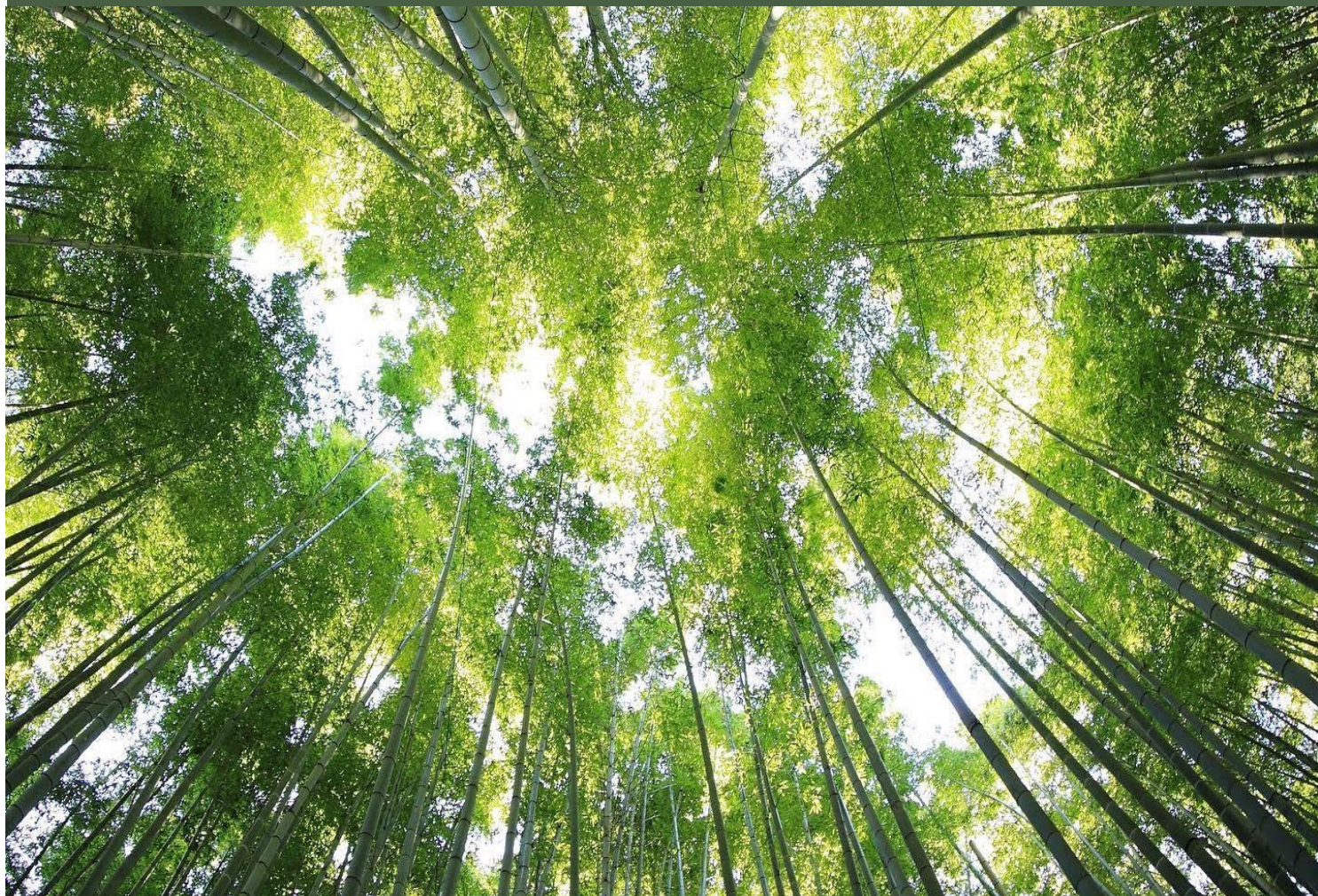


Engineered Bamboo Conference



UPGRADING VALUE CHAIN OF ENGINEERED BAMBOO IN CONSTRUCTION

Braja N. Mohanty,
Ex Director, IPIRTI
India

India @17th Session of United Nations Forum on Forests ([#UNFF17](#))

(9-13 May 2022)

Statement by Shri Chandra Prakash Goyal, DG of Forests

- 80.95 million ha of forests locks 7204 million tons of Carbon (ISFR, 2021)
- Committed to create additional Carbon sink of 2.5 -3.0 billion tons of CO₂ equivalent by 2030 (Paris COP, 2015)

Natural Corollary:

- Bamboo a strong favorite as carbon sink
- National Bamboo Mission since 2006 in Ministry of Agriculture
- In spite of tremendous euphoria around [#Bamboo](#), no enough traction

