Production
All production phases and processes are included in this stage, from raw material extraction and transformation to floor tile production at our site in Maastricht (NL), until storage of the end product in the Mosa warehouses in Beek/Brunssum (NL). Emissions to air and water as well as transport of raw materials, intermediate and end products are taken into account based on actual data.

Transport
This phase includes transport of floor tiles from the Mosa warehouses to main Benelux markets.

Tile fixing
This step considers floor tile fixing, including use of cement mortar and grout.

Use
This phase comprises maintenance: weekly cleaning according to Mosa's cleaning advice over the full 75 year technical lifecycle of the tiles. No relevant environmental exchanges occur during the use stage of the product.

End of life
After demolition of buildings, the Mosa tiles end up as construction waste. Based on information from the construction sector, it was assumed that this waste is being recycled for 98% as base for new roads, while 2% is being incinerated or dumped as landfill.

Environmental Product Declaration
The environmental impact of the floor tiles throughout their entire life cycle, from raw materials extraction, transport, production, use to end-of-life, is analysed in this Life Cycle Assessment (LCA), which was compiled during 2010. Reference year for the input data is 2008. Where possible, input data which was collected for the C2C certification was used instead of general assumptions.

The functional unit chosen for this LCA is per m² floor surface. This means 1m² fixed floor tile with a lifespan of 75 years.

Material Declaration
Mosa floor tiles consist of the materials listed below. The average weight is 22.76 kg/m² excluding packaging.

<table>
<thead>
<tr>
<th>Material</th>
<th>kg/m²</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>13.81</td>
<td>58</td>
</tr>
<tr>
<td>Sand</td>
<td>0.28</td>
<td>1</td>
</tr>
<tr>
<td>Kaolin</td>
<td>0.68</td>
<td>2</td>
</tr>
<tr>
<td>Feldspar</td>
<td>3.63</td>
<td>16</td>
</tr>
<tr>
<td>Scrap</td>
<td>4.79</td>
<td>21</td>
</tr>
<tr>
<td>Pigsment</td>
<td>0.54</td>
<td>2</td>
</tr>
</tbody>
</table>

Scrap is to be considered as preconsumer recycled content.

Environmental Product Declaration
The environmental impact of the floor tiles throughout their entire life cycle, from raw materials extraction, transport, production, use to end-of-life, is analysed in this Life Cycle Assessment (LCA), which was compiled during 2010. Reference year for the input data is 2008. Where possible, input data which was collected for the C2C certification was used instead of general assumptions.

The functional unit chosen for this LCA is per m² floor surface. This means 1m² fixed floor tile with a lifespan of 75 years.

Distribution of the environmental impacts for the relevant life cycle stages

<table>
<thead>
<tr>
<th>Impact category</th>
<th>Unit</th>
<th>Production</th>
<th>Transport</th>
<th>Tile Fixing</th>
<th>Use and maintenance</th>
<th>End of life</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming (GWP100)</td>
<td>kg CO2 eq</td>
<td>9,018</td>
<td>0,647</td>
<td>0,384</td>
<td>0,274</td>
<td>5,786</td>
<td>15,951</td>
</tr>
<tr>
<td>Ozone layer depletion (ODP)</td>
<td>kg CFC-11 eq</td>
<td>0,170</td>
<td>0,245</td>
<td>0,180</td>
<td>0,106</td>
<td>0,071</td>
<td>0,342</td>
</tr>
<tr>
<td>Photochemical oxidation</td>
<td>kg CH4 eq</td>
<td>2,042</td>
<td>0,620</td>
<td>8,208</td>
<td>2,684</td>
<td>1,148</td>
<td>15,748</td>
</tr>
<tr>
<td>Acidification</td>
<td>kg SO2 eq</td>
<td>1,061</td>
<td>2,645</td>
<td>0,608</td>
<td>1,061</td>
<td>1,148</td>
<td>5,388</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>kg PO4 eq</td>
<td>1,715</td>
<td>0,845</td>
<td>7,856</td>
<td>1,796</td>
<td>1,148</td>
<td>11,358</td>
</tr>
<tr>
<td>Non renewable, fossil</td>
<td>MJ eq</td>
<td>163,374</td>
<td>10,827</td>
<td>1,560</td>
<td>4,720</td>
<td>128,101</td>
<td>283,091</td>
</tr>
</tbody>
</table>

For further information visit www.mosa.nl
Environmental aspects of Mosa floor tiles during their life cycle

Global warming
Is an index for the rising of the global temperature due to the release of greenhouse gases in the atmosphere.

Photochemical smog
Is a type of air pollution affecting human health and the environment, caused by a reaction of nitrogen oxides and VOC's (volatile organic compounds) under the influence of heat and sunlight.

Acidification
Is the damage to trees and life in waters as well as accelerated degradation of materials (e.g. metals, limestone and concrete) due to emissions of acids.

Ozone layer depletion
Is the decline of the ozone layer causing damage to plants, animals and human health (increased skin cancer risk) resulting from higher concentrations of harmful UV radiation due to emission of halocarbon refrigerants like CFC and freon.

