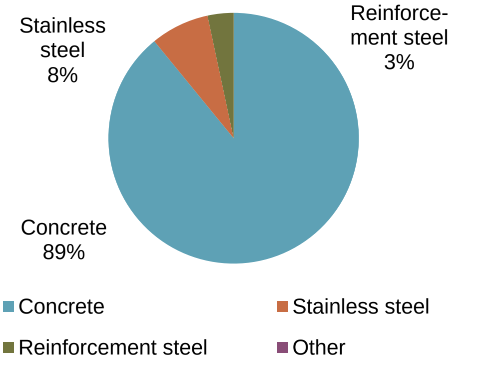


Figure 1: Composition of the concept bridge (mass %)

TECHNICAL INFORMATION

Length:	44,4 m
Span:	35 m
Width:	5 m
Height:	5 m

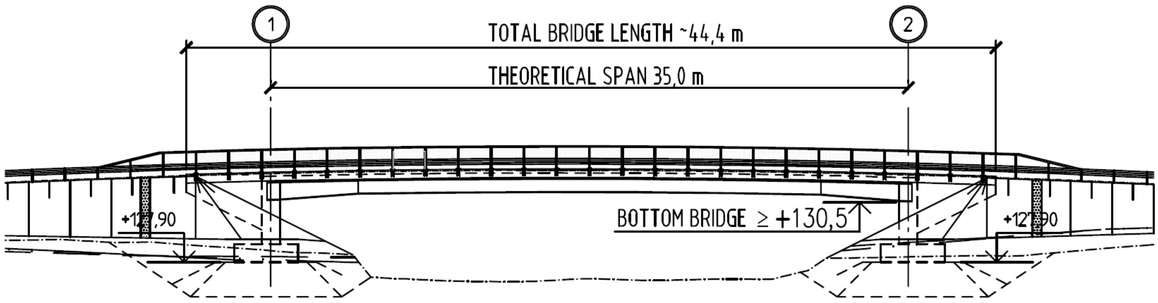


Figure 2: Section of the bridge span

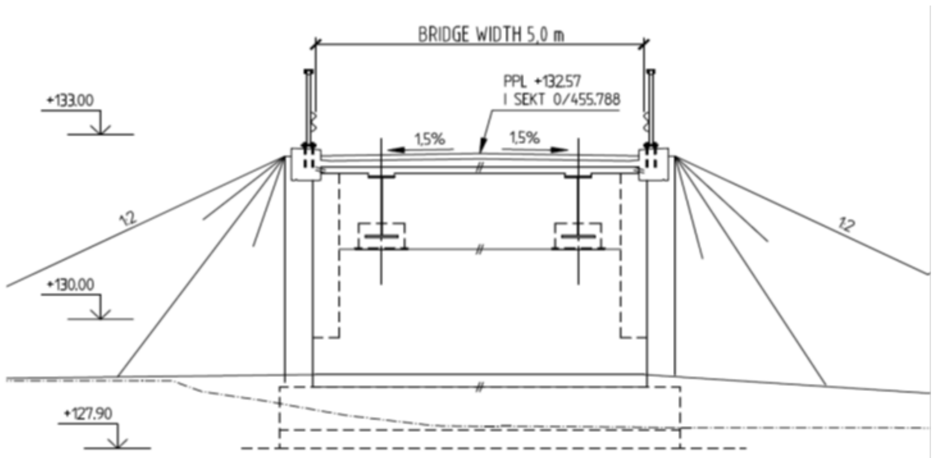


Figure 3: Cross section of the bridge

1. FUNCTIONAL UNIT

The functional unit is 1 meter of concept bridge without defined application and location referring to per 1 year of RSL (Reference Service Life).
The RSL of the stainless steel bridge is 80 years. Additionally, results are given in the Annex for 1 square meter per year of RSL.

2. SYSTEM BOUNDARY

This is a “cradle to grave” EPD. All processes to construct and maintain the bridge are included according to the /PCR/.

The declared modules are shown by figure 4.

According to the /PCR/, the formworks are excluded from the declaration.

The concept bridge EPD declares a bridge without defined application, meaning that no operational maintenance will be required (e.g. electricity consumed by traffic lighting), as no equipment has been defined yet. For this reason, the phase “operation” is not declared.

Additionally, no pavement, sealing layer or other application-specific materials (e.g. rails or asphalt) are part of the declaration.

The exact location/ site of the construction of the bridge is not finally defined during design stage therefore, groundwork is excluded.

According to the /PCR/ the materials used for maintenance of the infrastructure have to be declared under the ”Upstream” module. The required energy and auxiliary materials, and the waste treatment, are declared in the ”Downstream” module.

