

Result summary

# Density (EN15804)

MOSO

Calculation number: EPD-NIBE-20210322-18246

Generation on: 14-03-2022

Issue date: 14-03-2022

Valid until: 14-03-2027

Status: verified

R<THiNK

# 1 Density (EN15804)

## 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-20210322-18246

**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 m3 Bamboo**

1 m3 Bamboo produced in China and used for the Dutch market.

It is a semi-finished product, therefore this EPD considers Cradle to Gate with options. The following stages have been declared: A1-A4, C2-C4 and D.

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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)

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## 1.6 PRODUCT DESCRIPTION

MOSO® High Density® products are made of rough bamboo strips, which are put in resin (phenol formaldehyde) after which, under high compression, they are cold-pressed in moulds, which are activated in ovens, to form High Density® Beams and (toplayers for) Flooring and Solid Panels. The result is an extremely hard material with a look that is hardly distinguished from tropical hardwood. It is a semi-finished material which can be applied in several indoor applications such as flooring, panelling, window frames, stairs, etc. Due to the extreme hardness it is ideally used in applications where this hardness is utilized, such as (top layers of) flooring, stairs and panels for table tops. MOSO® High Density® products consists for 95-96 % 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 about 4-5% of glue (phenol formaldehyde), and is also available with FSC certificate on request.

### Dimensions

Various sizes depending on final product

### Indoor emissions (formaldehyde)

Class E1 (< 0.124 mg/m<sup>3</sup>) (EN 717-1)

### Hardness (Brinell)

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

### Reaction to fire

Class C-s1-d0 (EN 13501-1)

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

|                                                        |                               |          |
|--------------------------------------------------------|-------------------------------|----------|
| Density of material kg/m <sup>3</sup> (u=12%)          | ρ                             | 1.050    |
| glue content                                           | %                             | 3,8%     |
| carbon content                                         | %                             | 50,24%   |
| Bamboo without glue kg/m <sup>3</sup>                  | Pw                            | 1.010    |
| Density without 12% moisture content kg/m <sup>3</sup> | Pw x Vw <sup>*1,12</sup>      | 902      |
| kg carbon / m <sup>3</sup>                             | cf x Pw x Vw <sup>*1,12</sup> | 453      |
| kg CO <sub>2</sub> / m <sup>3</sup>                    | 44/12                         | 1.662,33 |

For more information see:

- <https://www.moso-bamboo.com/bamboo/how-bamboo-products-are-made/high-density-bamboo-production/>
- Technical datasheet MOSO® Solid Beam <https://www.moso-bamboo.com/product/bamboo-solid-beam/>

## 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

Rough bamboo strips are put in resin (phenol formaldehyde) after which, under high compression, they are cold-pressed in moulds, which are activated in ovens, to form High Density® Beams and (toplayers for) Flooring and Solid Panels.

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1.8 RESULTS

| Environmental effects | Unit              | A1       | A2      | A3       | A4       | A5      | B1      | B2      | B3      | C1      | C2      | C3      | C4       | D        | Total    |
|-----------------------|-------------------|----------|---------|----------|----------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
| AP                    | mol H+ eqv.       | 1.82E+0  | 1.59E-1 | 1.07E+0  | 3.34E+0  | 3.46E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.21E-1 | 3.07E-1 | 3.91E-3  | -1.93E+0 | 5.23E+0  |
| GWP-total             | kg CO2 eqv.       | -1.32E+3 | 2.75E+1 | 1.92E+2  | 1.60E+2  | 5.01E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.09E+1 | 1.68E+3 | 8.81E+1  | -6.28E+2 | 2.64E+2  |
| GWP-b                 | kg CO2 eqv.       | -1.66E+3 | 1.27E-2 | -1.63E+1 | -7.12E-2 | 6.58E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 9.65E-3 | 1.58E+3 | 8.74E+1  | -6.87E+0 | -2.28E+1 |
| GWP-f                 | kg CO2 eqv.       | 3.41E+2  | 2.75E+1 | 2.08E+2  | 1.60E+2  | 4.94E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.09E+1 | 9.99E+1 | 6.57E-1  | -6.20E+2 | 2.87E+2  |
| GWP-luluc             | kg CO2 eqv.       | 1.24E-1  | 1.01E-2 | 7.74E-2  | 1.70E-1  | 2.03E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 7.66E-3 | 2.44E-3 | 1.15E-4  | -7.16E-1 | -3.04E-1 |
| ETP-fw                | CTUe              | 1.06E+4  | 3.69E+2 | 5.25E+3  | 1.84E+3  | 1.02E+3 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.81E+2 | 2.41E+2 | 9.78E+0  | -3.67E+3 | 1.60E+4  |
| PM                    | disease incidence | 2.33E-5  | 2.47E-6 | 1.40E-5  | 9.21E-6  | 2.72E-6 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.88E-6 | 2.48E-6 | 8.24E-8  | -5.02E-6 | 5.12E-5  |
| EP-m                  | kg N eqv.         | 3.96E-1  | 5.61E-2 | 2.37E-1  | 8.56E-1  | 8.81E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.27E-2 | 1.43E-1 | 2.89E-3  | -2.91E-1 | 1.53E+0  |
| EP-fw                 | kg P eqv.         | 9.35E-3  | 2.77E-4 | 4.66E-3  | 1.37E-3  | 8.31E-4 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.11E-4 | 1.82E-4 | 6.87E-6  | -3.23E-2 | -1.55E-2 |
| EP-T                  | mol N eqv.        | 4.38E+0  | 6.19E-1 | 2.62E+0  | 9.50E+0  | 9.79E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.71E-1 | 1.64E+0 | 1.59E-2  | -3.50E+0 | 1.67E+1  |
| HTP-c                 | CTUh              | 9.40E-7  | 1.20E-8 | 2.29E-7  | 1.29E-7  | 8.76E-8 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 9.12E-9 | 4.00E-7 | 3.01E-10 | -9.75E-8 | 1.71E-6  |
| HTP-nc                | CTUh              | 4.29E-6  | 4.04E-7 | 2.40E-6  | 1.90E-6  | 5.59E-7 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.07E-7 | 1.25E-6 | 1.16E-8  | -2.93E-6 | 8.20E-6  |
| IR                    | kBq U235 eqv.     | 5.44E+0  | 1.74E+0 | 2.11E+0  | 9.10E+0  | 1.04E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.32E+0 | 2.37E-1 | 5.53E-2  | -5.69E+1 | -3.59E+1 |
| SQP                   | Pt                | 2.03E+5  | 3.59E+2 | 2.78E+4  | 1.01E+3  | 1.16E+4 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.73E+2 | 3.13E+1 | 3.06E+1  | -1.68E+3 | 2.43E+5  |
| ODP                   | kg CFC 11 eqv.    | 1.76E-5  | 6.06E-6 | 5.06E-6  | 3.23E-5  | 3.60E-6 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.61E-6 | 1.16E-6 | 1.64E-7  | -7.07E-5 | -1.72E-7 |
| POCP                  | kg NMVOC eqv.     | 1.37E+0  | 1.77E-1 | 7.31E-1  | 2.55E+0  | 2.74E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.34E-1 | 4.28E-1 | 5.77E-3  | -9.53E-1 | 4.72E+0  |
| ADP-f                 | MJ                | 4.65E+3  | 4.14E+2 | 2.13E+3  | 2.17E+3  | 5.00E+2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.15E+2 | 9.49E+1 | 1.20E+1  | -1.14E+4 | -1.11E+3 |
| ADP-mm                | kg Sb-equiv.      | 3.30E-3  | 6.96E-4 | 1.01E-3  | 3.16E-3  | 4.54E-4 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 5.30E-4 | 5.83E-5 | 3.99E-6  | -7.56E-4 | 8.46E-3  |



