

# Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

## Flexilink® Connection Point



The Norwegian EPD Foundation

**Owner of the declaration:**

Mørenot Aquaculture AS

**Product:**

Flexilink® Connection Point

**Declared unit:**

1 pcs

**This declaration is based on Product Category Rules:**

CEN Standard EN 15804:2012+A2:2019 serves as core

PCR

NPCR 031:2023 Part B for sea-based aquaculture infrastructure and components

**Program operator:**

The Norwegian EPD Foundation

**Declaration number:**

NEPD-7162-6559-EN

**Registration number:**

NEPD-7162-6559-EN

**Issue date:**

26.07.2024

**Valid to:**

26.07.2029

**EPD software:**

LCAno EPD generator ID: 466320

## General information

### Product

Flexilink® Connection Point

### Program operator:

The Norwegian EPD Foundation  
Post Box 5250 Majorstuen, 0303 Oslo, Norway  
Phone: +47 977 22 020  
web: [www.epd-norge.no](http://www.epd-norge.no)

### Declaration number:

NEPD-7162-6559-EN

### This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR  
NPCR 031:2023 Part B for sea-based aquaculture infrastructure and  
components

### Statement of liability:

The owner of the declaration shall be liable for the underlying  
information and evidence. EPD Norway shall not be liable with respect  
to manufacturer information, life cycle assessment data and  
evidences.

### Declared unit:

1 pcs Flexilink® Connection Point

### Declared unit with option:

A1,A2,A3,A4,C1,C2,C3,C4,D

### Functional unit:

A component that connects anchor lines, grid lines, and bridles,  
forming the mooring system that secures pens and floating  
structures in place.

### General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information  
and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4.  
Verification of each EPD is made according to EPD-Norway's  
guidelines for verification and approval requiring that tools are i)  
integrated into the company's environmental management system, ii)  
the procedures for use of the EPD tool are approved by EPD-Norway,  
and iii) the process is reviewed annually by an independent third  
party verifier. See Appendix G of EPD-Norway's General Programme  
Instructions for further information on EPD tools

### Verification of EPD tool:

Independent third party verification of the EPD tool, background data  
and test-EPD in accordance with EPDNorway's procedures and  
guidelines for verification and approval of EPD tools. Approval  
number: NEPD65.

Third party verifier:

Elisabet Amat, GREENIZE projects

(no signature required)

### Owner of the declaration:

Mørenot Aquaculture AS  
Contact person: Liv Lund  
Phone: +4792032311  
e-mail: [liv.lund@morenot.com](mailto:liv.lund@morenot.com)

### Manufacturer:

Mørenot Aquaculture AS

### Place of production:

Mørenot Aquaculture AS  
Langlandsvegen 35  
6010 Ålesund, Norway

### Management system:

ISO9001 and ISO14001

### Organisation no:

997749588

### Issue date:

26.07.2024

### Valid to:

26.07.2029

### Year of study:

2023

### Comparability:

EPD of construction products may not be comparable if they not  
comply with EN 15804 and seen in a building context.

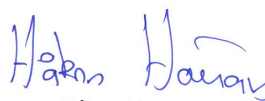
### Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03,  
developed by LCA.no. The EPD tool is integrated in the company's  
management system, and has been approved by EPD Norway.

Developer of EPD: Ingrid Johanne Høydal

Reviewer of company-specific input data and EPD: Liv Lund

### Approved:



Håkon Hauan

Managing Director of EPD-Norway

## Product

### Product description:

Flexilink® is Mørenot Aquacultures metal-free mooring solution and consists of several fibre straps connected at a single connection point and has no steel plates, shackles or thimbles. The Flexilink® connects anchor lines, grid lines and bridles that make out the mooring system and keep the pen and other floating structures in the desired position at all times.

### Product specification

Flexilink® is metal free and made from fibre straps consisting of Polyester threads.

Outer shell is made from polyester and protects the fibres in the core. MBL from 50 to 280 tons.

Certified according to NS-9415:2021 and NYTEK23.

Materials	kg	%
Textile - Polyester (PE)	64,10	100,00
Total	64,10	100,00

Packaging	kg	%
Packaging - Paper	2,00	7,41
Packaging - Wood	25,00	92,59
Total incl. packaging	91,10	100,00

