

Environmental Impacts of Timber Production

INTRODUCTION



TIMBER/LUMBER is a type of wood and which means TO BUILD.

Suitable for building and which is applied to the trees measuring not less than 600mm circumference of its trunk.

SUSTAINABLE BUILDING WITH TIMBER TO REDUCE THE BUILDING SECTOR'S ENVIRONMENTAL IMPACT

- Timber offer good prospects for cost-effective improvement
- Both massive and lightweight designs and construction methods with timber-core buildings provide good insulation.
- Has low thermal conductivity.
- Methods and recommendations for moisture-resistant timber building technology are therefore particularly important development areas.



TIMBER PROVES IT ALL!!

Timber should be the preferred building product on environmental grounds across the life of the various building products. To demonstrate the difference between wood and other building products it is essential to take into account thermal utilisation of wood waste. Therefore it is critical that the Renewable Energy Regulations support the use of wood waste as an effective and efficient bioenergy resource.



ULTIMATE BENEFITS OF TIMBER :

- Renewable
- Low in production energy
- Good insulator of heat and electricity
- Readily available
- Easy to work

U S E S



Hadimba Temple, Manali

In zones with cold climates and earthquake prone areas, structures are entirely constructed out of timber. These buildings have a distinct architecture and all structural elements are made of timber.



Timber is frequently used in the frames of doors and windows.
Type of Wood used:
Shorea robusta
Vernacular name:



Source: KAASHTHA Timber Traders, Surat



U S E S



Timber as a cast and support for concrete casting of ;
Beams
Columns
Slabs
Foundation



Source: Extension to EED, SVNIT

While Bamboo is used for scaffolding in Asian countries, Timber is occasionally used in scaffolds as platforms and in shoring



Source: Extension to EED, SVNIT

Plantations

In plantations trees are specifically planted and nurtured for timber production.



Harvesting timber



Durability issues

- Timber has natural durability to some hazards. This can be due to the chemicals stored in the wood structure, or in some cases it may be due to the wood structure itself.

700 year old grain store, France



Environmental Impacts of Sawmilling Process

- A major source of the environmental impacts is the consumption of energy required to produce timber products and emission of greenhouse gases (GHG) during the manufacturing process from raw materials to the final products.
- Out of 1 m³ of tree cut and removed from the forest, about 50% goes to waste in the form of damaged residuals, followed by abandoned logs (3.75%), stumps(10%), tops and branches (33.75%), and butt trimmings (2.5%).

Sawmilling

- The sawmilling process involves debarking and cutting of logs into sections, which are sawn into timber boards. Particulate environmental matter arises from log debarking, sawing into boards, wood residues and kiln drying as these processing stages create environmental hazards on the land.
- Heavy machinery is involved throughout the process with the impacts on land, water, and air quality.
- On the environmental impact of sawmilling industry concluded that several gases such as CO₂, CH₄, NO_x, N₂O, SO₂, and CO were found discharged into the environment and the impacts were found in the form of global warming, acidification, human toxicity, eutrophication, and photo-oxidant formation.

Environmental Impact of Wood Seasoning and Preservation

- It involves different **types of machines and processes** such as sawing, drying, machining, jointing, gluing and finishing and so on, which can be connected to both environmental hazards, and workers occupational health and safety.
- The major hazards with the machines could be classified into **mechanical** (e.g. crushing, cutting, trapping, shearing, abrasion, friction), structural (e.g. sharp edges, projections, obstructions, potential to fragment, collapse, overturn), physical (e.g. electricity, pressurized content, noise and vibration, heat, moisture or cold temperatures), chemical (e.g. gases, fumes, liquids, dusts, that can cause adverse health effects), ergonomic hazards (awkward working positions, manual handling, repetitive movements), and biological (e.g. present of bacteria, molds in materials used or processed in machinery).

Toxic chemicals

- Different types of chemicals **are used in the process of timber production**, especially in preservative treatment, adhesive application and coating of final products.
- Many countries have introduced policies, which prevent the use of toxic chemicals.

