Bamboo a green building material trade opportunity for Europe and Indonesia

by Ann-Cathrin Joest, February, 2020

Bamboo can play a crucial role in contributing to the European Green Deal, while also encouraging sustainable development between bamboo consumer and producer countries such as in tropical countries.

This paper looks at bamboo as a circular building opportunity, by identifying opportunities and barriers for its integration in the European market but also its value chain. Opportunities relate to an increasing demand for bamboo as building material in Europe and Indonesia. Its mechanical features turn it into a suitable alternative to steel and other construction materials. Barriers relate to underdeveloped value chains, unclear regulations for the utilisation of bamboo and bamboos’ confusing classification as Non-Timber Forest Products. This makes its management, processing, legal sourcing and trade difficult.

This report was written during my five month stay in Indonesia and I could have not written it without the help of professionals in the field, their support and guidance. A special Thanks goes to professionals in the field who provided me insights and guidelines.
Bamboo for greener construction – EU Indonesia

In December, 2019 the European Green Deal was introduced, which sets out how to make Europe the first climate-neutral continent by 2050. The European Green Deal covers all sectors of the economy, notably transport, energy, agriculture, buildings, and industry. As each year nearly 500 million tonnes of construction waste are created in the EU, a transition in the building industry has become one of the key priority areas.

To follow sustainable building principles, materials should remain in the loop at the end of their life cycle or be renewable and regenerative by design. To support the latter, new building designs and the use of renewable resources are being promoted in EU law (i.e. EU Circular Economy Package, EU Construction 2020 strategy, Nearly Zero Energy Buildings).

In Asia and other tropical regions, bamboo is frequently used as green building material for structural support, flooring and particle boards. Due to bamboo's strength properties and rapid growth (5 years to mature), it is promoted as a sustainable supplement to steel and alternative to timber. It can be harvested without the need to replant, because the root system is left intact when it is harvested. At the same time, its root structure has the ability to hold the soil in place and prevent erosion.

In comparison to other crops such as palm or even cotton, bamboo does not need fertilizer or pesticides. Bamboo rejuvenates the soil, feeding nutrients back and therefore can be used for restoration of wasted and exhausted soils. Bamboo does not need to be rooted up, the plant itself will exist for 100 years, while palm needs to be rooted up after 20 years with the whole plantation needing to be replanted.
Construcing with bamboo in Indonesia

In Indonesia, bamboo poles are widely used for constructions and as an earthquake resistant building material. It is favoured for its strength and is used for entire structural building support or for parts of it (see left image below). Due to bamboo's tensile strength, it is less likely to break during earthquakes than buildings built with concrete and steel. Next to the bamboo poles, bamboo boards are frequently used for walls and flooring (see image to the right).

A benefit of using bamboo poles and semi processed bamboo for construction purposes is that finite materials such as steels can be largely avoided or replaced. To build with bamboo, **proper treatments** of the poles and protection from the sun and wet surfaces is a **pre-requisite for material longevity**.

Constructing with bamboo poles in Europe

While bamboo structures are found frequently across Indonesia, these type of bamboo structures are less present in European countries, where major building materials are built with steel and concrete. Bamboo could be used to replace these materials such as in the parking garage in Rotterdam, where bamboo is pioneered for structural support.

A pre-request for bamboo utilization in buildings is that bamboo meets the requirements of the local and-or international building codes. Currently, two ISO standards exist for the bamboo as building material; ISO 19624:208- Visual and mechanical sort of bamboo poles applicable for construction and ISO 22157: 2019- Bamboo structures- Determination of physical and mechanical properties of bamboo culms. There are no ISO codes for entire bamboo building structures yet.
Engineered bamboo

Bamboo can also be transformed into a value added product by engineering it such as into engineered sawn wood, also known as lumber, veneers, plywood and bamboo composite materials. Due to bamboo's fibrous structure, which gives it also its strong structure, it is particular efficient if transformed into beans, lumber and boards. Strand woven bamboo, which is produced by extracting its fibres and compressing these under extreme pressure, is exceptional strong and durable, almost twice as hard as oak wood flooring.

A barrier for engineered bamboo products is the large proportion of glues that are used for their production. These make it unfit for recycling or up-cycling purposes and appeals less as bio-based and sustainable product. If a bamboo product is engineered while using entirely bio-based components, it fulfils sustainability or circular economy criteria. At the end of its lifecycle it could be up-cycled or used as biomass.

Engineered bamboo applications in Europe

Unlike the use of bamboo poles, engineered bamboo for flooring, walls and ceilings are being used more widely in Europe. It is particular favoured for its strengths properties, material longevity, quick growth and most of all, it's hardwood characteristics. Due to these characteristics, it has been pioneered for its industrial and large scale purposes. Existing examples for the use of engineered bamboo for industrial or large scale constructions are the shopping mall in Milano, Italy, the Airport ceiling in Madrid, but also entire outside and interior applications for industry and household.

