

# Construction timber in Sri Lanka - future trends and technologies



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(2023)





**SPECIES**



**TECHNOLOGIES**

# Wood and Wood based Research at University of SJP

- Since 1983 – MSc course and teaching and research in forest and wood products. Trained many forest department, wildlife department, STC and CEA senior staff
- Conducts research on seasoning, preservation, wood properties, anatomy, identification, marketing, waste utilization etc
- In Sri Lanka Timber research has been conducted by Forest Department, State Timber corporation and Universities



# Why timber is different building material?

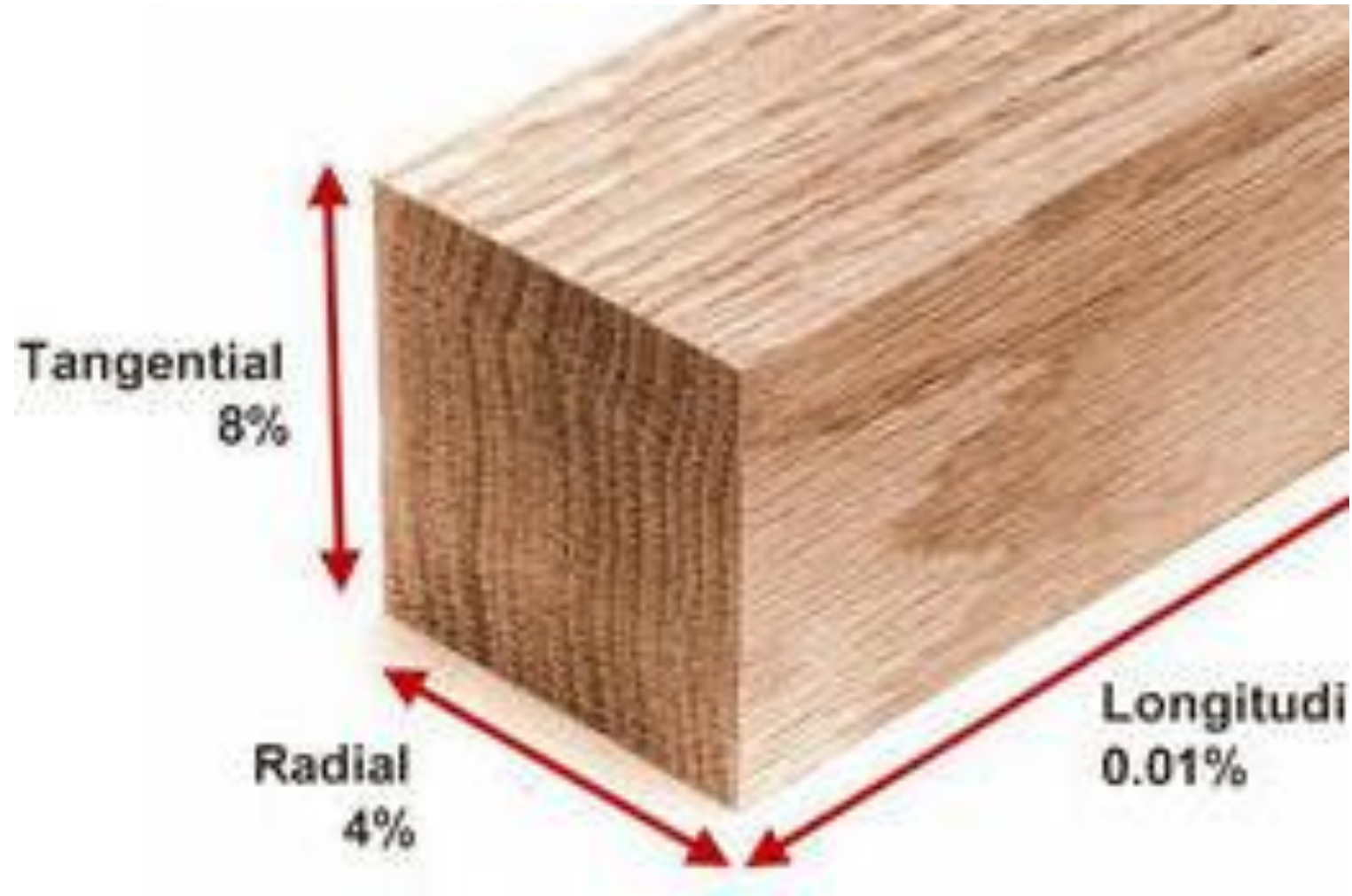
- Biological Origin
- Therefore variable (species, between and within trees)
- Anisotropic – Properties vary along three directions longitudinal, radial, tangential
- Hygroscopic
- Bio-degradable
- It has good strength/ weight ratio