Adhesives

- Adhesives are important materials made up of both natural and synthetic substances for bonding wood components into wood product they still might have some negative environmental impacts.
- **Phenol–formaldehyde (PF) and urea–formaldehyde (UF)** are the two commonly used adhesives in external environments due to high weather- and water-resistance properties

- For example, some curing agents such as **aliphatic amines**, and **cycloaliphatic amines** might cause irritation or damage to the skin, eyes, lungs, and liver.
- There is growing interest in the use of adhesives which are environmentally benign.

Wood coatings

- **Wood coatings protect wood** from environmental influences such as moisture radiation, mechanical and chemical damage, and biological deterioration.
- They contain liquid made up of either organic solvent or water, and have potential to emit **volatile organic compounds (VOC)**.
- VOC such as those **containing chlorofluorocarbon are considered a major environmental problem from both air pollution and human health and safety perspectives**

Environmental Impacts from Transportation and Energy Use of Wood Industry

- Environmental impacts associated with the transportation of timber from forest to sawmills, then sawn timber from sawmills to manufacturing companies, and finally to end-users, consume significant amounts of **fossil fuel, and thereby emit greenhouse gas (GHG)** to the environment.
- A study carried out in Swedish wood supply chain showed that **transportation of timber from forests to industrial sites consumes more fossil fuels than any other part of the chain.**
- The **energy used during the transportation system has impacts on the environment** due to release of emission with likely effects on global warming, acidification and eutrophication.
- For example, **organic compounds and phosphorus released to water**, and emissions of nitrogenous compounds to both air and water, are the most serious environmental impacts.
- Road transport of timber account for almost half of the total GHG emissions.
- In East Norway, GHG emissions from the final felling, **extraction and transport of timber**, was found to have **17.893 kg CO₂-equivalents per m³** of timber delivered to industry gate in 2010.
- As a result, transportation creates impacts on the atmosphere, land and water resources, and noise pollution.

- GHG emissions of forestry supply chain activities and found **road transport of timber** had the highest impact in climate change category.
- **Primary energy is used for processing** and materials handling, drying of raw materials, and associated utilities and services such as boiler steam, and condensation system, heating and lightning of premises.
- Sources of energy from fossil fuel have a significant impact on the environment and are non-renewable

Reducing the Environmental Impacts of Timber Productions

Changes in energy sources and consumption pattern

- As energy sources and consumption patterns are critical towards overall environmental impacts of energy consumption practices, **environmental friendly energy sources should be promoted**.
- For example, fossil fuel based energy such as **energy generated from coal**, has more adverse environmental impacts than that of non fossil based energy sources.
- Similarly, **anthropogenic emissions** due to fossil fuel have comparatively higher emission and negative environmental impacts, than that of biogenic emission from burning wood materials.
- Therefore, while choosing energy sources for the timber production process, there needs to be proper care in the use of **renewable energy** instead of fossil fuel-based energy techniques.
- Even if fossil fuel based energy source are to be used, efforts must be made to use as **little energy** as possible.
- **Energy efficient equipment and machines should be used and promoted.**

Use of Sawmill by-products as a thermal energy

- Instead of leaving the sawmill products within the premises of sawmills, and creating environmental hazards, they could be collected and used for producing thermal energy to reduce environmental impacts.
- This would help to minimize the reliance on offsite fossil fuel to some extent and promotes the production of bioenergy at the sawmill site.
- For example, the sawdust could be recycled into a bio-briquette.
- Such bio-briquettes have even higher heating value ranged from 14.88 up to 16.94 MJ/kg, than that of the briquette made from other substances.

Improved sawmilling and sawing machinery

- **Improved sawmilling techniques**, machinery and manufactured products help reducing the environmental hazards and human health problems and ultimately contribute to environmental sustainability in numerous ways.
- The use of **recent technology and safety procedures** could be helpful in these regards.
- **Environmental assessment of a wood manufacturing industry** and established environmental profile of the company so that company continue to maintain its environmental integrity as well as environmental profile of different wood products it manufactures.
- **Improved and new varieties of machinery** instead of old and obsolete one help reducing the wood waste, thereby reduce environmental impacts.
- **Hazardous energies related to machinery use can be minimized** as safety and precautionary measures.
- **Workers health and safety, and ergonomic measures** have to be taken into account while planning and executing the sawmilling operation in the field.

