

bamboo for disaster relief

disaster strikes

In disaster prone areas, bamboo holds great potential for both temporary and long-term shelter. When shelter is needed as an immediate response to sudden crisis, bamboo structures are appropriate since they can be cheaply and quickly constructed as well as easily transported. Since bamboo frequently grows in climates and regions susceptible to hurricanes, typhoons, floods and earthquakes, shelters can be constructed on the spot using locally available materials and labor. As permanent shelter, the advantages of using bamboo in disaster-prone areas come from the lightness and flexibility of the material, which give it resilience to collapse and strong winds.

The cost of bamboo shelters can vary greatly depending



A bamboo transitional shelter built with CHF International after the 2006 Yogyakarta earthquake in Indonesia
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on the intended longevity of the building. Temporary shelters may be constructed for low cost, but predictably will be less stable and of lower quality. Bamboo shelter for long-term use will be more expensive and require more time and skilled workers to construct assuming that the quality of the building is comparable to one constructed using conventional materials. The payoff, however, is that the finished home will be more appropriate to the climate and culture.

GREEN MATERIALS TECHNICAL NOTES SERIES

UN-Habitat promotes the use of green building materials within the context of slum upgrading, large scale affordable housing, social housing, and reconstruction in developing countries and emerging economies. UN-Habitat supports the adoption of green materials in mainstream building based on affordability and capacity to uphold the 4 dimensions of sustainability. UN-Habitat also encourages governmental support for alternative building materials, which may include adaptations to building codes and providing subsidies.

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Information adapted from "Going Green: A Handbook of Sustainable Housing Practices in Developing Countries". 2012 UN-Habitat: Nairobi

International Network for Bamboo and Rattan
<http://www.inbar.int/>

The Role of Bamboo in Disaster Relief
<http://www.guadabamboo.com/bamboo-disaster-relief.html>

Cover photo © Humanitarian Bamboo

GREEN MATERIALS BAMBOO

Bamboo has long been used as a traditional building material, and is achieving increasing popularity due to its potential for environmental sustainability. As a construction material, bamboo has similar properties as timber and often uses analogous techniques of structural framing, though the suitability of bamboo for construction is largely dependent on the species. A light and durable material, bamboo's dimensions make it ready to use in construction with minimal sawing, splitting or cutting. Since bamboo can be quickly and easily cultivated as well as harvested and treated without complicated techniques or tools, it is a good fit in communities where skills training is available.

environmental

Bamboo's potential for environmental sustainability is apparent across many areas. As a natural material, the process of preparing bamboo for construction has few environmental impacts, and when used locally, bamboo construction can lower carbon emissions related to transportation.

Bamboo's high productivity makes it an ideal substitute for timber, since it can be grown and harvested at a much faster rate. Bamboo can also curtail deforestation by reducing the need for wood and help with the regeneration of forest on degraded land. Since bamboo maintains a thick canopy of the over forest ground, it has tremendous ability to decrease soil erosion, provide both food and habitat for wildlife, aid with biomass regeneration, and increase carbon sequestration.

cultural

Promoting the use of bamboo in areas where it has been a traditional material, can mean promoting local methods of construction instead of replacing them with new and foreign technologies. This reinforces the connection to local culture and history.

economic

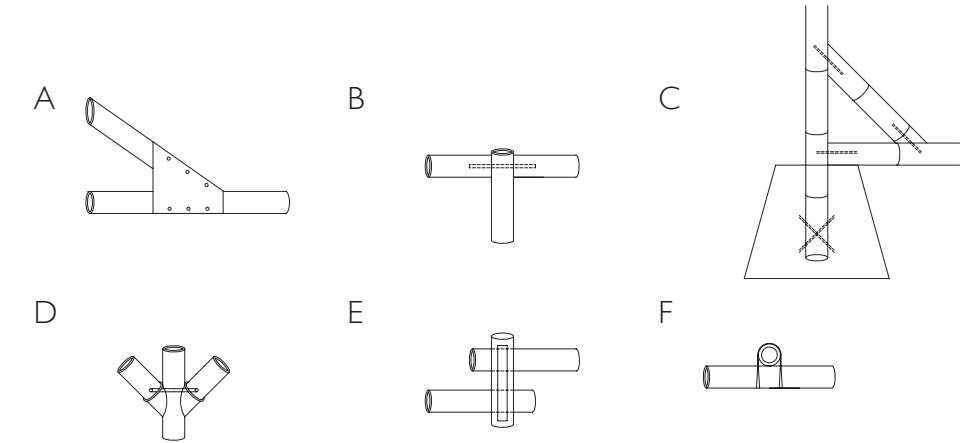
Innovations in bamboo construction and bamboo-based products have brought increasing awareness and popularity for these commodities as well as grown market demand for them. Current data values the worldwide market for bamboo and rattan at USD 2-3 billion per year. Bamboo products can stimulate local economic development and create employment opportunities (China's bamboo industry alone employs 5mil people) if workers are successfully trained.

