



WOOD

BUILDING THE
BIOECONOMY

Foreword

In November 2018 the European Commission released its vision “*A Clean Planet for All*”, a long-term strategy for a prosperous, modern, competitive and climate-neutral economy by 2050. The European Parliament backed such vision and called for the EU to raise its climate ambitions already by 2030, by increasing the greenhouse gases emission reduction target to 55%. More recently, the President of the European Commission, Mrs Ursula Von der Leyen, committed to present an “European Green Deal” that should become the first European Climate Law to enshrine the 2050 climate-neutrality target into legislation.



Looking ahead, it becomes increasingly evident that the shift towards a European climate-neutral economy will have to encompass all aspects of sustainability - environmental, social and economic. This will ensure that the pursuit of our environmental goals will provide new opportunities for development and growth in a socially fair way.

This is where sustainable wood products enter the picture. The European woodworking industries provide renewable alternatives to fossil-based and carbon-intensive materials; they source their raw materials from sustainably managed forests and process them in a resource-efficient way that minimises waste and enhance circularity. As such they are a building block of the European circular bioeconomy that brings jobs in urban and rural areas.

In particular, wood in construction provides promising perspectives in meeting the housing challenges in Europe while delivering a unique environmental performance that helps reducing the release in the atmosphere of carbon, as also recognized by the European Commission¹.

And, as this booklet aims to show, this is only one example of the potential that such natural, renewable and recyclable material offers to meet the expectations of European citizens.

A handwritten signature in blue ink, appearing to read 'Simona Bonafè', written in a cursive style.

Simona Bonafè

Member of the European Parliament

Brussels, October 2019

1. European Commission, In-depth analysis supporting the Communication (COM(2018) 773) “A Clean Planet for all”.

INTRODUCTION

Wood - A vital resource for the planet

Throughout human history, wood has provided us with a diverse, versatile, durable and renewable manufacturing and construction material. Today it is potentially more valuable still. Its use in a bioeconomic development strategy can help reduce, even reverse adverse climate and wider environmental impacts of modern human activity.

The majority of scientific opinion is now clear; man-made emissions from use of fossil fuels and other finite resources and over dependence on energy intensive materials are implicated in global warming and we must reduce and mitigate them urgently (Chapter 1 and 2.3). It is increasingly apparent that the global economy must work in harmony with the environment. What is needed is a circular bioeconomy, reliant on renewable, low carbon-impact materials and products such as wood (Chapters 1.5 and 3).

A natural, renewable material, wood has a uniquely low impact production and processing cycle (Chapters 2 and 6).

The story starts in the forest, where trees transpire oxygen, absorb the key global warming gas carbon dioxide and lock carbon into wood, potentially for generations (Chapter 2.2). What is more, tree planting and regeneration strategies in Europe mean that its overall forest area is expanding (Chapters 4 and 6), with positive environmental, social and economic effects.

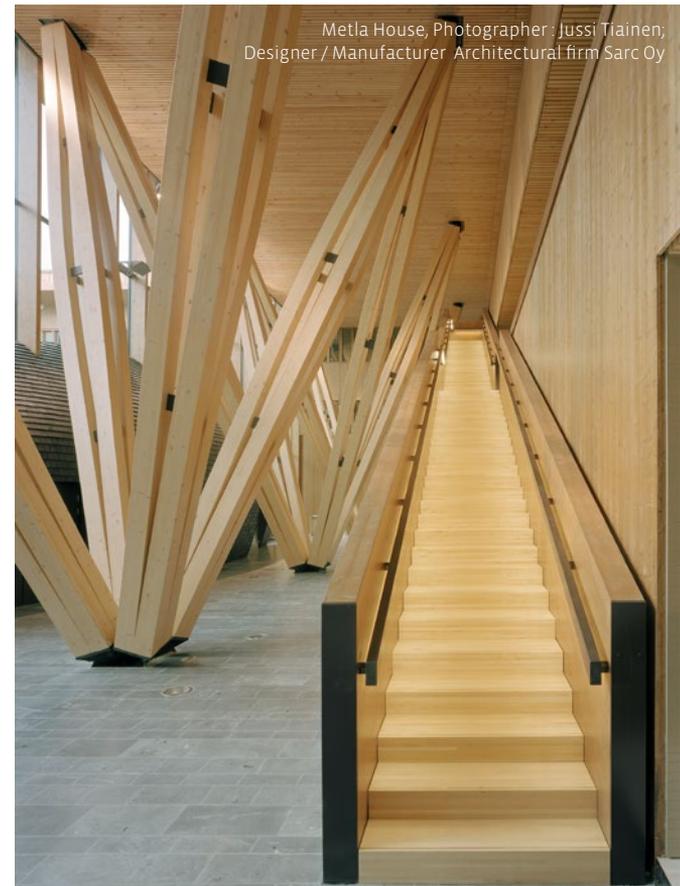
Timber from sustainably managed forests is also not only inherently low energy in terms of production, manufacturing, transport and application. Advances in processing, machining and engineering are enabling it to substitute man-made materials in an increasingly wide range of ever more technical and higher specification applications.

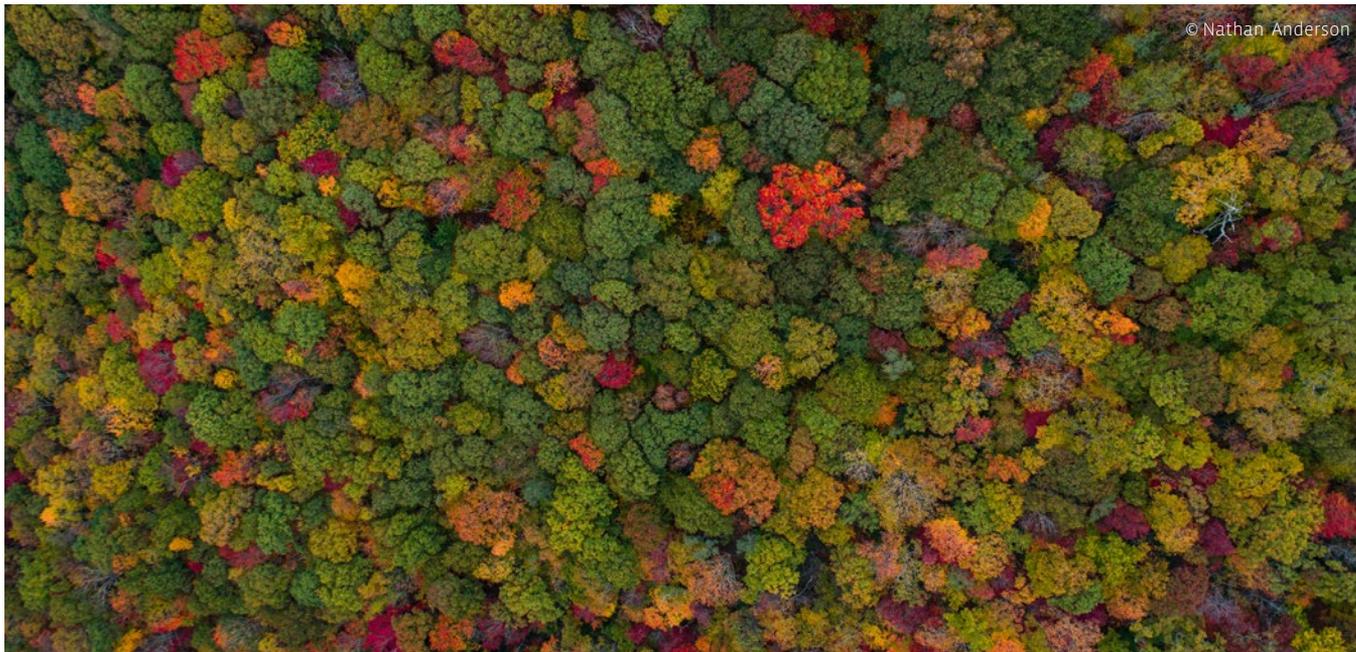
Adding to its attraction, when it is increasingly clear that a throw-away society is bad for the planet's health, wood is resource efficient in processing and manufacture. It can be recycled into numerous new products and formats (Chapter 4) and, at the end of its useful life, it can be used as a renewable, carbon neutral energy source.

Low carbon building

The combination of timber's environmental credentials and performance characteristics offers perhaps greatest promise in construction (Chapter 7).

Wood-based products and construction systems provide the building sector, a major greenhouse gas (GHG) emitter, with





the ultimate low carbon solution. They not only require less energy to process, manufacture, transport and erect than non-renewable alternatives, they deliver buildings that are ultra-low energy to maintain, work and live in.

Realising timber's sustainable potential

From all aspects, timber is increasingly proven as one of the prime materials on which to base bioeconomic and circular economic models.

More advanced life cycle analysis is underlining its minimal cradle to grave impacts relative to alternatives (Chapter 5).

Timber technology has also made further advances recently. Advanced new engineered wood products are enabling architects to build better, bigger and higher in timber. At the same time, innovative, more environmentally benign preservative treatments, timber modification and thermo treatment are enhancing its natural durability.

New wood fibre-based materials are also being used in a range of manufacturing sectors, while renewable wood-based fuels continue to evolve.