Improved energy efficiency in drying system

- Wood drying is the key to controlling wood quality of final products, and it consumes up to 90% of the processing time in hardwoods and more than 70% of primary processing cost, with the use of significant amounts of heat and energy.
- Environmentally friendly drying process would be beneficial to reduce the environmental impacts while ensuring the quality of final products.
- For example, solar drying provides opportunity as an alternative method of drying timber, while using renewable solar energy to address the shortcomings associated with fossil fuel based drying process.
- Hence, in order to improve efficiency and reduce the environmental impacts, various kind of solar drying are in practice.

Environmental Friendly chemical for wood processing

Preservatives

- There is a growing trend towards environmentally friendly preservatives to reduce the environmental impacts while improving the durability of timber products.
- Environmentally benign wood preservative systems can be developed with proper combination of an organic biocide with metal chelating and/or antioxidant additives.
- It will enhance the protection of wood against fungi as compared to the biocide alone, but also consequently, help reduce the environmental impacts especially on land and water resources.

- Policy and legislative measures to ban the use of toxic preservatives, and growing awareness on using less toxic and more environmentally friendly preservatives would be another way to reduce the environmental impacts.
- For example, a number of toxic preservatives such as CCA (Chromated copper arsenate), creosote, and preservatives based on volatile organic solvent (VOC), are restricted in Europe and the USA.
- Use of environmentally friendly preservatives such as copper-organic preservatives replacing CCA, CCB(Copper Chrome Boron) and CCP (Commercial chemical product) preservatives.
- Stringent environmental policies will have to be practiced to reduce the use of harmful chemicals in wood preservatives.

Adhesives

- As biochemical adhesives have 22% fewer environmental impacts than that of petrochemical adhesives, **use of biochemical adhesives should be encouraged.**
- For example, **bio-based adhesives such as tannin, protein, carbohydrate, lignin,** and unsaturated oil to maintain both environmentally friendly alternatives and efficient traditional adhesives of the timber industries.
- **Seven times higher emission of urea formaldehyde** than that of biochemical based adhesive such as lignin and tannin.
- **Adhesive based on hexamine** could be used to reduce the impact of formaldehyde.

