

# MOSO<sup>®</sup> Bamboo Products

*Mastering green*



*Harvested after  
only 5 years*



*Locks enormous  
amounts of CO<sub>2</sub>*





Bamboo: the fastest growing plant in the world

# MOSO® Mastering Bamboo

MOSO® **develops** and **creates** bamboo products for **indoor** and **outdoor** applications that meet the **highest technical requirements** and **quality** standards, enhance the **beauty** of applications and are made from the **sustainable**, renewable resource: Moso bamboo.

With more than **25 years of experience** in the bamboo industry, MOSO® has learned to manage the production process to **perfection**. Bamboo is one of the **fastest growing** plants on earth. Although giant bamboo is formally not a wood, rather a **grass**, it has **excellent** hardwood like characteristics. Discover the **benefits** that **MOSO® Bamboo Products** can offer in your project. Follow the bamboo footprints!



Building material of the future



More information about bamboo is available in the book "Booming Bamboo - the (re-)discovery of a sustainable material with endless possibilities" at:  
▶ [www.boomingbamboo.com](http://www.boomingbamboo.com) or request MOSO® for a copy.

## Table of contents

MOSO® <b>Bamboo</b> Footprint	4
Moso <b>bamboo</b> Growth phase	6
MOSO® <b>Bamboo</b> Production phase	8
Benefits	11
MOSO® <b>Bamboo</b> Use phase	12
Contribution	13
MOSO® <b>Bamboo</b> End-of-life-phase	14
Looking ahead	15

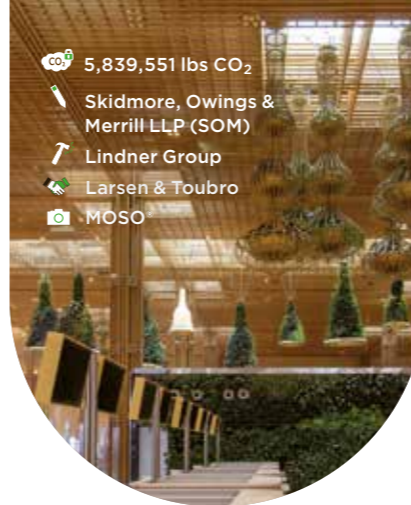


811,010 lbs CO<sub>2</sub>  
Zaha Hadid Architects  
Hufton+Crow

**CityLife Shopping District - Podium Zaha Hadid**  
LEED Gold - (107,640 ft<sup>2</sup> + 229,659 ft<sup>2</sup>) Milan, Italy

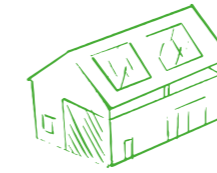
288,794 lbs CO<sub>2</sub>  
Brenac & Gonzalez et Associés  
MOSO

# MOSO® Bamboo Footprint



CO<sub>2</sub> 5,839,551 lbs CO<sub>2</sub>  
 Skidmore, Owings & Merrill LLP (SOM)  
 Lindner Group  
 Larsen & Toubro  
 MOSO

**Kempegowda International Airport**  
 LEED Platinum  
 (3,280,840 ft<sup>2</sup>) Bengaluru, India

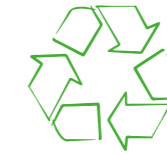


To determine the environmental impact of a product, every phase of the life cycle should be taken into account. MOSO® Bamboo Products offer clear sustainability advantages in each phase. During growth Moso bamboo absorbs enormous amounts of CO<sub>2</sub> in the forest and in the biomass. As long as the MOSO® Bamboo Products are in use, they act as enormous carbon stores. The inclusion of MOSO® Bamboo Products contributes to a higher LEED and SITES certification score for green building projects. That's one of the reasons why you can find MOSO® Bamboo Products referenced in many sustainable projects all over the world.

## Use Phase

**Environmentally sound, highly durable**

- Durable = Sustainable: because of the hardness, high density and stability, MOSO® Bamboo Products last very long (less replacement) even in demanding environments.
- Proven Quality: MOSO® Bamboo Outdoor products achieve the use/risk Class 4 according to EN 335 and are guaranteed up to 25 years.
- Healthy climate: all MOSO® products produce very low VOCs. Rated E0 or E1 in standard air quality tests (covers the board).



## End-of-life phase

**Easy to recycle and reuse**

- MOSO® Bamboo Products fit very well into the Circular Economy concept, within the Biological cycle. MOSO® is currently researching a bio-based glue to make our products 100% compliant with standards like Red-list and Greenguard. [www.inbar.int/bamboo-in-the-circular-economy](http://www.inbar.int/bamboo-in-the-circular-economy)
- MOSO® Bamboo Products offer several options for the second life:
  - If maintained well, MOSO® Bamboo Products may be reused in similar applications (upcycling, e.g. through the use of demountable systems). If this is not possible, MOSO® products may be safely used as input material for the chipboard industry (downcycling).
  - If up- or downcycling is not possible, it is recommended to use the bamboo material as sustainable substitute for fossil fuels in a biomass energy plant for the production of green energy.

## Growth phase

**Fastest growing plant on earth, sustainability managed**

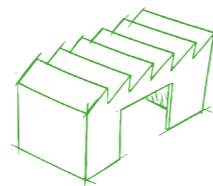


- Made from the extremely rapidly renewable giant bamboo species "Moso", renowned for its CO<sub>2</sub> absorbing and O<sub>2</sub> producing capacity.
- Abundantly available in China (approx. 7 Mha) and always sourced from sustainably managed forests and plantations.
- The Moso bamboo plant consists of multiple stems. As a result, several stems may be harvested each year without killing the mother plant.
- MOSO® Bamboo Products are available with an FSC® certification.