Forestry

INDIA @ UN
NEW YORK

Engineered Bamboo a strong Candidate for Climate Action

(If Bamboo is good, Engineered bamboo still better)

1. Bamboo releases 35% more O₂ than tree stand : crucial for O₂-CO₂ balance
2. Sequesters 5 - 10 times more CO₂ than wood
3. Timber bamboo : renewable, carbon-sinking building material
4. Engineered Bamboo being a low-carbon solution : caters to 'Negative feedback Loop' that causes a decrease in function (to stabilize CLIMATE)

Indian Plywood Industries Research & Training Institute (IPIRTI)



(Since 1962 R & D Body of Government of India)



Agenda

- RESEARCH & DEVELOPMENT
- TRAINING & EDUCATION
- TESTING & STANDARDIZATION
- INFORMATION & EXTENSION

RELATING TO PANEL PRODUCTS FROM WOOD, BAMBOO AND OTHER RENEWABLE FIBRES INCLUDING AGRO AND FOREST RESIDUES

ENGINEERED BAMBOO/COMPOSITES

Gen 1: BAMBOO MAT BASED

- BAMBOO MAT BOARD (BMB) (1985)
- BAMBOO MAT CORRUGATED SHEETS (BMCS) (2002)
- BAMBOO MAT RIDGE CAP (BMRC)
- BAMBOO MAT MOULDED SKIN BOARD (BMMSB)

Gen 2: BAMBOO STRIP BASED

- BAMBOO HORIZONTAL LAMINATES (2011)
- BAMBOO VERTICAL LAMINATES

Gen 3: Bamboo Strand Lumber/Scrimber(2014)

(Courtesy: Moso International/DASSO)

Gen 4: Densified Lumber/Fused Bamboo

Gen 5: Bamboo N-finity (Finger jointed beams)





GEN 1:
BAMBOO MAT BASED:
From Slivers

BAMBOO MAT BOARD (BMB): 1990s

FORWARD LINKAGES of BMB



(Circa 1990s)

BAMBOO MAT CORRUGATED SHEET (BMCS) & CAP



- ❖ **BMCS IS A GREEN ROOFING MATERIAL PITTED AGAINST ASBESTOS, ALUMINIUM SHEETS, GALVANISED IRON SHEETS**
- ❖ **ENERGY REQUIREMENT FOR PRODUCTION IS LOW**
- ❖ **HIGHLY RESILIENT, LOW WEIGHT, LOW THERMAL CONDUCTIVITY, SOOTHING AESTHETIC APPEARANCE**