Europe's authorities and timber industry have focused too on enhancing and providing assurance on the sector's sustainability and legality.

The European wood industry is also confident that we are only beginning to realise the potential of timber.

Critically, the European timber industry delivers on the economic aspect of the bioeconomy too (Chapter 8). It comprises more than 170,000 businesses large and small. It employs a million people and contributes around €133 billion per annum to EU GDP. The industry also clearly has the ability, drive and ambition to grow further and faster and play a central role in Europe's bioeconomic development.

INDEX

Introduction	4	6. Wood leads life cycle comparisons	28
1. Dawn of the wood age	7	Wood's positive impacts	28
The growing challenge of climate change and the bioeconomic solution	7	Carbon Calculators and buildings	28
Bioeconomy – the holistic solution	8	Wood and the science of Life Cycle Assessment	30
The wood age	8	Whole Life Costing	30
2. Climate, carbon and wood	9	7. Decarbonising construction	31
Trees, wood and emissions	9	Timber buildings aim high	31
Wood a key carbon store	9	Construction environmental impact	31
Substituting energy intensive alternatives	10	New wood building techniques and technologies	32
Bio-based substitution	11	Urbanisation drives wood housing	33
3. Wood at the root of a bioeconomy	12	Wood in energy efficient construction	35
A sustainable European bioeconomy	12	Versatile and high performance	35
Bioeconomic boost for European industry	13	Quantifying building carbon efficiency and EPDs	35
4. A sustainable, circular future in wood	15	Wood's multiple construction applications	36
Exciting opportunities for wood	15	Wood and Wellness	39
Timber, the prime bioeconomic resource	15	8. The EU Wood Industry – engine of growth and development	41
Sustainable sourcing	16	The EU's fourth largest manufacturing industry	41
The resource efficient approach	16	Industry diversification	42
A zero waste Industry	16	Sawnwood at the cutting edge	42
Less wood to land fill	17	An engineered timber future	44
Old wood-new products	17	Manufactured wood products	44
Post-consumer fibre panels	18	Global timber traders	47
Waste product innovation	18	ANNEX	48
Planning ahead	18	EU Policy and Legislative Framework	48
5. Europe's forests – a growing resource	19	References	50
The EU – a forest community	20		
Setting sustainable forest management standards	22		
Backing biodiversity	23		
EU leads sustainability certification	24		
The EU combats illegal timber	25		
Supporting timber legality assurance	25		
Sustainable forest management in the tropics	27		

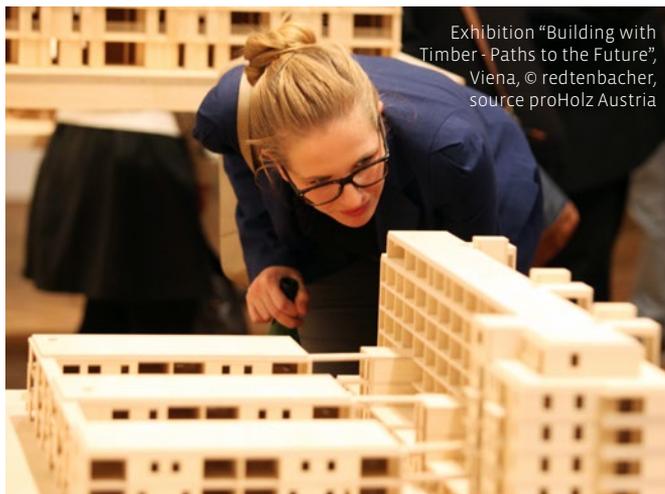
1. Dawn of the wood age

1.1 The growing challenge of climate change and the bioeconomic solution

The urgency of taking steps to mitigate and minimise climate change – including afforestation and using more wood – is becoming ever more apparent.

The overwhelming consensus, as laid out in the Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC), is that emissions from human activity have tipped the atmospheric balance and been the dominant cause of global warming since the mid-20th century. CO₂, the main gas implicated, comprises up to 70% of man-made emissions and at current rates of output will double in atmospheric concentration levels by 2100. Critical emission sources are burning of fossil fuels, general industrial pollution, deforestation and use of energy intensive materials, such as steel, concrete and plastic (see Chapter 6).

The Global Carbon project estimates that mankind contributes around 39 billion tonnes of CO₂ to the atmosphere annually. Of this, carbon sinks or reservoirs, comprising, the oceans and minerals, flora and fauna, including forests, absorb 21 billion tonnes. That leaves 18 billion tonnes ‘free’ in the atmosphere, where it exacerbates global warming¹.



Exhibition “Building with Timber - Paths to the Future”, Vienna, © redtenbacher, source proHolz Austria

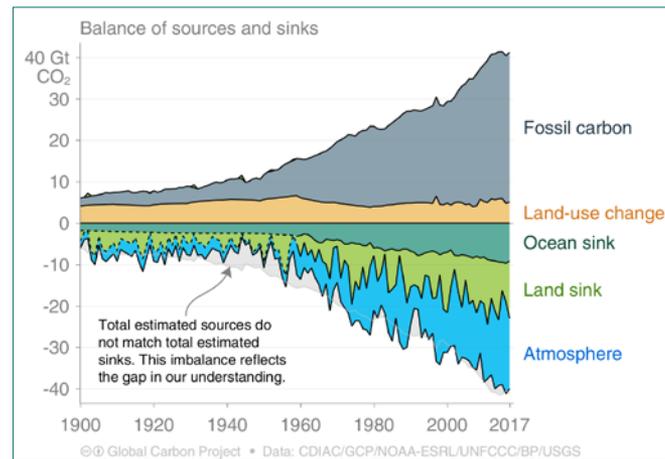


Figure 1 - Balance of CO₂ sources and sinks at global level.
CC: Global Carbon Project

One solution is to reduce our dependence on fossil fuels for heat, power and manufacturing materials through making what we do use go further and substitution. It is important that we also cut use of other finite resources, from minerals and metals to water.

The other key solution to climate change and to cope with population growth is to use more renewable, biological-based resources, notably sustainably sourced wood. These require less energy and result in fewer emissions in production, use and disposal than man-made counterparts, while also being recoverable, recyclable and re-usable.

Under the 2015 Paris Agreement, signatories committed to efforts to keep global warming to ‘well below’ 2° C and if possible 1.5° C above pre-industrial temperature levels. Although the US withdrew from the Agreement in 2017, it is set to come into force in 2020.



1.2 Bioeconomy – the holistic solution

Developing a circular bioeconomy brings together all these strands. It entails increasing dependence on natural, renewable materials that can go through numerous cycles of use and both substitute and work in conjunction with finite resource-based materials and products.

The EU Waste Framework Directive includes the principle of ‘preparing for re-use’, with product manufacturers urged to design goods with ease of disassembly and repurposing built-in.

The EU in 2018 updated its 2012 strategy ‘to accelerate deployment of a sustainable European bioeconomy in order to maximise its contribution to its Sustainable Development Agenda 2030 and obligations under the Paris [Climate Change] Agreement’.

“The update also responds to new European policy priorities, in particular the renewed Industrial Policy Strategy, the Circular Economy Action Plan and the Communication on Accelerating Clean Energy Innovation, all of which highlight the importance of a sustainable, circular bioeconomy to achieve their objectives” stated the European Commission.

1.3 The wood age

It is increasingly realised that a core component of a circular bioeconomy must be greater use of wood products from sustainably managed forests. Wood performs well in life cycle analysis, which measures a material’s carbon and other environmental impacts from cradle to grave (see Chapter 5). It is being developed into increasingly advanced engineered construction and manufacturing products and systems, with cellulose fibre also used as the basis of an increasingly diverse range of fabrics, bioplastics and other advanced materials. Ultimately, after its range of uses, it is also capable of ‘energy recovery’ through incineration, providing a renewable, carbon-neutral source of heat and power.

In short, a growing body of opinion maintains that we should now be moving into a new industrial and developmental era. We’ve been through stone, bronze and iron ages. More recently we’ve had the concrete, steel, glass and plastic age. Now is time for the wood age.

2. Climate, carbon and wood

2.1 Trees, wood and emissions

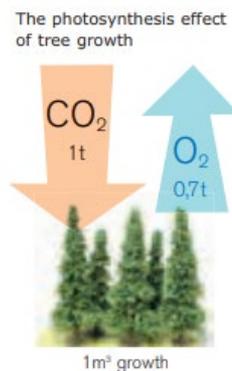
Integral to the part trees and timber can play in mitigation of man-made climate change is their critical role in the global carbon cycle.

It is generally accepted that to restore the atmospheric balance requires a two-fold strategy; reducing CO₂ emissions in the first place and increasing the capacity of the global carbon sink.

In 2016 EU forests provided a net sink of 424 million tonnes of CO₂-equivalent, corresponding to around 10% of total GHG emissions (442 billion tonnes), compared to less than 7% (390 million tonnes) in 1990 (source: European Commission, Clean Planet for All Communication²)

Forests and timber products can be part of both solutions. Through the process of photosynthesis, they absorb CO₂, acting as a key reservoir for carbon. At the same time wood products save on man-made emissions. They are substituting more energy intensive materials and substances, including fossil fuels in energy generation, plus steel, concrete, aluminium and plastic across a range of areas in manufacture and construction. And research and development are underway to enable them to replace more.

