

BauBuche Beech laminated veneer lumber

Wood. Forest. Timber.



Sheet **CONTENTS**

- 2 7.1 The history of sustainability
- 2 7.2 The transformation of our forests
- 3 7.3 Beech – the tree species with the largest resource reserves in the world
- 4 7.4 Past and future use of timber
- 6 7.5 Forests as protectors of our climate
- 7 7.6 How much CO₂ is stored in one cubic metre of BauBuche?
- 7 7.7 Sustainably managed forests versus wild nature reserves
- 8 7.8 Certification systems

© Pollmeier Massivholz GmbH & Co.KG

Pferdsdorfer Weg 6
99831 Creuzburg

BauBuche consulting service for
architects, civil engineers, builders and
timber construction companies
P +49 (0)36926 945 560
baubuche@pollmeier.com

Consulting service on sawn timber,
BauBuche, Pollmeier LVL and contact
person for the trade
P +49 (0) 36926 945 163
sales@pollmeier.com

Cover photo: Adrian Tyler, page 5: The Fogong Temple Wooden Pagoda of Ying county, Shanxi province, China: The_Fugong_Temple_Wooden_Pagoda, Wikimedia Commons, licensed under GNU for free documentation, URL <https://commons.wikimedia.org/w/index.php?curid=3078442>, Codex Atlanticus, fol. 30v: Exploded view of winch with two free spools, URL <http://www.codex-madrid.rwth-aachen.de/essays/freilauf/rahmen.html> Little Moreton Hall, Cheshire, UK: LittleMoretonHall, Wikimedia Commons, URL <https://commons.wikimedia.org/wiki/File:LittleMoretonHall.jpg>, Sydney Opera House: Enoch Lau, Sydney_Opera_House_Sails_edit02, Wikimedia Commons, GNU licensed, URL https://de.wikipedia.org/wiki/Datei:Sydney_Opera_House_Sails_edit02.jpg, elobau sensor technology, Probstzella: Michael Christian Peters, Chicago River Beech Tower: Visualisation by Perkins + Will

7.1 The history of sustainability

Forests in Germany have been managed sustainably for more than 300 years. The German term for sustainability, »*Nachhaltigkeit*«, originates from the forestry industry and referred initially to the practice of cutting no more timber than grows in the same period of time. Through this method, the natural resource is protected for generations to come.



In 1713, the scientist and forestry expert Hans Carl von Carlowitz published »*Sylvicultura Oeconomica*«, attacking the destruction of forests through the excessive felling. He coined the term »*Nachhaltigkeit*« and was the first to clearly formulate the concept of sustainability in European forestry.

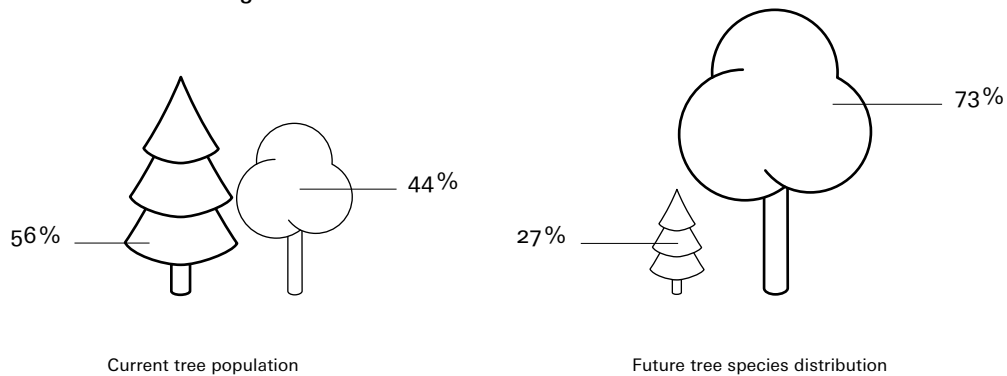
Today, Germany has one of the strictest forestry laws in the world, based on the principles of sustainable management and the long-term protection of woodlands. Over the last decades, biodiversity and the protection of indigenous species and habitats came into focus and are now also duly reflected in law.

7.2 The transformation of our forests

In Germany, forests cover just below one third of the area. About half of the forests are privately owned, while the rest is in the hands of the state, the Laenders and municipalities. Every year, around 95 million cubic metres of wood grow in German forests, while approximately 75 million cubic metres are cut down.¹ The wood reserves in Germany are thus on the increase. The dominating tree species are spruce, pine, oak and beech, accounting for around 80% of the wood reserves. While pine is predominantly found in the north of the country, spruce is the main tree in the south of Germany. Beech and oak grow mainly in the central German uplands.