PRE-FAB HOUSES WITH BMB, BMCS & BMRC



Prefab Bamboo House, Hyderabad



Prefab Bamboo Solar Hut, Delhi



IPIRTI-TRADA Bamboo Housing

- Low Cost
- Earthquake resistant

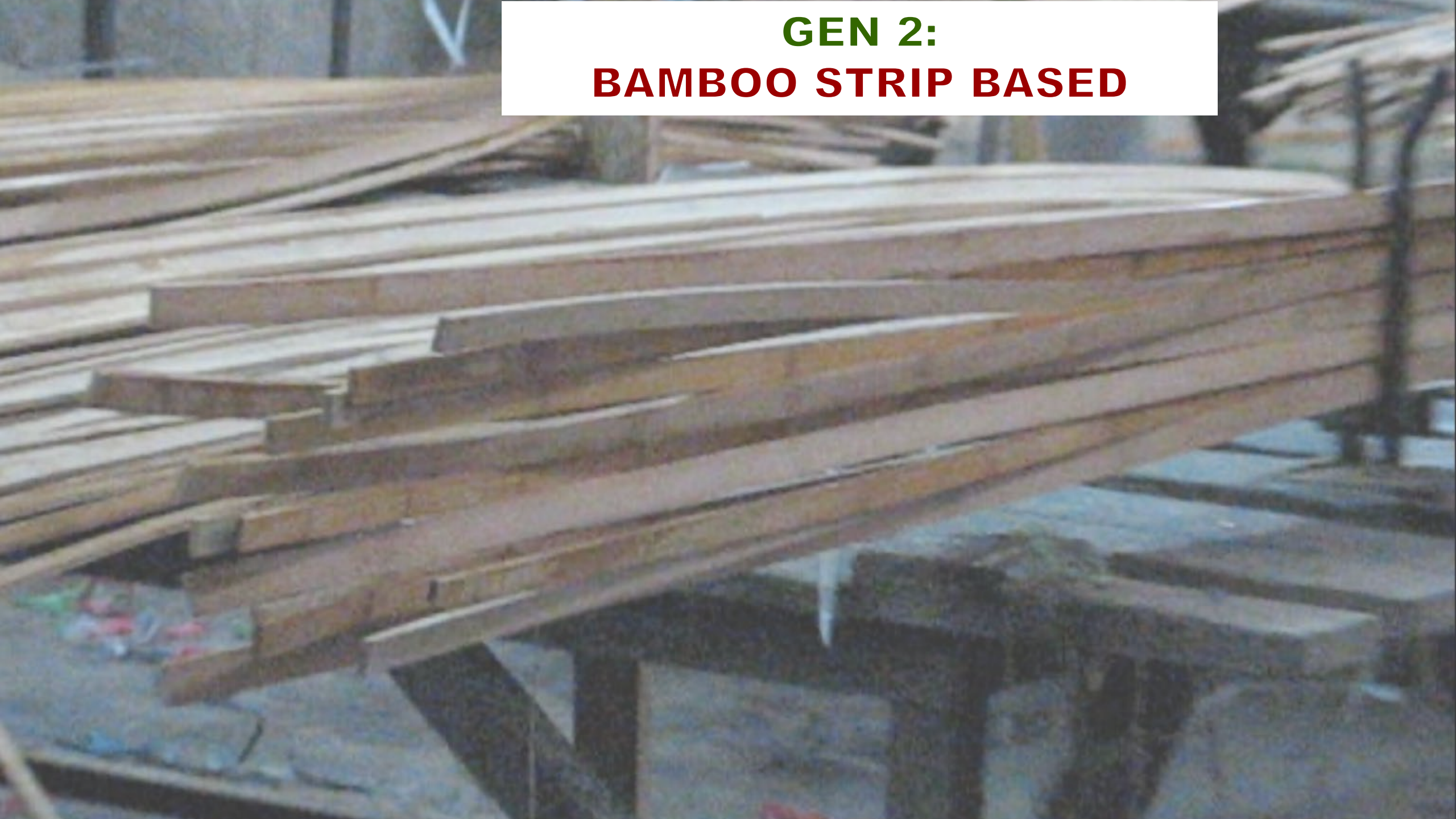


1. Can withstand seismicity of Zone 5
2. Intensity 7.0 in Richter scale



(Shake Table Test)

GEN 2:
BAMBOO STRIP BASED



BAMBOO LAMINATES

(Commercial production since, 2011)



**Horizontal
Laminate**



**Vertical
Laminate**



Laminated product

MODEL INTERIOR BENGALURU AIRPORT

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GEN 3:
BAMBOO STRAND LUMBER

Bamboo Strand Lumber/Wood



Commercial production since 2014 in Agartala, Tripura.



FORWARD LINKAGES of Bamboo lumber

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Bamboo Wood Dining Set [6 Seater]



(Wall Cladding, Guwahati, Assam)



Bamboo Wood Wall Cladding installed @ Raj Bhawan (Governor's Residence) - Kharguli Hills, Guwahati, Assam



(Flooring, Nagpur, Maharashtra)

Gen 4: Densified Lumber/Fused Bamboo (Outdoor Decking)







Densified Lumber: (X-treme)
Density of 1200Kg/m² attained by
hot-pressing thermally modified strips
(Moso International)

Fused Bamboo: (Classic/Epic)
Extremely dense product out of
modified strips compressed 2:1
after extracting/crystallizing the nutrients
(DassoXTR)

(Good for G7 & European countries)

Summary Statement

	BMB 	Laminates 	Lumber 	Fused Bamboo 
Prepared from	Slivers	Strips	Crushed Strips	Modified Strips
Resin used	PF	UF/MUF/PF	PF	PF
Temperature	140-145 ⁰ C	105-145 ⁰ C	Cold	Fused
Pressure	16Kg/Cm ²	2.5 Kg/Cm ² Vertical 10 Kg/Cm ² Side	Density of 700- 1000Kg/m ²	Compression 2:1
Curing	8Hrs stacking	Stacking	In Hot Chamber	Stacking
Colors	Natural	Few as per glue	Multiple	Multiple
Housing	Yes	-	Yes	Outdoor
Furniture	Yes	Yes	Yes	Yes
Decorative	Yes	Yes	Yes	Yes
Handicrafts	Yes	Yes	-	-

(UF: Urea Formaldehyde, MUF: Melamine Urea Formaldehyde, PF: Phenol Formaldehyde)