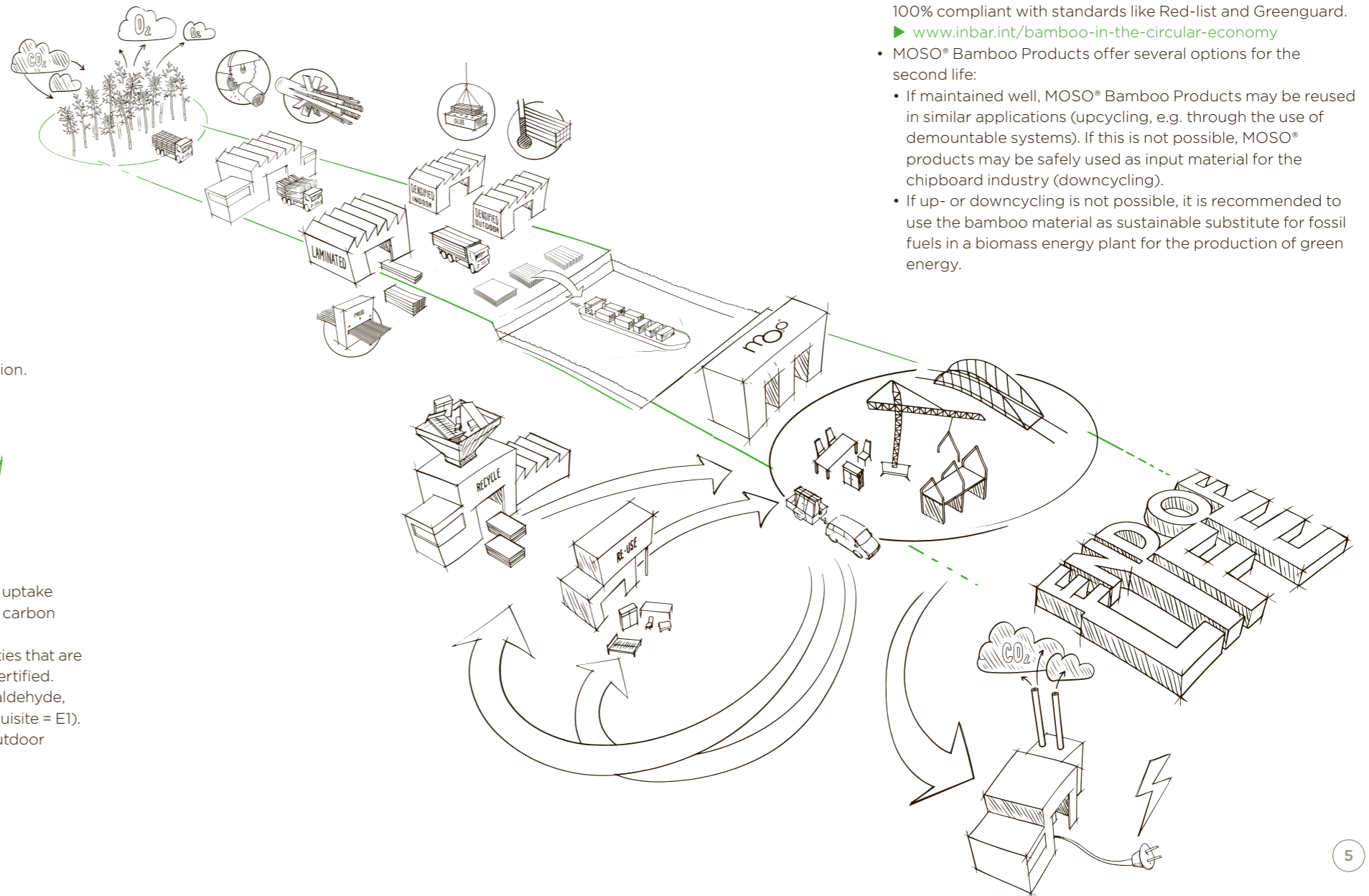
## Production phase

**Responsible production**



- CO<sub>2</sub> emissions during production are lower than carbon uptake during growth\*. This makes MOSO® Bamboo Products a carbon store during use.
- MOSO® Bamboo Products are made in production facilities that are ISO 9001 and ISO 14001 (important quality standards) certified.
- Optional: use of low emissions glue with no added formaldehyde, complying with the strictest emissions norm: E0 (EU requisite = E1).
- MOSO® is developing a bio-based glue for indoor and outdoor MOSO® Bamboo Products.

\*) Excluding MOSO® Bamboo N-durance®



# Moso bamboo

## Growth phase

### Bamboo: wood, plant, grass?

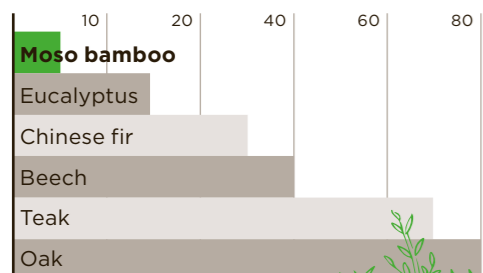
From a botanical point of view, bamboo belongs to the grasses and is therefore not a tree. Bamboo is a collective name for a group of botanical species. Although the complete taxonomy is still evolving, current estimations are that around 1600 different varieties exist. There are considerable differences in size, color, mechanical properties and climatic preferences between species. The Moso bamboo species is native to China and other Asian countries and grows up to 65ft tall, with a diameter of 4-6 inches.

### Unsurpassed growing speed

#### Bamboo: the fastest growing plant in the world

Because of the fast growth, Moso bamboo is managed as an agricultural crop. The annual harvest of the 4 to 5-year-old stems provides a steady annual income to farmers and stimulates the bamboo plant to reproduce even faster. Therefore, by default, no deforestation occurs with production of MOSO® Bamboo Products, while large amounts of CO<sub>2</sub> are captured in the bamboo forests and products.

Harvesting age (years)