In the 20th century, forests were decimated by heavy storms and as a consequence of reparation payments after the war. To compensate for this loss, fast-growing species such as spruce and pine were planted. In some regions, this resulted in vast monoculture forests consisting entirely of softwood species prone to damage by wind, pests and diseases. As a consequence, there is now a move away from conifers towards broadleaved species and mixed forests.

At the moment, German woods are made up of 44 % deciduous species and 56 % conifers. Following the changes in forest management adopted in the 1980s, the share of broadleaved species in our forests will increase significantly over the coming decades. The next generation of forests will consist of 73 % deciduous species and 27 % conifers. The tree that will benefit most from this change is beech.²



¹ Source: Third German National Forest Inventory 2012

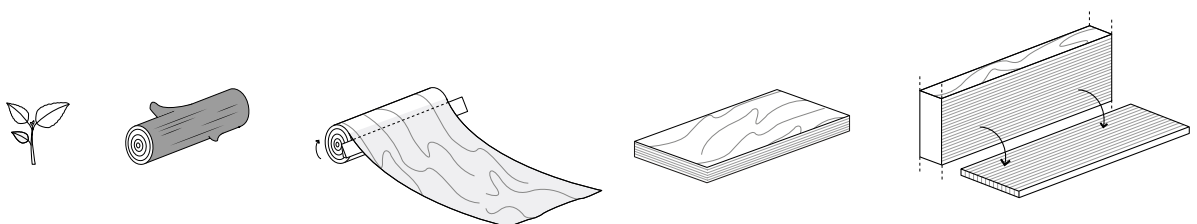
² Source: Third German National Forest Inventory 2012 (comparison of main stock/young tree stock)

7.3 Beech – the tree species with the largest resource reserves in the world

Beech is the most common deciduous tree in Central Europe. Every year, 18.3 million cubic metres of beech timber grow in Germany, while only 10.9 million cubic metres are cut down. This means that only around 60 % of the annual growth is harvested. Beech wood reserves are thus at a record high. According to the Third German National Forest Inventory, the current reserves of beech timber amount to more than 548 million cubic metres. This makes beech one of the tree species with the largest reserve from sustainable management.

The main reason behind this development is the fact that beech is no longer widely used in building construction, as nearly 99 % of all timber used by the industry originates from softwood species. “Spruce is simply made for our sawmills!” say people within the industry, referring to long and straight stems of this tree. Beech on the other hand is less straight, has many knots and is therefore more difficult to cut and machine than softwood. Drying the timber is also more complicated with broadleaved species than with conifers. That is why construction materials made from hardwood have for a long time been too expensive to compete in the market, despite the fact that beech is much stronger and harder than softwood. Today, most of the beech harvested in Germany is used for furniture, the production of paper and cellulose, or as a solid fuel.

This is about to change as new technologies and industrial processes are turning beech into an attractive building material.



From tree to high-end material

7.4 Past and future use of timber

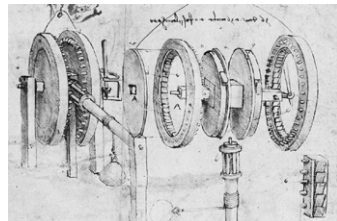
From prehistoric times to the beginning of the Industrial Revolution, timber was one of the main building materials in Europe. Many of today's standard construction methods are actually rooted in timber building methods. From the 1400s to the 1930s, most machines were made from wood. Until the 1940s, aeroplanes also consisted primarily of plywood. From the end of the 19th century, new, industrially produced materials pushed timber to the side. The construction sector for instance adopted steel and concrete as the main building materials, as they can be produced industrially, offer high strengths and are not flammable. For machines and aeroplanes, steel, aluminium and plastics became the materials of choice. Initially, people were generally unaware of the long-term consequences of a move away from timber towards fossil fuels, i.e. from a renewable resource to non-renewable resources. Today, timber as a construction material is experiencing a renaissance nobody would have expected 20 years ago. There is now a much greater awareness of environmental issues in general and climate change in particular. And the move towards renewable resources is also transforming the construction industry. The last few years have seen the development of innovative, high-performance wood-based materials that can be produced at an industrial scale. By using timber in our buildings, we can turn our cities and towns into carbon sinks that help protect our climate.

At the moment, roughly 99 % of all timber used in construction comes from conifer species. Despite huge wood reserves and better physical properties, broadleaved species still play a minor role in the construction sector. The transformation of our forests into deciduous woods will however force the industry to develop new products and production methods for hardwood, as this will soon become the dominant wood type grown in Central Europe. Unless this happens soon, our efforts to combat climate change and to move towards more sustainable resources will be doomed.

