

IRGWP: An international network of key players for a better understanding and industrial developments in wood protection and preservation

Wood durability around the world in a global climate change context

Wood has long been one of the world's primary building materials, and it remains so today despite competition from alternative materials (e.g., PVC, fiberglass, concrete). Worldwide wood consumption is on the rise, and this trend is set to continue, given the growing importance of the bioeconomy (FAO 2022). This rising demand for wood to provide local construction materials with a low environmental impact is all the more pronounced in the southern countries, where demographic growth is high. In response to higher wood consumption, the area occupied by forest plantations is increasing in most developed countries, while deforestation in tropical parts of the world is still of serious concern (Fisher et al. 2020).

In most tropical countries, with large forest areas and great diversity in terms of wood species, local timber production generally only focuses on a few abundant species (associated with a long renewal period) and only values the old large-sized trees (with a diameter greater than 50 cm). In the context of growing needs for timber, such a restrictive value chain may exacerbate pressure on tropical forest ecosystems. It is therefore essential to broaden our knowledge about the potential to use more species and lower-quality logs for timber production. Tropical rainforests currently cover 1,070 million hectares of the world's surface (90% of them are located in Central Africa, South America, and Southeast Asia), with more than 50,000 timber species, but only a handful of these are used (figure 1). It is estimated that 400 million hectares of these forests are currently given over to timber production. However, research over many decades has shown that the regulations that govern timber harvesting in tropical forests – currently based on logging intensity and cutting cycle – do not allow for the long-term recovery of the timber volume being harvested from these ecosystems. It is therefore urgent that we seek out new sources of timber (Putz et al. 2012).

Many types of wood are overlooked in the international market today, as the demand lies with the more well-known types of timber species. It is therefore important to consider alternative options and choose wood according to the qualities and characteristics required to meet targeted end-use applications.

In numerous tropical forest species, wood properties are poorly described, and wood is undervalued. At the same time, to maximise yield, foresters often apply intensive silvicultural management to fast-growing tree species, resulting in wood

with wide growth rings, lower wood density, a lower proportion of heartwood, and, in many cases, lower wood durability (Kojima 2009).

Wood protection refers to measures that, in various ways, aim to improve the resistance of wood and wood-based materials to biodegradation and biodeterioration. Such organisms include wood-decaying fungi, termites, and other wood-destroying insects, marine borers, and discolouring microorganisms such as blue stain and mould (Jones and Brischke 2017). Wood-decaying fungi are the most common of the destructive organisms in temperate climates, while termites are a dominant vector in tropical regions.

In this context, and although preservation or modification methods to improve the durability of wood have been developed, some of these processes or chemicals remain expensive, unavailable worldwide, or create potential environmental risks. While research on effective and sustainable