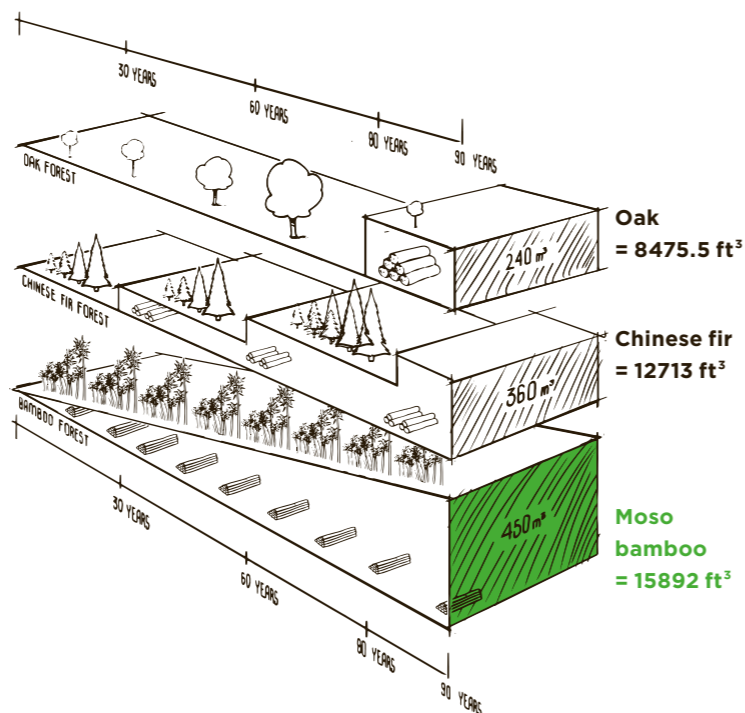


### Forest production per 2.5 acres

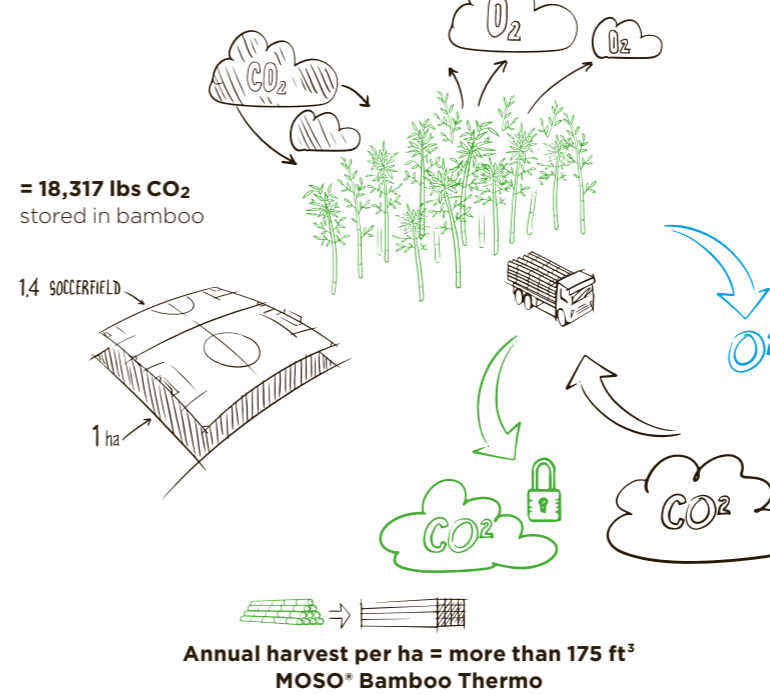
#### Bamboo forest stays intact, no deforestation

A large difference with wood production forests is that a bamboo forest stays intact after stems are harvested due to the underground rhizome system and multiple bamboo stems that sprout from the mother plant. That means that each year about 20-25% of the mature bamboo stems can be harvested (similar to, or much like mowing your lawn), which stimulates new growth of bamboo and leads to a maximum annual yield. In contrast, wood production forests are often harvested in rotation cycles, where a large amount of wood becomes available at once, which takes considerably longer (up to 80 years). After harvesting, a large amount of wood is available for processing. In a bamboo forest, there is a constant supply of material on a yearly basis due to this fundamental difference of forest management and characteristics.

Forest production per 2.5 acres of land (more than 107,000 sq ft)

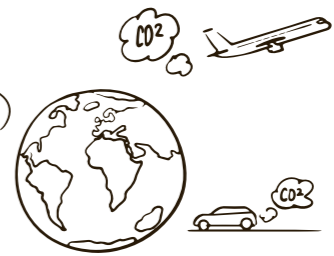


Harvesting after 1 year per 2.5 acres



For example, when Moso bamboo is grown on roughly 2.5 acres of land (more than 107,000 sq ft) for a year, it yields just over 175 ft<sup>3</sup> of bamboo material. 175 ft<sup>3</sup> of MOSO® Bamboo Thermo can capture and store 18,317 lbs of carbon dioxide (CO<sub>2</sub>). To put this in perspective, this is equivalent to the CO<sub>2</sub> emitted by an average passenger vehicle driving 20771 miles. (1.74 trips around the world!)

**= 13,228 lbs O<sub>2</sub> produced**  
**= About 21 years of oxygen for one person's breathing needs.**



**= Almost 6 round trips** from San Francisco (SFO) to New York (JFK) by airplane.

**= 20,771 miles** driven by an average 4 cyl car.  
**= 1.7 trips** around the world!

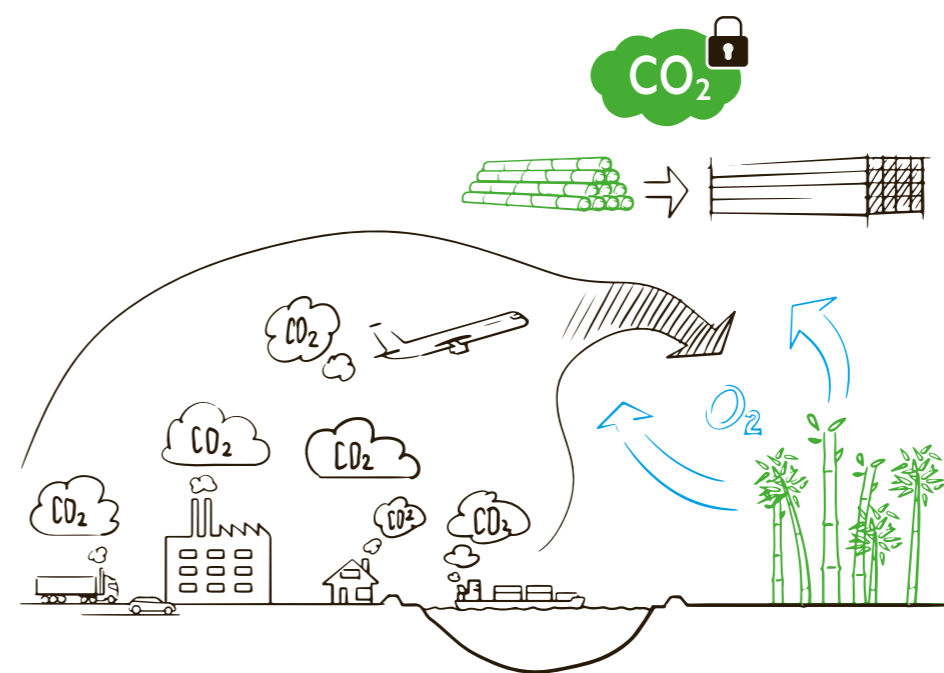
### Carbon storage in bamboo

#### Biobased materials act as CO<sub>2</sub> sinks

Through photosynthesis, plants absorb carbon dioxide (CO<sub>2</sub>) and convert it into glucose (building block for biomass) and oxygen. The CO<sub>2</sub> is stored in the material for the lifetime of the product, and even longer if the product is recycled into new, durable products. **Due to the fast growth - and related high yields - Moso bamboo locks far more CO<sub>2</sub> in durable products compared to most wood species.** The combined carbon reduction potential of a giant bamboo production forest in the ecosystem (soil, roots, plant) and the durable products that come from the harvest, can absorb up to 1000 tons CO<sub>2</sub> per hectare.