Upstream Module		**Core Module**	**Downstream Module**						**Other environmental information**
Construction			Operation	Maintenance	End-of-Life				
Raw material supply (extraction, processing, recycled material) Transport to manufacturer Manufacturing	Transport to construction site	Construction of the bridge	Use / application Operational energy use Operational water use	Maintenance Repair Replacement Refurbishment	Deconstruction / demolition	Transport to end-of-life	Waste processing for reuse, recovery or recycling	Disposal	Benefits and loads beyond the system boundaries (BLBSB)
A1-A3	A4	A5	B1, B6, B7	B2-B5	C1	C2	C3	C4	D
X	X	X	MND	X	MND	X	X	X	X

Figure 4: The system boundaries of the LCA. Modules of the production life cycle included in the EPD
(X = declared module; MND = module not declared)

3. ESTIMATES AND ASSUMPTIONS

The concept of the NCC Composite bridge is assumed to be equivalent to the example bridge with dimensions as given in the product description and with girders made of stainless steel instead of carbon steel.

The foreground data was collected by the manufacturer in 2014. The data of the raw materials has been collected per bridge component.

Upstream Module

The production waste is assumed to be always 10% of the total raw materials.

For transport a general truck dataset will be used.

In this EPD concept, even if the construction site location is not defined, a scenario for module A4 (transportation to the construction site) is declared.

The transport distances to the construction site are assumed to be the same ones as for the built V27 project bridge.

For stainless steel data from Outokumpu /EPD Outokumpu 2014/ is applied. For stainless steel, the input of secondary material (metal scrap) is without burdens.

Core Module

For the construction of the bridge Green Electricity grid om Vattenfall (5% Windpower: VindEl med Environmental Product; 95% Water power: VattenEl med Environmental Product) is used.

Downstream Module

As no application and equipment is considered, there is no need for operation. The impact from operation is not declared.

Based on available data, stainless steel needs to be maintained after 100 years. For this reason, the phase "Maintenance" contains a maintenance scenario for the edge beams and concrete layers. Every 35-40 years the edge beams of the superstructure have to be replaced. Every 10 years, minor repairs of the concrete layers are required. For the maintenance scenario SE grid mix is used.

In the end-of-life (EoL) scenario, the recycling and landfill of materials of the bridge is accounted for according to Table A. The collection rate of EoL stage is assumed to be 100%.

Table A: Waste treatment and EoL

Material	Waste treatment
Stainless steel	100% Recycling
Reinforced steel	95% recycling + 5 % landfill
Concrete and Reinforced concrete	90% recycling as layer for pavement in roads + 10% landfill

The burdens of these processes are included in the module C3, but material benefits – that occur due to the recycling process – as benefits in the module D.

4. CUT-OFF CRITERIA

In the assessment, all available data from the production process are considered, i.e. all raw materials used, utilised auxiliary materials, and electric power consumption using GaBi datasets. Only a geotextile made of cotton used with the stones/gravel in very little quantities for the project bridge has not been included (less than 1% of the cumulative mass). It is considered as irrelevant in comparison with the other raw materials used for the construction of the bridges (e.g. steel and concrete).

In the assessment, all available data were considered, i.e. all raw materials used, thermal energy consumption and electric power consumption-including material and energy flows contributing less than 1% of mass or energy (if available).

During the design phase, the final location of the bridge and the final application has not been defined. Therefore, groundwork, equipment and facing (e.g. asphalt or rails) are excluded from the system.

5. BACKGROUND DATA

For life cycle modelling of the concept bridge, the software system for Life Cycle Engineering, developed by PE INTERNATIONAL AG /GaBi 6 2013/, is applied. The GaBi-database contains consistent and documented datasets which are available in the online GaBi-documentation /GaBi 6 2013D/.

6. DATA QUALITY

The concept bridge analysed here is based on the same design data as for the V27 project bridge and it is assumed to be built in Sweden. Overall the data quality can be described as good.

The model is based on primary data provided by NCC. Background data is geographically representative of the bridge location, and is less than 10 years old.

7. ALLOCATION

For all refinery products, allocation by mass and net calorific value has been applied.

Two allocation rules for upstream data have been used: 1. the raw material (crude oil) consumption of the respective stages, is allocated by energy (mass of the product * lower calorific value of the product); and 2. the energy consumption (thermal energy, steam, electricity) of a process is allocated to the product according to the share of the throughput of the stage (mass allocation).

Specific information on allocation within each background dataset is available in the corresponding GaBi dataset documentation.

The construction process does not deliver any co-products. The applied software model does not contain any allocation of foreground data.

Regarding the recycling of metals, the metal parts at EoL are declared as end-of-waste status. Thus, the environmental burden for the recycling process and the credits for these materials are considered in module D.

8. COMPARABILITY

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared are created according to /ISO 14025/ and /EN 15804/ and the building context, particularly the product-specific characteristics of performance, are taken into account.

ENVIRONMENTAL PERFORMANCE RELATED-INFORMATION

The results for the functional unit of 1 m per one year of RSL are calculated by dividing the total by the length of the bridge and the RSL.

