

Result summary

# N-durance (EN15804) (Decking)

MOSO

|                     |                         |
|---------------------|-------------------------|
| Calculation number: | EPD-NIBE-20210707-20469 |
| Generation on:      | 14-03-2022              |
| Issue date:         | 14-03-2022              |
| Valid until:        | 14-03-2027              |
| Status:             | verified                |

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## 1 N-durance (EN15804) (Decking)

### 1.1 COMPANY INFORMATION / DECLARATION OWNER

**Manufacturer:** MOSO

**Production Location:** Manufacturing plant CN

**Address:** Adam Smithweg 2, 1689 ZWZwaag

**E-mail:** info@moso.eu

**Website:** www.moso-bamboo.com

### 1.2 EPD INFORMATION

**Calculation number:** EPD-NIBE-20210707-20469

**Date of issue:** 14-03-2022

**End of validity:** 14-03-2027

**Version NIBE's EPD Application:** v2.0

**Version database:** v3.07 (2021-11-08)

**PCR:** EN15804+A2:2019

### 1.3 VERIFICATION OF THE DECLARATION

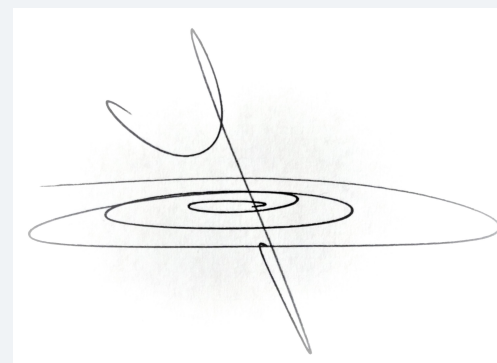
CEN standard EN 15804:2012 serves as the core PCR.

Independent verification of the declaration. according to EN ISO 14025:2010.

☐ Internal ☒ External

I hereby confirm that, following detailed examination as independent 3rd party verifier, I have not been able to trace any relevant deviations by the report concerning bamboo products by MOSO, and by its project report from the requirements outlined in the corresponding product category regulations based on the EN 15804:2019 and as PCR, the Dutch Assessment (Determination) Method version 1.0 July 2020, including the amendments Hereby the report meets also the standards given in ISO 14040/44 and ISO 21930.

A.K. Jeeninga is recognized by NMD as verifier.



Third party verifier: Anne Kees Jeeninga, Advieslab

### 1.4 DECLARED UNIT

#### **1 m2 decking**

A square meter of decking with the minimum technical thickness required end meets requirements of the Dutch Buildings Decree. Subframe joists and fasteners are not included.

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## 1.5 SCOPE OF DECLARATION

| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4  | B5  | B6  | B7  | C1 | C2 | C3 | C4 | D |
|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----|----|----|----|---|
| X  | X  | X  | X  | X  | X  | X  | X  | MND | MND | MND | MND | X  | X  | X  | X  | X |

(X = included, MND = module not declared)

## 1 N-durance (EN15804) (Decking)

### 1.6 PRODUCT DESCRIPTION

MOSO® Bamboo N-durance goes through a unique process of thermal treatment followed by High Density® compression to enhance the hardness, dimensional stability, fire resistance and durability to a level superior to the best tropical hardwood species.

Bamboo N-durance consists for approx. 85 % of rough strips made from the giant bamboo species “Phyllostachus Pubescens (Edulis)” from China (diameter up to 15 cm, length up to 15 meters) and approx. 15% of glue (phenol formaldehyde), and is also available with FSC certificate on request.

#### Dimensions

Decking: 1850 x 137/155/178 x 20 mm

#### Biological durability:

Class 1 (EN 350)

#### Hardness (Brinell)

> 9,5 kg / mm<sup>2</sup> (EN 1534)

#### Reaction to fire

Class Bfl-s1 (EN 13501-1)

#### Biogenic CO<sub>2</sub>

|                                                        |               |        |
|--------------------------------------------------------|---------------|--------|
| Density of material kg/m <sup>3</sup> (u=12%)          | ρ             | 1.200  |
| glue content                                           | %             | 17,1%  |
| carbon content                                         | %             | 50,24% |
| Bamboo without glue kg/m <sup>3</sup>                  | Pw            | 995    |
| Density without 12% moisture content kg/m <sup>3</sup> | Pw x Vw*/1,12 | 888    |

|                                     |                    |          |
|-------------------------------------|--------------------|----------|
| kg carbon / m <sup>3</sup>          | cf x Pw x Vw*/1,12 | 446      |
| kg CO <sub>2</sub> / m <sup>3</sup> | 44/12              | 1.637,44 |
| kg CO <sub>2</sub> / m <sup>2</sup> | m2                 | 31,37    |

#### Substances of very high concern

The product does not contain any substances listed in the “Candidate List of Substances” of Very High Concern (SVHC) for authorisation” exceeding 0.1% of the weight of the product.

