Pablo van der Lugt

PEFC EDITION

TOMORROW'S TIMBER

TOWARDS THE NEXT BUILDING REVOLUTION

MATERIAL DISTRICT.

TOMORROW'S TIMBER

PEFC EDITION

CARING FOR OUR FORESTS LOCALLY AND GLOBALLY

PEFC™

PEFC/30-01-01

CONNECT DESIGN WITH NATURE AND BE PART OF THE SOLUTION

Design has been taking inspiration from nature for centuries. Natural systems such as forests are critical to our planet's health and we are now starting to understand that preserving and managing these has an important role for human health. Did you know that living and working in timber buildings has been proven to benefit our health and wellbeing? Additionally, the use of sustainable timber contributes largely to the wellbeing of our planet.

Architecture requires a combination of creative critical thinking and in-depth knowledge of materials and products. Construction requires compliance with building regulations and understanding protocols in health and safety requirements. Nowadays, sustainable projects should be using natural materials responsibly. Certified timber and timber products enable architects and designers to comply with stringent public and private procurement policies and green building rating tools worldwide. The use of certified sustainable timber is an important first step in creating sustainable buildings, whether small or tall. Certified timber helps to mitigate climate change by increasing absorption of CO_2 and preventing deforestation. These issues are all critical to our future.

In this chapter, PEFC shares its expertise on the use of certified timber sourced from sustainably managed forests and the positive impact this has on our planet and our lives.

> "We need to search for the big picture solutions of today's vast climate, environmental and world housing needs. This requires looking at the fundamentals of the way we build – from the material choices of large urban buildings to the details of energy performance"
>
> **Dr Frank Werner**
> Environment and Development

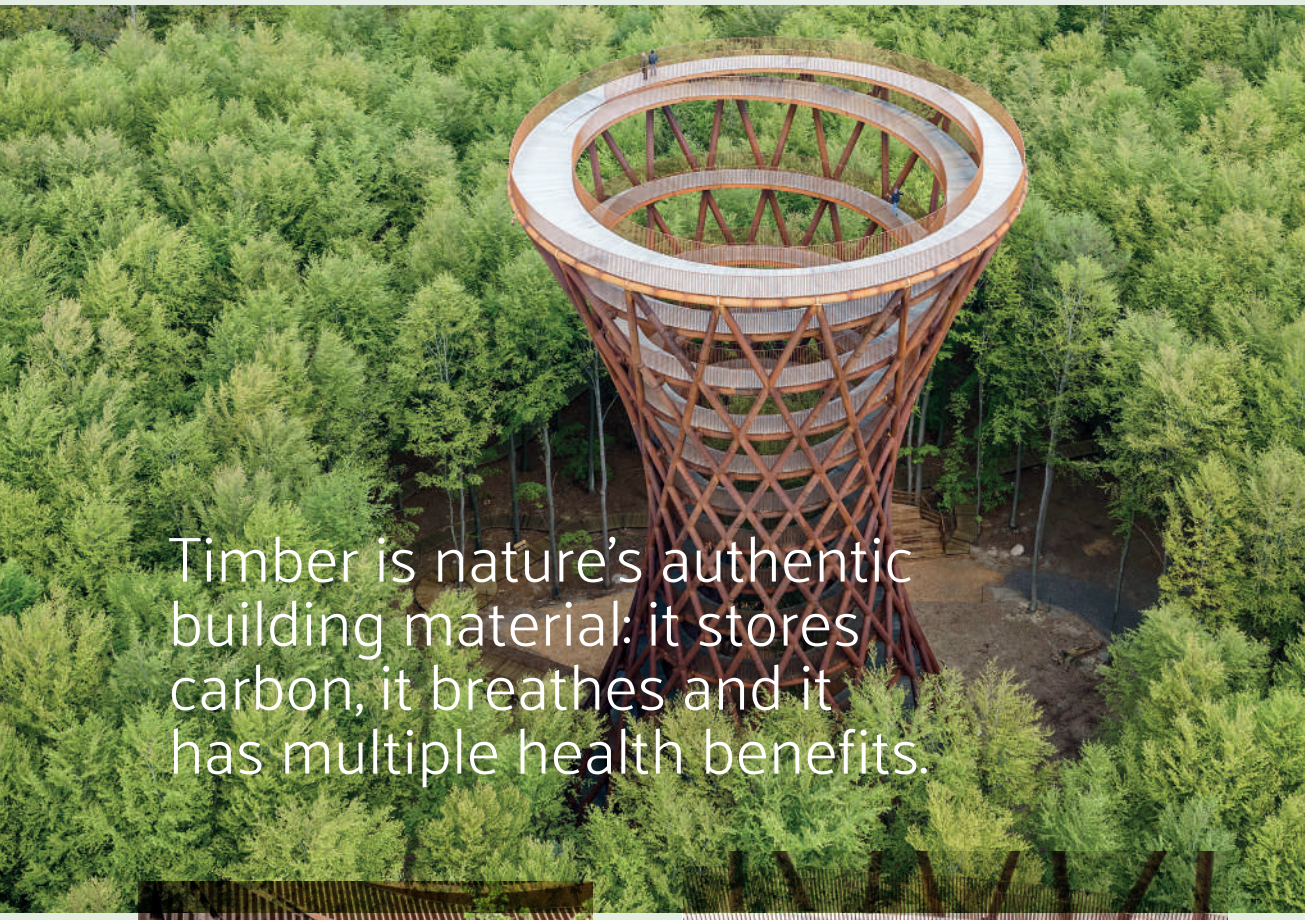
> "Growing trees to use for timber construction not only absorbs carbon dioxide, but all kinds of other particulate pollution. Trees produce oxygen while they are growing. If we plant 3 trees for every one that is harvested, and live with trees as well as building with them, we have a healthier environment"
>
> **Professor Alex de Rijke**
> Architect, educationalist and founder of dRMM

