



Bamboo Construction for Development



Coosje Hoogendoorn & Oliver Frith

World Bamboo Congress, Antwerp , Belgium, April 2012

Contents

1. INBAR and the Global Bamboo Construction Programme
2. Why Bamboo for Construction & Development
3. Example of INBAR Construction Initiatives:
 - Engineered bamboo: Beijing, China
 - Bamboo for flood resilient homes: Guayaquil, Ecuador
 - Bamboo and Adobe: Zhemgang District, Bhutan
 - Pre-shaping Bamboo: Utthan, India
4. Conclusions

INBAR Mission

To Improve the well-being of the producers and users of bamboo and rattan within the context of a sustainable bamboo and rattan resource base



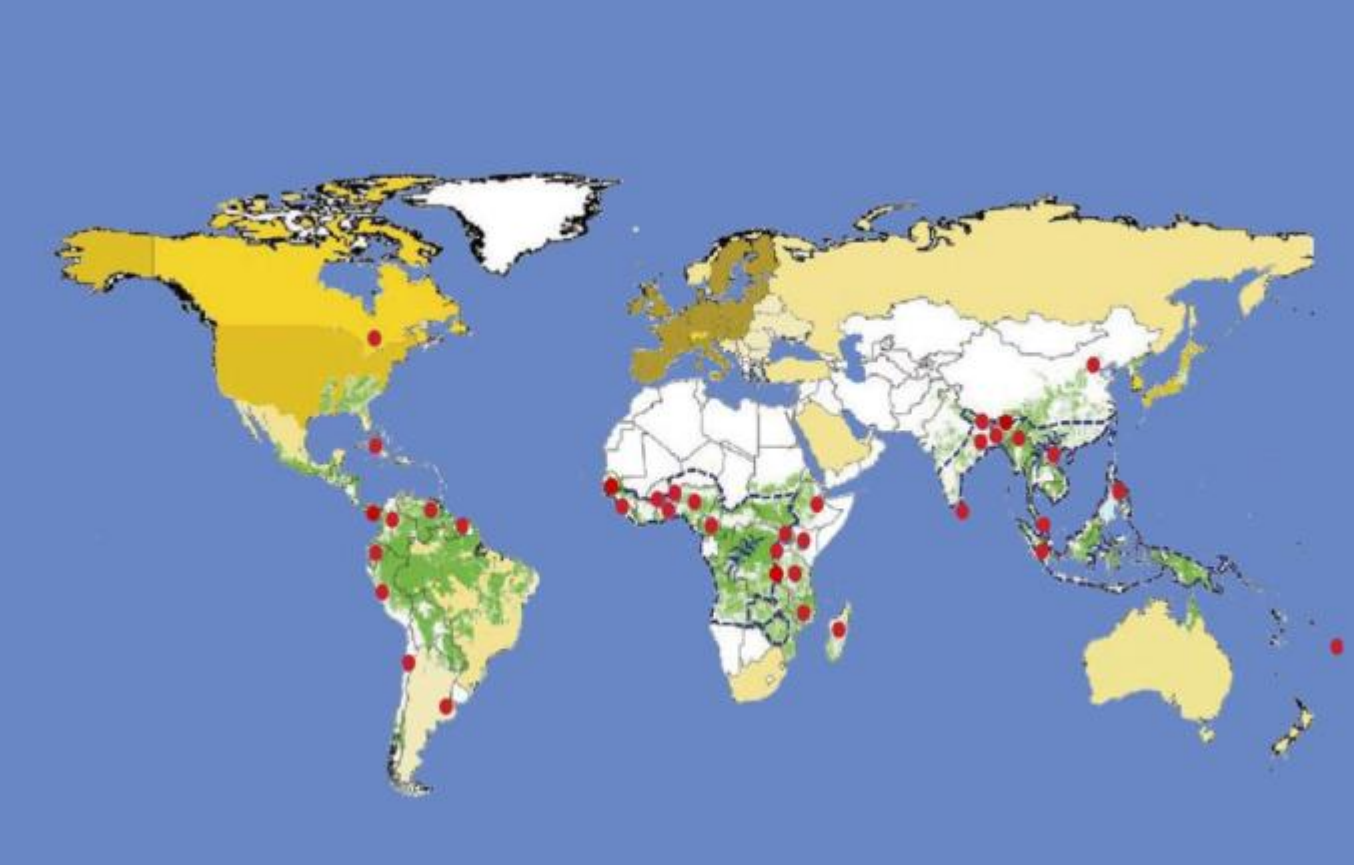
15th Anniversary Year



- INBAR established in 1997 in China as a global intergovernmental organization
- Regional offices in
 - India
 - Ghana
 - Ethiopia
 - Ecuador
- Budget 2011 5.6 mln USD
- 60 Staff – 40 at HQ



The World of Bamboo & INBAR member countries



15th Anniversary Year



Global Bamboo Construction Programme



- Consolidate, coordinate and support strategic and adaptive research and development
- Disseminate knowledge on how bamboo-based construction can be applied to poverty reduction and more resilient homes and communities
- Support the development of markets for bamboo-based construction



15th Anniversary Year



Why Bamboo?