► [www.inbar.int/understanding-bamboos-climate-change-potential](http://www.inbar.int/understanding-bamboos-climate-change-potential)

The CO<sub>2</sub> emissions, bamboo absorption & carbon storage

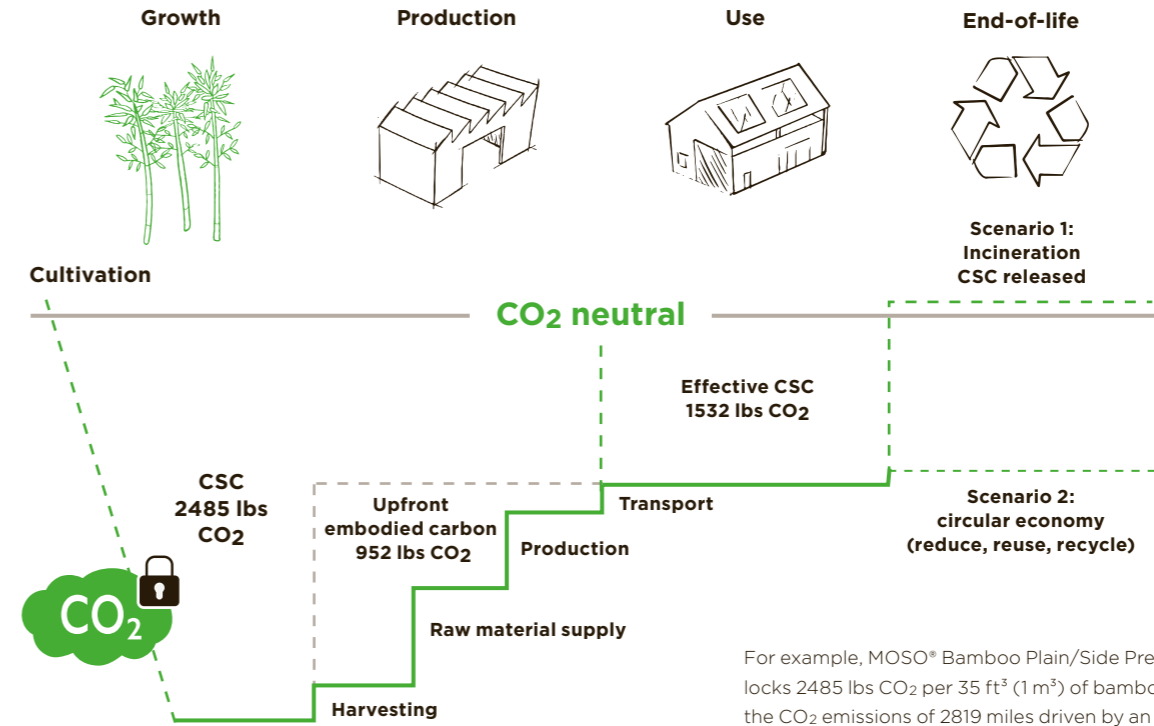
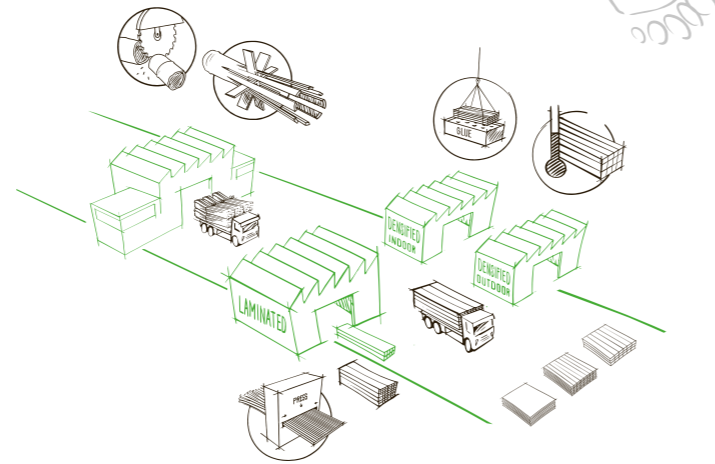


**Bamboo growth speed = more than 3 ft a day!**



# MOSO® Bamboo Production phase

Transforming a hollow bamboo stem into a high quality MOSO® product – how is it done? With more than 25 years of experience in the bamboo industry, MOSO® has learned to manage the production process to perfection.



For example, MOSO® Bamboo Plain/Side Pressed (laminated bamboo) locks 2485 lbs CO<sub>2</sub> per 35 ft<sup>3</sup> (1 m<sup>3</sup>) of bamboo, which is the equivalent of the CO<sub>2</sub> emissions of 2819 miles driven by an average passenger vehicle.

## Carbon Footprint

### MOSO® Bamboo Products environmental studies

MOSO® has conducted several LCA studies, including carbon footprint studies together with Delft University of Technology (TU Delft) and NIBE (LCA experts). The 2015 LCA report, was the first of its kind and resulted in many new findings about the carbon footprint of bamboo products. The environmental impact of MOSO® Bamboo Products, excluding the carbon sequestration effect, has also been published in 2016 and updated in 2022 in an official Environmental Product Declaration (EPD) following EN 15804 ([www.moso-bamboo-outdoor.com/bamboo/sustainability](http://www.moso-bamboo-outdoor.com/bamboo/sustainability)). The results show that the carbon footprint of MOSO® Bamboo Products\* during production is lower compared to carbon stored during growth.

\*) Excluding MOSO® Bamboo N-durance®

## Construction Stored Carbon (CSC)

### MOSO® Bamboo Products act as a carbon store

All plants, algae and certain organisms, including Moso Bamboo, undergo a process known as photosynthesis in which carbon is stored in the material throughout its useful life. The locked amount of CO<sub>2</sub> can be calculated rather simply by looking at the density of the material and taking into account the biobased content (biogenic carbon - EN 16449). Since bamboo is so dense, it stores high amounts of carbon throughout the product life cycle. Although this carbon storage is a huge benefit for biobased materials, this carbon storage is not (yet) taken into account in whole life carbon assessments as it is assumed that within 100 years the biobased material will be discarded (decay) or incinerated. However, based on circular economy principles and applied in the built environment in long-lasting applications this carbon storage - also known as Construction Stored Carbon (CSC) - may be perceived as semi-permanent and under certain conditions is even eligible for voluntary carbon credit systems.

For more information check out the Construction Stored Carbon methodology of NGO Climate Cleanup, which includes MOSO® Bamboo Products in their database:

[www.climatecleanup.org/constructionstoredcarbon](http://www.climatecleanup.org/constructionstoredcarbon)

For various MOSO® projects the amount of CSC has been calculated, see the examples in this booklet with the icon of a cloud of CO<sub>2</sub> with a lock.