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|     |                  |         |         |         |         |         |         |         |         |         |         |         |         |          |         |
|-----|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| WDP | m3 world<br>eqv. | 9.11E+1 | 1.48E+0 | 7.69E+1 | 7.29E+0 | 9.38E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.13E+0 | 2.69E+0 | 7.41E-2 | -6.94E+1 | 1.21E+2 |
|-----|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|

**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, 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)

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| Parameter | Unit | A1      | A2      | A3       | A4      | A5      | B1      | B2      | B3      | C1      | C2      | C3      | C4      | D        | Total    |
|-----------|------|---------|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|
| PERE      | MJ   | 2.71E+2 | 5.19E+0 | 2.17E+2  | 2.69E+1 | 2.72E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.95E+0 | 4.09E+0 | 4.60E-1 | -1.10E+3 | -5.40E+2 |
| PERM      | MJ   | 1.41E+4 | 0.00E+0 | 1.92E+3  | 0.00E+0 | 8.02E+2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -3.28E+1 | 1.68E+4  |
| PERT      | MJ   | 1.44E+4 | 5.19E+0 | 2.14E+3  | 2.69E+1 | 8.30E+2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.95E+0 | 4.09E+0 | 4.60E-1 | -1.13E+3 | 1.63E+4  |
| PENRE     | MJ   | 4.17E+3 | 4.40E+2 | 2.05E+3  | 2.31E+3 | 4.81E+2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.35E+2 | 1.02E+2 | 1.27E+1 | -1.23E+4 | -2.38E+3 |
| PENRM     | MJ   | 7.94E+2 | 0.00E+0 | 2.10E+2  | 0.00E+0 | 5.02E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | -3.37E+0 | 1.05E+3  |
| PENRT     | MJ   | 4.96E+3 | 4.40E+2 | 2.26E+3  | 2.31E+3 | 5.32E+2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.35E+2 | 1.02E+2 | 1.27E+1 | -1.23E+4 | -1.33E+3 |
| 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   | 2.32E+0 | 5.05E-2 | 1.88E+0  | 2.39E-1 | 2.62E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.84E-2 | 4.73E-1 | 1.47E-2 | -5.31E+0 | -2.70E-2 |
| HWD       | Kg   | 2.67E-3 | 1.05E-3 | 9.95E-4  | 3.89E-3 | 5.09E-4 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 7.99E-4 | 3.72E-4 | 1.48E-5 | -8.59E-3 | 1.71E-3  |
| NHWD      | Kg   | 3.23E+1 | 2.63E+1 | 2.36E+1  | 6.58E+1 | 1.19E+1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.00E+1 | 7.80E+0 | 5.26E+1 | -2.19E+1 | 2.18E+2  |
| RWD       | Kg   | 5.56E-3 | 2.72E-3 | 2.22E-3  | 1.44E-2 | 1.41E-3 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 2.07E-3 | 2.85E-4 | 7.80E-5 | -4.80E-2 | -1.92E-2 |
| 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 | 1.34E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0  | 1.34E-1  |
| 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 | -1.72E+1 | 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 | -4.46E+3 | -4.48E+3 |
| EEE       | MJ   | 0.00E+0 | 0.00E+0 | -1.00E+1 | 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 | -2.59E+3 | -2.60E+3 |
| 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.