A study by the European Forest Institute estimates that the EU's sustainably managed forests today produce an overall



climate mitigation impact amounting to 13% of total European GHG emissions, including carbon storage and substitution in wood products. It also states that, through 'climate smart forestry', (CSF) this mitigation effect could double by 2050. This involves reducing net greenhouse gas emissions, increasing forest resilience to climate change through such measures as site specific species selection and increasing forest productivity and economic welfare based on forestry³.

2.2 Wood a key carbon store

Each 1m³ of wood grown by a tree holds 0.9 tonnes of CO₂ 'sequestered' from the atmosphere⁴. So, the total so-called 'biogenic' carbon stored in the forests of Europe is estimated at almost 13 billion tonnes. This total is growing at 167 million tonnes per annum⁵.

As the UNIPCC stated in its Fourth Assessment Report: *“In the long term, a sustainable forest management strategy, aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, wood fibre, or energy from the trees, will generate the largest sustained mitigation benefit”.*

The carbon a tree absorbs is locked into the harvested wood products for their lifetime. Recycling of wood-based products in numerous forms, makes timber an even higher capacity, longer term carbon store, with consequently increased potential for limiting man-made global warming.

2.3 Substituting energy intensive alternatives

The EU’s objective, set out in its *“Roadmap for moving to a competitive low-carbon economy in 2050”*, is to reduce emissions by 80-95% on 1990 levels by 2050. This is to be achieved through emissions reduction, energy use savings, and an

increase in energy generation from renewables. In the shorter term, its 2030 Climate and Energy Framework sets out objectives to:

- cut EU greenhouse gas emissions from 1990 levels by at least 40%
- achieve renewable energy market share of at least 32%
- deliver a 32.5% improvement in energy efficiency.

In its 2018 *“Strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050”*, the European Commission proposes eight possible scenarios for future carbon dioxide emissions and removals. Most are designed to meet the Paris Climate Agreement goal of keeping average global temperature rises below 2°C. However, only two would help restrict the temperature increase to 1.5 °C or lower, which is increasingly considered the level we should be aiming for. So there are calls for more far-reaching measures and ambitious emissions targets. The timber sector is ready to play its part in achieving these.

	GHG EMISSIONS	RENEWABLE ENERGY	ENERGY EFFICIENCY	INTER-CONNECTION	CLIMATE FUNDS IN EU-PROGRAMMES	CO ₂ FROM:
2020	-20%	20%	20%	10%	2014-2020 20%	
2030	≤ -40%	≥ 32%	≥ 32.5%	15%	2021-2022 25%	Cars -37.5%

Figure 3 – EU 2020 and 2030 Climate and Energy Framework

European wood industry backs EU Long-term Climate Strategy.

The European wood sector welcomed the European Commission’s 2018 Strategy for long-term EU greenhouse gas emissions reductions.

It maintains that it can play a major role in helping meet the climate change mitigation challenge, while at the

same time acting as an engine for green growth and ensuring employment stability, especially in rural areas.

One effective way to improve the atmospheric carbon balance is to use a greater proportion of wood products in place of fossil-based and high embodied energy products, to use wood products with a longer useful life and to increase recycling.



"A 1% increase in use of European wood-based products in global construction, textile and plastics markets could generate revenue for the European wood-based bioeconomy of €10 to 60 billion. This would amount to 3% - 20% of the current total turnover of the EU forest industry" (EU 2018 Bioeconomy Strategy - Staff Working document)⁶

2.4 Bio-based substitution

Wood's carbon performance relative to key construction and manufacturing materials it can substitute has been extensively analysed. It is calculated that producing a tonne each of steel and aluminium generates 1.24 tonnes and 9.3 tonnes of CO₂ respectively⁷. By contrast, wood absorbs CO₂ from the atmosphere.

In total, the volume of wood in use and being processed in Europe currently stores 38.2 million tonne equivalents of CO₂, making a key contribution to reducing levels of atmospheric greenhouse gases⁸.

As subsequent chapters show, the use of wood in place of other materials, particularly in construction, can help reduce human climate impact still further.

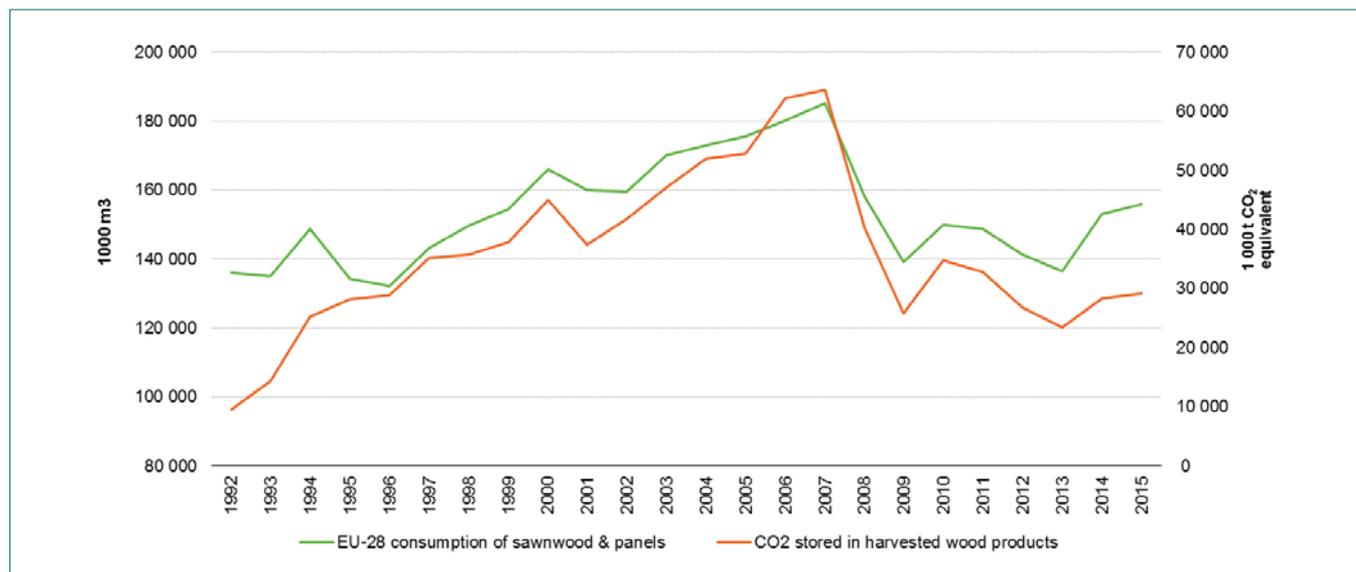


Figure 4 - Consumption of wood products and storage of CO₂, EU28, 1992-2015. Source: Eurostat. Note: different scale on the left and right axis

3. Wood at the root of a bioeconomy

3.1 A sustainable European bioeconomy

In 2018, the European Commission issued the strategy document, *A sustainable Bioeconomy for Europe: strengthening the connection between economy, society and the environment*⁹. It presents a European model for a sustainable bioeconomy and sets out an Action Plan for roll-out from ‘2019 at the latest’.

It states that: ‘A sustainable European bioeconomy is necessary to build a carbon neutral future in line with the climate objectives of the UN Paris Agreement. For instance, in the construction sector engineered wood offers great environmental benefits as well as excellent economic opportunities. Studies show that the average impact of building with 1 tonne of wood instead of 1 tonne of concrete could lead to an average reduction of 2.1 tonnes of CO₂ emissions over the life cycle of the product (including use and disposal).’

“A Bioeconomy is defined as the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes agriculture, forestry, fisheries, food, and pulp and paper production, as well as parts of [the] chemical, biotechnological and energy industries.”

EU Bioeconomy Strategy, 2012.

To be successful, states the EU, a bioeconomy must have sustainability and circularity at its heart. That puts the emphasis on reuse, recycling and, ultimately, environmentally sound disposal of products and materials, in short, their life cycle performance. The aim is to ensure that natural resources go further and last longer and that adverse impacts in their use are minimised or eliminated.

“In a circular economy the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized. The transition to a circular economy is a tremendous opportunity to transform our economy and make it more sustainable, contribute to climate goals and the preservation of the world’s resources through protection and enhancement of biodiversity, create local jobs and generate competitive advantages for Europe. It will also help meet the objectives of the EU’s 2030 Agenda for Sustainable Development”

Communication from the European Commission on a monitoring framework for the circular economy, 2017.

The European Commission also highlights that the basis of a circular bioeconomy already exists – and is already very valuable. In 2018, the EU’s bio-materials based industries, including forestry and timber production, turned over €2.3 trillion and employed 8.2% of the EU workforce. Moreover, the EC states, the ‘strong and fast-growing start-up ecosystem’ that characterises the sector creates fertile soil for growth. In fact, it estimates it could create a million new jobs by 2030.