### Technical data:

FLEXILINK GRID STRAPS 105T 1,5m

FLEXILINK STRAP 56 T 2m/4m

FLEXILINK ANCHOR LINE STRAP 105T 5m/10m

FLEXILINK BRIDLE STRAP 56T 1,5m/3m

FLEXILINK MAIN STRAP 280T 1,5/3m

FLEXILINK SAFETY STRAP 105 T 1,5/3m

### Market:

Norway

### Reference service life, product

15 years

### Reference service life, building or construction works

## LCA: Calculation rules

### Declared unit:

1 pcs Flexilink® Connection Point

### Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

### Data quality:

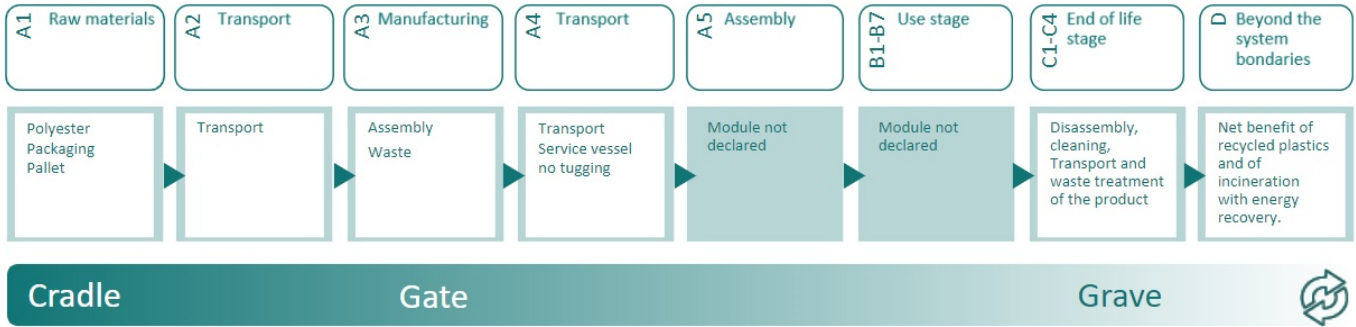
Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Packaging - Paper	ecoinvent 3.6	Database	2019
Packaging - Wood	Modified ecoinvent 3.6	Database	2019
Textile - Polyester (PE)	Modified ecoinvent 3.6	Database	2019

**System boundaries (X=included, MND=module not declared, MNR=module not relevant)**

Product stage			Construction installation stage	Use stage								End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	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	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

**System boundary:**



**Additional technical information:**

<https://www.morenot.com/aquaculture/mooring/>

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Module A4 - Default travel distance from manufacturing site to the production location include a default travel distance by 300 km with road freight and 1 Nm (1.852 km) freight as stated in NPCR 031 part B if not specified to a specific customer/order.

Module C1 - Freight from the aquaculture facility to disassembly require a service vessel aquaculture operations. For this scenario its used a default travel distance with sea freight of 1 Nm (1.852 km) to account for transport between the production location at sea and the nearest dock.














Module C2 - Use default distance of 300 km for Norwegian conditions as stated in NPCR 031 part B.

Module C3-C4 - Waste treatment and the processing of waste are based upon the assumption that all material is collected at the end-of-life phase as provided in table 3 in NPCR 031 part B for aquaculture infrastructure and components. Phase C3, waste treatments include material recycling, incineration with and without energy recovery, and fly ash extraction. In phase C4, disposal methods involve landfilling of different waste fractions and ashes.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Ship, aquaculture transport, work boat, 14 meters, without tugging (kgkm) - Global	20,0 %	2	1,790	l/tkm	3,32
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	300	0,043	l/tkm	12,90
De-construction demolition (C1)	Unit	Value			
Ship, aquaculture transport, service vessel, 24 meters, without tugging (kgkm) - Global	kgkm/DU	1,85			
Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	300	0,043	l/tkm	12,90
Waste processing (C3)	Unit	Value			
Polyester to recycling (kg)	kg	44,87			
Waste treatment of plastic mixture, incineration with energy recovery and fly ash extraction (kg)	kg	9,62			
Waste treatment per kg of impregnated aquaculture components, washing process (kg) - Norway	kg	64,10			
Disposal (C4)	Unit	Value			
Landfilling of ashes from incineration of Plastic mixture, process per kg ashes and residues (kg)	kg	0,34			
Landfilling of plastic mixture (kg)	kg	9,62			
Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of electricity, in Norway (MJ)	MJ	14,77			
Substitution of polyethylene terephthalate, PET, amorphous (kg)	kg	44,87			
Substitution of thermal energy, district heating, in Norway (MJ)	MJ	223,49			

## LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact											
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D	
 GWP-total	kg CO <sub>2</sub> -eq	2,07E+02	7,45E+00	6,69E-01	5,38E+00	2,68E-03	4,42E+00	4,14E+01	1,10E+00	-1,43E+02	
 GWP-fossil	kg CO <sub>2</sub> -eq	2,47E+02	7,44E+00	5,92E-01	5,37E+00	2,68E-03	4,42E+00	4,13E+01	1,10E+00	-1,42E+02	
 GWP-biogenic	kg CO <sub>2</sub> -eq	-4,06E+01	3,08E-03	7,69E-02	2,02E-03	7,92E-07	1,83E-03	9,03E-02	9,83E-05	-2,85E-01	
 GWP-luluc	kg CO <sub>2</sub> -eq	2,47E-01	2,65E-03	1,66E-04	1,96E-03	2,16E-06	1,57E-03	3,50E-02	2,16E-05	-1,15E-01	
 ODP	kg CFC11 -eq	1,61E-05	1,69E-06	1,06E-07	1,21E-06	5,69E-10	1,00E-06	2,18E-06	3,01E-08	-9,44E-02	
 AP	mol H+ -eq	1,07E+00	2,14E-02	4,13E-03	4,57E-02	8,97E-05	1,27E-02	9,32E-02	7,47E-04	-6,20E-01	
 EP-FreshWater	kg P -eq	1,32E-02	5,94E-05	6,43E-06	3,80E-05	1,19E-08	3,53E-05	4,63E-04	9,98E-07	-3,77E-03	
 EP-Marine	kg N -eq	2,11E-01	4,23E-03	1,73E-03	1,05E-02	2,16E-05	2,51E-03	1,88E-02	1,41E-03	-1,09E-01	
 EP-Terrestrial	mol N -eq	2,01E+00	4,73E-02	1,81E-02	1,15E-01	2,37E-04	2,81E-02	2,21E-01	2,97E-03	-1,18E+00	
 POCP	kg NMVOC -eq	1,11E+00	1,81E-02	4,78E-03	3,37E-02	6,28E-05	1,08E-02	7,30E-02	1,08E-03	-4,34E-01	
 ADP-minerals&metals <sup>1</sup>	kg Sb-eq	3,91E-03	2,06E-04	1,12E-05	1,26E-04	2,37E-08	1,22E-04	7,56E-04	7,32E-07	-2,49E-03	
 ADP-fossil <sup>1</sup>	MJ	5,48E+03	1,12E+02	7,50E+00	7,98E+01	3,62E-02	6,68E+01	2,69E+02	2,22E+00	-3,17E+03	
 WDP <sup>1</sup>	m <sup>3</sup>	1,48E+04	1,09E+02	1,10E+01	6,68E+01	7,36E-03	6,46E+01	1,41E+03	1,87E+01	-2,08E+03	







GWP-total = Global Warming Potential total; 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

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed

1. 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

## Remarks to environmental impacts











Additional environmental impact indicators											
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D	
 PM	Disease incidence	8,17E-06	4,56E-07	5,36E-08	4,99E-07	6,28E-10	2,70E-07	1,07E-06	1,51E-08	-6,01E-06	
 IRP <sup>2</sup>	kgBq U235 -eq	1,13E+01	4,92E-01	2,91E-02	3,49E-01	1,56E-04	2,92E-01	6,93E-01	1,07E-02	-3,28E+00	
 ETP-fw <sup>1</sup>	CTUe	3,67E+03	8,34E+01	8,05E+00	5,64E+01	2,18E-02	4,95E+01	3,94E+02	2,67E+00	-2,14E+03	
 HTP-c <sup>1</sup>	CTUh	1,24E-07	0,00E+00	7,01E-10	6,67E-10	2,00E-12	0,00E+00	2,93E-08	5,90E-11	-7,08E-08	
 HTP-nc <sup>1</sup>	CTUh	2,68E-06	9,11E-08	3,28E-08	6,01E-08	2,00E-11	5,41E-08	3,77E-07	1,72E-09	-1,53E-06	
 SQP <sup>1</sup>	dimensionless	1,94E+03	7,87E+01	4,79E+00	4,84E+01	4,97E-03	4,67E+01	1,61E+02	8,39E+00	-4,28E+02	

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed

1. 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
2. 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.




Resource use											
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D	
 PERE	MJ	4,26E+02	1,61E+00	1,43E-01	1,02E+00	2,58E-04	9,56E-01	1,06E+02	1,03E-01	-1,97E+02	
 PERM	MJ	3,75E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
 PERT	MJ	8,01E+02	1,61E+00	1,43E-01	1,02E+00	2,58E-04	9,56E-01	1,06E+02	1,03E-01	-1,97E+02	
 PENRE	MJ	5,48E+03	1,13E+02	7,50E+00	7,98E+01	3,63E-02	6,68E+01	2,69E+02	2,22E+00	-3,17E+03	
 PENRM	MJ	1,54E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,54E+03	0,00E+00	0,00E+00	
 PENRT	MJ	7,02E+03	1,13E+02	7,50E+00	7,98E+01	3,63E-02	6,68E+01	-1,27E+03	2,22E+00	-3,17E+03	
 SM	kg	1,68E+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	1,35E+01	5,76E-02	4,33E-03	3,42E-02	0,00E+00	3,42E-02	2,38E-01	2,13E-03	-2,00E-02	
 NRSF	MJ	2,40E-02	2,06E-01	3,86E-02	1,22E-01	0,00E+00	1,22E-01	2,55E+00	4,65E-03	-6,78E+00	
 FW	m <sup>3</sup>	3,68E+00	1,20E-02	4,28E-03	7,69E-03	2,33E-06	7,14E-03	8,64E-01	2,76E-03	-1,78E+00	