Your assurance

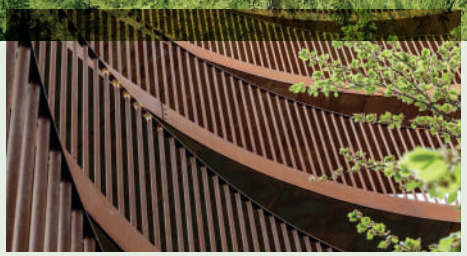
PEFC [1] is a global label for forest certification. We are the world's largest "Sustainable Forest Management" and "Chain of Custody" certification scheme for forest and tree-based products. Nearly two thirds of all certified forests around the world are PEFC-certified and 1,000,000 forest owners are PEFC-certified. Our standards are developed through multi-stakeholder processes with support from NGOs, associations, working groups, companies and individuals, all working together to champion sustainable forest management globally. PEFC stakeholders [2] meet on a regular basis to review whether the standards are still effective and up-to-date. PEFC gives you assurance of the origin of wood and responsible forest management and is internationally recognised, highlighting the vision of a world that values the contribution of sustainably managed forests, now and forever.

Why work with wood?

Wood is a valuable natural material which entire buildings can be constructed from. It can be decorative and is available in many species. Each piece of wood is unique in grain, colour and lines. These qualities can be mesmerising and can be used to complement or accentuate architectural designs. Although wood is a relatively lightweight building material, it is extremely strong, as well as easy to process, finish, maintain and repair. Wood



Timber is nature's authentic building material: it stores carbon, it breathes and it has multiple health benefits.



CAMP ADVENTURE

Location
Rønnede, Denmark

Client
Camp Adventure

Architect
EFFEKT Arkitekter ApS

Photo credits
Rasmus Hjortshøj - COAST and EFFEKT Arkitekter ApS

WAF Best Use of Certified Timber Prize
Shortlisted for WAF Best Use of Certified Timber Prize 2019

HARBOUR KIOSK

Location
Hong Kong

Client
Leisure and Cultural Services Department, HKSARG; New World Development Company Limited

Architect
LAAB Architects

Photo credits
LAAB Architects

WAF Best Use of Certified Timber Prize
Shortlisted for WAF Best Use of Certified Timber Prize 2019

