ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration: Kebony AS
Program operator: The Norwegian EPD Foundation
Publisher: The Norwegian EPD Foundation
Declaration number: NEPD-409-288-EN
ECO Platform reference number: 00000328
Issue date: 21.06.2016
Valid to: 21.06.2021

Kebony Character (Scots Pine) Cladding

Kebony AS

www.epd-norge.no
General information

Product: Kebony Character (Scots Pine) Cladding

Owner of the declaration:
Kebony AS
Contact person: Per Brynildsen
Phone: +47 06125
E-mail: info@kebony.com

Program operator:
The Norwegian EPD Foundation
Postboks 5250 Majorstuen, 0303 Oslo
Phone: +47 23 08 82 92
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Declaration number:
NEPD-409-288-EN

ECO Platform reference number:
00000328

Program operator:
The Norwegian EPD Foundation
Postboks 5250 Majorstuen, 0303 Oslo
Phone: +47 23 08 82 92
E-mail: post@epd-norge.no

Place of production:
Skien, Norway

Management system:

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serves as core PCR

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.

The objective of this EPD is to provide transparent and comparable information about the life-cycle environmental impacts of Kebony’s product.

Declared unit:
1 m³ of Kebony Character (Scots Pine) Cladding

Declared unit with option:

Functional unit:
1 m² of Kebony Character (Scots Pine) Cladding, planed, installed and maintained over 40 years

Comparability:
EPD of construction products may not be comparable if they do not comply with, NPCR 015 rev1 and EN 15804 and seen in a building context.

The EPD has been worked out by:
Nicole Lambert and Johannes Daae, Bergfald Miljørådgivere

Verification:
The CEN Norm EN 15804 serves as the core PCR.
Independent verification of the declaration and data, according to ISO14025:2010
☐ internal ☐ external

Third party verifier:
Marte Reenaas, Rambøll
(Independent verifier approved by EPD Norway)

Approved
Håkon Haauan
Managing Director of EPD-Norway
Product
Product description:
Kebony Character (Scots Pine) is produced from sustainably managed Scots Pine from Sweden, which is treated with bio-based, renewable chemicals, giving the wood an outstanding durability and an exclusive appearance. Kebony Character (Scots Pine) is produced in Kebony's production facilities located in Skien, Norway.

Product specification:
Kebony Character (Scots Pine) Cladding is sold under different profiles. The following EPD is valid for all profiles. The material overview below corresponds to the content in the final product and not the input quantities required to produce 1 FU of the product.

<table>
<thead>
<tr>
<th>Materials</th>
<th>kg/m³</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scots pine</td>
<td>530</td>
<td>82.8 %</td>
</tr>
<tr>
<td>Bio-based chemicals</td>
<td>110</td>
<td>17.2 %</td>
</tr>
<tr>
<td>Total</td>
<td>640</td>
<td></td>
</tr>
<tr>
<td>Plastic foil packaging</td>
<td>1,85</td>
<td></td>
</tr>
</tbody>
</table>

Technical data:
- Durability class (EN-350) : 1-2
- Hardness: brinell 20 - 30 N/mm²
- Maximum swelling: 4 - 6%
- Density: 640 kg/m³
- Technical data sheets for all Kebony Character (Scots Pine) Cladding profiles are available on www.kebony.com

Market:
Europe and USA

Reference service life, product:
40 years

Reference service life, building:

LCA: Calculation rules
Declared unit:
1 m³ of Kebony Character (Scots Pine) Cladding over 40 years

The production process is divided into 3 stages:
1) profiling
2) impregnation
3) drying

System boundary:
The scope of the study is "cradle to grave", described as A1 to C4 and D. The study takes into consideration the life cycle stages from the extraction of raw materials, production, installation, use and disposal, including all transport stages. The flowchart (Figure 1) illustrates the different stages of the product's life cycle considered.

Module D: energy under the form of heat and electricity is generated from the incineration of Kebony Character (Scots Pine) at end-of-life and is associated to the substitution of heat production from primary energy sources in Norway and Europe.

Data quality:
Upstream:
Specific data was acquired by sending questionnaires to suppliers. The yearly averages for 2014 are referred to in this life cycle analysis. When suppliers did not provide specific data, generic data was used.

Core process:
Specific data was acquired by using measurable consumption and emission data from Kebony’s facilities for 2014. The yearly averages for 2014 are referred to. Only specific data was used to analyse the core process of the LCA.

Downstream:
Scenarios were developed and generic data was used.

Cut-off criteria:
All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does 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 allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.
Conversion to process flows and LCI:
Conversion to primary flows and environmental effects were carried out via OpenLCA (version 1.4.2), which uses datasets from to Ecoinvent v3.1. Datasets were selected according to their technological, geographical and time related representativeness for the process assessed.

Impact assessment:
Open LCA software (version 1.4.2) was used to carry out the impact assessment of this LCA, the later refers to the CML baseline method for all impact assessment factors with the exception of the "global warming potential" which is analysed using IPCC 2013.

