



# KEY MESSAGES & RECOMMENDATIONS

## for political decision-makers

Based on:

### Scientific Background Paper

## Sustainable use of wood in construction, textile and packaging sector towards a carbon-neutral bioeconomy

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# WOOD IN CONSTRUCTION

## Key messages and recommendations

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### Starting point

According to the Global ABC report (2022)<sup>1</sup>, the construction sector accounts for 37% of worldwide CO<sub>2</sub> emissions and 34% of global energy consumption. Furthermore, construction activities utilize half of the world's natural resources and generate 40% of waste globally.

These negative effects are projected to escalate dramatically due to anticipated population growth in the future (especially in the Global South countries; e.g. in Africa the construction market is expected to rise by 70% in the next five years).

On the contrary, the use of wood for buildings can contribute to tackle these challenges as the sequestration and storage effect of carbon dioxide over a long-term period avoids emissions and can be even increased by multiple cascading cycles.

The urgent transformation towards sustainability in the construction sector cannot be tackled solely by using wood, due to its limited availability. Therefore innovative, cascading and sustainable concepts established along the wood supply chain are necessary and might be transferable to the processing industry of non-renewable resources (e.g. fossil-based and scarce material).

Additionally, a new challenging factor for the future forestry and timber industry has to be considered: climate change and the accompanying negative impacts (e.g. increased and stronger storms, incidence of pests and diseases, volatile timber prices, rising costs due to clearing damage etc.) call for adaptation in tree species and forest management and also challenge the wood processing industry.

Preventing deforestation with a special focus on forests with an important and rich biodiversity (especially for fuelwood extraction) and promotion of reforestation (with agroforestry practices) in areas with sparse forest resources has to be prioritized.

<sup>1</sup> Global ABC (2022). Towards a zero-emissions, efficient and resilient building and construction sector, UNEP, pp. 100.

<sup>2</sup> <https://valtioneuvosto.fi/en/-/1410903/parliament-adopted-acts-that-will-reduce-emissions-from-building-and-promotedigitalisation>

### Here are some recommendations how to reach this pathway and foster wood-based constructions:

**Holistic policy frameworks** prioritizing sustainable construction practices by creating incentives for the utilization of wood-based materials (e.g. carbon footprint calculation of new buildings mandatory in the amended “Land Use and Building Act” in Finland<sup>2</sup>), establishing guidelines for sustainable forest management (considering environmental and socio-economic objectives), and promoting the integration of circular economy principles within the construction industry considering legality, transparency, equality, and sustainability of the supply chains and businesses.

Promoting the **use of regionally sourced materials** for reducing reliance on imports and minimizing carbon emissions related to material transport together with supporting local industries, and fostering the growth of sustainable construction material production to strengthen the rural areas and communities (business and job creation, regional value, cultural identity).

**Promotion of reclaimed wood** in construction projects by developing policies, implementing incentives and a dense network of recycling and reprocessing facilities together with appropriate guidelines for deconstruction practices and awareness campaigns to promote the environmental and economic benefits of using reclaimed wood (e.g. minimizing waste production, reduction of CO<sub>2</sub> emissions).

Strengthened consideration of an **integrated design** already in the planning phase of wooden buildings and **digitalization** in wood construction according to the principles of circular economy to guarantee a high percentage of reusability or at least recyclability (e.g. the “National Building Code” of Finland will be amended with a declaration for building products and limitations on the carbon footprint of the buildings with durable and adaptable design).

Development of **appropriate regulations and standards**, as well as adaptation of existing frameworks for mass timber and bamboo construction supported by capacity-building programs and knowledge-sharing platforms to ensure the robustness and product safety, especially related to durability, fire resistance, height restrictions, and seismic construction requirements.

Even if the legal framework for the mobilization of wood in the construction industry is based on different foundations, an integrative approach of the material (wood) with the primary sector (forest) is essential for the goal of a sustainable bioeconomy (**integrated resource policy**). Forest management and adaptation and their contributions to carbon neutrality depend on the integrative approach of actors in the forest sector, the wood value-chain, and the ordering competence at the end of the value chain. Finally, the society benefits from this integrated approach by the provision of ecosystem services and goods supported by the local forests. A sustainable integrated resource policy considers local and global value creation cycles depending on the specific framework conditions.