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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009"

\*INA Indicator Not Assessed








End of life - Waste											
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D	
	HWD	kg	8,92E-01	5,80E-03	1,65E-01	3,84E-03	1,52E-06	3,44E-03	1,49E+01	9,12E-03	-5,55E-01
	NHWD	kg	2,12E+01	5,47E+00	7,63E-01	3,26E+00	9,09E-05	3,25E+00	5,71E+00	9,63E+00	-1,11E+01
	RWD	kg	1,04E-02	7,66E-04	4,42E-05	5,47E-04	2,52E-07	4,55E-04	8,06E-04	1,46E-05	-3,25E-03

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

End of life - Output flow											
Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D	
	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
	MFR	kg	0,00E+00	0,00E+00	1,08E+01	0,00E+00	0,00E+00	0,00E+00	4,49E+01	8,62E-04	0,00E+00
	MER	kg	0,00E+00	0,00E+00	1,58E+01	0,00E+00	0,00E+00	0,00E+00	9,62E+00	2,11E-05	0,00E+00
	EEE	MJ	0,00E+00	0,00E+00	1,11E+01	0,00E+00	0,00E+00	0,00E+00	1,48E+01	1,37E-03	0,00E+00
	EET	MJ	0,00E+00	0,00E+00	1,67E+02	0,00E+00	0,00E+00	0,00E+00	2,23E+02	2,07E-02	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

\*Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

\*INA Indicator Not Assessed

Biogenic Carbon Content		
Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	1,13E+01

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>

## Additional requirements

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

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

### Dangerous substances

The product contains no substances given by the REACH Candidate list.

### Indoor environment

## Additional Environmental Information

### Additional environmental impact indicators required in NPCR Part A for construction products

Indicator	Unit	A1	A2	A3	A4	C1	C2	C3	C4	D
GWPIOBC	kg CO <sub>2</sub> -eq	2,48E+02	7,45E+00	6,63E-01	5,38E+00	2,68E-03	4,42E+00	4,14E+01	1,13E+00	-1,43E+02

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

## Bibliography

ISO 14025:2010. Environmental labels and declarations - Type III environmental declarations - Principles and procedures. International Organization for Standardization.

ISO 14044:2006. Environmental management - Life cycle assessment - Requirements and guidelines. International Organization for Standardization.

EN 15804:2012+A2:2019. Environmental product declaration - Core rules for the product category of construction products. European Committee for Standardization.

ISO 21930:2017. Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products. International Organization for Standardization.






Ecoinvent v3, 2019. Allocation, cut-off by classification. Swiss Centre of Life Cycle Inventories.

Iversen et al., (2021). eEPD v2021.09, background information for EPD generator tool system verification, LCA.no. Report number: 07.21. System verification report.

Gaspard Philis (2023). EPD generator for NPCR 031 part B for aquaculture infrastructure and components, Background information for EPD generator application and LCA data, LCA.no report number: 03.23. PCR verification report.

EPD Norway (2022). NPCR Part A: Construction products and services. The Norwegian EPD foundation. Version 2.0 published 24.03.2021.

EPD Norway (2023). NPCR 031 Part B for aquaculture infrastructure and components. The Norwegian EPD foundation. Version 1.0 published 26.04.2023.

 <b>epd-norge</b> Global program operator	<b>Program operator and publisher</b> The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo, Norway	Phone: +47 977 22 020 e-mail: <a href="mailto:post@epd-norge.no">post@epd-norge.no</a> web: <a href="http://www.epd-norge.no">www.epd-norge.no</a>
 <b>MØRENØT</b>	<b>Owner of the declaration:</b> Mørenot Aquaculture AS Langelandsvegen 35, 6010 Ålesund	Phone: +4792032311 e-mail: <a href="mailto:liv.lund@morenot.com">liv.lund@morenot.com</a> web: <a href="https://www.morenot.com/">https://www.morenot.com/</a>
	<b>Author of the Life Cycle Assessment</b> LCA.no AS Dokka 6A, 1671	Phone: +47 916 50 916 e-mail: <a href="mailto:post@lca.no">post@lca.no</a> web: <a href="http://www.lca.no">www.lca.no</a>
	<b>Developer of EPD generator</b> LCA.no AS Dokka 6B,1671 Kråkerøy	Phone: +47 916 50 916 e-mail: <a href="mailto:post@lca.no">post@lca.no</a> web: <a href="http://www.lca.no">www.lca.no</a>
	ECO Platform ECO Portal	web: <a href="http://www.eco-platform.org">www.eco-platform.org</a> web: ECO Portal