

Environmental Product Declaration

In accordance with ISO14025:2006 and EN15804:2012+A2:2019

EPS – Fish box 23 kg



Owner of the declaration:

Tempura ehf.
Íshella 8, 221 Hafnarfjörður
Iceland

Product name:

EPS - Fish box 23 kg

Declared unit:

One delivery of 1000 kg fish using 23 kg EPS
fish boxes to market in Europe.

Product category /PCR:

NPCR 023

Program holder and publisher:

The Norwegian EPD foundation
Post Box 5250 Majorstuen,
0303 Oslo, Norway

Declaration number:

NEPD-6297-5556-EN

Registration number:

NEPD-6297-5556-EN

Issue date:

18.03.2024

Valid to:

18.03.2029

General information

Product:

EPS – Fish box 23 kg

Program operator:

The Norwegian EPD Foundation
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Declaration number:

NEPD-6297-5556-EN

This declaration is based on Product Category Rules:

NPCR 023: Packaging products and services, published 20.12.2021

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, life cycle assessment data and evidence.

Declared unit:

One delivery of 1000 kg fish using 23 kg EPS fish boxes to market in Europe.

Functional unit:

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal external

Jane Anderson

Dr Jane Anderson, ConstructionLCA Ltd
Independent verifier approved by EPD Norway

Owner of the declaration:

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Manufacturer:

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Place of production:

Íshella 8, 221 Hafnarfjörður, Iceland

Management system:

ISO 14001:2015, Certificate No: EMS 762147

Organisation no:

600900-2180 (Icelandic identity number)

Issue date:

18.03.2024

Valid to:

18.03.2029

Year of study:

2023

Comparability:

EPD of construction products may not be able to compare if they do not comply with EN 15804 and are seen in a building context.

The EPD has been worked out by:

Björgvin Brynjarsson, EFLA Consulting Engineers, Iceland

Approved

Helgi Halldórsson

Manager of EPD Norway

Product

Product description:

The product is a standard 23 kg expanded polystyrene (EPS) box for transporting fresh fish or other marine products to market. This EPD covers other sizes produced by Tempra ehf., the results of which can be obtained by using conversion factors, see below.

EPS fish boxes, crafted from expanded polystyrene beads via a heat and steam expansion method, feature a lightweight yet robust closed-cell structure, with 98% air content by volume. Utilizing styrene monomers in production ensures resource efficiency and minimal waste. EPS fish boxes have high insulation capabilities, offering optimal temperature control for transporting and storing seafood. The inherent buoyancy and shock absorption properties of EPS make it an ideal material for protecting the product during transit.

The manufacturing process of EPS products begins with the feeding of polystyrene beads into a pre-expander machine, where they are exposed to steam, causing them to expand and become lighter. Subsequently, the beads are moulded into desired shapes using heat and pressure in a mould cavity, forming the final product. Once moulded, the EPS products are cooled to solidify their shape and structure. Excess material is trimmed, and the products are cut into specific sizes and shapes as required. Finally, the finished EPS products are packaged and prepared for distribution.

Product specification:

The following data is per declared unit.

Materials	Value	%
Polystyrene (PS)	28.3 kg	94.4%
Air*	1.7 kg	5.6%

* During the production, PS beads which contain 5% pentane by weight are expanded with steam. During and after the expansion the pentane is released. By volume, EPS is 98% air and 2% PS.

Packaging*	Value	%
LD-PE film	0,41 kg	13%
LD-PE shim	0,041 kg	1%
HD-PE pallet	2,74 kg	86%

* Average weight per declared unit

Technical data:

The table below applies to the 23 kg fish box.

Box outside dimensions	784 mm × 392 mm × 211 mm
Box inside dimensions	725 mm × 333 mm × 173 mm
Lid dimensions	784 mm × 392 mm × 14 mm
Internal net volume	40.7 L
External volume	69.1 L
Weight of box with lid	0.689 kg
Weight of fish in one box	23 kg
Weight of ice in one box	5 kg
Total box weight capacity	28 kg
Weight of one functional unit (excl. packaging)	30 kg

Market:

Iceland and Europe

Reference service life, product:

Single use product

Conversion factor, per box

For results per box, divide the results per functional unit by 43.5.