Eutrophication
Is the loss of plant and fish life in water due to oxygen deficiency following algae growth which is stimulated by high nutrient concentrations resulting from the release of nitrogen and fertilizers.

Primary energy use
Use of non-renewable fossil energy embodied in natural resources that has not yet undergone any anthropogenic transformation.

Life Cycle Assessment
The graphs represent the contribution of the Mosa wall tile life cycle stages to environmental impact categories.

Production
Transport
Use
Tile fixing
End of life
Cradle to Cradle®

Cradle to Cradle is an innovative, positive and integral framework for system design. Cradle to Cradle aims at redefining products, processes and systems in such a way that they provide financial, environmental and social benefits.

Inspired by nature’s cycle of life, in which nutrients at the end of their life cycle become nutrients again, Cradle to Cradle applies the principle of waste equals food; or, in other words, products being eco-effective rather than just efficient. The second principle, use current solar income; promotes the use of renewable energy. And finally, celebrate diversity calls for creativity and variety during product and system development.

The Cradle to Cradle program is developed by the German knowledge centre EPEA (www.epea.com), lead by Prof. Michael Braungart, in conjunction with the American agency MBDC headed by William McDonough. In the Cradle to Cradle program products are evaluated according to five criteria: composition of raw materials, recycling potential, energy use, water management and social fairness.

• Pure raw materials
Mosa tiles do not release any harmful compounds during their useful life and do not damage nature in case of accidental dumping. The main constituents of Mosa tiles are clay and sand, natural raw materials that are present in abundance in nature. Mosa C2C tiles are free of hazardous compounds such as lead, mercury or cadmium – the result of years of R&D in which all the tile ingredients – including our suppliers’ raw material chain- were analysed and classified to ppm (parts per million) level. Very strict leaching tests carried out by independent laboratories were part of this program. The EPEA criteria governing the absence of hazardous compounds are much more stringent than the prevailing environmental legislation.

• 6 to 25% Recycling
Mosa tiles contain solely natural raw materials and can be recycled. The tiles currently contain a percentage of “pre-consumer” recycled material originating from production waste and residual materials from the stone industry: wall tiles contain between 16 and 25 percent of recycled materials, depending on the type of tile, and floor tiles contain between 21 and 45 percent.

Mosa is currently carrying out pilot trials with the waste collection sector to review the feasibility of a tile return system. These trials are limited to the return of used Mosa tiles that are suitable for reuse by virtue of a purity sufficient for eco-effective processing.

• Closed process water cycle
Mosa uses water during various production phases. Reusing water is an essential element of appropriate use of this scarce and expensive resource. The process water is purified in an in-house water treatment plant and the residual sludge is recycled in the tile production process. Since 2010 the cooling water cycle is closed, resulting in a 60% reduction of the total ground water volume to be pumped up.

• 48% reduction of CO2 emissions
Continuous improvement of the production facilities, in combination with the switch to green electricity, generated by hydropower stations, has resulted in a 48% reduction of CO2 emissions per tonne finished product over the last ten years. During the same period the emission of fine dust particles was reduced by 91% to virtually none. The next step is to find more renewable energy sources for the longer term. From mid 2011, the residual heat from the furnaces will be reused in the production process and for heating of the buildings.

• Working and social conditions
Mosa’s ongoing efforts to improve the working environment in its plants have resulted in our working environments being rated as one of the best in the European ceramic tile industry. Mosa implements the local-for-local principle whenever possible, namely production close to the key markets and sourcing of raw materials in the vicinity of the factory. Nearly all raw materials are sourced from controlled quarries in Holland, Germany and France, within a 500 kilometre radius from Maastricht. Mosa requires sustainable exploitation of quarries from material suppliers, plus an environment recovery plan after the exploitation period ends.

Mosa’s ongoing efforts have resulted in the certification of Maastricht by the MKB Waarderingsraad, which classifies Mosa as a green economy company.

Packaging and Transport
All our packaging materials are suitable for recycling. Paper and carton is produced from unbleached, recycled paper which can be reused. For transportation within Europe, “Euro pallets” which are part of a pallet recycling system are used. All goods supplied to the USA are packed on heat treated pallets. Moreover, only trucks equipped with soot filters are allowed on the Mosa premises.

Green Buildings, LEED and BREEAM
Mosa tiles are very durable, chemically inert and have a technical lifetime of hundreds of years without losing their aesthetical appearance. They do not produce fumes or gases and are VOC free. Tiles contribute positively to the indoor climate and energy performance of a building and enhance effectivity of low temperature heating systems. Mosa products can help win projects sustainable building labels such as LEED and BREEAM. For up to date information on credit opportunities, please refer to the Mosa website: www.mosa.nl/sustainability
Compilation and verification process
The LCA and EPD are conducted with Tebodin according to the ISO 14040-ISO 14044 standards for LCA. The LCA is verified externally by IVAM University of Amsterdam, The Netherlands. The characterisation data used are from the EPD (2008) method, version 1.03, published in the document *Introduction, intended uses and key programme elements for the Environmental Product Declarations, EPD*, dated 29-02-2008.

References
ISO 14025: Environmental labels and declarations - Type III environmental declarations.

Liability
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