Bamboo is as strong as mild steel in tension and as strong as cement in compression.

Bamboo matures in 3-6 years.

It takes 60 days for bamboo to grow 60 feet.

Earthquake resistant properties
e.g. Costa Rica (7.6 Richter Scale)



15th Anniversary Year



Appropriate treatment is essential



Untreated bamboo

***Cheap, fast, effective:
buy it today, use it today. Biodegrades:
lasts for 1-3 years depending on
exposure.***

Treated bamboo

***Has a 20-30yrs life expectancy if
correctly harvested, handled and
treated, and sheltered from weather in
use. Hence offers a greatly increased
contribution to community resources.***



Source: Humanitarian Bamboo , 2009

Appropriate Treatment



Appropriate Treatment



Appropriate Joinery and Craftsmanship



- Joints often weakest part of bamboo structure
- Joints require specialized skill
- Very labour intensive process
- Few tools dedicated to bamboo

Local Perceptions of Bamboo



Supportive policy is often lacking



Key Policy Issues	Examples of Good Practice
Standards and Building Codes	2 ISO standards; National building codes approved in Peru & Columbia; Technical Guidelines – Bihar, India
Resource management	Bamboo placed on commercial species list in Ecuador
Housing Incentive Schemes	Indira Awas Scheme, India
Finance for bamboo smallholders	Anji County, China

Initiative 1: Engineered Bamboo



Engineered Bamboo – Beijing, Teahouse



- Typical 2 x 4 USA structure
- Prefab. & installed onsite in days
- Earthquake resistant to Chinese Intensity Level 8
- Meets Chinese national standards for indoor air quality
- Fire retardant for over 1 hour
- approx. US\$225-250/m²
- Draft building code for engineered bamboo under development



Black Bamboo Garden Bamboo House, Beijing

Advanced Bamboo and Timber Technologies (ABTT), Ltd., Changsha, China

Technology Adaptation & Transfer



- CFC project establishing production capacity 3000m³ 12mm-thick/year bamboo ply in Ethiopia & Nepal
- Engineered bamboo adapted for emergency shelter in Sichuan, China

Top : Maseno, Kenya, ABTT Ltd., Changsha, China

Bottom: Sichuan, China, International Centre for Bamboo and Rattan (ICBR), China



Initiative 2: Guayaquil, Ecuador





Local Pre-fab Factory



Initiative 2: Guayaquil, Ecuador



- 300,000 existing poor quality bamboo homes
- Introducing improved designs, preservation & engineered panels
- Lifespan improved from 5 to 20 years
- New 32m² unit at US\$4000 - US\$1135 for typical units



Initiative 3: Bamboo and Adobe, Bhutan



- House uses 23.5m³ less wood than equivalent timber framed house
- 140US\$/m²; half the price of a equivalent concrete home
- Adapted local carpentry skills
- Funded by CFC
- Will contribute to Bhutan's 60% forest cover constitution pledge



Zhemgang District, Bhutan

Social Forestry Division, Department of Forest & Park Services,
Ministry of Agriculture & Forests



Initiative 4: Pre-Shaping, Utthan, India



- Bamboo pre-shaped with wooden formers
- *Bambusa vulgaris*, *B. bamboos*, *Dendrocalmus strictus* & *D. asper*
- May radically decrease complexity of working with bamboo for rural communities
- Next step: non-destructive testing kits for strength grading

Utthan, India

Indian Council for Agricultural Research (ICAR)



Conclusions

1. Bamboo construction technologies well demonstrated & proven
2. Growing interest in bamboo construction from research community
3. Adapting improved bamboo designs into existing architectural practices crucial for acceptance and uptake
4. Urgent need to develop strength grading methods for round culm bamboo + building codes for engineered bamboo
5. Bamboo in construction offers opportunities for local employment and income generation



Thank You!

Find out more at:

www.inbar.int

bamboohousing@googlegroups.com

INBAR Global Bamboo Construction Programme Contacts

Oliver Frith - obfrith@inbar.int

Programme Coordinator

Nripal Adhikary - nripal@inbar.int

Research Associate,

Liu Kewei - kwliu@inbar.int

Programme Officer



15th Anniversary Year