Example: A1-A3 GWP-total per box = $82.1 \frac{\text{kg CO}_2\text{-eq.}}{\text{FU}} \div 43.5 \frac{\text{boxes}}{\text{FU}} = 1.89 \frac{\text{kg CO}_2\text{-e.}}{\text{box}}$

Conversion factors for other box sizes

Tempra ehf. produces fish boxes in 8 different sizes. The table below shows conversion factors that can be used to calculate the environmental impact of other sizes than used for the functional unit. The conversion factor may only be used for the calculation of impacts from life cycle stages A1-A3. The impact between different box sizes is allocated by mass.

Box type (mass of fish in one box)	Weight of box with lid [kg]	No. of boxes to transport 1000 kg fish	Total weight of boxes to transport 1000 kg fish [kg]	Conversion factor
3 kg	0.177	333.3	59.0	1.97
5 kg (Type A)	0.197	200	39.4	1.32
5 kg (Type B)	0.222	200	44.4	1.48
7 kg	0.248	142.9	35.4	1.18
10 kg	0.431	100	43.1	1.44
13 kg	0.444	76.9	34.2	1.14
15 kg	0.470	66.7	31.3	1.05
23 kg	0.689	43.5	30.0	1

LCA: Calculation rules

Declared unit:

One delivery of 1000 kg fish using 23 kg EPS fish boxes to market in Europe.

Cut-off criteria:

Cut-off criteria of no more than 1% of total mass input of each unit process required by NPCR 023 and EN15804:2012+A2:2019 was fulfilled. Total of neglected input flows per module are less than 5%, as specified by NPCR 023 and EN15804:2012+A2:2019.

Allocation:

Energy use, auxiliary materials use, water use and waste production were allocated equally by mass among the products, i.e., depending on how large a fraction the production mass of each product is in the total production mass of the factory. Amounts of packaging materials used were allocated by volume among the products.

Tempra produces several different sizes of fish boxes but did not provide specifically data for each size but instead total for either the whole factory (total for boxes and insulation panels) or split into boxes (total for all sizes) and panels. Allocation between different sizes is based on mass.

Data quality:

Data quality requirements are as in NPCR 023 for Packaging products and services . Information about the EPS products’ production was provided by the manufacturer, Tempra ehf. The inventory data used for the assessment is geographically and technically representative for the products that it covers since they are all produced in the factory that the data is retrieved from. The amount of raw materials is based on data for the production year 2021 while information on origin and suppliers is from 2022. There are little changes in production between years and the inventory data is very recent (2021/2022) and therefore temporally representative for the products as well.

The LCE FE software and Sphera’s Managed LCA Content (MLC) databases (Professional database 2023) were used for the assessment for general background data. All appropriate processes, both background and foreground, were included in the EPS fish boxes production model. The MLC is updated annually so the temporal representativeness of the data is high.

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

Product stage			Supply	Use Stage		End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	Distribution	Maintenance	Transport	Waste Processing	Transport to disposal	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	B1	B2	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X

System boundary:

The included modules are A1-A3, A4, B1-B2, C1-C4 and D, in accordance with NPCR 023 for packaging products and services. Figure 1 shows a visualization of the LCA system boundaries.

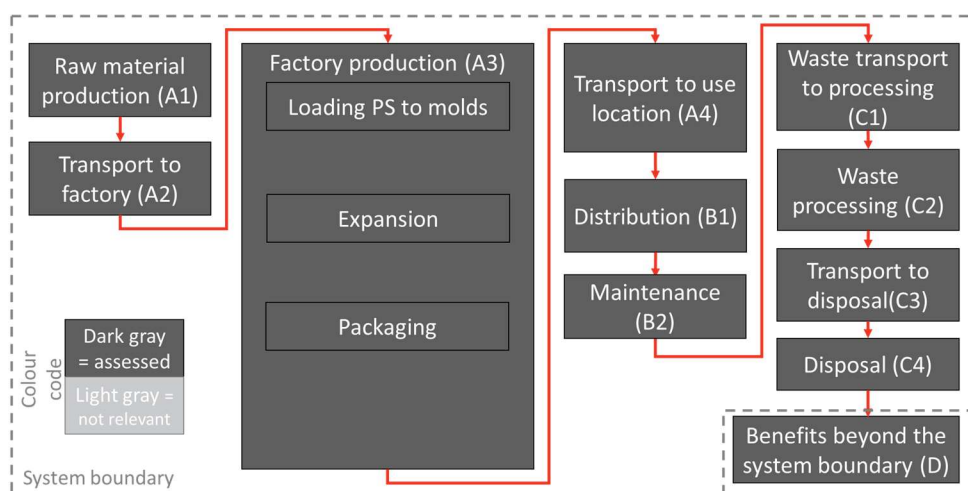


Figure 1 LCA system boundaries

LCA: Scenarios and additional technical information

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

Transport from production place to user (A4)