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)
The transport scenario considered for Kebony Character (Scots Pine) Cladding is based on the distribution of sales in 2014 and corresponding transport data. Datasets from Ecoinvent were referred to. The values for A4 in the rest of the document are average values.

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy consumption</th>
<th>Value (l/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>42 %</td>
<td>lorry 16-32 metric ton, EURO5</td>
<td>200</td>
<td>0,034 l/t.km</td>
<td>Diesel</td>
</tr>
<tr>
<td>Boat</td>
<td>65 %</td>
<td>transoceanic ship</td>
<td>5000</td>
<td>0,0025 kg/t.km</td>
<td>heavy fuel oil</td>
</tr>
<tr>
<td>Railway</td>
<td>INA</td>
<td>freight train, diesel</td>
<td>2200</td>
<td>0,014 kg/t.km</td>
<td>Diesel</td>
</tr>
</tbody>
</table>

Europe (99.98%)

| Boat       | 65 %                                  | transoceanic ship                    | 31          | 0,0025 kg/t.km         | heavy fuel oil | 0,08        |
| Truck      | 42 %                                  | lorry 16-32 metric ton, EURO5        | 218         | 0,034 l/t.km           | Diesel      | 7,41        |

Assembly (A5)
Installation will require the use of an electric saw to adjust the size of the planks, an electric hand drill to fasten the screws/fasteners and eventually a lift/small crane. The use of a hand drill, electric saw and crane is considered negligible, <1% of the cumulative energy of the system model. Screws/fasteners are also considered negligible, <1% of the cumulative mass.

Use stage: B1- B7
The use of Kebony Character (Scots Pine) Cladding is passive and does not require resource-demanding maintenance, nor repair/replacement/refurbishment.

End of Life (C1, C3, C4)
De-construction requires minimal tools. Kebony Character (Scots Pine) will be sorted as non-hazardous treated wood at the building site and is considered to be incinerated, generating energy/heat.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous waste disposed</td>
<td>0</td>
</tr>
<tr>
<td>Collected as mixed construction waste</td>
<td>0</td>
</tr>
<tr>
<td>Reuse</td>
<td>0</td>
</tr>
<tr>
<td>Recycling</td>
<td>0</td>
</tr>
<tr>
<td>Energy recovery</td>
<td>640</td>
</tr>
<tr>
<td>To landfill</td>
<td>0</td>
</tr>
</tbody>
</table>

The transport to waste processing will vary depending on local waste management policy for wood and distance from the waste management facility. An average distance of 50km was considered.

Transport to waste processing (C2)

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy consumption</th>
<th>Value (l/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>42 %</td>
<td>lorry 16-32 metric ton, EURO5</td>
<td>50</td>
<td>0,034 l/t.km</td>
<td>Diesel</td>
</tr>
</tbody>
</table>

Energy recovered from the incineration of Kebony Character (Scots Pine) at end-of-life is considered to substitute electricity and heat production from primary energy ressources in Norway and Europe.
LCA: Results

The environmental impact categories investigated are in accordance with NPCR 015 rev1.
The results are presented for:
- Product stage, corresponding to modules A1-A3,
- Distribution, module A4
- End of life stage, corresponding to modules C2-C3
- Beyond the system boundaries, module D

The modules for which no results are presented correspond to modules not relevant for the life cycle of the product.

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

<table>
<thead>
<tr>
<th>Product stage</th>
<th>Assembly stage</th>
<th>Use stage</th>
<th>End of life stage</th>
<th>Beyond the system boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Transport</td>
<td>Manufacturing</td>
<td>Transport</td>
<td>Assembly</td>
</tr>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Environmental impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1</th>
<th>A3</th>
<th>A4 (EU)*</th>
<th>A4 (USA)*</th>
<th>A5</th>
<th>B1-B7</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>kg CO₂-eqv</td>
<td>-738.39</td>
<td>21.88</td>
<td>103.79</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>4.76</td>
<td>1119.33</td>
<td>-184.40</td>
<td></td>
</tr>
<tr>
<td>ODP</td>
<td>kg CFC11-eqv</td>
<td>0.000059</td>
<td>0.0000043</td>
<td>0.000023</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0000009</td>
<td>0.0000067</td>
<td>-0.000025</td>
<td></td>
</tr>
<tr>
<td>POCP</td>
<td>kg C₂H₄-eqv</td>
<td>0.110</td>
<td>0.0042</td>
<td>0.052</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0009</td>
<td>0.048</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>kg SO₂-eqv</td>
<td>2.03</td>
<td>0.085</td>
<td>1.52</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0018</td>
<td>0.82</td>
<td>-0.38</td>
<td></td>
</tr>
<tr>
<td>EP</td>
<td>kg PO₄³⁻-equiv</td>
<td>0.36</td>
<td>0.017</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00037</td>
<td>0.31</td>
<td>-0.14</td>
<td></td>
</tr>
<tr>
<td>ADPM</td>
<td>kg Sb-eqv</td>
<td>0.00120</td>
<td>0.000077</td>
<td>0.00021</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.000017</td>
<td>0.000079</td>
<td>-0.00007</td>
<td></td>
</tr>
<tr>
<td>ADPE</td>
<td>MJ</td>
<td>5479.24</td>
<td>342.58</td>
<td>77.80</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>77.80</td>
<td>380.80</td>
<td>-2707.17</td>
<td></td>
</tr>
</tbody>
</table>