### 1.7 DESCRIPTION OF THE MANUFACTURING PROCESS

Bamboo strips are double crushed to open up the material for further processing and become bundles of bamboo fibres, called strands. These strip strands are heated up to 140°C in the presence of saturated steam (to protect the bamboo from charring or burning) and cooled down. As a result of the thermal process the colour of the bamboo changes from white/yellow to medium brown. The bamboo strands are then dipped into thermosetting resin. As the strips are double crushed for more surface area, MOSO® Bamboo N-durance has a slightly higher glue content compared to Bamboo X-treme® or High Density®. After drying, the strands are put into a mould and are then compressed under high temperature and pressure to cure the glue. This process increases the density from 650-700 kg/m<sup>3</sup> to approx. 1.200 kg/m<sup>3</sup> and improves the hardness of this product significantly. At the same time, the dimensional stability of bamboo is improved significantly and the durability increases to the highest class possible (class 1 following EN 350), whereas because of the densification the product can reach the European fire class B without the use of fire retardants.

The output is a large panel, which is cut into smaller sections (boards or beams). These are then further processed and profiled to acquire the required shape. Waste created during this process is used in the factory to create energy / heat for the internal processes. For Bamboo N-durance, an extra step is involved which is a superficial anti fungi treatment to increase the resistance to fungi. As a last step, depending on the customer's request, the boards are usually prefinished. This optional step is not included in this LCA.

The final product is a very stable and durable board suitable for outdoor use, typically used as decking.



## 1 N-durance (EN15804) (Decking)

## 1.8 RESULTS

| Environmental effects | Unit              | A1       | A2       | A3       | A4       | A5       | B1      | B2      | B3      | C1      | C2       | C3      | C4       | D        | Total    |
|-----------------------|-------------------|----------|----------|----------|----------|----------|---------|---------|---------|---------|----------|---------|----------|----------|----------|
| AP                    | mol H+ eqv.       | 6.72E-2  | 3.62E-3  | 7.38E-2  | 7.32E-2  | 1.15E-2  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.67E-3  | 6.46E-3 | 8.81E-5  | -4.07E-2 | 1.98E-1  |
| GWP-total             | kg CO2 eqv.       | -1.84E+1 | 6.25E-1  | 1.55E+1  | 3.51E+0  | 2.24E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.60E-1  | 3.91E+1 | 1.68E+0  | -1.33E+1 | 3.14E+1  |
| GWP-b                 | kg CO2 eqv.       | -3.15E+1 | 2.88E-4  | -6.27E-1 | -1.56E-3 | -1.94E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.12E-4  | 2.98E+1 | 1.65E+0  | -1.71E-1 | -9.32E-1 |
| GWP-f                 | kg CO2 eqv.       | 1.31E+1  | 6.24E-1  | 1.62E+1  | 3.51E+0  | 2.26E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.60E-1  | 9.33E+0 | 3.13E-2  | -1.31E+1 | 3.24E+1  |
| GWP-luluc             | kg CO2 eqv.       | 9.59E-3  | 2.29E-4  | 3.96E-3  | 3.73E-3  | 9.20E-4  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.68E-4  | 5.93E-5 | 2.94E-6  | -1.51E-2 | 3.56E-3  |
| ETP-fw                | CTUe              | 5.35E+2  | 8.40E+0  | 4.14E+2  | 4.03E+1  | 5.17E+1  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 6.18E+0  | 6.56E+0 | 2.17E-1  | -7.72E+1 | 9.85E+2  |
| PM                    | disease incidence | 6.67E-7  | 5.62E-8  | 9.38E-7  | 2.02E-7  | 9.87E-8  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.14E-8  | 5.21E-8 | 1.83E-9  | -1.06E-7 | 1.95E-6  |
| EP-m                  | kg N eqv.         | 1.46E-2  | 1.28E-3  | 1.61E-2  | 1.88E-2  | 2.76E-3  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 9.39E-4  | 2.99E-3 | 5.94E-5  | -6.14E-3 | 5.13E-2  |
| EP-fw                 | kg P eqv.         | 5.14E-4  | 6.30E-6  | 3.46E-4  | 3.01E-5  | 4.67E-5  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.64E-6  | 4.26E-6 | 1.59E-7  | -6.83E-4 | 2.70E-4  |
| EP-T                  | mol N eqv.        | 1.52E-1  | 1.41E-2  | 1.75E-1  | 2.08E-1  | 3.00E-2  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.04E-2  | 3.42E-2 | 3.53E-4  | -7.38E-2 | 5.51E-1  |
| HTP-c                 | CTUh              | 8.71E-8  | 2.72E-10 | 3.15E-8  | 2.82E-9  | 6.97E-9  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.01E-10 | 1.71E-8 | 7.76E-12 | -2.05E-9 | 1.44E-7  |
| HTP-nc                | CTUh              | 2.12E-7  | 9.19E-9  | 1.86E-7  | 4.17E-8  | 2.59E-8  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 6.76E-9  | 5.28E-8 | 2.47E-10 | -6.17E-8 | 4.72E-7  |
| IR                    | kBq U235 eqv.     | 3.25E-1  | 3.95E-2  | 1.31E-1  | 2.00E-1  | 3.90E-2  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.90E-2  | 5.82E-3 | 1.20E-3  | -1.20E+0 | -4.32E-1 |
| SQP                   | Pt                | 5.88E+3  | 8.17E+0  | 1.67E+3  | 2.21E+1  | 3.79E+2  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 6.01E+0  | 8.51E-1 | 6.72E-1  | -3.31E+1 | 7.93E+3  |
| ODP                   | kg CFC 11 eqv.    | 1.25E-6  | 1.38E-7  | 4.36E-7  | 7.09E-7  | 1.39E-7  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.01E-7  | 2.89E-8 | 3.61E-9  | -1.49E-6 | 1.31E-6  |
| POCP                  | kg NMVOC eqv.     | 5.98E-2  | 4.02E-3  | 5.13E-2  | 5.60E-2  | 9.23E-3  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.96E-3  | 8.87E-3 | 1.28E-4  | -2.01E-2 | 1.72E-1  |
| ADP-f                 | MJ                | 2.69E+2  | 9.42E+0  | 1.62E+2  | 4.76E+1  | 2.54E+1  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 6.93E+0  | 2.43E+0 | 2.65E-1  | -2.41E+2 | 2.83E+2  |
| ADP-mm                | kg Sb-eqv.        | 2.36E-4  | 1.58E-5  | 9.77E-5  | 6.93E-5  | 2.18E-5  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.16E-5  | 1.68E-6 | 9.32E-8  | -1.59E-5 | 4.39E-4  |
| WDP                   | m3 world eqv.     | 1.07E+1  | 3.37E-2  | 4.89E+0  | 1.60E-1  | 8.00E-1  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.48E-2  | 1.99E-2 | 3.10E-3  | -1.46E+0 | 1.52E+1  |