The beech laminated veneer lumber product BauBuche is the only industrially produced construction material made from hardwood. With BauBuche, the construction industry can now avail of a hardwood building material at a price that compares favourably with other construction materials. BauBuche is much stronger than any material made from softwood – with bending strengths that are about three times higher than that of spruce glulam. BauBuche allows for much more slender constructions and wider spans, saving material. At the same time, the material opens up new fields of application for timber as a construction material and has inspired many innovative designs.



Bridge across the Rhine built for Caesar's armies, ca. 55 BC



Codex Atlanticus,
exploded view of winch
with two free spools,
Leonardo Da Vinci, 1478–1518



Construction with iron girders –
Crystal Palace, exhibition hall of
Great Exhibition in London, 1851.



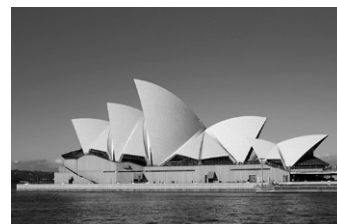
At the start of the 21st century, timber construction
is experiencing a renaissance:
Hall with lattice girders made in BauBuche, 2016



Ying Xian Pagoda,
1056 AD, height 67.3 m



Traditional timber frame house,
Little Moreton Hall in Congleton,
England, 1559



New construction materials replace
timber: Sydney Opera House,
steel & concrete construction, 1973

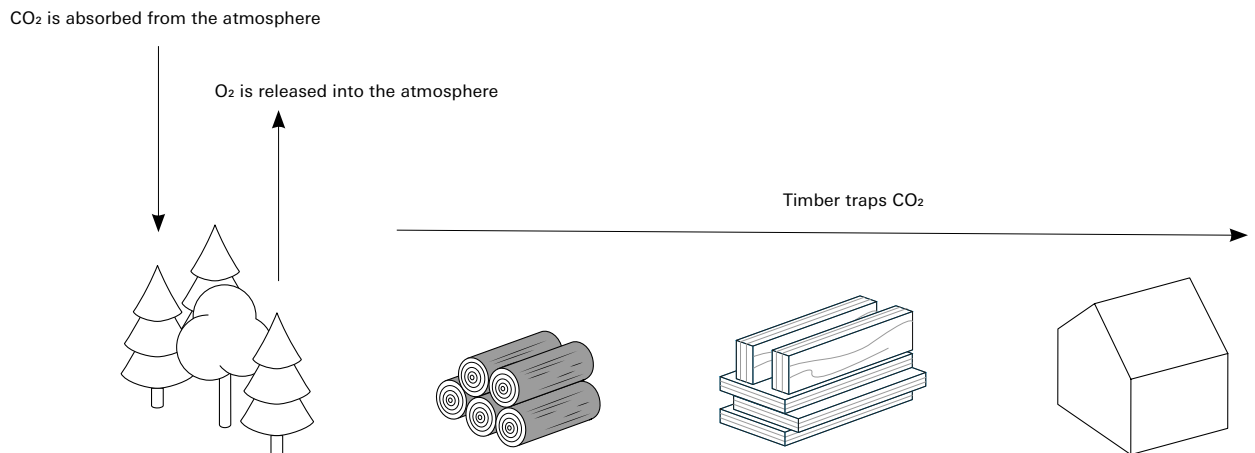


Chicago River Beech
Tower, draft for
80-storey building with
a hardwood support
structure, project by
Perkins + Will and
Thornton Thomasetti,
University of Cambridge

7.5 Forests as protectors of our climate

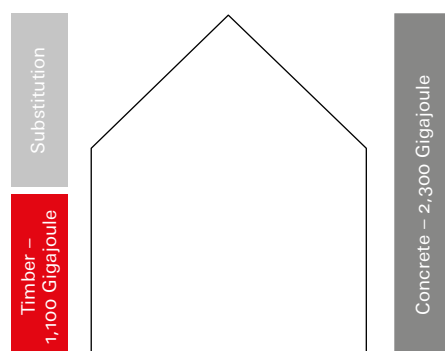
Climate change is mainly caused by the burning of fossil fuels whereby carbon dioxide (CO₂), a greenhouse gas, is produced in large quantities. In our country, forests are the greatest climate protectors. Through photosynthesis, trees absorb CO₂ from the atmosphere and store the carbon (C) in their wood. At the same time, oxygen (O₂) is released into the atmosphere. Woods in general, and timber produced in sustainably managed forests in particular, help reduce the greenhouse effect:

- Firstly, forests are important carbon sinks. Large amounts of carbon are stored in trees and in forest soils.
- Secondly, timber that is used as a material, for example in construction, keeps the carbon locked up for a long time. Also, new trees grow where timber has been cut, so that even more CO₂ is removed from the atmosphere.