# Biological origin Hence variable

Properties vary between species, between and within a tree



Anisotropic –  
Properties vary  
along  
longitudinal,  
radial and  
tangential  
directions

higher stiffness  
and strength  
parallel to grain



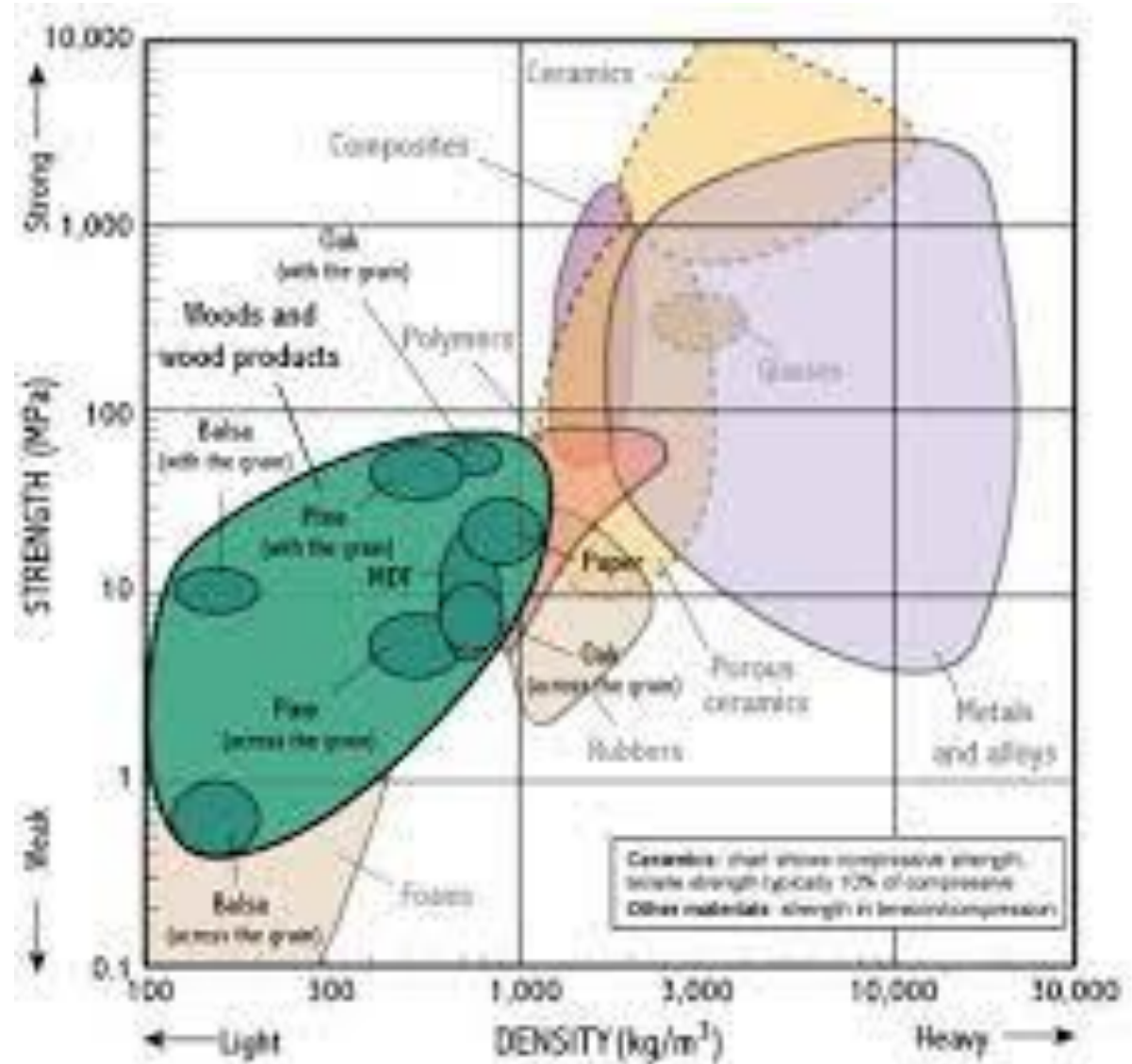
Hygroscopic  
– Shrinkage  
and swelling