Table 1: Results of the LCA – Environmental impact of **1 m** of concept bridge per year of RSL

RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/ production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Global warming potential; GWP	kg CO2 eq	3,97E+01	6,07E-01	2,55E-01	-	9,54E+00	1,59E-01	6,80E-02	5,44E-01	-1,82E+01
Ozone depletion potential of stratospheric ozone layer; ODP	kg CFC 11 eq	-3,88E-08	2,91E-12	2,11E-12	-	1,01E-10	7,59E-13	2,43E-12	5,77E-13	-4,32E-11
Acidification potential of land and water; AP	kg SO2 eq	1,97E-01	2,78E-03	1,17E-03	-	9,01E-02	7,19E-04	1,04E-04	6,98E-04	-1,19E-01
Eutrophication potential; EP	kg PO43- eq	1,13E-02	6,35E-04	2,60E-04	-	1,87E-02	1,64E-04	1,71E-05	3,42E-04	-8,17E-03
Formation potential of tropospheric ozone photochemical oxidants; POCP	kg ethylene eq	1,83E-02	-8,97E-04	1,70E-06	-	1,15E-02	-2,31E-04	1,22E-05	1,22E-04	-8,49E-03
Abiotic depletion potential for non fossil resources; ADPE	kg Sb eq	3,12E-03	2,29E-08	4,85E-07	-	3,16E-06	5,97E-09	1,94E-08	3,89E-08	-7,14E-04
Abiotic depletion potential for fossil resources; ADPF	MJ	3,20E+02	8,38E+00	2,39E+00	-	1,32E+02	2,19E+00	9,72E-01	1,39E+00	-2,07E+02

*BLBSB: Benefits and Loads Beyond the System Boundaries

Table 2: Results of the LCA - Resource use of **1 m** of concept bridge per year of RSL

RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Non-renewable materials	kg	3,22E+02	3,75E-02	4,51E-01	-	2,07E+00	9,79E-03	6,03E-02	8,45E-01	-2,12E+02
Renewable materials	kg	5,83E+04	3,15E+01	3,17E+04	-	1,56E+03	8,23E+00	6,03E-02	3,96E+01	-1,55E+03
Renewable primary energy as energy carrier; PERE	MJ	4,65E+01	-	-	-	-	-	-	-	-
Renewable primary energy resources as material utilization; PERM	MJ	0,00E+00	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources; PERT	MJ	4,65E+01	3,30E-01	1,81E+01	-	5,97E+00	8,62E-02	7,51E-01	8,14E-02	-2,80E+00
Non renewable primary energy as energy carrier; PENRE	MJ	3,73E+02	-	-	-	-	-	-	-	-
Non renewable primary energy as material utilization; PENRM	MJ	0,00E+00	-	-	-	-	-	-	-	-
Total use of non renewable primary energy resources; PENRT	MJ	3,73E+02	8,41E+00	2,52E+00	-	1,34E+02	2,19E+00	1,92E+00	1,40E+00	-2,08E+02
Use of secondary material; SM	kg	4,30E+00	0,00E+00	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels; 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
Use of non renewable secondary fuels; 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
Use of net fresh water; FW[1,2]	m3	-	-	-	-	-	-	-	-	-

*BLBSB: Benefits and Loads Beyond the System Boundaries

[1] Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories contribute significantly to the production. The indicators are not declared.

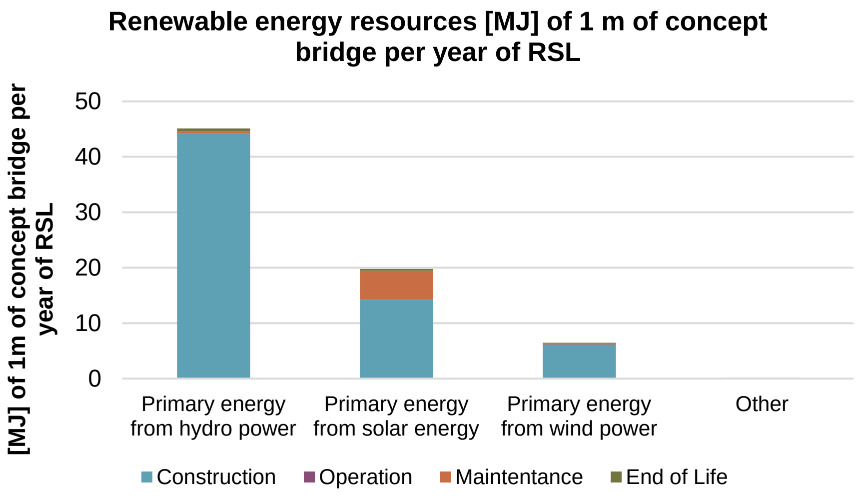
[2] Freshwater is considered as "blue water consumption"