FUTURE AFRICA CAMPUS

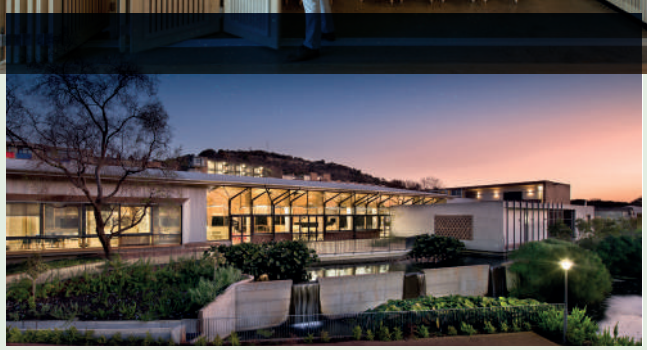
Location
Pretoria, South Africa

Client
University of Pretoria

Architect
Earthworld Architects cc

Photo credits
Dook Photography

WAF Best Use of Certified Timber Prize
Shortlisted for WAF Best Use of Certified Timber Prize 2019



insulates much more efficiently than concrete, steel or aluminium. As a result, buildings made from wood are more energy-efficient, consuming less operational energy for heating and cooling.
Life Cycle Assessment (LCA) studies frequently state that wood outperforms other materials in terms of embodied energy, air and water pollution, and carbon footprint.
Dependent on its use, wood is a fire-safe building material: due to its low thermal conductivity and the way it chars surfaces, wood may be even designed as a fire-retardant. As our society strives for a circular economy, wood is the easiest material to reuse or adapt for another use.
Finally, wood is renewable, provided it is sourced from a sustainably managed forest. Harvesting trees does not have a negative impact if forest are managed according to the PEFC standard requirements, as foresters replant what has been harvested.

> "There is a magic machine that sucks carbon out of the air, costs very little and builds itself. It's called a tree. A tree is an example of a natural climate solution"
>
> **George Monbiot**
> Author, columnist and political activist

Climate change

Climate change, which can be more accurately called a 'climate emergency', affects us all, on a personal and professional level. Building and construction work accounts for 36% of global energy use and 39% of energy-related CO_2 emissions when upstream power generation is included [3]. Architects and those working in the construction value chain have a vital role in responding to the climate emergency.

In 2018, the European Commission issued the strategy document 'A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment' [4]. In this document, it states: "A sustainable European bioeconomy is necessary to build a carbon neutral future in line with the climate objectives of the UN Paris Agreement."

> "Approximately 2.6 billion tonnes of carbon dioxide, one-third of the CO_2 released from burning fossil fuels, is absorbed by forests every year"
>
> **IUCN**

Trees are one of nature's best driving forces to combat global warming. They absorb 0.9 tonnes of CO_2/m^3 while growing. On average, the production of 1m3 of wood creates around 1.1 tonnes less CO_2 emissions than the production of an equivalent amount of fossil fuel-intensive materials, such as steel, concrete or plastics [5]. This amount, coupled with the 0.9 tonnes of CO_2 stored in the wood, means that every m^3 of wood that substitutes fossil fuel-intensive materials saves a total of about 2 tonnes of CO_2.
At present, it is estimated that forests store as much as 45% [6] of all land-based carbon. To give you an idea of the amount of carbon stored in trees: forests in the EU provide a net sink of around 424 million tonnes of carbon dioxide every year; around 10% of Europe's total greenhouse gas emissions. Thanks to sustainable forest management, this massive carbon sink has grown by 9% in area in as of 2019, compared to 25 years ago [7].

The construction industry is the largest buyer of timber and timber products. Using certified timber and certified timber products gives a clear signal to the market that only material from sustainably managed sources should be acceptable. If architects, designers, project managers, construction companies and property owners insist that PEFC-certified timber is used in their projects, they can mitigate climate change, since timber from sustainably managed forests is renewable: PEFC requires forest owners to manage their forests and forest biodiversity for generations to come. In this way, forests will continue to absorb and store CO_2 and protect important natural habitats.

> "Using timber for construction instead of concrete could reduce global CO_2 emissions by 31%"
>
> **UNECE**

The PEFC Sustainable Forest Management standard requires that the quantity and quality of forest resources is protected. This ensures that the capacity of the forest to store and sequester carbon shall be safeguarded in the medium and long term by balancing harvesting and growth rates, using appropriate silvicultural measures and favouring techniques that minimise adverse impacts on forest resources. The standard also requires that climate-positive practices, such as greenhouse gas emission reductions and efficient use of resources are encouraged in management operations.

Text taken from the PEFC Sustainable Forest Management standard, the Benchmark standard.[8]

UN Sustainable Development Goals

There are some obvious links between the SDGs and the activities of PEFC, which works towards a vision of a world where people value the full contributions of sustainably managed forests:

With many of the world's poorest people living in and around forests, enabling smallholders to manage their forests sustainably helps to eliminate poverty.