Bio-  
degradable  
Fungi (mold)  
and insect  
(borer,  
termite  
attack)



Strength  
to weight  
ratio  
- Lighter  
material



Timber has a high strength to weight ratio  
- It is lightweight

| MATERIAL                     | DENSITY<br>(kg/m <sup>3</sup> ) | STRENGTH<br>(MPa) | STRENGTH/DENSITY<br>[10 <sup>-3</sup> MPa.m <sup>3</sup> /kg] |
|------------------------------|---------------------------------|-------------------|---|
| Structural steel             | 7800                            | 400-1000          | 50-130  |
| Concrete (compression)       | 2400                            | 30-120            | 13-50   |
| Clear softwood (tension)     | 400-600                         | 40-200            | 100-300   |
| Clear softwood (compression) | 400-600                         | 30-90             | 70-150  |
| Structural timber            | 400-600                         | 15-40             | 30-80   |

Timber is fast becoming the world's sustainable building material of choice, thanks to its low carbon footprint, ease of use and fire-resistant qualities. Timber is also earthquake resistant and its sound-dampening qualities make for quieter homes.

## Mjøstårnet

Brumunddal, Norway

85.4m

## Brock Commons Tallwood House

Vancouver, Canada

53m

## Penttiläkulma

Joensuu, Finland

48m

## Treet

Bergen, Norway

49m

## 25 King

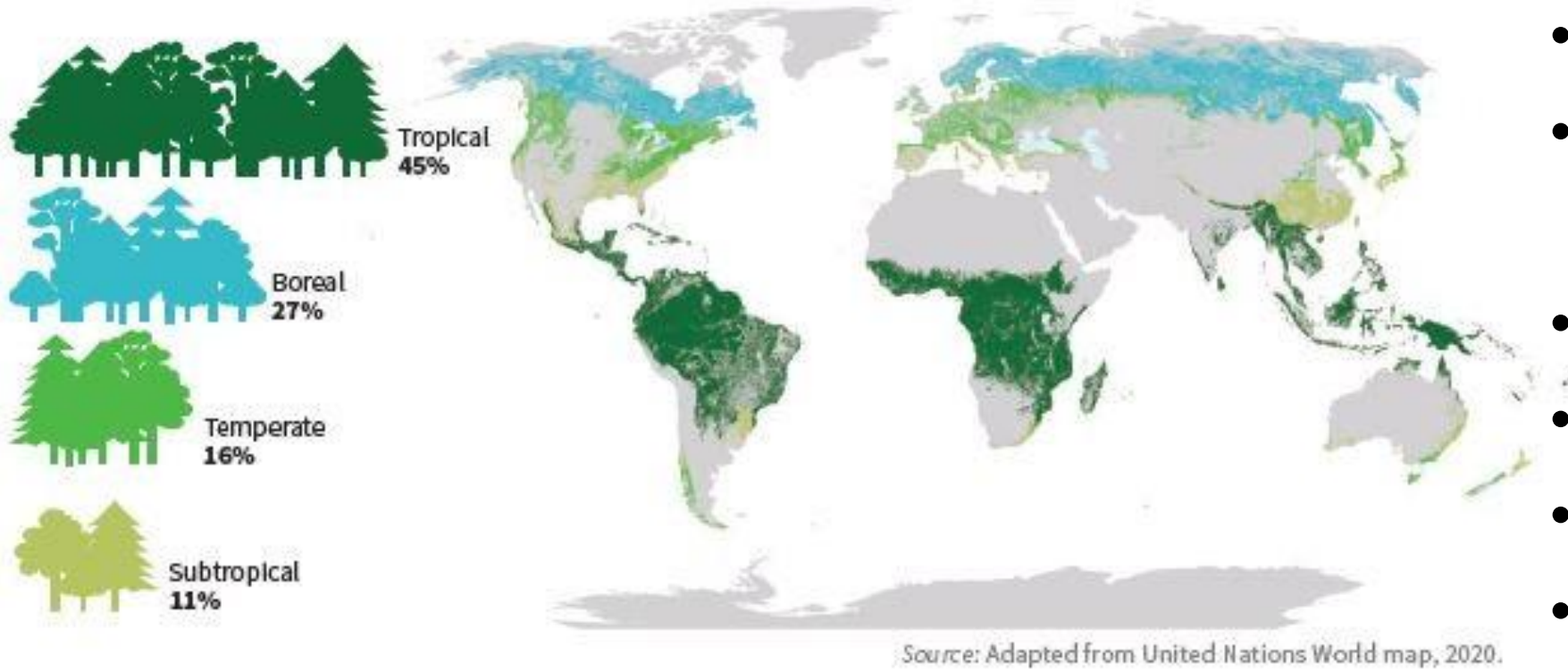
Brisbane, Australia

45m

Wood is sustainable building material



## Proportion and distribution of global forest area by climatic domain, 2020

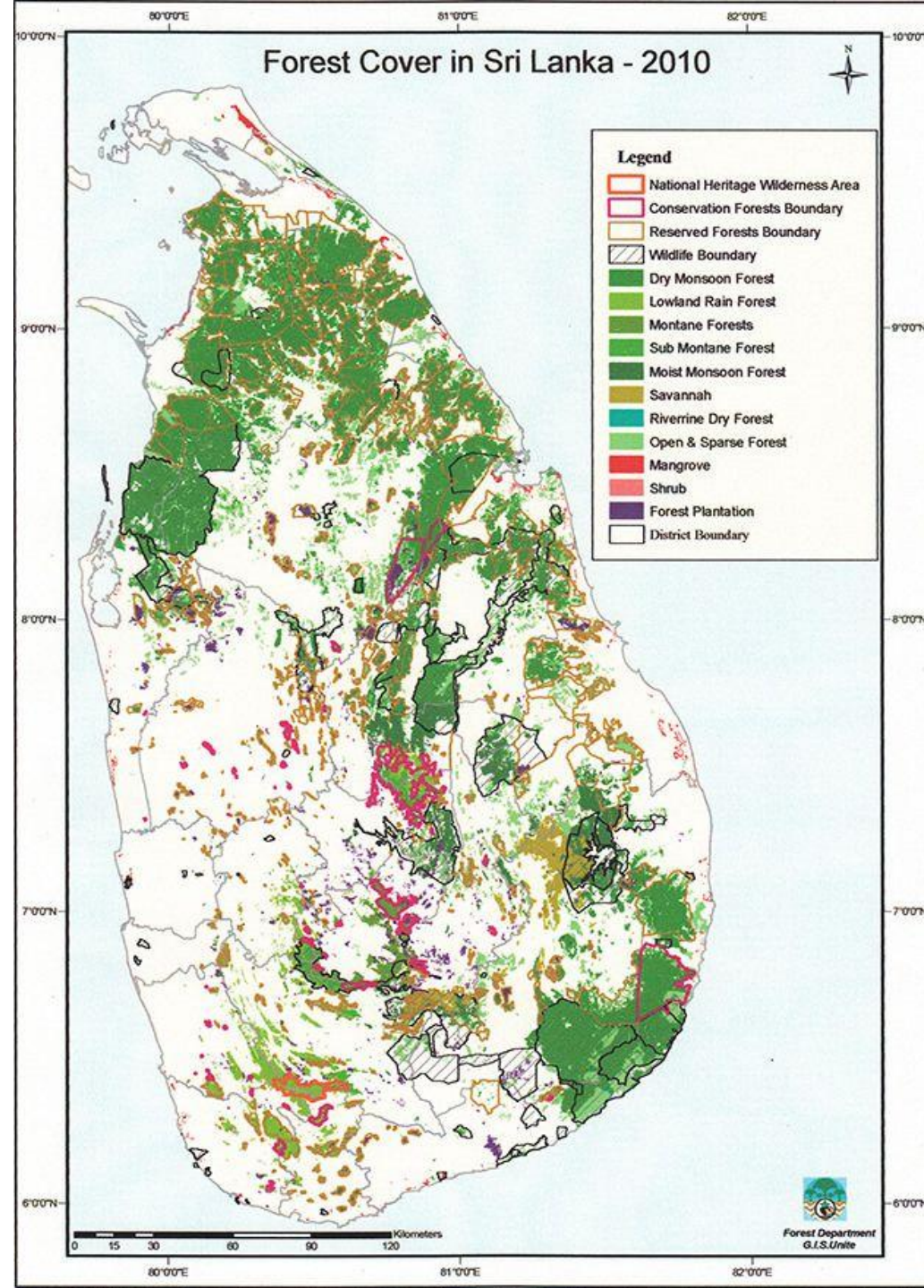


- Pine
- Spruce
- Oak