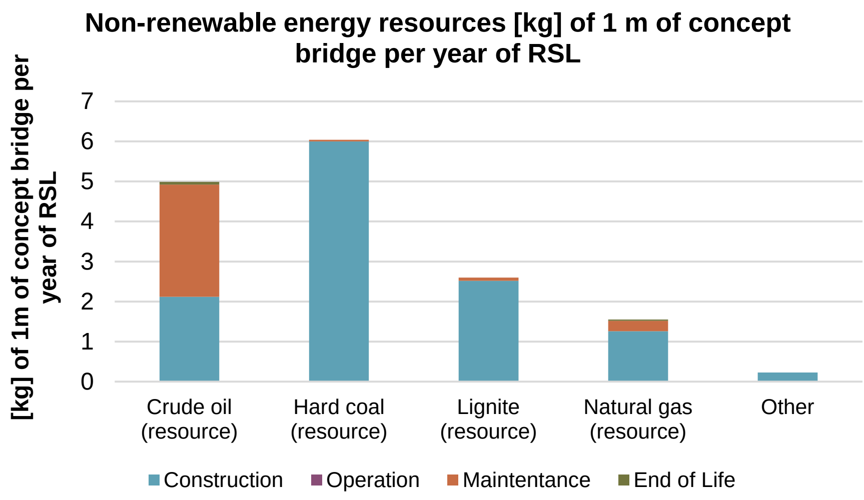
Table 3: Results of the LCA - Output flows and waste categories of **1 m** of concept bridge per year of RSL

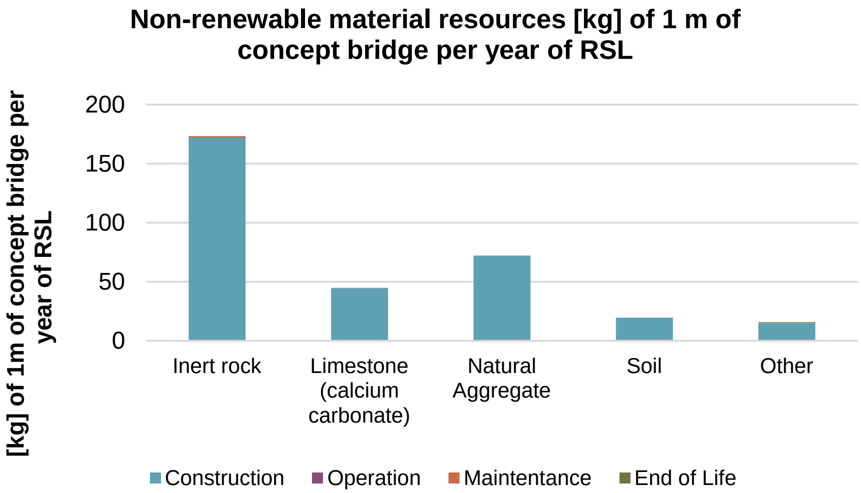
RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Hazardous waste disposed; HWD[1]	kg	-	-	-	-	-	-	-	-	-
Non hazardous waste disposed; NHWD[1]	kg	-	-	-	-	-	-	-	-	-
Radioactive waste disposed; RWD D[1]	kg	-	-	-	-	-	-	-	-	-
Components for re-use; CRU	kg	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Materials for recycling; MFR	kg	-	-	8,01E+00	-	2,48E+01	0,00E+00	6,94E+01	0,00E+00	1,08E+01
Materials for energy recovery; MER	kg	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Exported electrical energy; EEE	MJ	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Exported thermal energy; EET	MJ	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-

*BLBSB: Benefits and Loads Beyond the System Boundaries

[1] Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories contribute significantly to the production. The indicators are not declared.







Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The Renewable material resources [kg] of 1 m of concept bridge per year of RSL cannot be declared.

Figure 5: Specification of resources (material and energy) for **1 m** of concept bridge per year of RSL

The results of the life cycle assessment of 1 m of concept bridge without defined application and location referring to 1 year of RSL are given in Table 1 (environmental impact), Table 2 (resource use) and Table 3 (output flows and waste categories). Figure 5 shows the use of resources (material and energy) for 1 m of concept bridge referring to 1 year of RSL broken down into single material uses. Additionally, all these results are given for 1 square meter of concept bridge per year of RSL in the Annex.

The results on the upstream module are mainly influenced by the production of the stainless steel girders of the superstructure. Also the reinforced concrete of the other parts presents a fairly important influence to those results. In the core module (A5), the consumption of energy contributes significantly to the end results.

The results of the maintenance stages are mostly influenced by the production of the reinforced concrete used to replace the edge beams of the superstructure. The end-of-life stages (modules C) have a minor relevance in comparison with the previous described stages. In module D, the influence from the credits and loads beyond the system boundaries is visible, above all due to the recycling of the metal parts.

The indicators for Fresh Water (FW), Hazardous Waste Disposed (HWD), Non-Hazardous Waste Disposed (NHWD) and Radioactive Waste Disposed (RWD) are not declared in this EPD. The reason being is that the used stainless steel data from the Outokumpu published EPD for hot rolled cold stainless steel /EPD Outokumpu *2014*/ do not support the methodological approach for the declaration of those indicators (not declared in the EPD).

Although the groundwork of the foundations is not included in this declaration, a relevant influence to the end results can be expected.