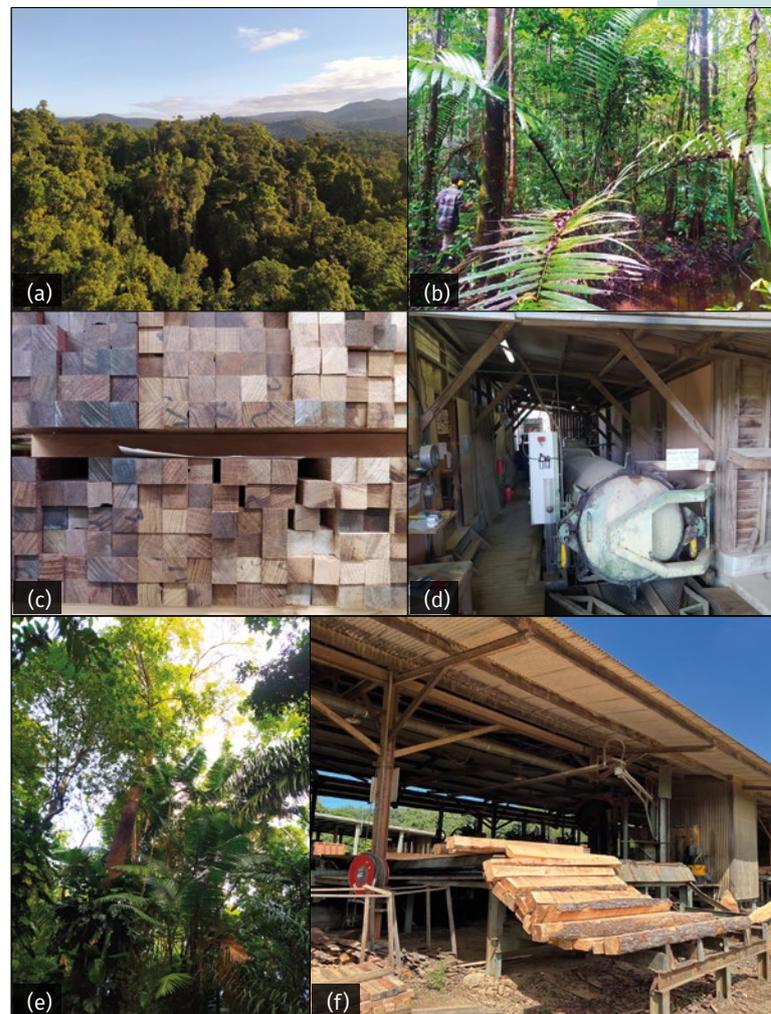


Figure 1.

(a) Tree diversity in the rainforest viewed from the canopy, northern Australia. (b-e) Tree diversity in the rainforest, French Guyana. (c) Wood diversity in test samples form in Laboratory, France. (d) Autoclave for preservative-impregnated wood curing in New Caledonia. (f) Sawmill company in New Caledonia. Photos © K. Candelier.



Figure 2.
(a) Examples of fungal decay test in French laboratory (EN 350-2).
(b) Termite resistance test in French laboratory (EN 118 and EN 117).
(c) Field tests in Queensland - Australia.
Photos © K. Candelier.

preservation and modification methods are still needed, the study of traits related to the natural durability of wood is of great importance for increasing wooden products' service life, choosing an appropriate wood species for an application, and increasing the service life of wooden products in general (Martín and López 2023).

Furthermore, the current context of globalisation and climate change is influencing the biological agents that deteriorate wood materials and wood-based products. On the one hand, globalisation in the trade of wood and wood packaging increases the probability of the inadvertent introduction of forest pathogens and xylophagous microorganisms, which in some cases emerge as invasive species with the potential to attack indigenous forests and timber products. On the other hand, climate change is altering the worldwide distribution of some wood-destroying organisms. Global trade and climate change are inducing a

shift in the distribution of invasive organisms (e.g., favouring spreading to higher altitudes) with the potential to cause damage to forest and wood elements, a trend that will probably be exacerbated in the next decades (Brischke and Rapp 2010). There are still important knowledge gaps regarding the mechanisms wood-deteriorating organisms use to attack wood, their ecology and mode of dispersion, and furthermore is some wood traits are affecting the natural durability of wood in service. To improve the social perception of wood as a raw material, further research is needed to develop or improve sustainable methods for preserving wood species of low natural durability against biological deterioration. Finally, it remains important to continue developing durability test methods, experimental studies, and monitoring approaches (figure 2) (Brischke et al. 2023).



Figure 3.
 Group picture of the participants at the IRG 54 annual meeting, May 28 - June 1 2023, Cairns, Australia.
 Photo © IRGWFP.

Focus on the scopes and activities of the International Research Group on Wood Protection (IRGWP)

A brief history

The International Research Group on Wood Protection (IRGWP) (known until 10 June 2004 as The International Research Group on Wood Preservation) was launched as an independent research group in 1969 to continue the work of a previous group of experts on wood protection that had been set up, following an Austrian proposal in 1965, by the Organization for Economic Cooperation and Development (OECD), in Paris, France. In 1979, the Group's administrative Secretariat moved to Sweden and was supported by the Swedish National Board for Technical Development (STU) until 1985. Since then, the IRGWP secretariat remains in Sweden and has been self-financing, relying entirely on the support of its personal and corporate members. Initially, the IRGWP was composed of 22 scientists from nine countries (Austria, Belgium, France, the German Federal Republic, Japan, the Netherlands, Spain, Switzerland, and the United Kingdom). Today, IRGWP has more than 350 members from 51 countries around the world.