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources; INA: indicator not assessed (due to a lack of specific data) and that the values are considered to be insignificant. *The transport scenarios are calculated individually per functional unit.
Resource use

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A2</th>
<th>A3</th>
<th>A4 (EU)*</th>
<th>A4 (USA)*</th>
<th>A5</th>
<th>B1-B7</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPEE</td>
<td>MJ</td>
<td>3078,43</td>
<td>4,38</td>
<td>42,44</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,96</td>
<td>3,76</td>
</tr>
<tr>
<td>RPEN</td>
<td>MJ</td>
<td>12301,71</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>TPE</td>
<td>MJ</td>
<td>15380,14</td>
<td>4,38</td>
<td>42,44</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,96</td>
<td>3,76</td>
</tr>
<tr>
<td>NRPE</td>
<td>MJ</td>
<td>5691,21</td>
<td>361,36</td>
<td>1967,41</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>386,78</td>
<td>237,72</td>
</tr>
<tr>
<td>TRPE</td>
<td>MJ</td>
<td>5764,80</td>
<td>361,36</td>
<td>1967,41</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>386,78</td>
<td>237,72</td>
</tr>
<tr>
<td>SM</td>
<td>kg</td>
<td>INA</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>RSF</td>
<td>MJ</td>
<td>INA</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>NRSF</td>
<td>MJ</td>
<td>INA</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>W</td>
<td>m³</td>
<td>25,00</td>
<td>INA</td>
<td>INA</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
</tbody>
</table>

RPEE Renewable primary energy resources used as energy carrier; RPEN 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; 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; INA: indicator not assessed (due to a lack of specific data) and that the values are considered to be insignificant. *The transport scenarios are calculated individually per functional unit.

End of life - Waste

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A2</th>
<th>A3</th>
<th>A4-A5</th>
<th>B1-B7</th>
<th>C1-C2</th>
<th>C3</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW</td>
<td>kg</td>
<td>INA</td>
<td>1,03</td>
<td>INA</td>
<td>0,00</td>
<td>INA</td>
<td>INA</td>
<td>INA</td>
</tr>
<tr>
<td>NHW</td>
<td>kg</td>
<td>INA</td>
<td>94,00</td>
<td>INA</td>
<td>0,00</td>
<td>INA</td>
<td>640,00</td>
<td>INA</td>
</tr>
<tr>
<td>RW</td>
<td>kg</td>
<td>INA</td>
<td>0,00</td>
<td>INA</td>
<td>0,00</td>
<td>INA</td>
<td>INA</td>
<td>INA</td>
</tr>
</tbody>
</table>

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed; INA: indicator not assessed (due to a lack of specific data) and that the values are considered to be insignificant.

End of life - Output flow

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A2</th>
<th>A3</th>
<th>A4-A5</th>
<th>B1-B7</th>
<th>C1-C2</th>
<th>C3</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>kg</td>
<td>0,00</td>
<td>50,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>MR</td>
<td>kg</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>MER</td>
<td>kg</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>EEE</td>
<td>MJ</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>846,18</td>
</tr>
<tr>
<td>ETE</td>
<td>MJ</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>0,00</td>
<td>8113,00</td>
</tr>
</tbody>
</table>

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

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

![Global warming potential over the different modules of the LCA](image-url)
Additional Norwegian requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase
Electricity at Kebony's factory is Norwegian hydro power (certificate of origin)

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Amount</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norwegian Hydro power</td>
<td>0,00675</td>
<td>kgCO₂-eqv/kWh</td>
</tr>
</tbody>
</table>

The GWP is calculated from the corresponding Ecoinvent 3.1 datasets, according to the IPCC 2013 method.

Dangerous substances
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0.1% by weight.
- The product contains dangerous substances, more than 0.1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Indoor environment
Not relevant the product is used for outdoor applications

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 16449:2014 Wood and wood based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide
Ecoinvent 3.1 Ecoinvent 3.1 Cutoff, Swiss Centre of Life-Cycle Database. www.ecoinvent.ch
ISO 21930:2007 Sustainability in building construction - Environmental declaration of building products
EN 15804:2012+A1:2013 Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
Lambert and Daae, 2015 LCI/LCA report: Kebony Scots Pine Cladding, Roofing and Decking
NPCR 015 Rev1 Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products

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