**Capacity-building and technology transfer** by encouraging partnerships between producers recognized for their best practises in sustainable construction materials to transfer skills, enhance local production capabilities, and promote technological decentralization involving investors and public-private partnerships for financial support.

**Investment in research and development** by governments, NGOs, industry and international organisations advancing wood science, optimizing processing techniques (e.g. material yield, drying technique, preservation treatment through local sustainable produced sources), and promoting the development of innovative wood-based materials (e.g. prefabricated, engineered wood products like CLT – Cross-Laminated Timber, CLB – Cross-Laminated Bamboo, module systems).

Implementation of comprehensive **community awareness-raising programs** (targeting farmers, foresters, households, and other consumers) by governments, NGOs and industry stakeholders highlighting the environmental benefits, durability, versatility and viability (e.g. high-rise buildings) of wooden buildings through showcasing successful pilot projects.

For promotion of greater use of **locally produced and sustainably harvested wood** in construction, it is crucial to **improve the knowledge of planners, builders and clients**. This requires raising awareness among these decision-makers at the end of the value chain of the commonly known benefits of timber buildings, but also of the added value of the ecosystem services provided by forests to educate local people and society in general. In addition, planners and builders need to weigh

up information on regional availability in order to optimize the balance between global and local value cycles. For this awareness-raising, it is of utmost importance to tailor the information to the respective audience.

Fostering and participation in **international collaborations and organisations** (e.g. INBAR – International Bamboo and Rattan Organisation, IUFRO) to facilitate knowledge exchange, technology transfer, and collaboration among member nations.

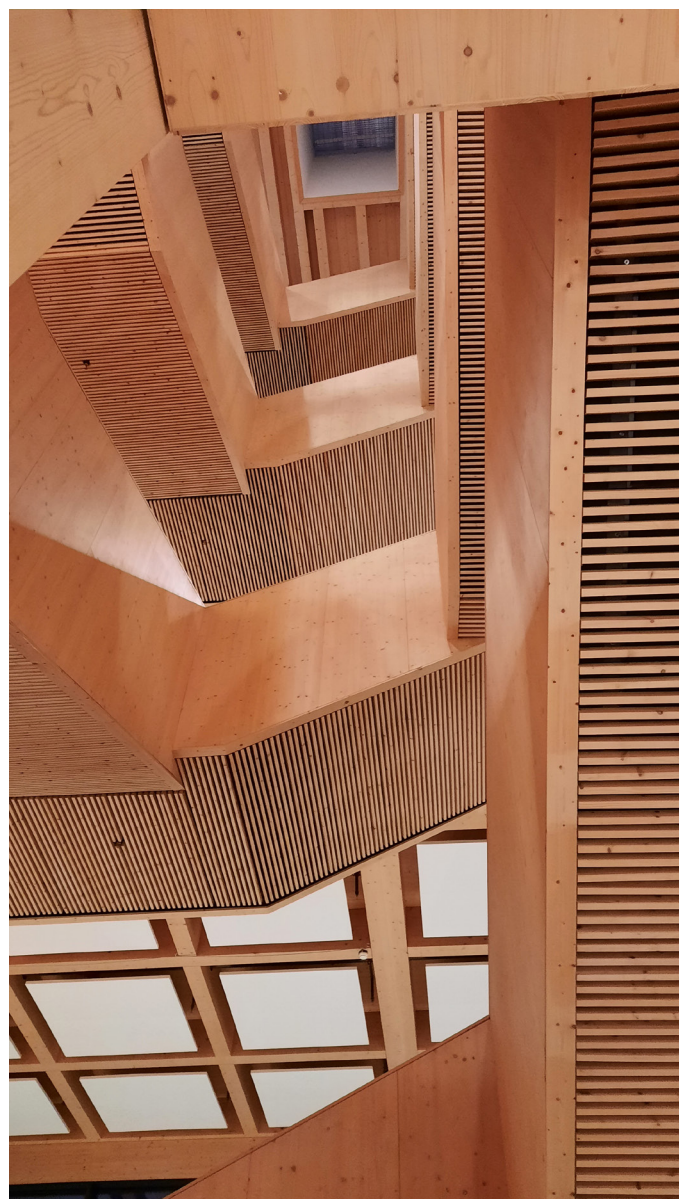


Photo IUFRO

# WOOD FIBRE IN TEXTILE, PACKAGING AND CONSTRUCTION

## Key messages and recommendations

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### Starting point:

Wood, along with its components and materials derived from them, show significant promise for use in a variety of applications, such as insulation panels, adhesives and wood composites in construction, advanced biomaterials, and biochemicals, among others. In fact, wood and especially cellulose fibers, hemicellulose and lignin are considered as fundamental resources for a sustainable and carbon-neutral bioeconomy.

The properties of biodegradability, high strength, and low density that these raw materials display, make them a promising resource, with the potential to replace scarce, polluting and energy-intensive materials such as fossil plastics and steel. However, most applications require the separation of cellulose fibers and their modification, which presents important sustainability challenges related to energy and water consumption, environmental footprint, as well as product recycling alternatives.

On the other hand, production of cotton, for example, consumes pesticides and over ten times more fresh water than production of wood for **textile fibers**. Dissolving pulp is used as raw material for regenerated cellulose fiber (RCF) for textile, which can be further processed in different fibers (viscose, lyocell, acetate, rayon). The global market has been growing rapidly (mainly in Asia) in the 21st century and is expected to increase further.

Paperboard (cardboard, white paper and paperboard) is used as **packaging** material worldwide for approximately 33%, whereas the contribution of non-renewable plastic materials encompasses 44%. The packaging paper demand is growing because of increasing e-commerce, people's positive perception of packaged goods, concern for environmental sustainability as well as safety and intact quality of the goods during transport. The benefits of paper-based packaging include its biodegradability, recyclability, attractiveness, and reduced cost.

<sup>3</sup> <https://metsanhoidonsuositus.fi/en>

**As both markets (textile, packaging) will further grow in the future, recommendations towards a circular, sustainable and carbon-neutral bioeconomy in the textile and packaging sectors and (partially) in the construction sector were developed:**

Use of wood in textile and packaging products is a significant **business opportunity**, which is, however, conditional to **stable and sufficient supply of proper-quality raw materials** and extensive **investments** (especially in the Global South countries). Reasonable relations between sustainable resource management and industrial growth have to be maintained.

The incorporation of wood fibers into different products does not mean that they are automatically preferable from a sustainability point of view (e.g. production of nanocellulose is quite energy-intensive). Also, the **substitution effect** of fossil alternatives can vary significantly because the impact of greener alternatives is highly dependent on local conditions. **Alternative fiber sources** to virgin wood should be analyzed for production of functional materials with **emphasis on circularity by using residual and recycled materials**. The **evaluation of the environmental (e.g. LCA – life cycle assessment, CO2 footprint) and social** (ethical reviews) **impact** of technological solutions (including post-treatments) aimed at introducing new products based on wood and its components or composite materials to the market should be conducted.

**Legal regulations** and comprehensive necessary frameworks such as quota for the **collection of used textiles and packaging materials** respectively the **reuse of textiles** should be conducted.

Countries with a long tradition and state-of-the-art know-how on sustainable supply chains (e.g. Finland with regularly updated “Best Practices for Sustainable Forest Management”<sup>3</sup>) can contribute to the evolution of sustainable wood-based textiles and packaging expertise in Global South countries by, e.g., **knowledge transfer, education, training, and business partnerships**.

**Research, development and innovation activities** should be supported as many unexploited material properties of wood have still to be discovered and some production processes need improvements (e.g. for cellulose dissolution and regeneration processes in the textile sector). **Collaboration** between and within Global

North and South countries should be fostered amid academia, government, and industrial actors (e.g. knowledge exchange based on “Best practices”). It is crucial to encourage productive discussions and partnerships among various stakeholders globally towards a sustainable bioeconomy.

**Awareness raising programmes** (for consumers, industries, designers, governments) to reduce cheap, short life-cycle and single-use fashion and packaging should be conducted. A holistic and participatory formulated understanding on acceptability, desirability, and sustainability of exploiting natural resources has to be promoted.