ADDITIONAL ENVIRONMENTAL INFORMATION

Impacts on biodiversity are monitored and sought to be minimized in all construction projects. Appropriate monitoring and measurements are dependent on location of each specific project. In the case when there is an impact on protected areas such as waters, habitats, nature reserves etc., appropriate applications, exemptions and permissions are sought. Vegetation meriting protection is protected by fencing. A common measure to minimize impacts on biodiversity is the construction of wildlife crossings.

National regulations regarding noise are adhered to during construction. As a rule, neighbours are informed well in advance when potentially disturbing works are going to be undertaken. Vibration is measured regularly during construction according to requirements.

The raw materials and auxiliary materials used in the construction and maintenance of the NCC Composite bridge does not include substances deemed to be of high concern such as SVHC or substances on the REACH candidate list. NCC also aims at using only materials that fulfil the BASTA chemical composition criteria. BASTA is a Swedish environmental assessment system for building and construction products. There is a list and safety data sheets of all chemical products used, and consumed amounts are accounted for yearly.

Environmental impacts on water flows, groundwater levels and water quality are monitored during construction in accordance to requirements. Whenever relevant, appropriate permissions are sought from the water-rights court. A common measure to maintain acceptable water quality is appropriate treatment of construction runoff. All tanks are kept in retaining dikes and at a specified distance from water courses. Absorbents are kept easily accessible.

VERIFICATION DETAILS

Product Category Rules (PCR) review was conducted by: *The Technical Committee of the International EPD® System. Chair: Massimo Marino* *Contact via info@environdec.com.*
Independent verification of the declaration and data, according to ISO 14025:2006: □ EPD process certification ☒ EPD verification
Third party verifier: Carl-Otto Nevén (carlotto.neven@bredband.net) Accredited or approved by: The International EPD® System

CEN/TR 15941
Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; CEN/TR 15941:2010

EN 15804
EN 15804:2012-07: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EPD Outokumpu 2014
EPD for “Hot Rolled Stainless Steel” from Outokumpu Oyj (EPD-OTO-20140001-IBD1-EN), 03.03.2014

VindEl (1)
Miljödeklaration för vindel med EPD, 5% Windpower: VindEl med Environmental Product, Vattenfall 2013

GaBi 6 2013
GaBi 6 2013: PE INTERNATIONAL AG; GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Leinfelden-Echterdingen, 1992-2013.

ISO 14025
DIN EN ISO 14025:2014-02: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

ISO 14040
EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework

ISO 14044
EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Require-ments and guidelines

SS-EN 1990:2002
Eurocode - Basis of structural design (Swedish Standard)

SS-EN 1990/A1:2005/AC:2010
Eurocode - Basis of structural design (Swedish Standard)

CPR
Regulation (EU) No 305/2011 of the European parliament and of the council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

EPD® SYSTEM
The International EPD® System, EPD International Ltd., Stockholm Sweden, 2014, http://www.environdec.com/

EPD VDZ
EPD for concrete C35/45 (EPD-IZB-2013441-D) and EPD for concrete C45/55 (EPD-IZB-2013451-D) from InformationsZentrum Beton GmbH, 26.07.2013

VindEl (2)
Miljödeklaration för vattenel med EPD, 95% Water power: VattenEl med Environmental Product, Vattenfall 2013

GaBi 6 2013D
GaBi 6 2013D: GaBi 6: Documentation of GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Leinfelden-Echterdingen, 1992-2013. ttp://documentation.gabi-software.com/

GPI
General Programme Instructions for the international EPD® system, Version 2.01, 2013

PCR
Product category rules UN CPC 53221: Bridges and elevated highways ,Version 1.0, 2013:23

WorldSteel
World Steel Association, Life cycle assessment methodology report, 2011. ISBN 978-2-930069-66-1

TRV 2011:085
Transport Administration requirements regulated in TRVK Bro 11, revised version of part A and appendix 2, (TRV 2011:085)

TRV 2011:086
Transport Administration requirements regulated in TRVK Bro 11, revised version of part A and appendix 103, (TRV 2011:086)

SS-EN 1991-1-1:2002
Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings (Swedish Standard)

SS-EN 1991-2:2003
Eurocode 1: Actions on structures - Part 2: Traffic loads on bridges (Swedish Standard

SS-EN 1991-1-3:2002
Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads (Swedish Standard)

SS-EN 1991-1-4:2005
Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions (Swedish Standard)

SS-EN 1991-1-5:2003
Eurocode 1: Actions on structures - Part 1-5: General actions - Thermal actions (Swedish Standard)

SS-EN 1991-1-6:2005
Eurocode 1 - Actions on structures - Part 1-6: General actions - Actions during execution (Swedish Standard)

SS-EN 1991-1-7:2006
Eurocode 1 - Actions on structures - Part 1-7: General actions - Accidental actions (Swedish Standard)

SS-EN 1992-1-1:2005
Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings (Swedish Standard)

SS-EN 1992-2:2005
Eurocode 2: Design of concrete structures - Part 2: Concrete bridges - Design and detailing rules (Swedish Standard)

SS-EN 1993-1-1:2005
Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings (Swedish Standard)

SS-EN 1993-2:2006
Eurocode 3: Design of steel structures - Part 2: Steel bridges (Swedish Standard)