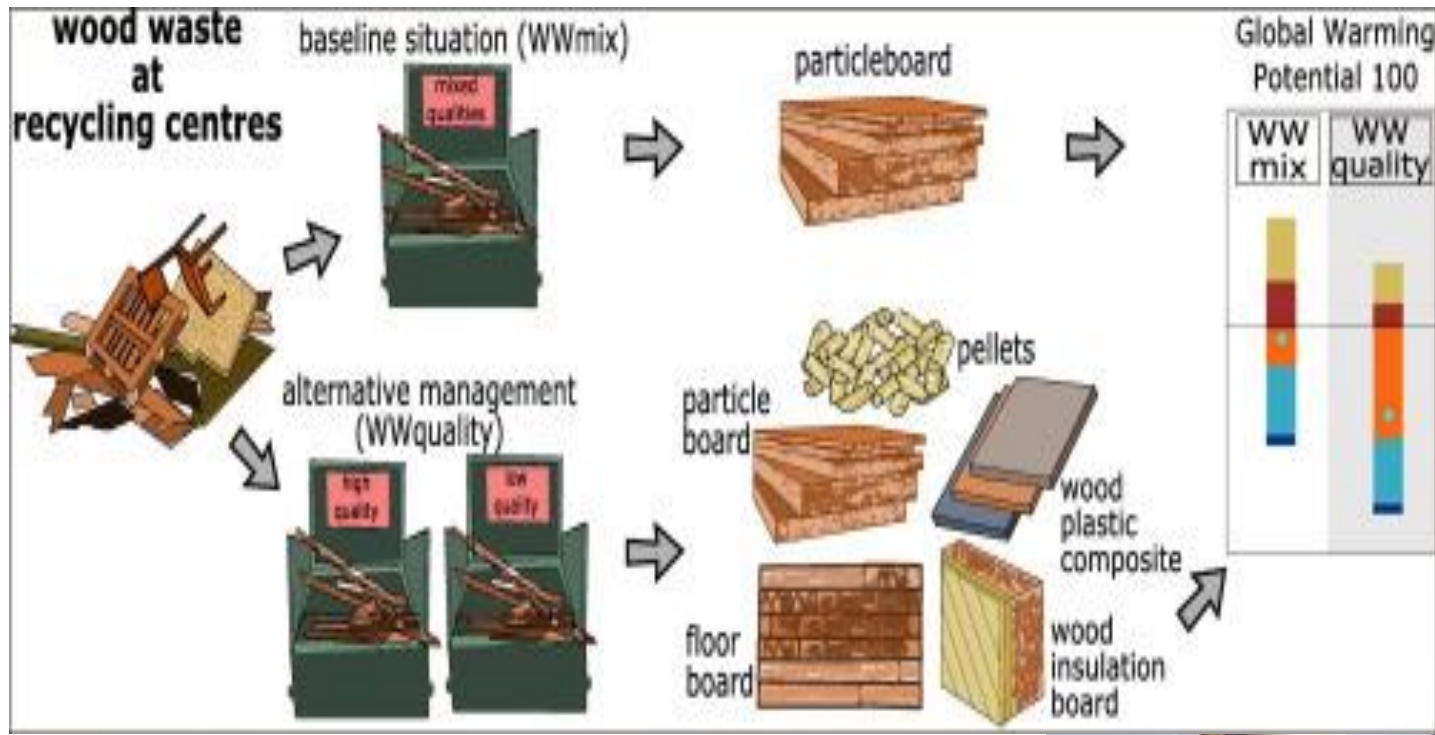
Wood coating

- Low-VOC finishes have led to the creation of a variety of new products.
- Many penetrating finishes, such as semi-transparent stains, have low solids content (pigment, oils, polymers) and are being reformulated to meet low-VOC regulations.
- To meet the VOC requirements, these reformulated finishes may contain higher solids content, reactive diluents (dilutants or thinners), new types of solvents and/or co-solvents, or other non-traditional substitutes.
- To decrease air emissions from wood finishes is to change the formulation to a water-based coating.
- The new water-based products achieve a dramatic improvement.

Other measurement

- Wood waste management
- Integrated industrial sites
- Energy efficient biofuel and improved transportation system
- Safe disposal
- Policy support