social

As resource bamboo has the potential to help its producers develop sustainable livelihoods. Bamboo cultivation is rapid and easy, which makes it accessible to growers with various levels of expertise and access to equipment. Since processing bamboo products requires various levels of skill it is possible to employ people at multiple scales from highly trained crafts-people to semi/low-skilled workers. Therefore training at all levels of production is necessary to maintain a fruitful enterprise. In addition to construction materials, the products fabricated from bamboo also include textiles, jewelry, woven mats and other trades more typically accessible to women. The possibility for inclusion at multiple levels lends bamboo processing to community-based growth and production.

challenges

Despite its estimable qualities, bamboo is not without problems which include: biodegradation; vulnerability to fire and insects; short service life; and some difficulty forming secure joints and connections. Since bamboo construction is not well established in many countries, bamboo may not be widely available or face regulatory problems which restrict its usage in construction.



Different bamboo joints. A- Gusset plated joints. B- ITCR joint. C- preformed concrete footing. D, F: Traditional joints made by tying. E: Through joint. Source UN-Habitat

treatment

Without treatment, bamboo may last for 1-5 years depending on the species and weather conditions. In order to increase the lifespan of the material, treatment can protect bamboo from rainwater and enhance its strength when used for structural framing. There exist numerous methods of traditional

treatments, which can be applied at little cost and requiring low-levels of skill, but the efficacy of traditional methods are not proven. Chemical treatments have been shown to enhance the durability of bamboo by 15-25 years, but are more expensive and require more experience to apply.

jointing

Like methods of treatment, there are both traditional and modern techniques for jointing bamboo. Traditional techniques require less skill in order to assemble, but are also less robust. Modern techniques are stronger and use accessory parts such as wood and steel, but are also more complicated and expensive.

Best Bamboo Species + Climate Types

Humid Tropics: Bambusa balcooa, Bambusa bambos, Bambusa blumeana, Bamboosa polymorpha, Bambusa tulda, Bambusa vulgaris, Cephalostachyum pergracile, Dendrocalamus asper, Dendrocalamus giganteus, Dendrocalamus latiflorus, Gigantochloa apus, Gigantochloa levis, Gigantochloa pseudoarundinacea, Guadua angustifolia, Melocanna baccifera, Ochlandra sps | **Dry Tropics:** Thyrsostachys siamensis, Dendrocalamus strictus | **Subtropics:** Bambusa textilis, Phyllostachys edulis | **Semi-arid:** Bambusa bambos, Bambusa blumeana, Dendrocalamus strictus, Bambusa vulgaris, Dendrocalamus strictus

Subtropics
Semi-arid
Dry tropics
Humid tropics

Note: The climate ranges show where it is possible to grow bamboo though bamboo does not necessarily naturally grow in all of the locations covered ex. bamboo can be grown around the Mediterranean region of Europe, but is not native to this area. Also, the list of species is not definitive, but only represents bamboo round-culm species most commonly used in construction.



Man cuts laminated bamboo lumber. © INBAR

Woven bamboo strips can be laminated to make boards and then multiple boards can be laminated to make bamboo lumber. The lumber can then be cut to the size of structural members. In the process the lumber may be coated with fire resistant materials.

engineered

In addition to building with bamboo culm (pole), engineered bamboo products such as various types of bamboo composite lumber and bamboo panel products are becoming more widely available. In some instances the usage of many of these products is preferable to wood given the specific structural or material needs of the project. The potential for engineered bamboo products to replace wood-based ones continues to grow as research into the development and technology of these products expands.