## Sustainable production

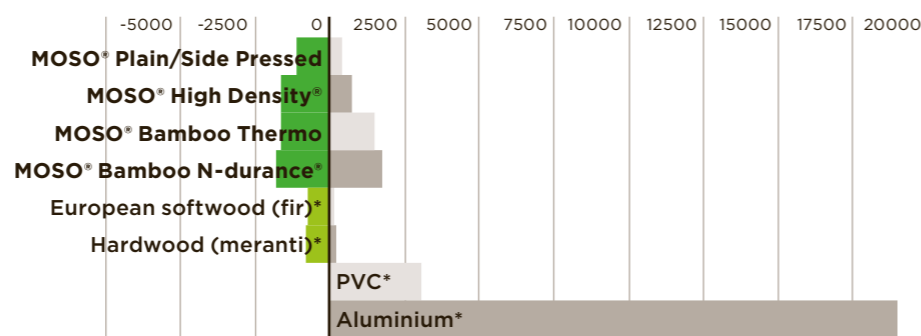
### From bamboo plant to product

The fast growth and abundant availability make bamboo a rapidly renewable resource, and a perfect material for many building applications. With good reason, it's often called 'the building material of the future'. However, bamboo as a raw material cannot be used outdoors without a protective treatment. Due to its high "sugar content", bamboo is more susceptible to being attacked by micro-organisms and fungi, which is relevant for outdoor applications. Let us explain how we get from the raw bamboo material to the final product.

### Bamboo stem to strip

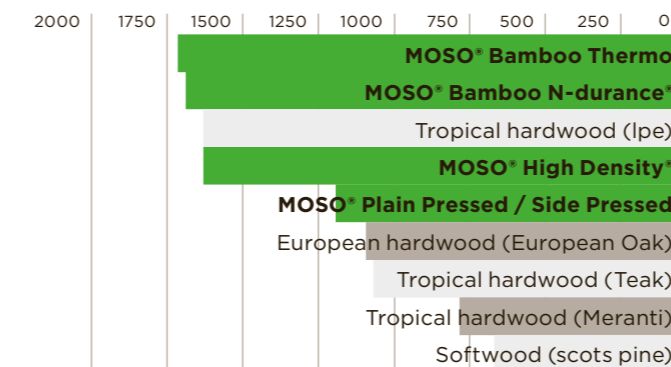
The first step in the production phase is getting from the hollow bamboo stem to a material that can be further utilized. To do so, the stems are split lengthwise into strips (much like how fries are made) and the outer skin (bark) is removed. The untreated strips have a yellowish color (Natural) but can be lightly steamed, reducing the yellowish tone (Ecru) or more intensely steamed for a warm brown color (Caramel). After treating and drying, the strips are ready to be joined in several ways to make the final product.

CO<sub>2</sub> storage vs. CO<sub>2</sub> emissions during production and transport

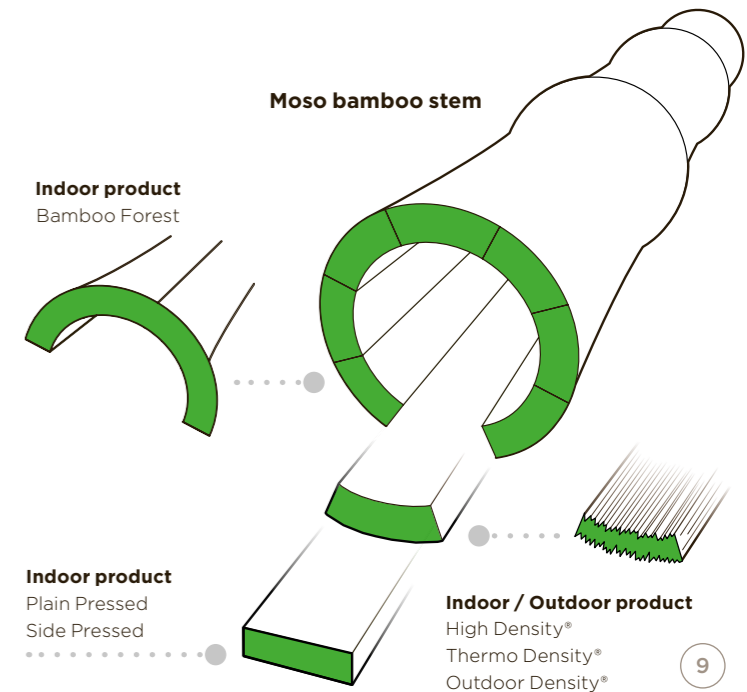


in kg CO<sub>2</sub> eq/m<sup>3</sup> material  
\*) Data abiotic materials from Idemat database TU Delft (industry averages).

Construction Stored Carbon (CSC)



In kg CO<sub>2</sub> eq/m<sup>3</sup> product



# MOSO® Bamboo+

## Benefits

### Strip to indoor product

Indoor products come in different variations. For Plain Pressed, the bamboo strips are positioned horizontally and glued together. For Side Pressed, the strips are positioned vertically and glued. Flexbamboo uses a flexible fabric backing to connect wide bamboo strips. High Density® involves crushing the strips into strands and gluing them under high pressure. Bamboo Forest flattens the bamboo stem through a special process to create the top layer of a solid bamboo board.

### Strip to outdoor product

To create outdoor products several additional steps are essential. The strips are crushed using a number of incision rollers which create cross linked strands. The untreated strands are a light yellow color. By modifying the bamboo strands with a special Thermo-Density® (Thermo) or Outdoor-Density® (N-durance®) process, the dimensional stability of bamboo is improved by about 50%. The heat-treatment at 392F (Thermo) or steam-pressure treatment at 284F (N-durance®) provides the highest durability class possible: Class 1 following EN 350.

### Colors of MOSO® Bamboo Products

Bamboo's original, natural color is light brown with a yellowish tint. By treating bamboo with steam, the light brown color becomes more intense and the yellow shade disappears, we call this Ecru. By increasing the temperature and pressure during the steam treatment, the durability and stability is enhanced and a warm brown color appears, this is called Caramel. The color Tiger was specially developed for panel materials: a mix of light and dark strips. Particularly in the case of outdoor products, the treatment is done at higher temperatures and with more pressure, which makes the bamboo warm or dark brown.