Wild foods from forests contribute to food security.

Forests play an integral part in the water cycle: about 75% of the world's accessible fresh water comes from the forest[10].

Woody biomass offers significant potential for clean energy.

Wood is an important renewable building material for making cities and buildings more sustainable.

The PEFC label encourages people to produce and consume responsibly.

The role forests have in addressing the effects of climate change is well-recognised (see section on climate change).

About 80% of plant and animal species depend on forests to exist and survive. As a result, the protection of life on land can partially be achieved through SFM.

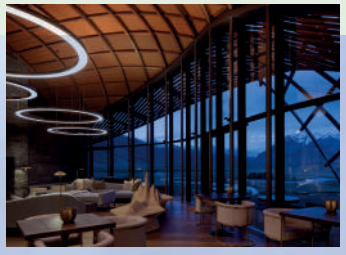
United Nations Sustainable Development Goals and PEFC

The UN Sustainable Development Goals (SDGs), adopted in 2015, are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we all face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The 17 Goals are all interconnected, and in order to leave no one behind, it is important that we achieve them all by 2030[9].

Sustainable Forest Management (SFM) and certification is at the core of PEFC and is a joint stakeholder effort through the whole value chain. SFM is much more than simply an environmental issue. It also addresses the social, economic and cultural dimensions of sustainability. These elements are also at the core of the 17 SDGs.

Some links between the SDGs and PEFC are less obvious. Forests generate employment in remote rural areas and are the basis of small enterprises (SDG 8: Decent work and economic growth). Many of these are run by women (SDG 5: Gender equality) and generate income that is invested in improving livelihoods, including the education of children (SDG 4: Quality education). Forests provide a source of medicine and contribute to health and well-being – many of us enjoy walking, hiking and cycling in the forest (SDG 3: Good health and well-being).
In total, 1.6 billion people worldwide rely on forests for their livelihood[11], including 60 million indigenous people. For 350 million other people, forests provide a direct source of income. Loss of forest area is therefore a direct threat to the way of life and livelihoods of a large group of people globally[12].

PEFC requires sustainable forest management to comply with the International Labour Organization (ILO)[13]. Since 2001, PEFC standards for forest management have included equal pay and treatment for women (SDG 5: Gender equality), even if a country has not signed the ILO Conventions[14]. Age, gender, disability, race, ethnicity, origin, religion and economic status are also of great importance in forest management and the wood value chain. As a result, PEFC standards include social requirements and these are reviewed regularly (SDG 10: Reduce inequality). Group certification for small-forest owners, a concept developed and popularised by PEFC, fosters effective and inclusive institutions (SDG16: Peace, justice and strong institutions).



"It is simple, really. Human health and the health of ecosystems are inseparable"

Gro Harlem Brundtland
Appointed by the United Nations as Chair of the Brundtland Commission, which published the report 'Our Common Future'.

LINDIS LODGE

Location
Wellington, New Zealand

Client
New Zermatt Properties Ltd

Architect
architecture workshop

Photo credits
Patrick Reynolds

WAF Best Use of Certified Timber Prize
Shortlisted for WAF Best Use of Certified Timber Prize 2019

ASKEWS SUPERMARKET

Location
Salmon Arm, BC, Canada

Client
Askews Supermarket

Architect
Allen + Maurer Architect.

Photo credits
Derek Lepper

PINGELLY RECREATION & CULTURAL CENTRE (PRACC)