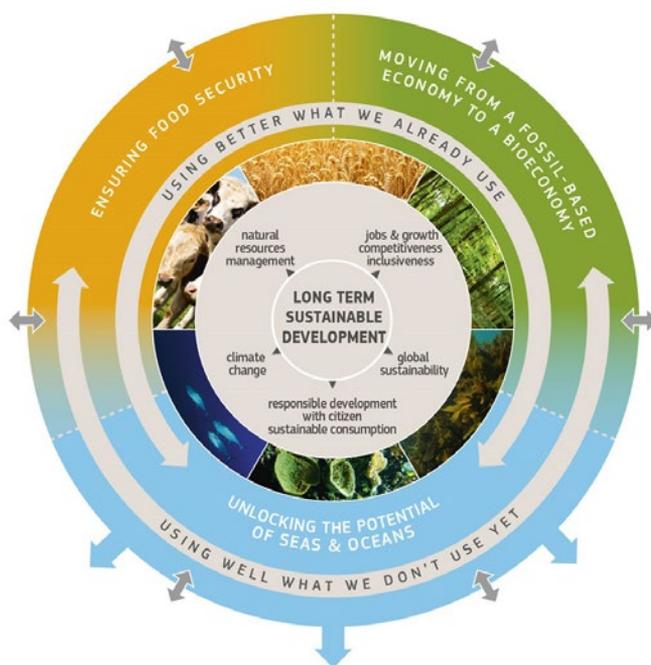


Figure 5 – European Bioeconomy Strategy. ©European Union 2018

3.2 Bioeconomic boost for European industry

A sustainable European bioeconomy, the EC states, will create ‘new value chains and greener, more cost-effective industrial processes’.

It describes a sustainable bioeconomy as the ‘renewable segment of the circular economy’ capable of:

- turning bio-waste, residues and discards into valuable resources
- restoring and supporting healthy ecosystems, including plastic-free seas
- helping ensure sustainable management of natural resources
- contributing to climate change mitigation through carbon sinks and ‘negative emission’ product development

- supporting the EU’s Greenhouse Gas Emission Reductions Strategy
- reducing dependence on non-renewable unsustainable resources
- promoting development of new bio-based processes and products

The EU action plan for bioeconomic development focuses on strengthening and scaling-up bio-based sectors and ‘ensuring their overall sustainability and circularity’.

The EC also stresses the importance of the bioeconomy in its “A Clean Planet for all strategy”. It describes this as a ‘long-term vision for a prosperous, modern, competitive and climate-neutral economy’ and it highlights the part timber can play.

“EU industry is already today among the most efficient globally. A competitive resource-efficient and circular economy will need to develop to keep it so. New materials will play an important role, whether rediscovering traditional uses, such as wood in construction, or new composites replacing energy intensive material¹⁰.”

Analysis backing the strategy also states: *“The more harvested wood used for durable goods replacing those produced with fossil materials, including in construction, the more effective it is in reducing release to the atmosphere of biogenic (and fossil) carbon¹¹.”*

The EC also backs further development of the EC Knowledge Centre for Bioeconomy, launched in 2017¹². This aims to ‘unlock investments and markets’, including via research and innovation grants, under Horizon 2020, the EU public-private sector partnership for bio-based industries.

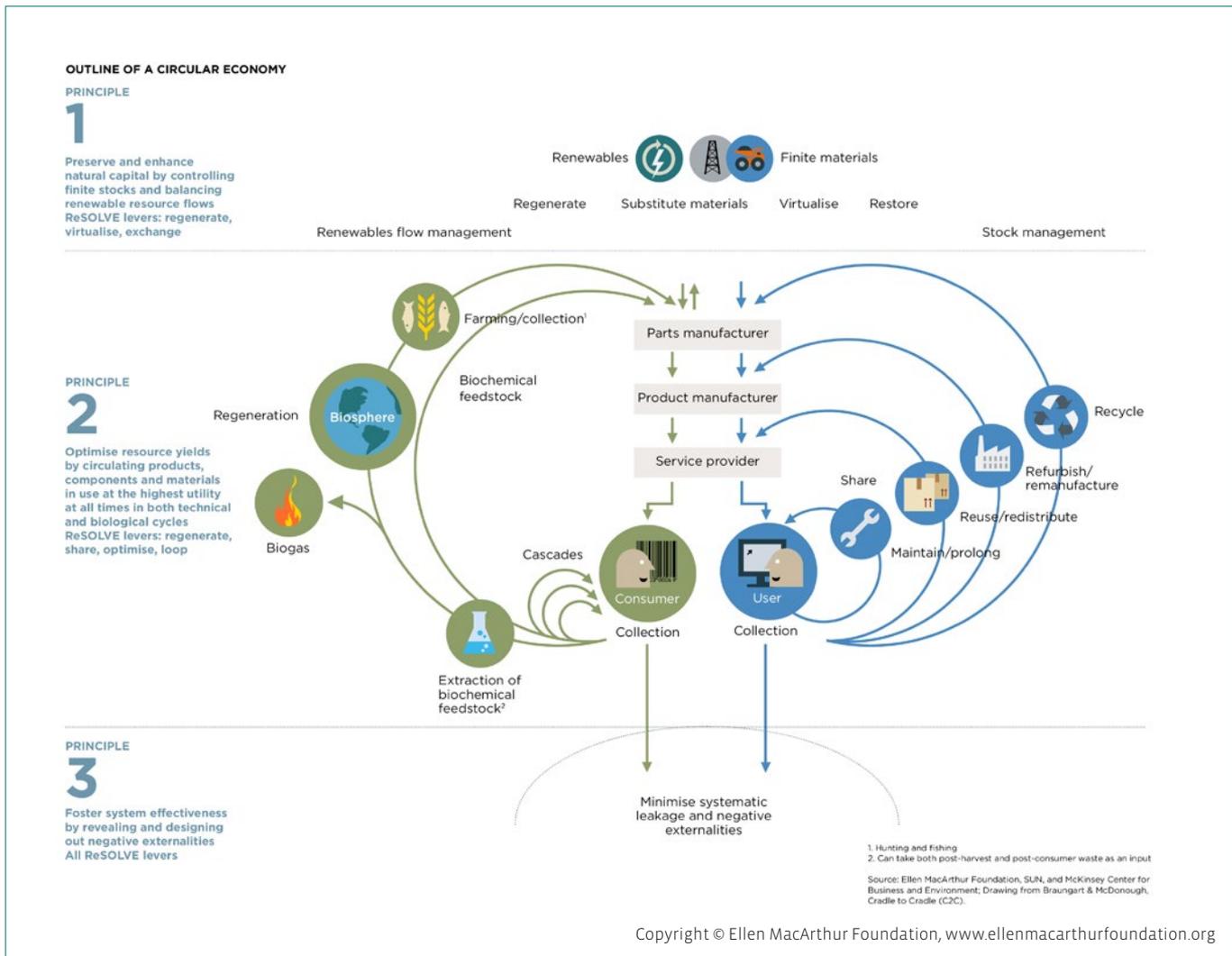


Figure 6 – Illustration of circular economy

4. A sustainable, circular future in wood

4.1 Exciting opportunities for wood

Given anticipated global demographic and economic development, the need to embed a circular bioeconomy worldwide can only grow. As a result, timber is set to become an ever more important resource. In many countries, increased use of wood has been officially recognised as a measure in climate change action. The pressure will be on to produce more, and to make it go further, last longer and to use it in an ever-greater variety of applications.

These are all areas the European wood industry is focused on right now. The woodworking industry is already thinking outside the box, working with customer industries to evaluate new opportunities to substitute fossil-based materials.

New market structures are also being developed, including manufacturing service and recycling contracts, where producers contract to take their wood products back at end of current use to recycle or repurpose for the next stage of their life in the so-called timber ‘cascade’.

4.2 Timber the prime bioeconomic resource

Timber and wood products meet the accepted criteria of a circular, bioeconomic resource more than almost any material. Wood is organic and, if obtained from sustainably managed forests, constantly renewable. That makes it unique among mainstream manufacturing and construction materials. Europe’s forests have also grown by 5% over the last quarter of a century, a rate of 700,000 ha per year, according to the State of Europe’s Forests 2015 report¹³.

This growth is being achieved through planting and natural regeneration outstripping timber harvest in established wood-



‘Europe’s forest area expanded by 17.5 million ha over the last 25 years’

Forest Europe

lands. Surplus agricultural and brownfield land is also being converted to forestry.

4.3 Sustainable sourcing

The European timber industry is also committed to sourcing only legally and sustainably harvested raw material (see chapter 5). One means of demonstrating the sustainable origin of timber is certification, with the best known schemes being those of the Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC).

4.4 The resource efficient approach

European timber processing and wood products manufacturing also generates low to zero waste, as resulting by-products

and residues can be used as raw material for other wood-based products and renewable energy sources.

There is also increasing understanding of how to maximize timber's contribution to development of a circular bioeconomy. This combines efficient use of virgin timber and its reuse in multiple applications though the wood fibre's potential lifetime, ensuring carbon is stored in the material as long as possible.

The ideal route for timber through the process of recovery and reuse to keep its value in the economy and keep carbon 'embodied' in the material for the longest time before incineration for renewable energy has been extensively evaluated. It has become known as the 'timber cascade'.

The EU itself has produced its 'Guidance on cascading use of biomass'⁴⁴. This looks at today's increasingly interlinked timber usage pathways resulting from 'technological developments, creation of new products based on woody biomass and emergence of new markets and industrial and organizational changes such as industrial symbiosis'.