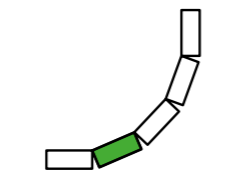
**MOSO® Plain Pressed Ecru & Caramel**  
(Laminated Bamboo)



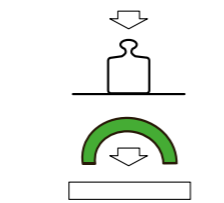
**MOSO® Side Pressed Ecru & Caramel**  
(Laminated Bamboo)



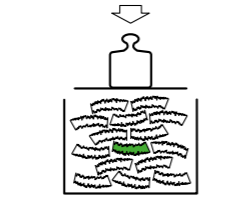
**MOSO® Flexbamboo Caramel**



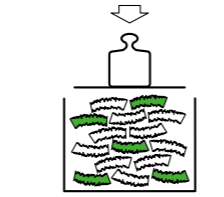
**MOSO® Bamboo Forest**



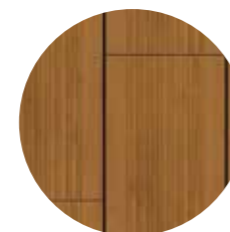
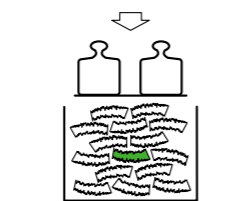
**MOSO® High Density® Natural & Caramel**



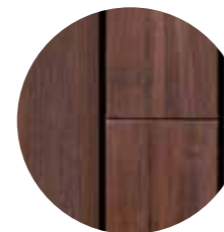
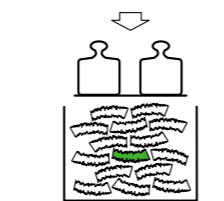
**MOSO® High Density® Natural + Caramel (Tiger)**



**MOSO® Bamboo N-durance®**



**MOSO® Bamboo Thermo**



Bamboo products are hard, stable and extremely versatile in their application. In addition to their natural beauty, there are many durability and sustainability benefits. These advantages are backed up by a warranty of up to 25 years. The properties of bamboo are equivalent or even superior to those of most hardwood species and other building materials.



#### Endless resource & Stored Carbon

Bamboo is an 'endless' resource. It grows faster than any other plant; up to 3 feet per day! Each year, 4-5 year old stems are harvested, providing room for the younger bamboo to grow to maturity. During growth, Moso bamboo absorbs more CO<sub>2</sub> than is released during production. As long as the MOSO® Bamboo Products are in use, they can act as a temporary carbon store (Construction Stored Carbon).



#### Natural beauty

The most striking feature of MOSO® Bamboo Products is certainly its natural beauty. The beautiful natural grain gives bamboo a distinct design appearance. Combined with the vast choice of different styles, configurations and colors, there is always a MOSO® Bamboo Product available which will match your preferences.



#### Hard & durable

Bamboo, after processing, is very hard and durable. This means MOSO® Bamboo Flooring and decking can be used in heavy duty applications, where conditions such as high-traffic are expected. Because of the incredible density, several products are more than suitable for being used outdoors.



#### High stability

Due to the composition of individual strips, bamboo will shrink and swell less than most solid wood species, providing a very stable solution. For outdoor use this is enhanced through the Thermo-Density® or Outdoor-Density® process. This allows for unique creations and intriguing solutions to be developed.



#### Healthy

MOSO® Bamboo Products are also a healthy choice as they are antistatic and hypoallergenic. Furthermore, they have very low emissions of harmful VOCs (Volatile Organic Compounds).



#### Fire resistant

MOSO® Bamboo Products fulfill stringent fire safety requirements and MOSO® has tested almost the full range of bamboo products. High Density® products even reach fire resistance Class A (ASTM E2768) without use of fire retardants.



#### Vast choice

With a growing portfolio of outdoor and indoor products, MOSO® has a bamboo product to suit every need. Whether for commercial, residential, or industrial use, MOSO® offers a wide range of solutions, along with the knowledge and expertise of our team to help you find the perfect fit.

► [www.moso-bamboo.com/project-support-us](http://www.moso-bamboo.com/project-support-us)

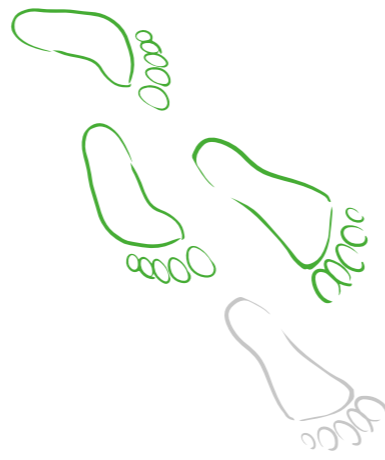


#### Up to 25 years guarantee

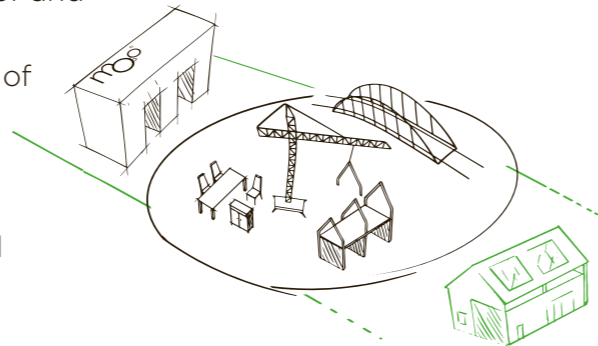
Developing the best bamboo product is only possible through continuous attention for each detail during production. MOSO® Bamboo Products are of the highest quality and come with a product guarantee of up to 25 years.



# MOSO® Bamboo Use phase



MOSO® develops and creates bamboo products for indoor and outdoor applications that meet the highest technical requirements and quality standards, enhance the beauty of projects, and are made for a long-lasting life in several demanding applications. In the US, MOSO® Bamboo Products can be divided into three product groups: MOSO® Bamboo Outdoor, MOSO® Bamboo Flooring, and MOSO® Bamboo Industrial.



## Durable = Sustainable

Durability is an important yet often overlooked aspect of sustainability. The longer the lifetime of product, the lower the environmental impact will be, simply because it will take longer before you need to replace it. Durability depends highly on the quality and characteristics (such as hardness, density, stability, etc) of the product. MOSO® Products score very high on all these factors making the product very durable.

this. Several MOSO® products even comply with the strictest level: E0 – no formaldehyde emission detectable. Healthy climate: all MOSO® products produce very low VOCs. Rated E0 or E1 in standard air quality tests (covers the board).

## Environmentally sound

A healthy indoor climate is important. In Europe and the USA there are very strict rules and norms regarding indoor emissions of Volatile Organic Compounds (VOCs). In Europe the emission of formaldehyde is regulated in the EN717-1 norm. The maximum tolerated level is called E1 and all MOSO® products comply with

## Certifications

The sustainability, safety and quality of MOSO® Bamboo Products is independently proven by the most respected testing facilities in the industry. In the US, MOSO® Bamboo Thermo and MOSO® Bamboo N-durance® Decking meets and exceeds AC-174 code compliance standards. Decking and cladding are Class A fire rated (ASTM E84 & ASTM E2768) and CSFM certified for WUI zones. The use of MOSO® materials can make a major contribution to LEED credits.