Wood Waste Management





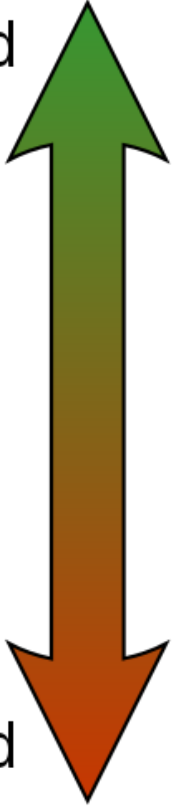
Today's EU-waste hierarchy



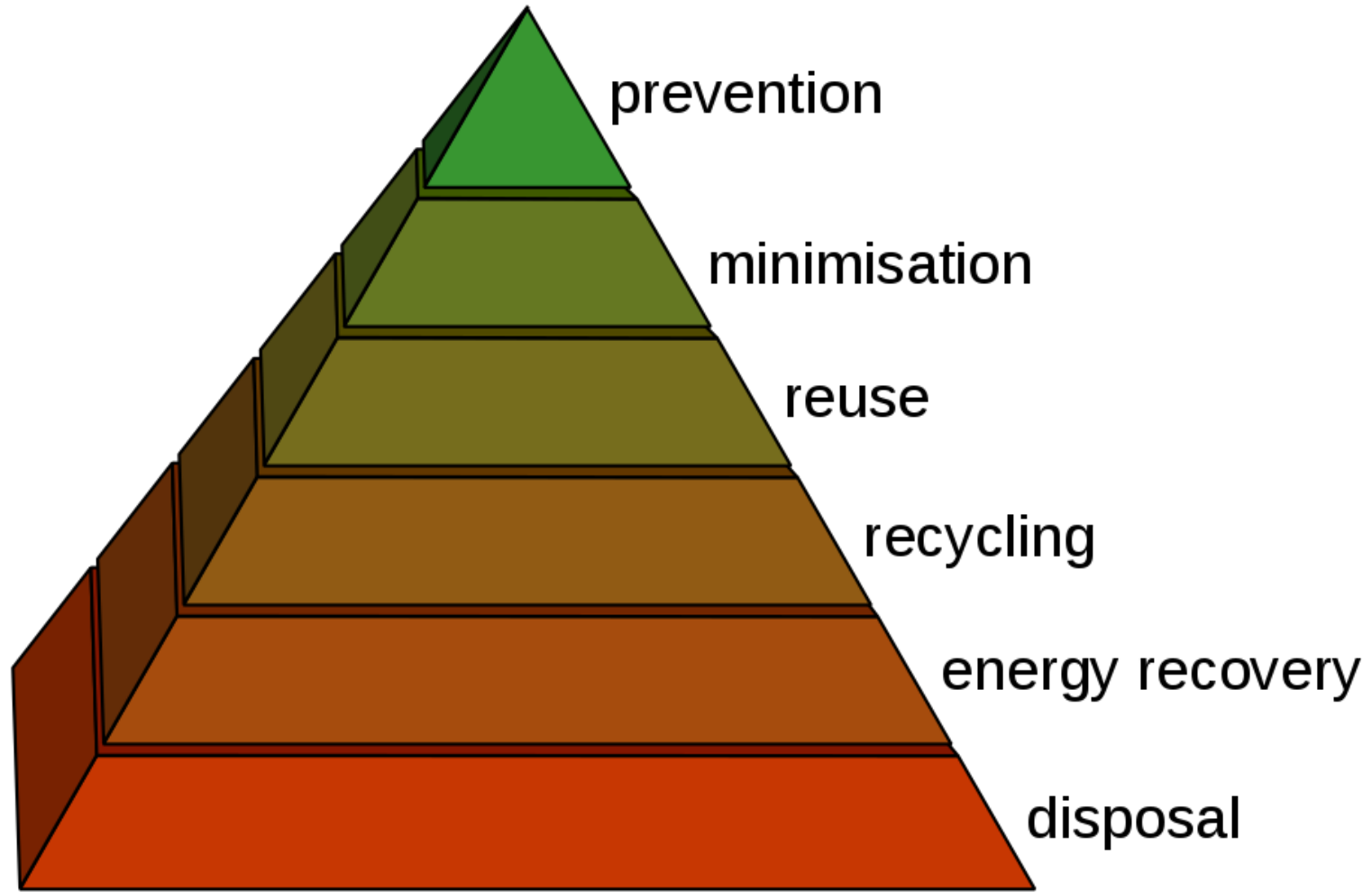
EU energy policy



most
favoured
option



least
favoured
option



- The primary sources of waste wood were wood packaging (21%), demolition and construction (26.7%), wood processing industry (14%), municipal wastes (20.7%), imported wood (9.7%) and others such as private households and railway construction (8%).

Disposal

- Disposal of timber products creates various **environmental impacts especially** in urban area.
- **Commercial and industrial wastes, construction and demolition activities, pallets** and packaging; and utilities are the main sources of urban wood wastes.
- **The products are disposed instead of being reused, recycled and refurbished** they will create the outside pollution and GHG emissions in many ways due to transport from the source to a landfill site; disposal of synthetic materials contributes to toxic waste, which can leach from landfill, and finally, such materials take up a large amount of space in landfill sites and create the need for new waste disposal sites.
- Data on wood waste from Landfills in Sydney and Melbourne, Australia, estimate that approximately 446,000 and 623,000 tonnes are annually disposed of respectively.
- Burning of wood waste produces smokes, contamination and emissions into the environment.