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck	4	300	Diesel	L/tkm	0,38

Distribution (B1)

Distribution (B1)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck in Iceland	5	50	Diesel	L/tkm	0,31
Boat to Rotterdam, NL	23*	2328	Heavy fuel oil	L/tkm	0,015
Truck in Europe	5	200	Diesel	L/tkm	0,31

** This value is derived to match the output of the modelling software to the output of the carbon calculator by Eimskip (an Icelandic shipping company). The value may not reflect the real capacity utilisation.

Maintenance (B2)

Since the product is single-use, there is no maintenance.

Transport to waste processing (C1)

Transport to waste treatment (C1)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck	55	100	Diesel	L/tkm	0,035

End of Life (C2, C4)

The data is provided per declared unit.

	Unit	Value
Hazardous waste disposed	kg	0
Collected as mixed construction waste	kg	0
Reuse	kg	0
Recycling	kg	15
Energy recovery	kg	15
To landfill	kg	0

Benefits and loads beyond the system boundaries (D)

The data is provided per declared unit.

Benefits and loads beyond the system boundaries (D)	Unit	Value
Substitution of electricity, in Europe	MJ	8,66E+01
Substitution of thermal energy, district heating, in Europe	MJ	1,54E+02
Substitution of virgin EPS with EPS from recycled polystyrene	kg	12

The energy recovered is assumed to replace electrical and thermal energy in the European energy grid. Half of the polystyrene waste is assumed to be incinerated for energy recovery and half is assumed to be recycled. It is assumed that 1 kg of recycled EPS replaces 0,8 kg of virgin EPS.

LCA: Results

All results are provided per declared unit.

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
GWP - total	kg CO2 eq	8,21E+01	1,09E+01	1,06E+01	2,87E-01	6,07E+01	0,00E+00	6,37E-02	-4,71E+01
GWP - fossil	kg CO2 eq	8,21E+01	1,08E+01	1,05E+01	2,85E-01	6,07E+01	0,00E+00	6,35E-02	-4,69E+01
GWP - biogenic	kg CO2 eq	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,90E-01
GWP - luluc	kg CO2 eq	2,58E-02	1,01E-01	6,06E-02	2,69E-03	6,69E-03	0,00E+00	2,00E-04	-1,19E-03
ODP	kg CFC11 eq	2,46E-09	1,42E-12	4,12E-08	3,78E-14	7,36E-07	0,00E+00	1,64E-13	-1,32E-09
AP	molc H+ eq	2,95E-01	3,57E-02	1,74E-01	2,11E-03	4,07E-02	0,00E+00	4,57E-04	-1,15E-01
EP- freshwater	kg P eq	2,82E-04	4,00E-05	1,08E-04	1,06E-06	1,52E-03	0,00E+00	1,30E-07	-1,27E-04
EP -marine	kg N eq	6,76E-02	1,63E-02	5,48E-02	1,04E-03	1,19E-02	0,00E+00	1,18E-04	-2,37E-02
EP - terrestrial	molc N eq	8,98E-01	1,82E-01	6,02E-01	1,15E-02	1,22E-01	0,00E+00	1,30E-03	-2,54E-01
POCP	kg NMVOC eq	1,24E+00	3,23E-02	1,34E-01	1,99E-03	3,45E-02	0,00E+00	3,56E-04	-8,79E-02
ADP-M&M ²	kg Sb-Eq	1,82E-05	7,25E-07	1,82E-06	1,93E-08	2,46E-05	0,00E+00	2,98E-09	-3,65E-06
ADP-fossil ²	MJ	2,62E+03	1,49E+02	1,40E+02	3,96E+00	1,72E+02	0,00E+00	8,57E-01	-1,27E+03
WDP ²	m ³	3,04E+01	1,32E-01	2,01E-01	3,51E-03	6,66E+00	0,00E+00	7,07E-03	-7,90E+00