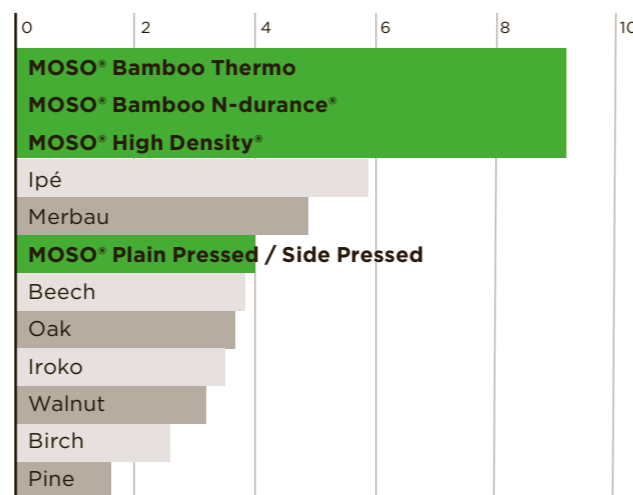
## Moso International Headquarters

(11840 ft²) Netherlands



40,313 lbs CO<sub>2</sub>  
Landmark Vastgoed Management BV  
Hans Gorter

## Average Brinell hardness



# MOSO® Bamboo Green contribution

MOSO® Bamboo Products offer clear sustainable advantages. The inclusion of MOSO® Bamboo Products positively contribute to higher LEED and SITES credits for green building projects. It is one of the many reasons MOSO® Bamboo Products are referenced in sustainable projects all over the world. Furthermore, MOSO® Bamboo Products are available with an FSC® certification.



LEED BD+C	Contribution	Flooring - UltraDensity*	Outdoor
MR Credit - Building life-cycle impact reduction	direct	yes	yes
MR Credit - Building product disclosure and optimization - environmental product declarations	direct		yes
MR Credit - Building product disclosure and optimization - sourcing of raw materials	direct	yes (if requested with FSC®)	yes (if requested with FSC®)
MR Credit - Building product disclosure and optimization - material ingredients (Reach optimization)	direct	yes	yes
EQ Credit - Low Emitting Materials	direct	yes	
SS Credit - Heat Island Reduction	direct		yes
IN Credit - Innovation	direct	yes (if used in innovative applications or if helps to meet twice the criteria limit)	yes (if used in innovative applications or if helps to meet twice the criteria limit)
EQ Credit - Interior Lighting	indirect	yes	

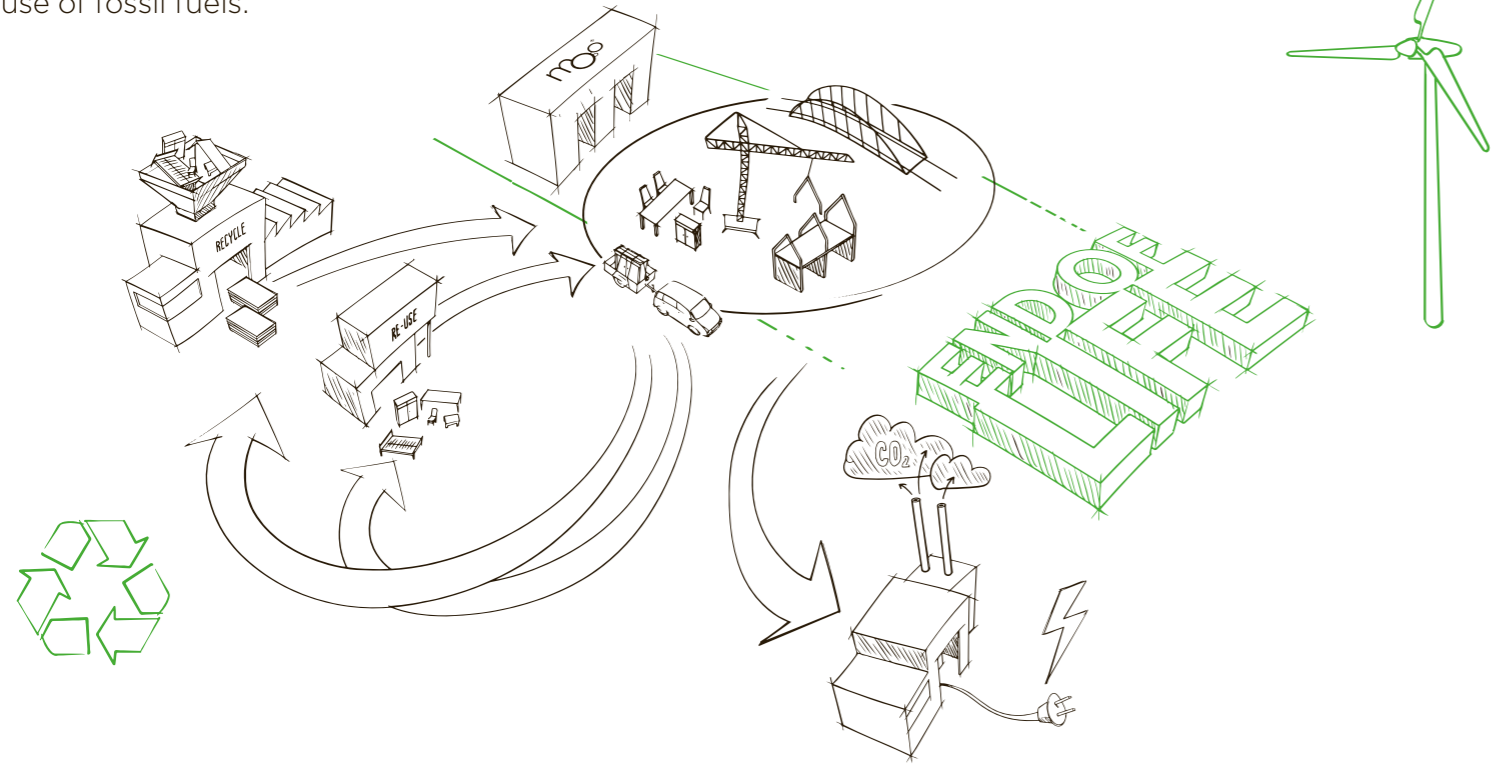


## LEED & SITES

LEED & SITES are prominent certification systems that focus on sustainability and environmental performance in the built environment. Each of these systems has its own unique approach and criteria, but they share a common goal: to promote more sustainable and healthier buildings. LEED and SITES both focus on the environmental impacts building materials have in their respective application.