- Thirdly, timber products reduce the release of large amounts of CO₂ through the substitution effect. Around 30% of the CO₂ emissions in Germany result from the construction and operation of buildings. More than half of these emissions are caused in the production of building materials (indirect emissions).⁵ By using timber as a substitute for construction materials such as cement, steel or aluminium, which all require a lot of energy in their production, the release of CO₂ into the atmosphere can be reduced significantly. This is known as the substitution effect.

Energy required to build four-storey building shell



Source: German Climate Action Plan 2050

7.6 How much CO₂ is stored in one cubic metre of BauBuche?

One cubic metre of BauBuche weighs 800 kg and consists of 50 % carbon (C).
Through oxidation, 1 kg of carbon turns into 3.67 kg of carbon dioxide (CO₂)

$$800 \text{ kg/m}^3 \times 50\% \times 3.67 = 1468 \text{ kg}$$

One cubic metre of BauBuche traps nearly 1.5 tons of CO₂.

7.7 Sustainably managed forests versus wild nature reserves

Germany's forestry laws are among the strictest in the world. The management of woods is governed by the Federal Forest Act and countless laws at Laender level, which do not only promote sustainability but also protect nature. In Germany, good forest management and the protection of species and habitats therefore go hand in hand. Clear-felling and the use of pesticides is mostly prohibited. To protect the woodland ecosystems and the habitats of plants and animals, only a few selected mature trees are cut in any section of wood. As a consequence, there is little need for replanting, as new trees can develop naturally under the protective cover of mature stock. Where a large tree is cut, more light enters the forest, promoting the growth of young trees. Through such careful management, forests serve as a source of timber while remaining attractive natural habitats for many species as well as popular spaces of recreation for people.



Despite all these benefits, some people maintain that forests should not be managed at all. Their voices are heard in discussions about the establishment of national parks where no timber is to be cut, expressing opinions that hark back to a romanticised image of wilderness. The idea that nature should best be left alone arose within the ecological movement of the last century: while there is a deep concern about the consequences of climate change, many people want to restrict the use of our most important renewable resource, which is of course timber. At the same time, huge amounts of wood products are imported into Europe. One must therefore ask the question whether it is morally justifiable that we "rich Europeans" protect our forests against any human interference while happily buying wood produced in other regions of the world.

If we want to be serious about climate change and the protection of our environment, we need to cover our demand for renewable materials from local resources – our own forests, managed according to credible environmental standards and within the strict laws that are already in place in most European countries.

7.8 Certification systems

Many parts of the world are still plagued by illegal tree cutting and overexploitation of forests. Products made from timber harvested in such unsustainable ways unfortunately still find their way to consumers in Germany and other countries in the European Union. In order to enable consumers to make informed choices, a number of certification systems for sustainable forestry management have been devised over the last few decades.

The largest organisation in this area is PEFC (Programme for the Endorsement of Forest Certification Schemes). The PEFC label is given only to products whose entire production process – from the raw material to the finished product – has been certified and is being continuously monitored by independent experts. In Germany, about two thirds of all forests are certified under this scheme. As PEFC-certified roundwood is locally available in sufficient quantities, Pollmeier offers PEFC-certified BauBuche products at no extra cost.

The second certification system widely-used in Europe is FSC (Forest Stewardship Council). Around ten percent of the forest area in Germany is certified by FSC. FSC-certified BauBuche products are available on request.

In Europe, the two labels of PEFC and FSC are competing with each other for market share. Apart from protecting forests, the organisations behind the labels thus appear to be pursuing their own commercial interests. Heated debates about the merits or otherwise of these labels and intense lobbying are sometimes overshadowing the actual goal of certification. As a result, we see forests in certain German Laender being certified by both PEFC and FSC. Such double certification however makes timber only more expensive and thus less attractive in a market where steel and concrete are still the main competitors. Double certification therefore does nothing for the protection of our forests and nature, as the only beneficiaries are the certification bodies.

FSC often claims that it has the “better” label, as its standards are stricter. There is however some doubt whether this is true or even relevant, as both FSC and PEFC work with national forestry standards that differ greatly from country to country and are based on the statutory framework in place. This means for instance that both labels apply extremely stringent requirements to timber products made in Germany, while the standards that apply to wood from Latin American plantations are much more lax.

Given the strict laws in Germany, it is fair to say that all timber products made from wood grown in the country – whether certified or not – meet much higher standards as regards sustainability and the protection of the environment than many wood products bearing the FSC label originating from other parts of the world.

Both the PEFC and FSC certification systems make sure that products bearing their labels comes from legally and sustainably managed forests. However, the rivalry between the certification schemes pushes up the price of wood and thus weakens the competitiveness of timber products.