SS-EN 1993-1-4:2006
Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels (Swedish Standard)

SS-EN 1993-1-3:2006
Eurocode 3: Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting (Swedish Standard)

SS-EN 1993-1-5:2006
Eurocode 3 - Design of steel structures - Part 1-5: Plated structural elements (Swedish Standard)

SS-EN 1993-1-7:2007
Eurocode 3: Design of steel structures - Part 1-7 : Part 1-7: Plated structures subject to out of plane loading (Swedish Standard)

SS-EN 1993-1-9:2005
Eurocode 3: Design of steel structures - Part 1-9: Fatigue (Swedish Standard)

SS-EN 1993-1-11:2006
Eurocode 3: Design of steel structures - Part 1-11: Design of structures with tension components (Swedish Standard)

SS-EN 1993-1-12:2007
Eurocode 3: Design of steel structures - Part 1-12: Additional rules for the extension of EN 1993 up to steel grades S 700 (Swedish Standard)

SS-EN 1994-1-1:2005
Eurocode 4: Design of composite steel and concrete structures - Part 1-1: General rules and rules for buildings (Swedish Standard)

SS-EN 1994-1-2:2005
Eurocode 4: Design of composite steel and concrete structures - Part 1-2: General rules - Structural fire design (Swedish Standard)

TRV 2011:047
Transport Administration requirements regulated in TRV Geo 11 (TRV 2011: 047)

TRVFS 2011:12
Transport Administration Statue Book (TRVFS 2011:12)

AMA Anläggning 13
General specifications of material and workmanship of civil engineering works, Svensk Byggtjänst, 2011

TRV AMA Anläggning 13
Transport Administration changes and additions to AMA Anläggning 10 (TRV 2012:123)

SS 13 70 10
Concrete structures - Concrete cover (Swedish Standard)

SS 13 70 03
Concrete - Application of EN 206-1 in Sweden (Swedish Standard)

SS-EN 206:2013
Concrete - Specification, performance, production and conformity(Swedish Standard)

SS-EN 1337-1
Structural bearings - Part 1: General design rules (Swedish Standard)

SS-EN 1337-2
Structural bearings - Part 2: Sliding elements (Swedish Standard)

MB802
Transport Administration requirements – Investigation of load-bearing capacity of constructions, (2009:61)

SS-EN 1993-1-8:2005
Eurocode 3: Design of steel structures - Part 1-8: Design of joints (Swedish Standard)

ABOUT THE EPD

This environmental product declaration (EPD) describes, from a lifecycle perspective, the total environmental impact of the NCC Composite bridge as a pedestrian and bicycle bridge. The EPD covers bridge substructure only. Power systems on the bridge and groundwork are not included.

The EPD is drawn up in accordance with Product Category Rules (PCR) 2013:23 for Bridges and elevated highways. The program operator is the International EPD® System (see www.environdec.com for more information). EPDs within the same product category but from different programs may not be comparable unless EN 15804 compliant where relevant.

The aim of this EPD is that it should provide objective and reliable information on the environmental impact of the construction of the NCC Composite bridge as a pedestrian and bicycle bridge.

This EPD is developed by NCC AB in cooperation with PE INTERNATIONAL. It is certified by Carl-Otto Nevén and the certification is valid for three years (after which it can be revised and reissued). The declaration owner is NCC AB.

As this EPD is based on data relating to the example bridge 15-1787-1, the results might not be representative for other bridges. The most important areas that should be checked to be comparable with bridge 15-1787-1 are:

- Bridge functionality
- Type of bridge (e.g. concrete or steel beam)
- Topography
- Origin of materials (mainly steel and concrete)

ABOUT NCC

NCC is one of the leading construction and property development companies in the Nordic region. The Group had sales of SEK 58 billion in 2013, with approximately 18 500 employees. NCC operates within three businesses; an industrial business within NCC Roads, a construction and civil engineering business within NCC Construction and a development business within NCC Housing and NCC Property Development.

NCCs vision is to renew our industry and provide superior sustainable solutions. NCC aims to be the leading society builder of sustainable environments and will capitalize on this sustainability perspective to proactively develop new businesses.

NCC works purposefully to reduce both our own and our customers' environmental impact and continues to further refine our offerings with additional products and solutions for sustainability. In terms of the environment, this entails that NCC, at every step of the supply chain, is to offer resources and energy-efficient products and solutions that help our customers in reducing their environmental impact and operating more sustainably. NCC has an ISO 14001 certificate. Each year NCC reports the Group's emission of greenhouse gases to the CDP.

NCC's sustainability work is based on a holistic approach with all three dimensions of sustainability – the social, environmental and economical – interacting in a distinct and thorough manner. Our long-term sustainability strategy includes the aim of being both a leader and pioneer. NCC reports on its sustainability each year and the report has been included in NCC's Annual Report since 2010. NCC applies G3.0, the voluntary guidelines of the Global Reporting Initiative (GRI) for the reporting of sustainability information.