# MOSO® Bamboo End-of-life phase

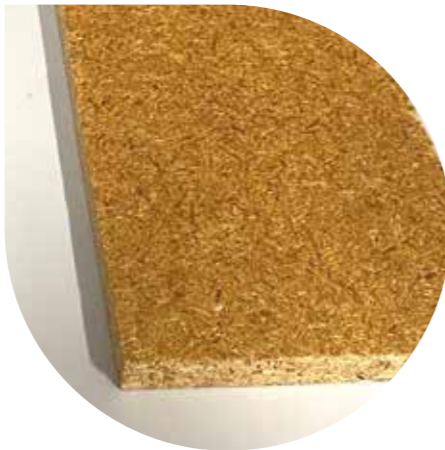
Of course we hope MOSO® Bamboo Products will be enjoyed for many years, but there will come a time when they have reached the end of their life cycle. At that moment, another characteristic of bamboo will become important: it is easily recycled, for example, as resource to make chipboard, as bamboo is assessed as category B waste wood (same as painted or treated lumber). However, we prefer the reuse of MOSO® materials in similar applications (upcycling), for example, facilitated by the use of demountable facade systems such as GRAD® for MOSO® Bamboo Thermo Cladding. As a last resort, bamboo may be burned in biomass energy plants, creating green electricity, replacing the use of fossil fuels.



**Bamboo chips**



**Bamboo chipboard**

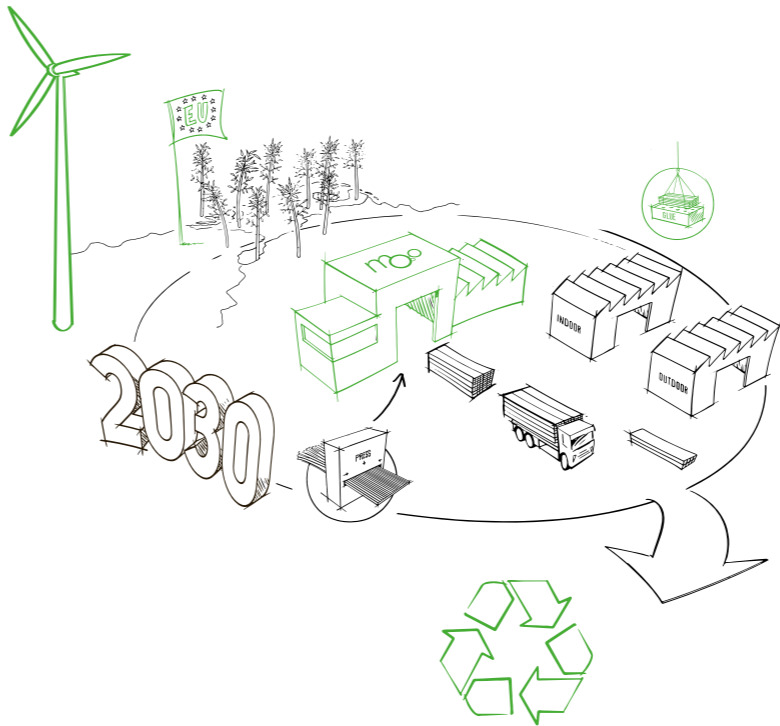


**Demountable clip-system**  
GRAD® system for MOSO® Bamboo Thermo Cladding



# MOSO® Bamboo Looking ahead

To be good stewards of our planet, we need radical change to include biobased construction, moving away from our current linear, largely fossil-based building economy. During this transition, MOSO® Bamboo Products and advanced mass timber products complement one another, providing a viable alternative to abiotic materials like concrete, metals, and plastics.



## Reducing our carbon footprint

In addition to seeking out new alliances with the timber industry, MOSO® continues to search for ways to reduce the carbon emissions. We have pinpointed four key elements for reducing the carbon footprint and increase the circularity of our engineered bamboo products even further in the coming years:

- 1 Developing biobased, non-toxic glue alternatives.
- 2 Lowering the transportation distance, e.g. in developing products made from European bamboo in collaboration with BambooLogic.
- 3 Recycling and reusing engineered bamboo products from donor buildings that were designed for disassembly.
- 4 Utilizing higher energy efficiency and increasing renewable energy content in production facilities.

Bamboo can truly make a significant contribution as we strive to achieve a climate neutral, circular economy.



## Bamboo and wood, partners in biobased construction

In the most sustainable hotel complex in the Netherlands, the Hotel Jakarta by WestCord in Amsterdam (BREEAM Excellent), the structure is made of cross-laminated timber (CLT) and glulam, and all the finishings (floors, walls, ceilings) are done with MOSO® Bamboo Products, representing an integrated approach to biobased construction that can help reduce carbon emissions.

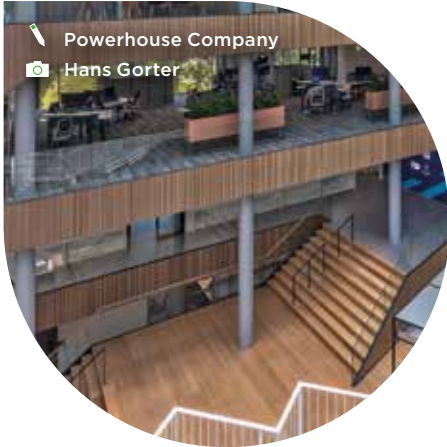
Together with the mass timber supplier for Hotel Jakarta, DERIX, MOSO® is researching the option of developing a CLT panel with bamboo top-layer for future projects.



**Hotel Jakarta Amsterdam** BREEAM Excellent  
(118,758 ft² + 19,030 ft) Netherlands



**ASICS EMEA Headquarters**  
**indoor** LEED Gold + WELL Gold  
 Netherlands



**Roaring Fork Valley outdoor**  
 Decking remains stable and durable in any  
 climate - (1,180sf) Colorado, USA



**Mammoet Jacking Beams**  
**unlimited** Hardwood timbers replaced  
 by sustainable bamboo - Netherlands



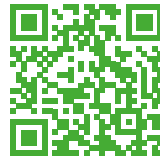
# Green, greener, greenest



**MOSO® North America**

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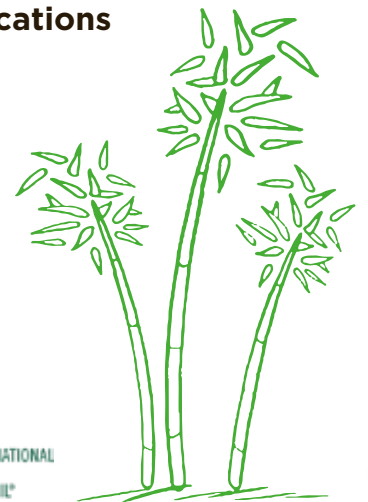
North America:

Headquarters:

**Moso North America HQ**  
 Lansdale PA  
 United States of America  
 T +1 855 343 8444  
[info@moso-bamboo.com](mailto:info@moso-bamboo.com)

**Moso International B.V.**  
 Adam Smithweg 2  
 1689 ZW Zwaag  
 the Netherlands  
 T +31 (0)229 265 732  
[info@moso.eu](mailto:info@moso.eu)

[www.moso-bamboo-outdoor.com](http://www.moso-bamboo-outdoor.com)



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