

Structural Bamboo Products

Summary

This project develops green construction materials and building codes for bamboo. China, India and Brazil have rapidly expanding economies with increasing demand for building materials. The production of conventional construction materials such as steel and concrete is energy intensive and unsustainable: concrete alone accounts for 5% of global CO₂ emissions. Bamboo is a fast growing, renewable building material widely cultivated in these countries but not utilized to its full potential in modern construction. Its mechanical properties are similar to wood but it produces up to six times as much mass per hectare as conventional timber plantations. Structural bamboo products (SBP), similar to plywood, oriented strand board, or glue-laminated wood products, therefore have enormous potential to partially replace the use of more energy intensive materials in rapidly developing countries.

Widespread use of SBP is hampered by limited knowledge of their manufacture, structural and thermal behavior, and lack of appropriate building codes. The goal of this project is to develop modern structural building materials from renewable bamboo in order to place growth in rapidly developing countries onto a more sustainable path. Low-carbon solutions can also help to meet developed countries' own obligations under schemes like the UK's Carbon Reduction Commitment.

Project components: microstructure and mechanical properties of bamboo culm material (Gibson, MIT); appropriate methods for stranding bamboo culms, manufacture of SBP with uniform, predictable and dependable strength and mechanical properties (Smith, UBC; Gibson, MIT); structural performance and thermal behavior of SBP (Ramage, CU; Smith, UBC, Gibson, MIT; Mulligan, CAR); design and joining systems for heavy construction members from bamboo and the development of construction code of practice for SBP (Ramage, CU); embodied energy in SBP compared with conventional construction materials, allowing life cycle assessment (LCA) of products and buildings in terms of energy and CO₂ emissions (Mulligan, CAR).