- Mahogany
- Teak
- Eucalyptus

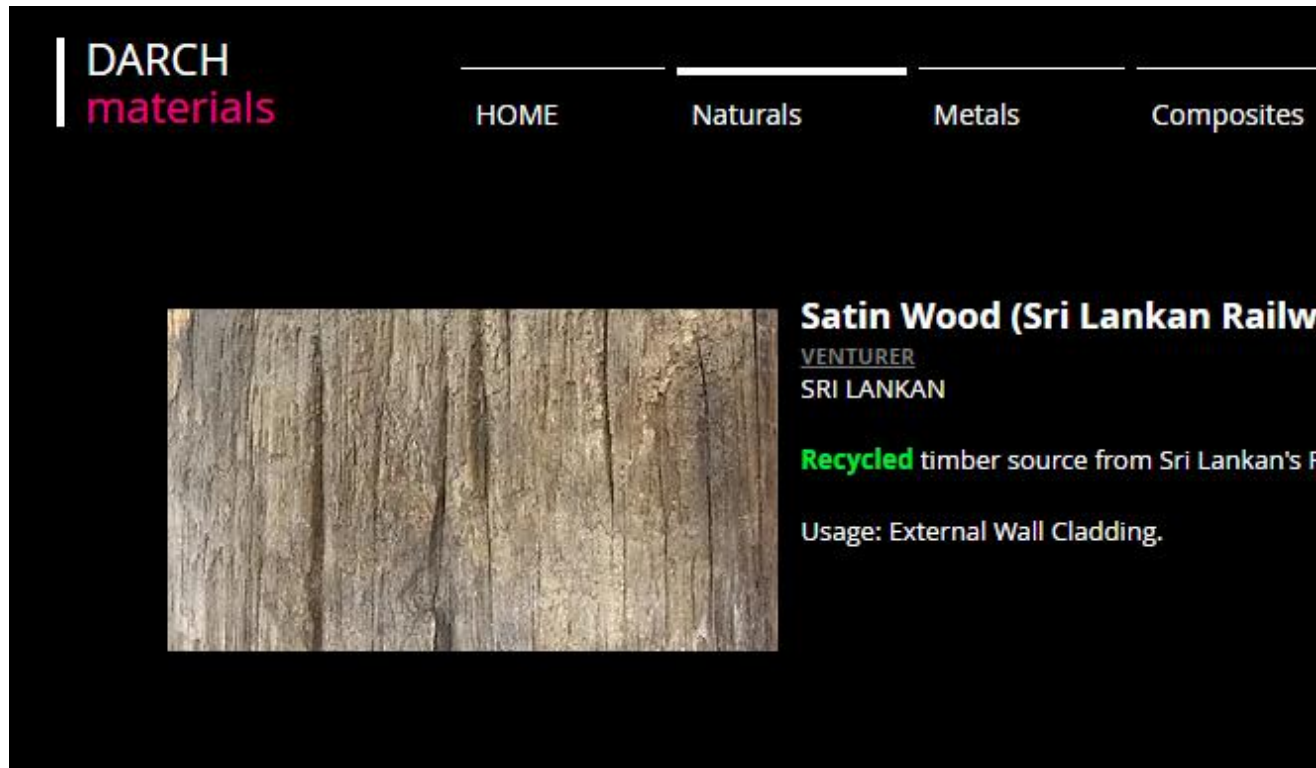
## Top five countries for forest area, 2020 (million ha)



Future timber supplies  
From plantations and  
Home gardens



# Traditional Timbers in Sri Lanka - Red/black colour, Durable and Strong



- mee, satin, wewarana, milia, palu, halmilla, hulanhik, etathimbiri, dun, alubo, liyan and suriyamara.
- mostly grown in natural forests
- supplies have now become very limited.



# Potential Construction timbers for future

- Eucalyptus grandis,
- E. microcorys
- Ginisapu
- Teak
- Mahogany
- Jak
- Imported timber – Balau, Tualang, Kempus



Rubber and Pine –

Large underutilized Pine Forest resources is available . With a favourable method of treatment, these can convert into dimensionally stable and durable construction timber.