GWP-total: Global Warming Potential; **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; See "additional Norwegian requirements" for indicator given as PO4 eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
PM	Disease incidence	3,43E-06	1,99E-07	2,45E-06	7,64E-09	9,88E-07	0,00E+00	5,62E-09	-8,54E-07
IRP ¹	kBq U235 eq.	1,90E+00	4,17E-02	5,80E-02	1,11E-03	1,86E+00	0,00E+00	1,13E-03	-1,11E+01
ETP-fw ²	CTUe	7,01E+03	1,07E+02	9,64E+01	2,84E+00	4,00E+01	0,00E+00	4,64E-01	-5,73E+02
HTP-c ²	CTUh	3,78E-08	2,17E-09	2,38E-09	5,76E-11	1,04E-08	0,00E+00	7,20E-11	-1,28E-08
HTP-nc ²	CTUh	1,13E-06	9,64E-08	8,15E-08	2,56E-09	1,29E-07	0,00E+00	7,61E-09	-2,79E-07
SQP ²	Dimensionless	1,75E+02	6,22E+01	4,16E+01	1,65E+00	1,03E+02	0,00E+00	2,08E-01	-6,45E+01

PM: Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

¹ This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

² The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Resource use

Parameter	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
RPEE	MJ	1,57E+03	1,08E+01	6,91E+00	2,88E-01	3,70E+01	0,00E+00	1,40E-01	-1,10E+02
RPEM	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
TPE	MJ	1,57E+03	1,08E+01	6,91E+00	2,88E-01	3,70E+01	0,00E+00	1,40E-01	-1,10E+02
NRPE	MJ	1,24E+03	1,50E+02	2,77E+02	3,97E+00	1,42E+03	0,00E+00	8,58E-01	-1,27E+03
NRPM	MJ	1,38E+03	0,00E+00	-1,37E+02	0,00E+00	-1,24E+03	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	2,62E+03	1,50E+02	1,40E+02	3,97E+00	1,72E+02	0,00E+00	8,58E-01	-1,27E+03
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
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
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
W	m ³	3,44E+00	1,19E-02	1,00E-02	3,16E-04	1,68E-01	0,00E+00	2,17E-04	-2,23E-01

RPEE Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non-renewable primary energy resources used as energy carrier; **NRPM** Non-renewable primary energy resources used as materials; **TRPE** 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; **W** Use of net fresh water.

End of life – Waste

Parameter	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
HW	kg	2,91E-07	4,63E-10	4,17E-10	1,23E-11	-2,83E-09	0,00E+00	1,87E-11	-1,12E-02
NHW	kg	1,22E+00	2,28E-02	1,77E-02	6,06E-04	1,67E+00	0,00E+00	4,29E+00	-6,23E-01
RW	kg	1,35E-02	2,80E-04	2,19E-04	7,44E-06	8,46E-03	0,00E+00	9,77E-06	-3,33E-02

HW Hazardous waste disposed; **NHW** Non-hazardous waste disposed; **RW** Radioactive waste disposed.

End of life – output flow

Parameter	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
CR	kg	0,00E+00	0,00E+00	2,74E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	9,15E+01	0,00E+00	0,00E+00	0,00E+00	1,48E+01	0,00E+00	0,00E+00	0,00E+00
MER	kg	9,71E-02	0,00E+00	2,20E-04	0,00E+00	1,48E+01	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,66E+01	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,54E+02	0,00E+00	0,00E+00	0,00E+00

CR Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery; **EEE** Exported electric energy; **ETE** Exported thermal energy.

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0
Biogenic carbon content in the accompanying packaging	kg C	0

Additional requirements

Location based electricity mix from the use of electricity in manufacturing

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 (foreground/core) per functional unit.

National electricity grid	Data source	Foreground / core [kWh]	GWP _{total} [kg CO ₂ - eq/kWh]	SUM [kg CO ₂ - eq]
IS: Electricity grid mix	Sphera	44.7	0.0403	1.73

Guarantees of origin from the use of electricity in the manufacturing phase

Guarantees of origin not applied.

Additional environmental impact indicators required for construction products

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.

Parameter	Unit	A1-A3	A4	B1	C1	C2	C3	C4	D
GWP-IOBC	kg	8,21E+01	1,09E+01	1,06E+01	2,87E-01	6,07E+01	0,00E+00	6,37E-02	-4,69E+01

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

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

Indoor environment




Not relevant

Carbon footprint

Carbon footprint has not been worked out for the product.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
NPCR 023	Packaging products and services, published 20.12.2021
ISO 14001:2015 Certificate of Registration for Tempra ehf. Certificate No: EMS 762147.	https://www.tempra.is/static/files/Vottanir/ems-762147-en.pdf

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