NCC is a member in BSCI (Business Social Compliance Initiative) which is the broadest business-driven platform for the improvement of social compliance in the global supply chain. NCC has also joined the UN Global Compact. The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with 10 defined and universally accepted principles in the areas of human rights, labor, environment and anti-corruption.

CONTACT

Magnus Alfredsson
08-585 518 85
magnus.alfredsson@ncc.se
Also visit www.ncc.se/epd

Larissa Strömberg
08-585 530 36
larissa.stromberg@ncc.se

ANNEX ENVIRONMENTAL PERFORMANCE RELATED-INFORMATION WITH ADDITIONAL FUNCTIONAL UNIT

The results for the functional unit of 1 m per one year of RSL are calculated by dividing the total by the length of the bridge and the RSL. To convert these results to the other functional unit of 1 m² per one year of RSL, they are divided again by the width of the bridge.

Table A1: Results of the LCA - Environmental impact of **1 m²** of concept bridge per year of RSL

RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Global warming potential; GWP	kg CO2 eq	7,93E+00	1,21E-01	5,10E-02	-	1,91E+00	3,17E-02	1,36E-02	1,09E-01	-3,64E+00
Ozone depletion potential of stratospheric ozone layer; ODP	kg CFC 11 eq	-7,77E-09	5,82E-13	4,21E-13	-	2,02E-11	1,52E-13	4,86E-13	1,15E-13	-8,64E-12
Acidification potential of land and water; AP	kg SO2 eq	3,94E-02	5,56E-04	2,34E-04	-	1,80E-02	1,44E-04	2,08E-05	1,40E-04	-2,37E-02
Eutrophication potential; EP	kg PO43- eq	2,26E-03	1,27E-04	5,20E-05	-	3,73E-03	3,28E-05	3,42E-06	6,83E-05	-1,63E-03
Formation potential of tropospheric ozone photochemical oxidants; POCP	kg ethylene eq	3,65E-03	-1,79E-04	3,41E-07	-	2,29E-03	-4,61E-05	2,45E-06	2,45E-05	-1,70E-03
Abiotic depletion potential for non fossil resources; ADPE	kg Sb eq	6,25E-04	4,58E-09	9,70E-08	-	6,32E-07	1,19E-09	3,87E-09	7,77E-09	-1,43E-04
Abiotic depletion potential for fossil resources; ADPF	MJ	6,39E+01	1,68E+00	4,78E-01	-	2,64E+01	4,37E-01	1,94E-01	2,78E-01	-4,14E+01

*BLBSB: Benefits and Loads Beyond the System Boundaries

Table A2: Results of the LCA - Resource use of **1 m²** of concept bridge per year of RSL

RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Non-renewable materials	kg	6,45E+01	7,50E-03	9,02E-02	-	4,13E-01	1,96E-03	1,21E-02	1,69E-01	-4,23E+01
Renewable materials	kg	1,17E+04	6,31E+00	6,33E+03	-	3,13E+02	1,65E+00	1,21E-02	7,91E+00	-3,10E+02
Renewable primary energy as energy carrier; PERE	MJ	9,30E+00	-	-	-	-	-	-	-	-
Renewable primary energy resources as material utilization; PERM	MJ	0,00E+00	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources; PERT	MJ	9,30E+00	6,61E-02	3,62E+00	-	1,19E+00	1,72E-02	1,50E-01	1,63E-02	-5,60E-01
Non renewable primary energy as energy carrier; PENRE	MJ	7,46E+01	-	-	-	-	-	-	-	-
Non renewable primary energy as material utilization; PENRM	MJ	0,00E+00	-	-	-	-	-	-	-	-
Total use of non renewable primary energy resources; PENRT	MJ	7,46E+01	1,68E+00	5,03E-01	-	2,68E+01	4,39E-01	3,84E-01	2,79E-01	-4,15E+01
Use of secondary material; SM	kg	8,60E-01	0,00E+00	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels; 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
Use of non renewable secondary fuels; 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
Use of net fresh water; FW[1,2]	m3	-	-	-	-	-	-	-	-	-

*BLBSB: Benefits and Loads Beyond the System Boundaries

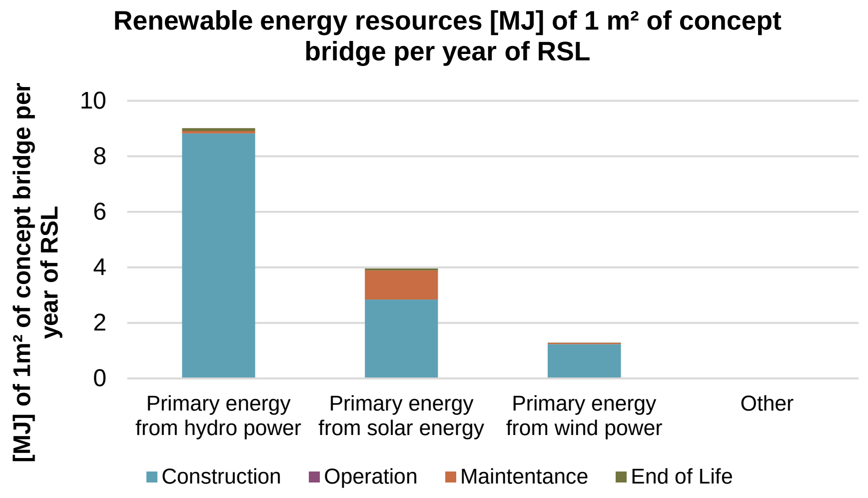
[1] Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories contribute significantly to the production. The indicators are not declared.