# Technologies





***Ambalama* - knowledge of traditional timber applications in Sri Lanka  
Research with University of Moratuwa**



# Simplicity - Complicated timber wasting roof designs in Sri Lanka

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# Boron treatment of Rubberwood Invented by Forest Department in 1966

- Tissaverasinghe A.K.E. 1966. Preservative treatment of rubber (*Hevea brasiliensis*) wood by boron diffusion process. Ceylon forester. Vol IX

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| Brand                  | Damro       |
| Material               | Rubber Wood |
| Style                  | Modern      |
| Minimum Order Quantity | 1 Set       |

Product ID : IMHDTTO004 + IMHDCTO001  
Item Included : 1 Torino Dining Table (IMHDTTO004), 4 Torino Dining Chair (IMHDCTO001)  
Primary Material : Rubber wood...

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Present  
Sri Lankan  
Timber  
usage is  
limited –  
similar to  
China

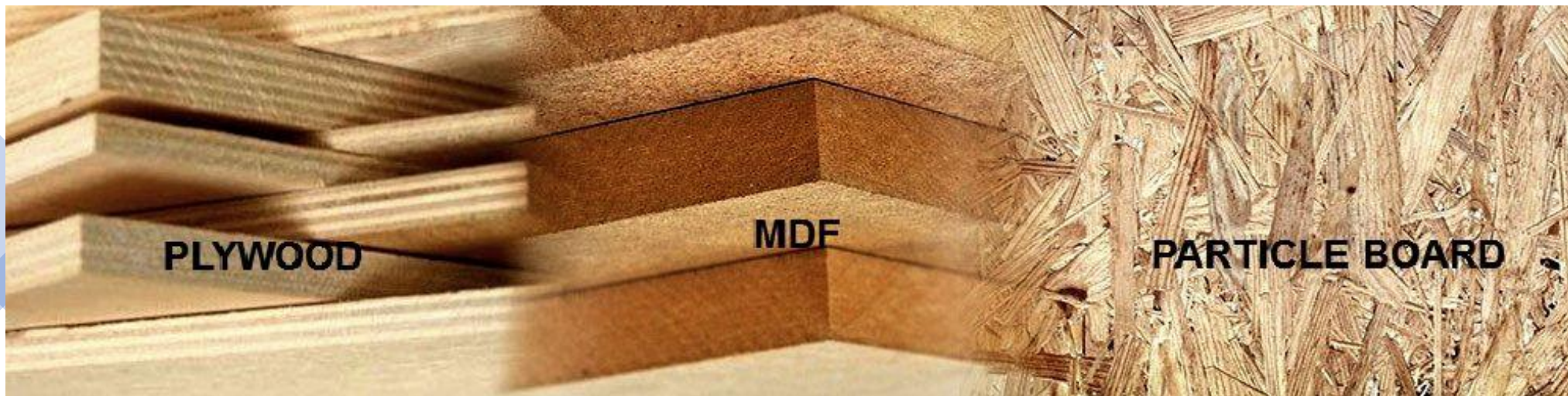
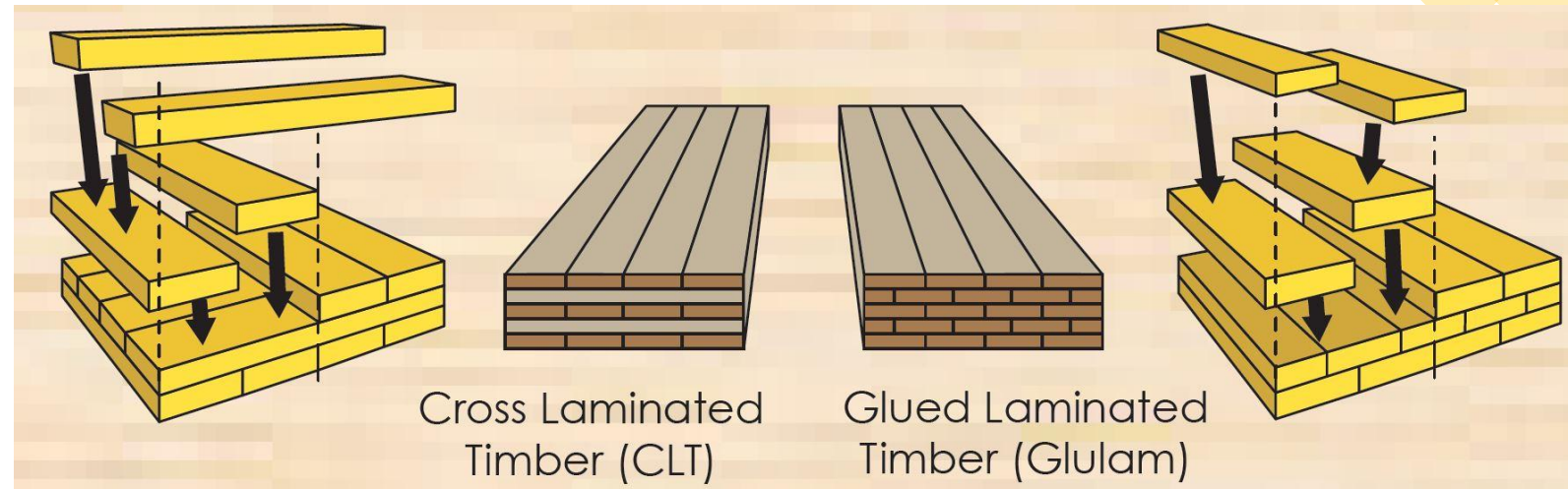
- Chinese designers have been familiar with concrete and masonry construction rather than timber constructions.
- Timber products utilization is still very limited in China
- Feasibility study on further utilization of timber in China. S Karol, H Jianli, G Isaac, X Weiqi... - IOP Conference, 2018 - [iopscience.iop.org](http://iopscience.iop.org)