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**Bamboo value chain in Indonesia**

**Sourcing**

Bamboo is largely abundant in Indonesia with 160 species, but there are only a few suitable species for construction or engineered products such as the species *Dendrocalamus-Asper*. Most bamboo is growing in community forests or on private land, which averages between one and two hectares. There are currently only a few locations on which bamboo has been planted for commercial use, such as in Ketapang/Air Hitam (Kalimantan) and Jasinga (West Java island) but none of the bamboo planted is being used - at this moment.

**Treatment**

In order to ensure material longevity, bamboo needs to be treated rapidly after harvest. Currently, most of the communities treat bamboo with a simple treatment method knowns as "leaching" through which bamboo is soaked in water to reduce its glucose content for several months. This type of treatment does not make bamboo resistant to insects in the long term.

More commercial treatments include "borax" treatment. This consists of a natural salt mineral solution. This type of treatment is used by IBUKU in Bali and removes the natural sugars of the bamboo, which makes it unattractive to fungi. While the use of borax is efficient and ecological, its excess exposure into the environment can have a toxic effect on vegetation. Closed loop system, allow waste waters to remain in the loop.

**Processing and marketing**

Most of the bamboo is processed in rural areas, where it is then brought to a customer. It appears that there are currently only a few medium sized companies that produce engineered bamboo with many artisan that produce engineered products on construction project base – made for order. Most small and medium enterprises (SMEs) use Instagram to "unofficially" promote and sell their product.

One study describes that the disadvantage with bamboo in Indonesia is its consideration as cheap material as it sells around Rp 7,000 (50cent) per pole. Bamboo products with more added value such as bamboo handicrafts and kitchen utensils appear to fully contribute to the monthly income (minimum wage). Farmers, however, receive the lowest profit and therefore do not have a large incentive for its proper management. Key barriers are the lack of bamboo management knowledge, entrepreneurial skills and English speaking ability.
Bamboo, a valuable commodity

In 2017, Asia remained the largest exporter of bamboo and rattan products: the export value of bamboo and rattan products from Asia accounted for 88 per cent of the global total and averaged USD 1.5 billion in 2017. The **EU is the largest importer of bamboo products, with an import value of USD 536 million in 2017.** At the same time, the EU is also the second largest exporter of bamboo products with an export value of USD 153 million in 2017, roughly equivalent to 9 per cent of the total. The EU is largely sourcing raw materials and intermediate bamboo products from Asia and turns these into high value-added finished products for export. Most exported bamboo product include **industrialised bamboo products** (21%) and woven bamboo products (22%) on a global scale (INBAR, 2017).

![Figure 1. Global export of bamboo and rattan products in 2017](image)

Bamboo could provide a valuable market opportunity next to other commodities such as Palm Oil and Tropical Timber in Indonesia. It is difficult to compare these sectors strictly, as the supply chain and the regulations of these commodities differ. The table below provides an average summary of the job magnitude per sector, hectares utilized for growth and the total value per commodity exported to the EU (mostly from Indonesia). The numbers do not represent the full potential of certain commodities such as bamboo in Indonesia, as the bamboo market is more established in other tropical regions. The numbers also vary per value added product.

<table>
<thead>
<tr>
<th>Forest Cover</th>
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<tbody>
<tr>
<td><strong>Total Forest cover in Indonesia/ha</strong></td>
<td>91 million ha</td>
</tr>
<tr>
<td><strong>Total bamboo cover in Indonesia/ha</strong></td>
<td>2.1 million ha</td>
</tr>
<tr>
<td><strong>Total bamboo in Indonesian forest</strong></td>
<td>700,000 ha</td>
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</tbody>
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<table>
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<tr>
<th>Estimates/Commodity</th>
<th>Bamboo 2017</th>
<th>PO 2018</th>
<th>Tropical Timber 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs</td>
<td>Indonesia/ (globally 20 mil.)</td>
<td>3.7 million</td>
<td>7800.000</td>
</tr>
<tr>
<td>Hectares used for production</td>
<td>1.4 million hectares within garden/farm property. 1-2 ha per household.</td>
<td>14.3 million, mainly in plantations</td>
<td>57.7 million hectare are recognized as production forest</td>
</tr>
<tr>
<td>EU import value in Euros</td>
<td>63 558 (Indonesia) / 1.5 billion from Asia</td>
<td>2.2 billion</td>
<td>1 billion (2015)</td>
</tr>
</tbody>
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![Figure 3. Major exporters and importers of bamboo and rattan products in 2017 (Unit: USD million)](image)
Bamboo and legality

While the bamboo market could be promoted to enhance sustainable development in the producer country, the cultivation and processing should be regulated and conform to certain legality standards in Indonesia. This is important in order for bamboo products to align with sustainability criteria laid out treaties and trade policies of importing countries such as in the European Union. For bamboo, these standards appear weak in Indonesian regulations, where it is classified as Non-Timber –Forest Product (NTFP). Legality standards mainly apply for bamboo value added products that are similar to timber products.