Value Chain Analysis

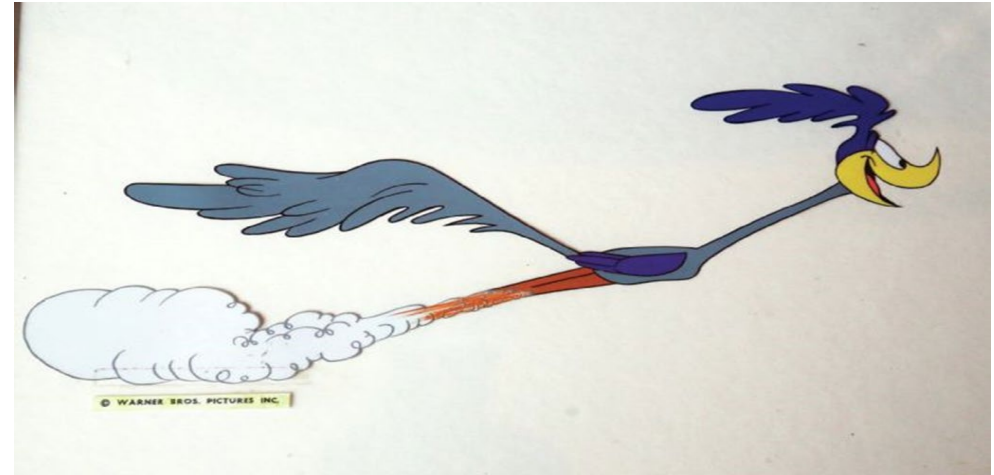
Value Chain is full range of activities
from conception to delivery (Michael Porter)

Primary Activities : Inputs, Processing, Outputs, Marketing & Sales-Service;
Support Activities : such as Procurement, Technology , HR and Infra.

e.g

For Bamboo Lumber, the **inputs** are Nursery, Farming, Capacity building, etc;
the **processing** includes Enterprises, Machinery, Households, Group/SHG;
The **outputs include** Risk Mitigation, Quality Control, Policy / strategy, etc;
Marketing, Sales and Service include Traders, Small business, Consumers, etc.

Upgrading Value Chain of Bamboo



Value chain management: **Organizing** all activities with analysis and evaluation.

Upgrading Value Chain: **Innovate and improvise** for maximum value with least cost

e.g.

Chain starts from growing ***Bambusa tulda*** (ideal species) with QPM, harvest in 4 years, transport to factory, cross cutting, knot removal, splitting, planning, strip making, dyeing, grooving, gluing, drying, cold/hot pressing, curing, trimming, shaping, products making, finishing, packaging, marketing and export.

Innovations at all stages to reduce cost without compromising quality. (In Indian parlance **JUGGAD**)

Cluster Development in MSME Ecosystem: Global South

Cluster : group of similar & interconnected enterprises at a location having common opportunities & threats. (*Micro, Small, Medium Enterprises*)

✓ For Example:

Plywood – Yamunanagar (Haryana), Gandhidham (Gujarat) , Permbavoor (Kerala)

Bamboo – Agartala (Tripura), Chandra Pur (Maharashtra) Anji, Lin'an (China)



- ✓ Why clusters:
 - For United, federated Actions
 - Complementing** each other
 - For Synergy
 - For Exponential Growth
 - For Improvisation, Innovation, Invention

Benefits of Clustering

- ✓ Clusters increase productivity with which companies can compete
- ✓ comparative advantage— locational factors (i.e., raw material, cheap labour) — **less relevant**.
- ✓ Now, competitive advantage— i.e productive use of inputs, requiring continual innovation—is **success mantra**
- ✓ Significantly more innovation (*Juggad*)
in clusters having stronger networking



Value Chain & Clusters

Activation: Tips

- **Trading** Scenario of Bamboo Products
- **Resource** Status and **Policy** Environment
- Existing and Potential Bamboo **Products**
- Value-Chain **actors** and their Functions
- **Enablers** and their Functions
- Existing Status and Future **Potential** of Bamboo
- R & D and **Innovation**



Success Stories in India

- Only **isolated** Success Stories, No Big Bang Success in Bamboo
- But Huge Success, in **Engineered Wood** from farm grown timbers:
Eucalyptus & Poplar (Maturing in 5 Years)

Example:

Enterprise Clusters in

1. Yamuna Nagar, Haryana State
2. Permbavoor, Kerala State
3. Gandhidham, Gujarat State



Paris Hilton

Courtesy:
[@SanjeevKarpe](#)





Early Signs of Bamboo Cluster Formations in India

1. Chandra Pur, Maharashtra state
2. Agartala, Tripura state

- Massive **Bamboo Plantation** of engineering variety
- **Infrastructure**
- Human Resources
- R & D
- Political Will
- **Business Ecosystem**



Concluding Remarks

The success *mantra* of Bamboo sector is hinged on

- **Promote MSME Clusters**
- **Bulk/Mass Production**
- **Inclusive Growth**
- **Green/Circular Economy: Non-polluting**
- **Nature Based Solutions**
- **Sustainable Development Goal (SDG)**



Thank You All

Email: bnmohanty86@gmail.com