# Modification methods to increase wood stability and durability.

- Impregnation: Chemical treatment
- Thermal modification: improve wood dimensional stability and durability against biodegradation
- Chemical Modification: Externally applied chemical reagents react with the hydroxyl and phenyl groups of the cell wall polymers to reduce the hygroscopicity.

# Engineered wood products

- Plywood - veneer-based material
- MDF - composite material
- Glulam and cross laminated timber (CLT)- laminates



# Processing chain of engineered wood products

M.H. Ramage et al.

Renewable and Sustainable Energy Reviews 68 (2017) 333–359

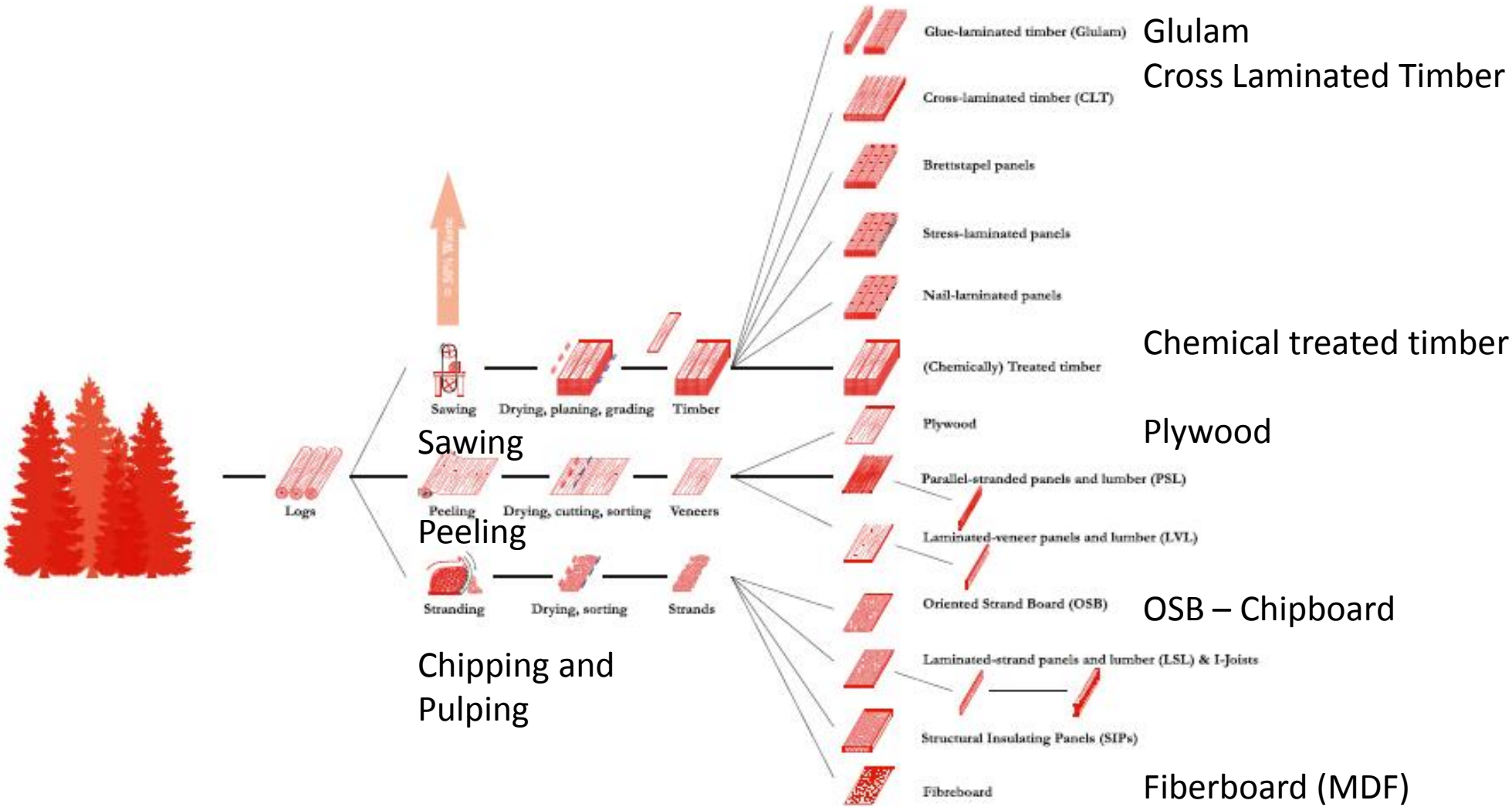


Fig. 12. The processing chain of engineered timber products, P.H. Fleming.



# Common structural engineered timber products in Europe


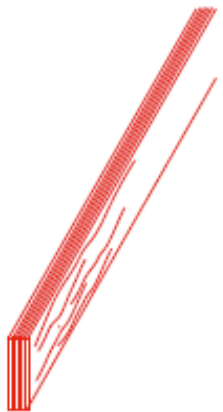

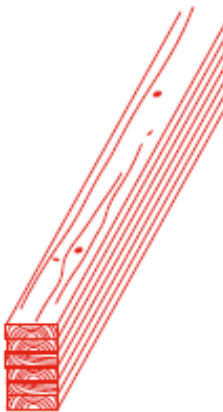
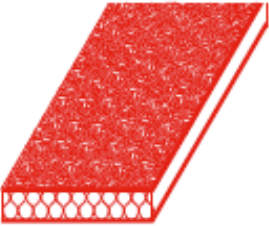
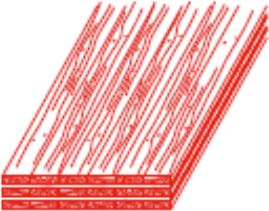
| Engineered Timber Product | Parallel Strand Lumber (PSL)  | Laminated Veneer Lumber (LVL)   | I-Joist   | Glulam   | Structural Insulating Panel (SIP)   | Cross Laminated Timber (CLT)  |
|---------------------------|---|---|---|--|---|---|
| Typical Detail            |  |           |  |           |        |        |