**Legality, transparency, equality, and sustainability of the supply chains and businesses** are prerequisite. The ways of operating within the society must be adapted according to local regulative conditions, regimes and culture, so that a sustainable and just transformation can be supported.

The substitution of fossil raw materials with renewable resources must be linked to the **design of circular products and processes**, including both cascade principles and massive, simple, and effective recycling.

In addition to **virgin wood**, other renewable materials such as **non-wood and recycled paper** can be used for **dissolving pulp production in the textile process**. This production can be integrated into **forest biorefineries**. More research is needed to implement these innovations.

As global markets are growing, producers of **resource-efficiently generated wood-based textiles** have to be extended and supported (e.g. investments to improve the production techniques and thus reducing production costs).

Further **research and investments** on the most **environmentally friendly methods in the textile processes** (e.g. **CMC** – carboxymethylation of cellulose instead of the xynthation method, **ionic liquids** for cellulose dissolution instead of toxic chemicals) are necessary to avoid harmful chemicals in textile fiber production, refurbishing the production process, and adopting circularity to minimize the generation of toxic wastewater.

Despite existing global production, expected increasing **demand of wood-based packaging materials** opens space for **new cost-competitive producers**. Policymakers should discourage and set up regulations to restrict the use of plastic materials and **encourage bio-based packaging materials**.

More **research and investments** are important to improve the quality of virgin-like and even bleachable pulp from OCC (Old Corrugated Container), thus increasing wood fiber in the packaging sector and **circular bioeconomy**. This concept is especially important for forest deficient countries (like Bangladesh, Pakistan, Middle-East countries, etc.).

More **research and investments** are needed to improve barrier properties of paper for **packaging** (e.g. for food). Bio-based materials such as **nanocellulose, nano-chitosan, sodium alginate etc.** can be explored for improving food packaging. Additionally, due to the unique (barrier and mechanical) properties of nanocellulose an incorporation of sensorbased technologies in **smart food packaging** (e.g. embedded traceability) is possible and facilitates the relevant LCA. Nevertheless, the effects on human health are not completely known and need further research.

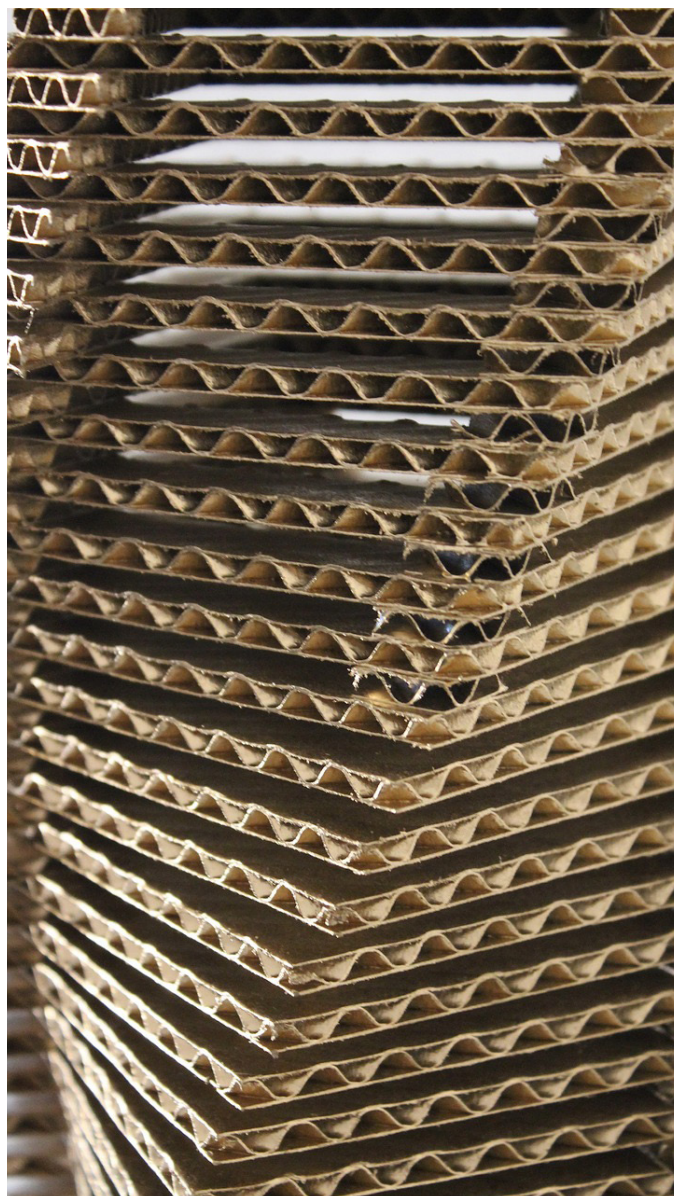


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# WOOD AS A SUSTAINABLE MATERIAL