**AP**=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **ETP-fw**=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation,

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human health (IR) | **SQP**=Land use (SQP) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

## 1 N-durance (EN15804) (Decking)

| Parameter | Unit | A1      | A2      | A3       | A4      | A5      | B1      | B2      | B3      | C1      | C2      | C3      | C4      | D        | Total    |
|-----------|------|---------|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|
| PERE      | MJ   | 1.13E+1 | 1.18E-1 | 1.21E+1  | 5.90E-1 | 1.27E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 8.68E-2 | 9.53E-2 | 9.36E-3 | -2.30E+1 | 2.64E+0  |
| PERM      | MJ   | 2.67E+2 | 0.00E+0 | 7.48E+1  | 0.00E+0 | 1.71E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -3.82E-1 | 3.58E+2  |
| PERT      | MJ   | 2.78E+2 | 1.18E-1 | 8.69E+1  | 5.90E-1 | 1.83E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 8.68E-2 | 9.53E-2 | 9.36E-3 | -2.34E+1 | 3.61E+2  |
| PENRE     | MJ   | 2.11E+2 | 1.00E+1 | 1.49E+2  | 5.06E+1 | 2.21E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 7.36E+0 | 2.62E+0 | 2.82E-1 | -2.59E+2 | 1.95E+2  |
| PENRM     | MJ   | 7.81E+1 | 0.00E+0 | 2.29E+1  | 0.00E+0 | 5.05E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -3.97E-2 | 1.06E+2  |
| PENRT     | MJ   | 2.89E+2 | 1.00E+1 | 1.72E+2  | 5.06E+1 | 2.72E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 7.36E+0 | 2.62E+0 | 2.82E-1 | -2.59E+2 | 3.01E+2  |
| SM        | Kg   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0  |
| RSF       | MJ   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0  |
| NRSF      | MJ   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0  |
| FW        | M3   | 2.73E-1 | 1.15E-3 | 1.21E-1  | 5.24E-3 | 2.09E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 8.44E-4 | 9.50E-3 | 3.19E-4 | -1.12E-1 | 3.20E-1  |
| HWD       | Kg   | 1.65E-4 | 2.39E-5 | 7.37E-5  | 8.52E-5 | 1.97E-5 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.76E-5 | 1.73E-5 | 3.39E-7 | -1.81E-4 | 2.22E-4  |
| NHWD      | Kg   | 1.27E+0 | 5.97E-1 | 1.57E+0  | 1.44E+0 | 3.44E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.40E-1 | 2.72E-1 | 1.15E+0 | -4.62E-1 | 6.63E+0  |
| RWD       | Kg   | 2.88E-4 | 6.18E-5 | 1.30E-4  | 3.16E-4 | 4.47E-5 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.55E-5 | 7.16E-6 | 1.71E-6 | -1.01E-3 | -1.17E-4 |
| CRU       | Kg   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0  |
| MFR       | Kg   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 1.58E-3 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 1.58E-3  |
| MER       | Kg   | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 0.00E+0  |
| EET       | MJ   | 0.00E+0 | 0.00E+0 | -3.21E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -9.44E+1 | -9.76E+1 |
| EEE       | MJ   | 0.00E+0 | 0.00E+0 | -1.87E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -5.48E+1 | -5.67E+1 |
| SP        | s€   | s€ 0,00 | s€ 0,00 | s€ 0,00  | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00 | s€ 0,00  | s€ 0,00  |

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

## 1.9 ADDITIONAL INFORMATION

## Allocation

There is no allocation applied for the environmental profiles / datasets used in this LCA.