| Application               | <ul style="list-style-type: none"> <li>• Beams</li> <li>• Columns</li> </ul>      | <ul style="list-style-type: none"> <li>• Beam</li> <li>• Columns</li> <li>• Cord</li> </ul> | <ul style="list-style-type: none"> <li>• Joist</li> <li>• Beam</li> </ul>           | <ul style="list-style-type: none"> <li>• Beam (Long span)</li> <li>• High Loading</li> </ul> | <ul style="list-style-type: none"> <li>• Roof</li> <li>• Wall</li> <li>• Floor</li> </ul> | <ul style="list-style-type: none"> <li>• Roof</li> <li>• Wall</li> <li>• Floor</li> </ul> |
| Usage                     | Interior  | Interior  | Interior  | Interior / Exterior  | Interior  | Interior/ Exterior  |

Fig. 13. Common structural engineered timber products in Europe.



## Future trends and technologies in construction timber usage

- Use of sustainable and renewable timber sources e.g. **Pine**
- Increasing the durability of timbers e.g. **Chemical treatment**
- Increasing the dimensional stability and density of timbers e.g. **Thermal modification**
- Introducing new technologies, such as **cross-laminated timber (CLT)** and **glulam**, in construction
- Potential for increased use of timber-concrete composite (TCC) construction techniques

# Issues in promoting new technologies

Policy - Lack of relevant legislations, design and construction codes.

Dissemination of Knowledge - Lack of awareness among construction professionals and general public

Development of Knowledge - Lack of research data on these novel technologies and timber classification



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- <https://www.sjp.ac.lk/timber/>