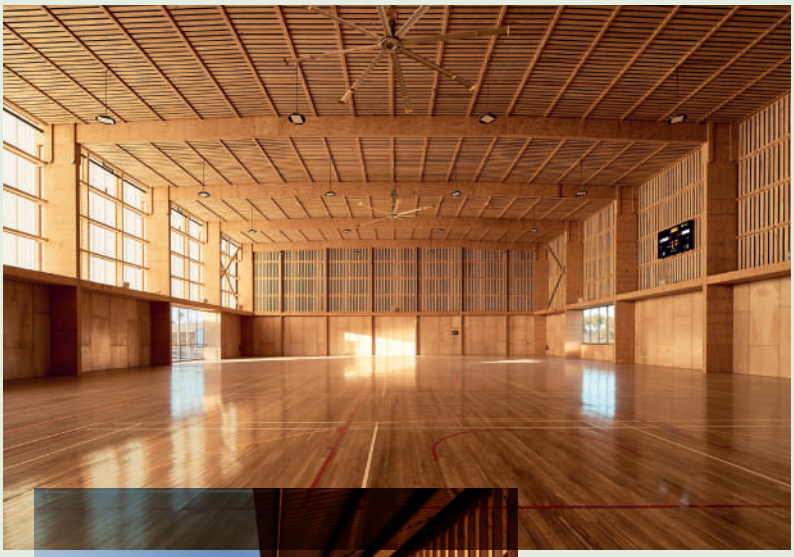
Location
Perth, Australia

Client
Shire of Pingelly

Architect
iredale pedersen hook architects & Advanced Timber Concepts

Photo credits
Peter Bennets

WAF Best Use of Certified Timber Prize
Winner WAF Best Use of Certified Timber Prize 2019



NURSERY

Location
Guastalla, Italy

Client
Municipality of Guastalla (RE)

Architect
Mario Cucinella Architects, Bologna

Photo credits
Rubner Holzbau (Fausto Franzosi)

PEFC itself is a global, multi-stakeholder partnership that facilitates the sharing of knowledge, expertise, technologies and financial resources at all levels from local through to global (SDG17: Partnerships for the goals).

Health and well-being

Spending time in nature is known to be beneficial for our health and well-being. A calming and relaxing effect can be experienced in forests. Incorporating timber into a design has proven long-term health benefits, often described as a biophilic effect [15.] Timber's moisture-absorbing properties can improve indoor climate and provide high-quality acoustics indoors. Wood is extensively used to make musical instruments because of its high acoustic performance. Using wood products in interiors also creates a warm and friendly living environment, resulting in increased positive feelings for those living in them. Research suggests that incorporating natural materials into interior design can reduce stress levels, implying lower risks of depression and immune system impairment.

> "Studies examining the effects of wooden rooms and furnishings clearly demonstrate that the presence of wood has positive physiological effects, lowering blood pressure, heart rate and stress responses when compared to other material types"
>
> Planet Ark report 'Wood, Housing, health, humanity' [16]

In a recent scientific study at Aalto University, Finland [17], solid wood surfaces showed clear antibacterial properties. The antibacterial properties of wood could reduce the possibility of cross-contamination from surfaces.

Timber in the Low Carbon Economy

Specifying timber significantly contributes to the global Low Carbon Economy (LCE). Architects, designers and specifiers can help to grow the LCE by demanding that timber and wood products are used.

The rate and extent to which trees sequester carbon is influenced by many factors including species, site quality, climate and forest management. Trees sequester carbon more rapidly during their peak growth period between 10 - 30 years of age. If a tree is not harvested, its carbon sequestration rate slows after it reaches maturity, which is about 40 years for softwood and 80 years for hardwood. Beyond this point, the rate of sequestration flattens as carbon captured from new growth is offset by the release of carbon from parts of the tree which decay or are shed.

Sustainably harvesting trees in their early mature phase ensures that a forest's carbon sequestration rate is kept at an optimal level. Forests and wood product industries contribute to the LCE in many ways, including by:

- capturing and storing atmospheric carbon in growing forests;
- protecting forest carbon stores from damaging wildfires;
- providing long-term storage of carbon in durable wood products;
- providing a renewable substitute for building materials that are much more emissions-intensive, such as steel, aluminium and concrete;
- replacing carbon-intensive fossil fuel sources such as coal, oil and gas with bioenergy from wood.

Many timber products also undergo a significant phase of recycling, further extending the carbon storage of the element.

Design for Deconstruction

Timber products have a long service life, with the half-life of solid wood products being up to 30 years when used in furniture, and up to 100 years when used in buildings. Design for Deconstruction (DfD) is a method that reduces CO_2 emissions and facilitates the reuse and recycling of wood products at the end of their first life. The DfD criteria can be applied to each of a building's elements and each element can be scored by:

- reuse and recycling potential of the key timber elements within;
- careful selection of connections between elements and components;
- accessibility of elements and components;
- the deconstruction process.