4.5 A zero waste Industry

When mature trees are harvested (and 80% of European timber production is softwood, such as pine, spruce, fir and Douglas fir and 20% hardwood, such as oak, beech, ash and birch), the large dimension logs go generally to mills for production of solid wood products, plywood and laminated veneer products. Smaller logs, plus other parts of the tree, go for pulp and paper manufacture and production of wood-based panel products, such as MDF, OSB, and particleboard. Their raw material is additionally supplemented with dust and chips from sawmills and post-consumer waste wood from further up the timber cascade. A proportion of residue from the harvest process also goes straight for wood-fuel, or applications such as animal bedding.

Figure 7 – Wood Value Chain



The European sawmill industries are pioneers in working to the resource efficiency principle, maximising the added value of wood resources in a zero-waste, highly mechanized production circle.

New technology enables them to maximise lumber output and the quality of by-products. Logs are sawn into planks or other dimensioned goods. Sawn timber can be further processed into profiled cladding, decking, mouldings, flooring, joinery, furniture components and a range of other products. It can also be pressure laminated into high performance multi-layer products known as engineered wood.

The latter includes highly stable and strong components for joinery, and such products as glue-laminated timber (glulam) and laminated veneer lumber (LVL) beams and cross laminated timber panels (CLT). These are becoming increasingly core structural elements in ever larger, more technically advanced timber-based buildings (see Chapter 7).

Sawdust and other sawmill residues are processed into other wood-based products or used for bio-energy production. Co-generation facilities also produce power for the mills themselves and feed any excess into the grid.

Bark can be burned for heat and power, or used for landscaping, while wood pellets made from sawdust also offer high performance, clean solutions for commercial and residential heating.

4.6 Less wood to land fill

The lifetime (service life) of wood structures and products can be increased through maintenance and repair, treatment and product design, for instance, to prevent exposure to humidity.

Today, while rates vary between countries vary, more than the half the overall potential of post-consumer wood is recov-

ered in Europe²⁵. This is thanks to legislation and taxation to curb landfill use, plus development of new processes and applications for wood fibre and growing appreciation of the importance of recycling timber to maximise its carbon storage capabilities.

Among other factors boosting growth in EU wood recycling is ambitious legislation on the recycling of wood packaging waste. This stipulates that 15% be recycled by 2020, 25% by 2025 and 30% by 2030. Through a combination of new packaging rules and industry development, some member states have already exceeded these targets, achieving packaging recycling figures up to 70-80%.

The wood pallet and packaging sectors (see chapter 8) are now among the most highly geared industries to recovery, repair and reuse. A whole business has developed to give used pallets a new lease of life several times over through replacement of worn and damaged sections with new timber and blockboard. It is highly efficient and much lower energy than processes required to recycle and reuse damaged plastic pallets.

A target to recycle 70% of Construction and Demolition waste by 2020 was also set in 2009²⁶ and further goals may be introduced²⁷.

4.7 Old wood - new products

Wood is recovered and repurposed for a range of applications after initial use.

For instance, old timber beams and other structural components are much sought after for conversion into products for building homes and refurbishment, such as flooring, or kitchen cabinets. And many feel wood actually looks better with age.

Old panelling, flooring and furniture components are also transformed into other products. Some specialist businesses

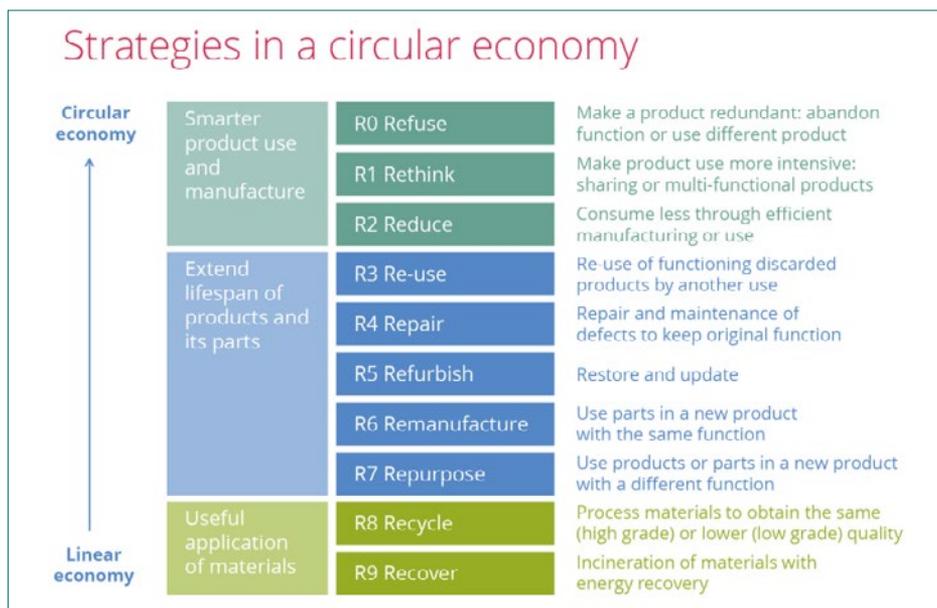


Figure 8 – Strategies in circular economy.
Source: Kircher et al., 2017¹⁹

even recover wood to make into musical instruments, so they replicate the sound of period instruments.

Given their natural durability and value, hardwoods are especially widely recovered from demolition and disposal sites. These are remanufactured into everything from furniture, to garden sheds, shingles, decking, cladding and fencing.

4.8 Post-consumer fibre panels

The sector which has increased its recycled material consumption most is the wood-based panels sector. It is estimated that in 1970 European particleboard producers used one third recycled wood content to two-thirds virgin fibre. Today, the EU panel industry is the second largest user of secondary fibres after the bioenergy industry, deriving half its raw materials from post-consumer sources¹⁸. Some manufacturers are now equipped to use 100% mill residue and recovered wood.

The panel sector makes a diverse range of versatile products, including medium density fibreboard (MDF), oriented strand board (OSB) and particleboards. These are also becoming

increasingly durable and high tech, with the development of moisture- and fire-resistant variants. They are consequently being used in a growing variety of manufacturing and construction applications, from furniture and other manufactured products, to structural and non-structural building components.

In line with the trend to recycling, the European Panel Federation has adopted strict standards on permissible content of impurities in finished products to ensure they are safe and environmentally sound.

4.9 Waste product innovation

Research and development work across Europe has also targeted new and better uses for wood industry residues and recovered post-consumer wood.

These include a growing range of wood plastic composites, extruded materials comprising blends of recycled polymers, sawdust and resins. These help reduce plastic entering the waste chain and are used to make products such as decking, cladding, garden buildings and fencing.

4.10 Planning ahead

As stated, wood product manufacturers, including furniture makers, are increasingly addressing how their raw material will be recovered and recycled in initial design and production.

The construction sector's CO₂ emission reduction strategies also focus on materials reuse and recycling and building this into projects at the outset. Design for deconstruction looks at how decisions made at the design stage can increase the quality and quantity of materials that can be re-used at the end of a building's life.

5. Europe's forests – a growing resource

Europe's forests by numbers

- › EU forest and other wooded land cover 182 million ha, 43% of land area
- › They produce 470 million m³ of round wood annually
- › They have grown 9% in area in 25 years
- › Around 63% of annual timber growth is harvested
- › 25% of EU forest is set aside as ecological reserve
- › 90% of EU wood consumption is supplied from EU forests
- › The forest sector employs around 3 million people