Wood protection

The science of wood protection is by nature multi-disciplinary, and can encompass elements of forestry, wood science, mycology, entomology, physics, chemistry, engineering, and technology. Progress in modern wood protection development usually includes two or more of these elements, making the field highly accepting of multi-institutional approaches to solving complex challenges.

Moreover, to adequately describe the current state of wood protection, it requires an approach that involves viewpoints from various regions of the world and, within some of those regions, a country-by-country approach. In this regard, IRGWP has included the following regions of the world: Africa, Asia, Europe, North America, Latin America, and Oceania.

IRGWP's activities

The IRGWP provides the global forum for research and industrial developments in wood protection sciences, including method development, experimental studies, monitoring approaches, models, product development, environmental aspects, etc., in order to promote knowledge about wood durability science and strategies for the protection and preservation of woods, wood-based materials, structures and building components.

- Through worldwide cooperation, the IRGWP:
- Facilitates contacts between specialists working on the complex problems of wood protection and durability.
 - Issues more than one hundred documents every year, providing members and sponsors with invaluable information.
 - Arranges, with the help of local organising committees, annual conferences, and regional meetings with active workshops to discuss and disseminate significant research progress and develop the relationships between academics and industrial companies (figure 3).
 - Provides help and encouragement for scientists in developing countries to enable contributions to their research activities and to attend conferences.
 - Facilitates the participation of able young scientists in the collaborative research of its Working Parties using the Ron Cockcroft Award scheme¹.
 - Works continuously as a forum for discussion and dissemination of research results.
 - Avoids duplication of research work and therefore saves time, effort, and money, through its unique around-the-world strategy.
 - Shares a durability database aimed at the allocation of wood durability test results (in the field and laboratory conditions) for comparative studies and re-analyses.
 - Stimulates progress and quality. IRGWP members and sponsors are proud of their status and strive continuously towards excellence.
 - Provides cost-benefits: the annual conferences and the regional meetings provide powerful opportunities for making business contacts while keeping aware of the very latest information in this field.
 - Supports financially a permanent Secretariat based in Stockholm, which aims to provide supportive services to members, sponsors, and new interested parties.

¹ <https://www.irg-wp.com/RCAGuidelines.html>

A brief description of the papers published within this Special issue

This special issue of *Bois et Forêts des Tropiques* was prepared in the framework of the IRG54 annual meeting, which was held in Queensland, Australia, from May 28 to June 1, 2023. During this international meeting, the IRGWP proposed a special session dealing with the natural and conferred durability of tropical wood species. Topics of interest included extractives defense mechanisms against fungi and termites, protection of tropic wood in service (including modification and design), and valorisation of tropical wood with low natural durability.

From these presentations, several papers were selected and are hereby presented in this Special issue. The Scientific Program Committee feels these give a good indication of the current status of durability, preservation and valorisation of tropical wood species, and that you find them as interesting as they did during their presentation during the IRG54 conference.

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Doi : 10.19182/bft2023.358.a37406 – Droit d'auteur © 2023, Bois et Forêts des Tropiques – © Cirad – Date de soumission : 12 juillet 2023 ; date d'acceptation : 5 septembre 2023 ; date de publication : 25 décembre 2023.



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Citer l'article / To cite the article

Candelier K., Stirling R., Humar M., Ross L., 2023. IRGWP: An international network of key players for a better understanding and industrial developments in wood protection and preservation. *Bois et Forêts des Tropiques*, 358 : 3-6. Doi : <https://doi.org/10.19182/bft2023.358.a37406>