Forestry regulations in Indonesia

In Indonesia, forest areas are divided into conservation, protection and production forest (Hutan Produksi). The vast majority of the production forests are owned by the state, but directly managed by private corporations and institutions based on forest concessions. Any entity that intends to engage in timber production, whether in natural or plantation forests with production function must possess permits to cultivate, process and market timber products. This does not apply to private forest (hutan hak) and community forests.

In order to trade timber to markets outside of Indonesia, timber needs to be certified for its legality under the Indonesian Timber Legality System (SVLK). The EU is neutral with respect to the content of a legality definition, but expects a partner country to frame a definition around the three pillars of sustainable development – economic, social and environmental. Timber legality needs to verify that wood products conform to national laws. But, countries take their own approaches in choosing how to consider and define legality.

To ensure that legal timber and their products enter the EU, the EU and Indonesia formed a legally binding trade agreement known as the Voluntary Partnership Agreement (VPA). Under this agreement EU Forest Law Enforcement, Governance and Trade Action Plan (FLEGT) licenses are issued to confirm the legality of timber products. The VPA recognizes SVLK as a national certification system and can issue FLEGT (V-licenses) once SVLK certified.

In Indonesia, more than 20 independent private companies called Conformity Assessment Bodies verify compliance. These operate under ISO rules and need accreditation by Indonesia’s independent National Accreditation Committee. Overall oversight remains the responsibility of the government.

Bamboo, which falls into the category of a NTFP, does not need to be verified for its legality under Indonesian and international law. However, engineered bamboo products must be verified for their legality and technical specifications for construction products under the same scheme as timber. To enter the EU market, bamboo products need to align with the requirements set out in Harmonised System codes (HS) that are applicable to wood and articles of wood; HS: 440921 for bamboo flooring and HS 441210 for bamboo plywood.

While recognized as timber product, bamboo is not recognized as timber in Indonesian forestry law. However, in the new regulation of the Minister of Environment and
Forestry of the Republic of Indonesia Number p.62&MENLHK/SETJEN/KUm.1/10/2019 regarding Timber Forest Development, bamboo can be cultivated for the supply of industrial raw materials such as carpentry (article 15). Bamboo should remain a minor crop.

Because bamboo is not officially recognized as timber product and weakly promoted in production forest, there is a limited supply of legal bamboo. Most of the bamboo is cultivated and processed in private land and community forests. Landowners of private forest or community forests are not required to obtain a SVLK certificate. Instead, another Supplier Verification form (Dokumen Kesesuaian Pemasok-DKP) is considered as legal evidence adhering to SVLK.

It therefore appears difficult to verify the legality of bamboo and its compliance with existing legality schemes, as different regulations apply to bamboo cultivated and processed inside and outside of production forests, or on private land. Bamboo however, holds potential to be planted on degraded land, which was estimated to be around 24 million hectare in 2018. It would be important to verify that land has been degraded prior to planting to avoid conversion of biodiversity rich forests into bamboo plantations for commercial purposes. Just like with palm oil, could we use degraded land that has been no forest after 2008?

In the light of sustainable development, bamboo provides a unique opportunity as building material, for which an existing European demand and material standards exist. Challenges remain in the development of the Indonesian bamboo market and bamboos' missing recognition as "bamboo timber" in production forests. This missing recognition and bamboos' vast growth on private land or community forest makes it difficult to be SVLK certified.

However, bamboo provides a valuable income opportunity and it also provides vital ecosystem services by storing carbon and water, by being efficient in restoring degraded land and by being able to regrow by itself. While there are currently lacking bamboo resources, bamboo could be used to restore degraded land or be integrated more into existing agro-forestry schemes, or in other areas with unproductive land.

In order to ensure the legality of bamboo products, bamboo should be integrated into the existing SVLK scheme, while considering legality schemes for bamboo grown on private and community lands. The latter is particular important as it allows rural communities to engage in international supply chains. Bamboo, which is growing on all islands could provide a valuable source of income. In addition, markets need to be developed, the right species selected, communities need to be educated and products need to meet legality standards.

Conclusion

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References


Eurostat (2019). Tropical wood imports to the EU.


PERATURAN MENTERI LINGKUNGAN HIDUP DAN KEHUTANAN REPUBLIK INDONESIA NOMOR P.62/MENLHK/SETJEN/KUM.1/10/2019 TENTANG PEMBANGUNAN HUTAN TANAMAN INDUSTRI


+ Interviews with professionals in the field