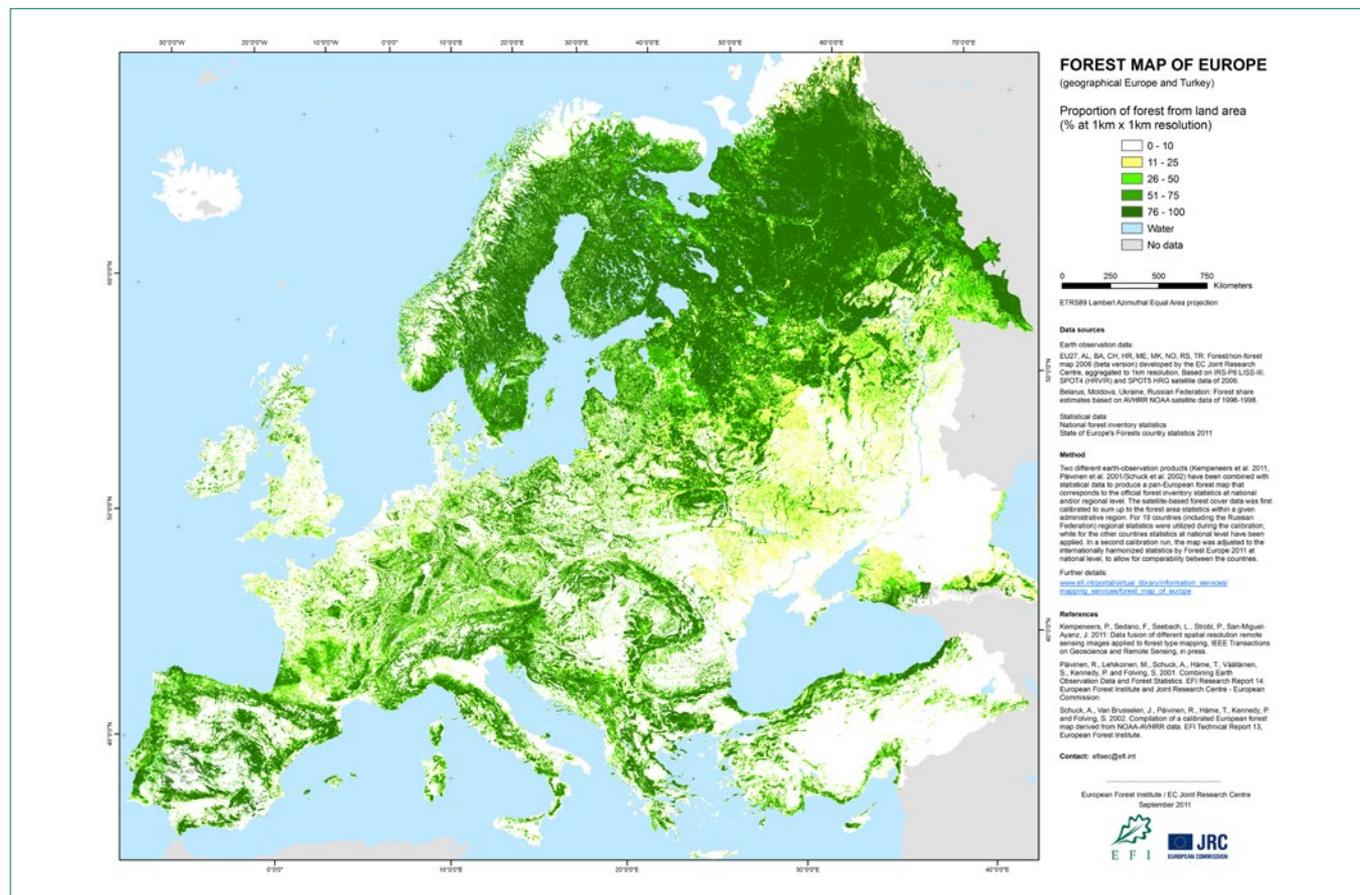


Figure 9 – Forest Map of Europe. Copyright: European Forest Institute²⁰

5.1 The EU – a forest community

Forests cover nearly one third of the world's land surface – a total of some 4 billion hectares, of which the EU accounts for 182 million ha. It varies between states, but tree cover corresponds overall to 43% of total EU land area. In the Netherlands, Ireland and the UK it is less than 15% and in Malta 1.1%. In

Sweden and Finland, it is over 75% of land area, and over 63% in Slovenia²¹.

These woodlands are also hugely productive. Around 83%, or 134 million ha is available for timber production, with an output of 470 million m³ of roundwood, or logs annually²².

Table 1 –
Forest area, 2015.
Source: Eurostat

	Land area 2015 with- out inland water (1)	Forest and other wooded land 2015	Forest 2015	Forest available for wood supply 2015
	(1 000 hectares)			
EU-28	424 694	181 918	160 931	134 486
Belgium	3 033	719	683	670
Bulgaria	10 840	3 845	3 823	2 213
Czechia	7 722	2 667	2 667	2 301
Denmark	4 292	658	612	572
Germany	34 877	11 419	11 419	10 888
Estonia	4 343	2 456	2 232	1 994
Ireland	6 839	801	754	632
Greece	13 082	6 539	3 903	3 595
Spain	50 229	27 627	18 418	14 711
France	55 010	17 579	16 989	16 018
Croatia	5 659	2 491	1 922	1 740
Italy	29 511	11 110	9 297	8 216
Cyprus	921	386	173	41
Latvia	6 221	3 468	3 356	3 151
Lithuania	6 265	2 284	2 180	1 924
Luxembourg	259	88	87	86
Hungary	8 961	2 190	2 069	1 779
Malta	32	0	0	:
Netherlands	3 369	376	376	301
Austria	8 241	4 022	3 869	3 339
Poland	30 619	9 435	9 435	8 234
Portugal	9 068	4 907	3 182	2 088
Romania	23 008	6 951	6 861	4 627

	Land area 2015 with- out inland water (?)	Forest and other wooded land 2015	Forest 2015	Forest available for wood supply 2015
	(1 000 hectares)			
Slovenia	2 014	1 271	1 248	1 139
Slovakia	4 904	1 940	1 940	1 785
Finland	30 389	23 019	22 218	19 465
Sweden	40 734	30 505	28 073	19 832
United Kingdom	24 251	3 164	3 144	3 144
Iceland	10 024	193	49	26
Liechtenstein	16	7	6	4
Norway	30 423	14 124	12 112	8 259
Switzerland	3 999	1 324	1 254	1 208
Montenegro	1 345	964	827	675
North Macedonia	2 491	1 131	988	804
Serbia	8 746	3 228	2 720	1 795
Turkey	76 960	21 862	11 943	8 183

(1) Latest available year; France: only covers the mainland.

Source: Eurostat (online data code: demo_r_d3area; for_area); Food and Agriculture Organization of the United Nations:

— Global Forest Resources Assessment, 2015

— Forest Europe 2015, as published on UNECE database (http://w3.unece.org/PXWeb2015/pxweb/en/STAT/STAT__26-TMSTAT1/)

Sweden is the biggest EU roundwood producer, supplying 73 million m³ in 2017, while Finland, Germany and France all produce more than 50 million m³ per annum.

Just over a fifth of the EU28's roundwood production in 2017 was used as fuelwood. The remainder was industrial material used for sawnwood and veneers, or for pulp and paper or wood-based sheet materials production.

The EU's growing stock of timber, the volume of trunks of living trees in forests and woodland, is 26 billion m³, of which 23 billion m³ is in forests where harvesting is possible²³.

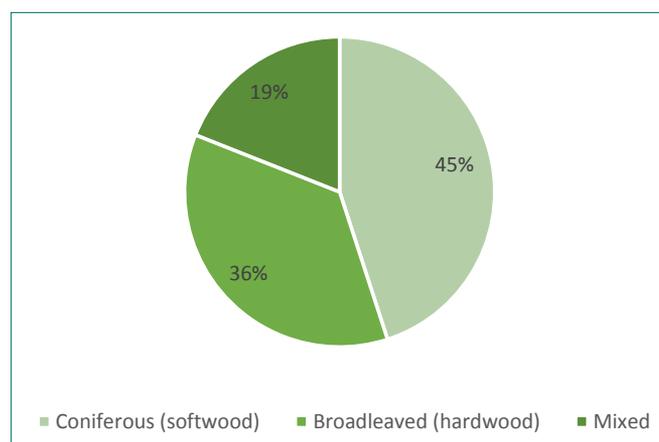


Figure 10– Composition of Europe's forests. Source: State of Europe's Forests 2015

Currently, between 60-70% of net annual increment of available roundwood is felled, and growth in stock exceeds timber harvest in all areas²⁴.

About 60% of the EU28's forests are owned by several million private forest owners, but with private/public ownership varying between member states. In Scandinavia, France, Portugal and Austria private forest ownership is dominant. By contrast, in Bulgaria and Poland the share of privately-owned forests is only 11% and 17.8%, respectively. Remaining forests largely belong to central and local government, municipalities and communities²⁵.

Forestry contributes particularly to rural economic development and provides around three million jobs across the EU. The common agricultural policy (CAP), represents the main source of EU funds for forests. Some 90% of finance comes from the European Agricultural Fund for Rural Development (EAFRD). Following the most recent reform of the CAP, the new regulation on support for rural development by the EAFRD was published in December 2013²⁶.

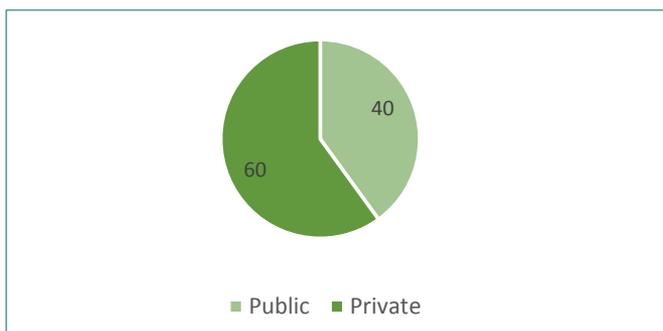


Figure 11 – Forest area by ownership, EU28. Source: State of Europe's Forests 2015

Mobilising Europe's forest resource for the bioeconomy

In order to contribute to the transition to a low-carbon EU economy, woodworking industries say they must be able to rely on wood availability and quality. Although forest policy is under Member States' competence, they maintain that the EU should support continuous and increasing mobilization of wood raw material from sustainable sources, industrial side-streams and forest residues.

By ensuring forest regeneration after harvesting through active management, production of wood and other ecosystem services is assured for generations.

5.2 Setting sustainable forest management standards

Historical traditions in forestry, demographics, economics, climate and ecology across the EU make for varied forest management and regeneration methods.

However, in 1993, Forest Europe, the Ministerial Conference on the Protection of Forests in Europe, comprising representatives of 46 European countries and the EU, launched

Future forest management

With the aim of agreeing on how to manage the region's forests, Forest Europe hosts ministerial level conferences where commitments and resolutions are adopted.