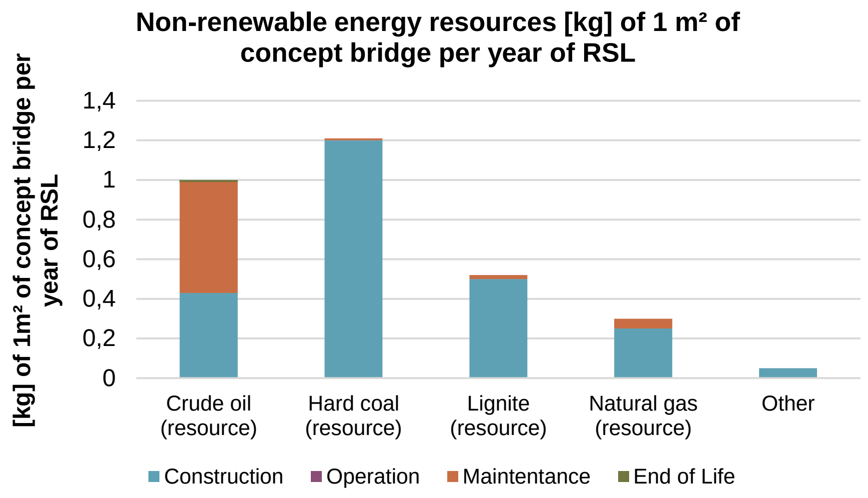
[2] Fresh water is considered as “blue water consumption”

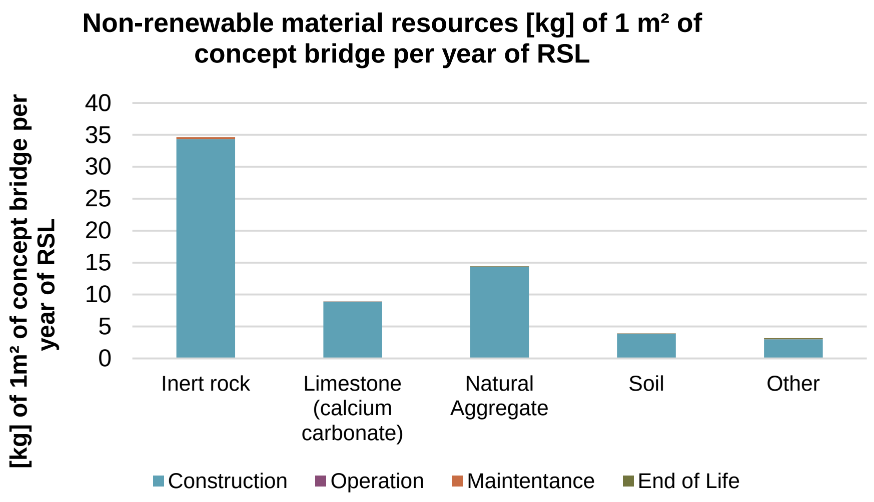
Table A3: Results of the LCA - Output flows and waste categories of **1 m²** of concept bridge per year of RSL

RESULTS OF THE LCA		Upstream module		Core module	Downstream module					Other environmental information
		Product stage	Transportation	Construction stage	Use stage		End of life stage			BLBSB*
		Raw materials/production	Transport to construction site	Construction of the bridge	Operation	Maintenance	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
Parameter	Unit	Module A1-A3	Module A4	Module A5	Module B1, B6, B7	Module B2-B5	Module C2	Module C3	Module C4	Module D
Hazardous waste disposed; HWD[1]	kg	-	-	-	-	-	-	-	-	-
Non hazardous waste disposed; NHWD[1]	kg	-	-	-	-	-	-	-	-	-
Radioactive waste disposed; RWD[1]	kg	-	-	-	-	-	-	-	-	-
Components for re-use; CRU	kg	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Materials for recycling; MFR	kg	-	-	1,60E+00	-	4,96E+00	0,00E+00	1,39E+01	0,00E+00	2,16E+00
Materials for energy recovery; MER	kg	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Exported electrical energy; EEE	MJ	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
Exported thermal energy; EET	MJ	-	-	0,00E+00	-	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-

*BLBSB: Benefits and Loads Beyond the System Boundaries
[1] Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories contribute significantly to the production. The indicators are not declared.







Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The Renewable material resources [kg] of 1 m² of concept bridge per year of RSL cannot be declared.

Figure A1: Specification of resources (material and energy) for **1 m²** of concept per year of RSL