PROJECT CASE

HURLINGHAM RACQUET CENTRE

Location
Fulham, London, Great Britain

Client
Hurlingham Club

Architect
David Morley Architects

Photo credits
Hurlingham Racquet Centre/Metsä Wood

'THE GSK' CO_2-NEUTRAL LABORATORY FOR SUSTAINABLE CHEMISTRY

Location
Nottingham, Great Britain

Client
University of Nottingham

Architect
FDG - The Fairhursts Design Group

Photo credits
b&k structures / binderholz

The emerging principles of the "circular economy" are driving greater resource efficiency and DfD will be an important contributor. Design for Deconstruction can increase a building's value by extending its maintenance life. Other DfD benefits include:

- contributing to the reduction of greenhouse emissions, specifically carbon dioxide;
- creating jobs and improving quality employment via trade skills;
- it is a precursor to an advanced carbon positive or zero carbon economy;
- reducing disruption of soil-based carbon reserves by re-using a sustainable resource.

Market supply
PEFC-certified timber is available in many species and provides the widest choice to architects, specifiers and designers: from traditional timber frame, sheet materials like OSB or MDF panels, to mass engineered timber such as Cross Laminated Timber (CLT), Laminated Veneer Lumber (LVL) and Glued Laminated Timber (Glulam). PEFC-certified timber is also used for interior fit-out and building, such as for flooring, roof trusses, staircases, façades, windows and doors.

Mass engineered timber
Mass engineered timber gives architects and designers a sustainable alternative for building strong, stable prefabricated modules and brings a striking aesthetic to modern building design. Mass engineered timber is predominantly (approximately 90%) made from PEFC-certified Douglas-Fir, Pine, Spruce or Larch and provides a low carbon building solution that can be stacked on-site with increased construction speed.

Specify
Certified timber is often an important specification requirement in your invitation to tender or request for quotation. PEFC advises you to not specify timber species, but to explain the relevant performance requirements needed for the material. This will enable the most cost-effective and sustainably sourced solution for your project.

By specifying PEFC, you are rewarding foresters around the world and showing that their investment in sustainable forest management certification is valued and appreciated by businesses. Your clients will also benefit from the certainty that illegal logging and unsustainable practices did not take place while their project was being carried out.

Suppliers around the globe with a PEFC-certificate [18] can be found on pefc.org-/find-certified.

Outstanding ratings
PEFC-certified timber is accepted in green building ratings around the globe, and using this material helps to achieve Excellent and Outstanding BREEAM [19] ratings. Certified timber is a central component of the RICS SKA [20] environmental performance standard for fit-out projects. It is also included in the US Green Building Council's LEED [21] environmental assessment program, Built Green [22] in Canada and CASBEE [23] in Japan. Certified timber can gain material credits and its thermal properties and ability to reduce thermal bridging can contribute to energy credits.

HOW DOES CETIFICATION WORK?

Forests
PEFC believes that forest certification needs to be local. For this reason, we choose to work with national organisations and individuals to advance responsible forest management. We provide forest owners, from the large to the small, with certificates that are independently verified by certification bodies. These certificates allow them to evidence their sustainable practices in a transparent manner, while empowering governments, companies and consumers to buy sustainably.

Each national forest certification system undergoes rigorous third-party assessment against the internationally recognised Sustainability Benchmark. The Benchmark lays out the international requirements for sustainable forest management and is developed collaboratively by a working group with representation of all relevant stakeholders, including public consultation. The Benchmark describes the requirements and indicators that are vital for sustainable forest management. PEFC has endorsed national forest certification systems in over 50 countries. To date, more than 325 million hectares of forest, a total 62% of certified forests worldwide, are managed sustainably by 1,000,000 foresters around the globe that meet the requirements of PEFC.