Political decisions and resolutions agreed are voluntary, but it is clearly appreciated that by endorsing Forest Europe commitments, countries underline their willingness to protect and sustainably manage their forest areas. They provide a framework for implementing management approaches, which can be adapted to national circumstances, but form a broadly coherent approach and the basis for international cooperation in the field.

Forest Europe also works with other global and regional processes and initiatives focused on political and social issues related to forests.

Forests Europe (<https://foresteurope.org>)

its guidelines, criteria and indicators for sustainable forest management. Since then, Europe has moved towards more uniform methods to enhance natural forest processes, resulting in 'authentic' forest composition that is environmentally appropriate, socially beneficial and economically viable. Broadly commercial forests and their habitats are viewed together with protected nature conservation areas as integrated biodiversity networks.

5.3 Backing biodiversity

Supporting and enhancing biodiversity is a key aspect of EU sustainable forestry.

Since the late twentieth century, the area of forest that naturally regenerates and expands has decreased slightly. It currently accounts for 68% of the total, with 27% replanted or seeded and 5% coppiced²⁷. However, efforts to boost natural regrowth are now underway as part of biodiversity and habitat development strategy.

Around 25% of the EU28's forests are protected under the EU's Natura 2000 scheme²⁸. Covering 18% of EU land surface and 6% of marine territory, this is the largest coordinated network of protected areas in the world, a haven for the most threatened and valuable habitats and species. Forest within the area includes strictly protected nature reserves, but also woodlands where sustainable management for timber production is permitted.

Sustainable forest management means using forests and forest land in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, which does not cause damage to other ecosystems.

EU 2013 Forest Strategy

Additional forest areas are protected by other EU or member state regulation, which either restricts or bans commercial exploitation. The largest areas with some form of biodiversity protection and conservation controls are in Spain, Italy, Finland and Sweden.

The aim across the EU is the correct balance between forestry for timber production and protected forest to ensure maintenance of biodiversity.

The EU additionally exerts an influence on forest policy and safeguarding of forest cover through legislation in other areas, including energy and climate, environment and plant health.



Photo by Annie Spratt on Unsplash



Picture of Solemar salt-water baths
in Bad Dürrenheim, Germany

5.4 EU leads sustainability certification

The EU is also among the foremost adherents of forest sustainability certification schemes.

These are independent market-based, non-regulatory tools designed to recognise, independently accredit and promote environmentally responsible forestry and sustainability of forest resources.

The two international certification schemes are those of the FSC and PEFC.

The FSC has a set of criteria and principles for sustainable forest management and forest product chain of custody applied internationally, against which individual businesses and state forestry are third party audited.

The PEFC accredits national forest certification schemes to its standards, with associated chain of custody systems, for which companies must also undergo independent audit.

Between them, FSC and PEFC certification cover approaching 500 million ha, or 11% of total global forest area and growing. This divides 196 million ha under the FSC scheme, 300 million ha under the PEFC scheme, with the former having issued 36,000 product chain of custody certificates, the latter 20,000.

They are designed to halt deforestation and forest degradation, support forest growth, promote ecosystem protection and underpin the social and economic benefits of sustainable forestry. Their key focus is tropical regions, but environmental certification has developed most rapidly in Europe, principally due to its existing high forest management standards.

Today a quarter of global certified forest area is in Western Europe. The country with the highest proportion of forest certified is Finland, with 81%, followed by Austria, Poland and Estonia. The coverage tends to be lower in southern countries, with Portugal and Spain at 12% and Italy 9%.

The schemes' insistence on third-party audited chain-of-custody certification ensures that end products can be tracked back to the certified forest where they originated and can be kept separate from non-certified material along the supply chain.

Both FSC and PEFC schemes also include criteria addressing the social and economic welfare of forestry and timber sector employees and dependent local communities.

5.5 EU combats global illegal timber

The EU focuses on combating the illegal timber trade on a global basis.

A key initiative in this respect is its Forest Law Enforcement, Governance and Trade Action Plan (EU FLEGT), established in the early 2000s.

FLEGT comprises both demand-side and supply-side mechanisms to ensure that timber supplied to the EU is legally produced, which in turn is seen as an essential stepping stone to sustainability.

The demand-side measure is the EU Timber Regulation (EUTR). This was introduced in 2013 and stipulates that all operations which first place timber and forest products on the EU market (and most timber products are covered) ensure that they are legally harvested in the country of origin. The Regulation applies to both imported and domestically produced timber and timber products.

To meet EUTR requirements, importers must subject suppliers to legality assurance due diligence, so they can demonstrate that products are legally sourced, with appropriate documentary evidence and means of tracking along the supply chain. Where there is uncertainty, they must undertake further illegality risk mitigation, which can involve on-the-ground inspection of suppliers.

The Regulation is policed by EU member states' Competent Authorities and non-compliance by companies and individuals can be punished by fines, withdrawal of the right to trade, even imprisonment.

5.6 Supporting timber legality assurance

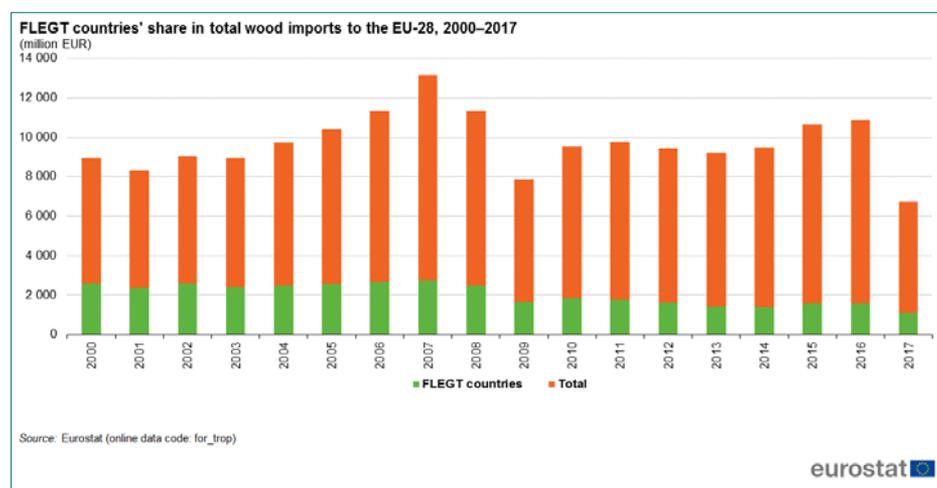
The supply side mechanism of the EU FLEGT initiative is the FLEGT Voluntary Partnership Agreement programme (FLEGT VPA). This involves supplier countries entering a VPA with the

EU and undertaking to establish an effective, nationwide timber legality assurance system (TLS), supported by forest products traceability, independent auditing, monitoring and licensing frameworks. They must also, where necessary, implement forest governance reform and ensure stakeholder engagement so that as broad a range of interests as possible, from businesses, to local communities and NGOs, are consulted and involved in forest and timber sector decision making.

When all this is achieved to the satisfaction of supplier country and EU governments, the authorities of the former can issue FLEGT licences for timber exports. Licensed products can then access the EU market without undergoing additional due diligence under the EUTR. This saves time and money, so effectively introduces a commercial incentive to promote timber legality assurance. And countries which enter a VPA must also commit to applying the same legality standards as applied to goods for the EU market to exports worldwide.

Indonesia was the first country to fully implement its VPA and started FLEGT licensing EU exports in 2016, but a further 15 are engaged with the initiative, to date all tropical suppliers. Five are currently at the final implementing stage.

Figure 12 – FLEGT countries' share in total wood imports to the EU28, 2000-2017.
Source: Eurostat