## Key messages and recommendations

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Derived from the expertise of all the scientists involved in the “Wood for Globe” scientific background paper, the following key messages and recommendations were jointly developed, which refer to both topics (“Wood in construction” as well as “Wood fibre in textile, packaging and construction”) and are aimed in particular at political decision-makers:

**Sustainable wood policies** have to be implemented in every country. These are policy measures that, based on **sustainable forest management**, encourage and promote the supply, processing and use of wood in a sustainable and resource-efficient way and replace fossil fuel-based products and scarce non-renewable raw material.

**Wood** is a diverse, versatile, durable, and bio-degradable material with aesthetic appeal, high strength, reusability, and recyclability. It holds strong potential for **various applications**, such as in construction, packaging, food packing, textiles, biochemicals, and other sectors, optimizing the balance between local and global value cycles.

An effective **balance between conserving and restoring valuable forests**, safeguarding biodiversity and sensitive ecosystems, and the **sustainable use of wood** for wood-based materials has to be found for every country. Reforestation (with agroforestry practices) in areas with sparse forest-resources should be promoted.

As the substitution of non-renewable materials in different sectors cannot be tackled with wood alone due to limited resources a comprehensive **societal, consumption-minimized transformation** (especially in the Global North) is necessary. In this context **awareness raising programmes** are needed to promote a holistic understanding of the sustainability of exploiting natural resources.

The **evaluation of the environmental** (LCA – life cycle assessment, CO2 footprint) and **social** respectively **socio-economic** (e.g. food security, fair salaries, local small and medium-sized enterprises, green jobs) **impacts** of new products and processes based on wood and its components or composite materials should be conducted. In this context **regionally sourced materials** should be preferred.

Emphasis on **circularity, cascading principles and resource-efficiency** is needed. This requires already at the beginning of the process an appropriate **integrated design**. The traditional use of fuelwood in some countries should be therefore reconsidered and alternative renewable energy sources should be promoted.

**Legal regulations** and comprehensive **policy frameworks** and **investments** are necessary to foster and implement sustainable forest management and innovative, circular, environment-friendly wood-based solutions. Additionally, **forest certification processes** to ensure sustainable practices and responsible harvesting should be further enhanced.

**Education and training** have to be improved according to the new challenges towards a sustainable bioeconomy, especially in the Global South countries, to enhance local production capabilities, and promote technological decentralization involving investors and public-private partnerships for financial support.

**Research, development and innovation activities** (e.g. unexploited material properties of wood, environmental impacts of the whole value chain, improving circularity) should be supported by governments, NGOs, industries and international organisations.

**Collaboration, knowledge transfer and business partnerships** between and within Global North and South countries should be fostered involving academia, government, and industrial actors. Also, the participation in **international collaboration and organization platforms** should be strengthened.

**Legality, transparency, equality, and sustainability of the supply chains and businesses** are prerequisite. The ways of operating within the society must be adapted according to local regulative conditions, regimes and culture, so that a sustainable and just transformation can be supported.

**Specific key messages and recommendations related to both “Wood in construction” and “Wood fibre in textile, packaging and construction” can be found in the respective sections of this document.**



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# **About WOOD for GLOBE**

WOOD for GLOBE aims at creating a global wood policy platform to support the use of sustainable wood for a carbon-neutral bioeconomy worldwide.

The project is led by the International Union of Forest Research Organizations (IUFRO) in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the Centre for Bioeconomy of the University of Natural Resources and Life Sciences, Vienna (BOKU).



## **Scientific Background Paper**

**Sustainable use of wood in construction, textile and packaging sector towards a carbon-neutral bioeconomy**