PROJECT CASE

PRIVATE BUILDING: FREEBOOTER

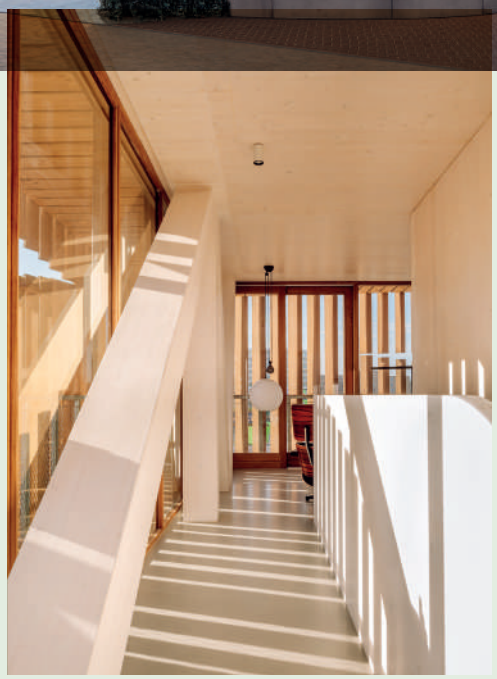
Location
Amsterdam, The Netherlands

Client
Private

Architect
GG-loop

Photo credits
Francisco Nogueira

WAF Best Use of Certified Timber Prize
Shortlisted for WAF Best Use of Certified Timber Prize 2019



Supply chain
Through PEFC certification, materials like timber can be tracked from the forests, down the supply chain to the final products, whether for consumer packaging, transport pallets, paper or used in construction projects. This tracking process is called "Chain of Custody" certification. As well as ensuring that the material comes from a PEFC-certified forest, certification also protects the rights of workers along the production process. Many customers that are part of associations or organisations, such as the Consumer Goods Forum, now need supply chain information to meet their corporate social responsibility requirements.

Chain of Custody
There are several tailored Chain of Custody certification options. To make certification feasible for small companies, PEFC offers group certification as a practical solution. Organisations with Chain of Custody activities in multiple locations can gain certification for all their sites under one certificate through PEFC multisite certification. Companies can opt for an individual certificate. Regular independent audits confirm the activities are maintained to the requirements of the certificate or certification is revoked. Construction companies can take advantage of PEFC project certification to demonstrate their decision to build with PEFC-certified timber.

For more information, visit pefc.org/what-you-can-do.

Trees outside Forests
Trees outside Forests (TOF) include trees in cities, along hedgerows, in fields, on farms, along roads and in many other locations which according to the Food and Agriculture Organization of the United Nations (FAO) do not constitute a forest [24]. TOF are immensely important for rural communities around the world for food, materials and livelihoods. Trees are also important in cities, as they lower surface and air temperatures by providing shade and through evapotranspiration. PEFC revolutionised forest certification by moving it out of the forest with the launch of TOF. In 2015, we started developing an approach that would be practical and affordable to farmers and other land managers, while maintaining the stringent requirements of PEFC sustainable forest management certification. Since the end of 2019, it has been possible for people, landowners and managers to demonstrate the sustainable management of their Trees outside Forests by obtaining a PEFC certificate.

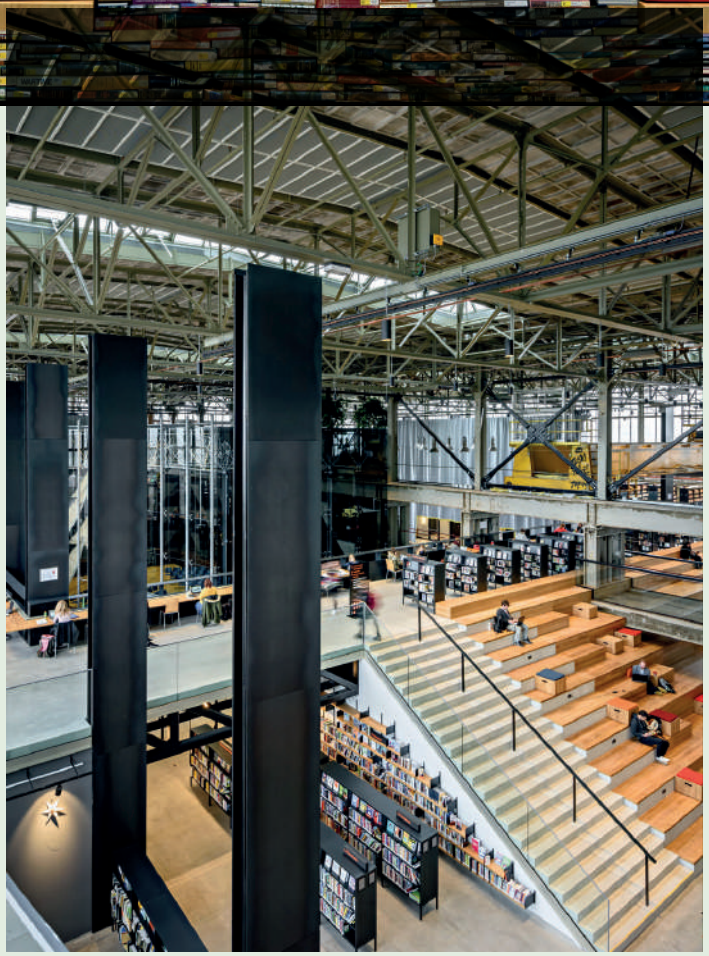
WAF BEST USE OF CERTIFIED TIMBER PRIZE

The Best Use of Certified Timber Prize, sponsored by PEFC, is awarded by a panel from the annual World Architecture Festival [25] (WAF). This prize recognises architects and project teams for their use of certified timber as a main construction material for buildings outstanding in sustainability, innovation, quality and aesthetics. Many of the photos in this publication are of architects and project teams that were awarded or shortlisted for the WAF Best Use of Certified Timber Prize. Participating architects and project teams gain excellent local and international marketing exposure by being awarded or shortlisted and having presented their project at the WAF event.

BE PART OF THE SOLUTION

Deforestation accounts for 13% of global carbon emissions, according to an IPCC report, while land use change generally accounts for 23% of emissions [26]. Converting forests for other purposes with a higher financial return such as palm oil or soya plantations, leads to deforestation. Buying PEFC-certified materials, whether for construction, paper, packaging, stationary or other use, gives the forest value. It creates demand and provides foresters with financial incentives to keep and protect the forest.

> "Creating additional value is one of the best ways to keep forests standing, as it prevents them from being cleared for alternative unsustainable land uses"
>
> **UNECO / FAO**



LocHal

Location
Tilburg, The Netherlands

Client
Municipality Tilburg

Architect
CIVIC Architects, architectural design; Braaksma & Roos Architectenbureau, restoration; Inside Outside in collaboration with the TextielMuseum, interior concept and textiles; Mecanoo, interior design library, labs and offices.

Photo credits
Arjen Veldt Photography (large photos), Marieta Verheul (small photo)

WAF World Building of the Year 2019

The PEFC-team is looking forward to future designs with sustainable timber.

References

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2. PEFC National members also include organisations that do not cite PEFC within their name, such as the Sustainable Forestry Initiative, American Tree Farm System, Responsible Wood, New Zealand Forest Certification Association, PAFC, South African Forestry Assurance, China Forest Certification Council, Network for Certification and Conservation of Forests, SGEC/PEFC Japan, Indonesian Forestry Certification, Malaysian Timber Certification, CERFLOR and CertforChile.
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Credits

We want to thank our colleagues, national members and Internationals Stakeholder members of PEFC, on all continents for their support in making our contribution to Tomorrow's Timber book possible. We are also very grateful to architects, project teams and businesses that have supplied us with photos to illustrate and demonstrate the sustainable, innovative buildings made with PEFC-certified timber.

Mark Thomson
Architect – Director at Eco Effective Solutions
ecoeffective.com.au

Patricia Dolman
Marketing & Communication Manager at PEFC Netherlands
pefc.nl

PEFC – Caring for our forests locally and globally
pefc.org

June 2020

"Show your commitment and support the forest. Together we can make a difference."

PEFC

PEFC
Hollandseweg 7G
6706 KN Wageningen

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TOMORROW'S TIMBER

TOWARDS THE NEXT BUILDING REVOLUTION

Architecture requires a combination of creative critical thinking and in-depth knowledge of materials. Building with sustainable timber is an excellent way of supporting sustainably managed forests. With this supplement of Tomorrow's Timber book PEFC shares knowledge about sustainable forest management. Using sustainable timber and timber products down the supply chain to the final construction projects has a positive impact on forests and our whole society.

PEFC is an international non-profit, non-governmental organisation dedicated to promoting sustainable forest management through independent, third-party certification.

THE PEFC LABEL GUARANTEES:

- Prevention of deforestation;
- Maintenance and improvement of biodiversity;
- Protection of ecological valuable areas;
- Indigenous people's rights are protected;
- Protection of the rights and well-being of people working in the forest and value chain;
- Employment for local people;
- Forests act as a carbon sink helping to mitigate climate change.

PEFC – Caring for our forests locally and globally
pefc.org

Cover photo: ©Anton Grassl Photography

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