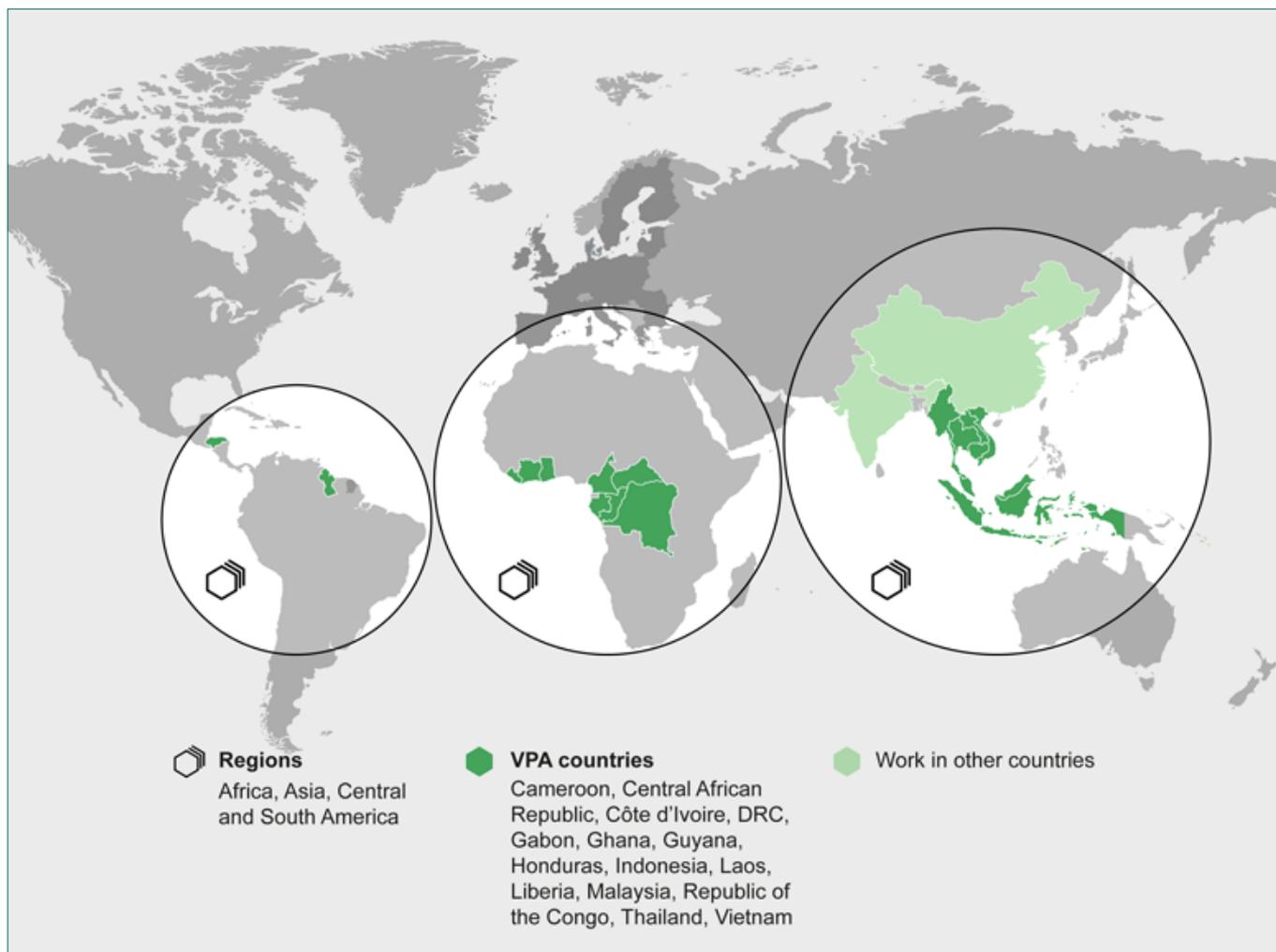


Figure 13 - EU FLEGT Facility's areas of work.
 Source: EU FLEGT facility, www.euflegt.efi.int

Increasingly, a FLEGT VPA is also being seen as laying the groundwork for sustainability certification, having a range of elements in common with the principles and criteria of the independent certification schemes, such as forest products traceability, forest governance reform, and insistence on social inclusion and welfare assurances. Today the initiative is increasingly promoted on its environmental, social and economic impacts²⁹.

5.7 Sustainable forest management in the tropics

With the seas, forests, of course, also provide the earth's breathing apparatus – its green lungs. So it is little wonder that deforestation is a key environmental concern worldwide.

The main driver for loss of forest cover is human activity. As populations grow and economies develop, forest land is being cleared for construction, industrial development and conversion to food agriculture and other cash crops, such as soya, palm oil and livestock. In some areas, notably poorer countries, trees are also felled indiscriminately for fuel.

The consequences of this forest shrinkage include increased atmospheric concentration of CO₂. Not only is the forest's capacity to absorb the gas diminished, the process of deforestation itself is estimated to be the second biggest human-caused source of CO₂ emissions after fossil fuel use.

When forests go, there can also be issues with soil erosion and changes in the water cycle. It is widely accepted that climactic patterns are disrupted too.

Solutions put forward for deforestation include economic mechanisms to support afforested countries so that, by maintaining forest as forest, they don't lose out commercially or in developmental terms.

But there is growing consensus across government, business and environmental NGOs that another key to solving the problem is sustainable forest management and timber production, as practiced across the EU, resulting in its forests growing by 9% in the last 25 years.

Sustainable forest management balances economic, ecological and social criteria. It requires a detailed forest inventory and long-term management plans, for instance a harvesting rota may involve felling just one or two trees per hectare over a 30-year cycle to enable natural regrowth.

Under sustainable management, the forest's economic value becomes an essential pillar for safeguarding its future. Wood production from sustainably managed forests provides livelihoods, generates tax revenue and delivers other social benefits. It incentivises maintenance of forests as forest, supporting ecosystem preservation and improvement. Where forests no longer have economic value in themselves, there is a risk of conversion to other uses, such as farming, plantations and building development.

Sustainable forest management creates a virtuous circle. When the prosperity of a community or country is seen to be associated with forest maintenance through sustainable forestry, sustainable management principles are, in their turn, more widely respected and implemented. To put it more succinctly, in the phrase that has gained currency across the timber sector, "the forest that pays is the forest that stays".

6. Wood leads life cycle comparisons

6.1 Wood's positive impacts

The capacity of trees to absorb CO₂ from the earth's atmosphere and help combat climate change is one good reason to plant more trees and use more wood. But when it comes to timber's low carbon impacts and wider environmental credentials, that is just the beginning. Using timber to substitute more energy intensive materials has a series of carbon and environmental positives through its life cycle.

There are three areas to consider when measuring the relative CO₂ impacts of different construction materials:

- energy expended in production and processing, CO₂ released in the manufacturing processes and the higher CO₂ emissions from energy use – and wood has an in-built advantage here, having absorbed CO₂ in its growth phase
- raw material and end product capacity to save energy during the products lifetime
- recycling and disposal of the materials or products

This can be a complex calculation, but it has become an increasing focus of the timber sector, in line with growth in international concern over emissions. The outcome is specific energy and carbon impact assessment tools for use by architects, designers, engineers, developers and their clients to help develop low carbon, sustainable strategies for construction and building management.

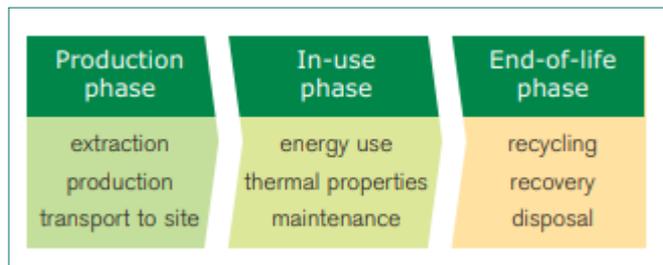


Figure 14 – LCA phases

These tools enable assessment of the initial CO₂ footprint of timber and wood-based products used and quantify their impact in decreasing the carbon footprint of a structure or building. The information can then be taken into account in specification and procurement, alongside fitness for purpose and price. It can also provide a baseline for subsequent assessment of product and materials' carbon impacts through use and eventual disposal.

6.2 Carbon Calculators and buildings

There are now a range of carbon calculators, developed by the timber industry, academia and other research bodies, for assessing the CO₂ impacts of using wood in construction relative to alternative materials.

The carbon saving figures can be substantial. For instance, the 3,600m³ of Austrian spruce glulam beams and cross laminated timber panels used in the world's new tallest wood building, the HoHo complex in Vienna (see chapter 7), gave a CO₂ saving of 2,800 tonnes compared to an equivalent structure in steel and concrete.

Similar results were seen when the city of Helsinki built four similar 5-storey apartment blocks, two in wood, two with concrete. The production of materials used in the timber buildings had a 74 % lower carbon footprint³⁰.

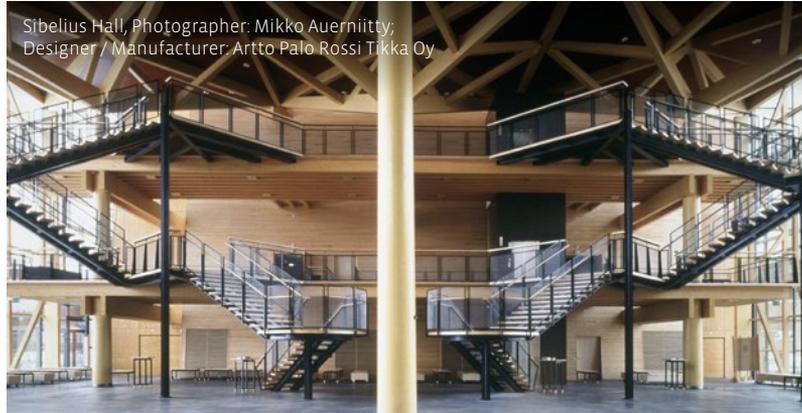
In the Netherlands it was calculated that scaling up the building sector with 10,000 timber (frame) houses could alleviate 10% of the total CO₂ emission produced by the building sector, and in a scenario with maximum wood use (including all window frames, doors, roofs, cladding etc.) this could reduce up to 42%³¹.



Light traffic bridge, Toijala,
Photographer: Mikko Auerniitty;
Designer / Manufacturer: Tuomo Poutanen



© Marc Goodwin



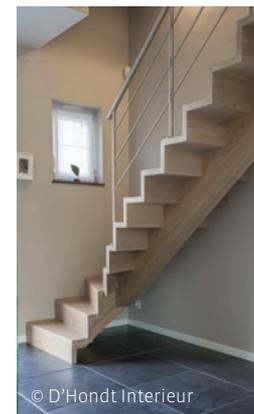
Sibelius Hall, Photographer: Mikko Auerniitty;
Designer / Manufacturer: Artto Palo Rossi Tikka Oy



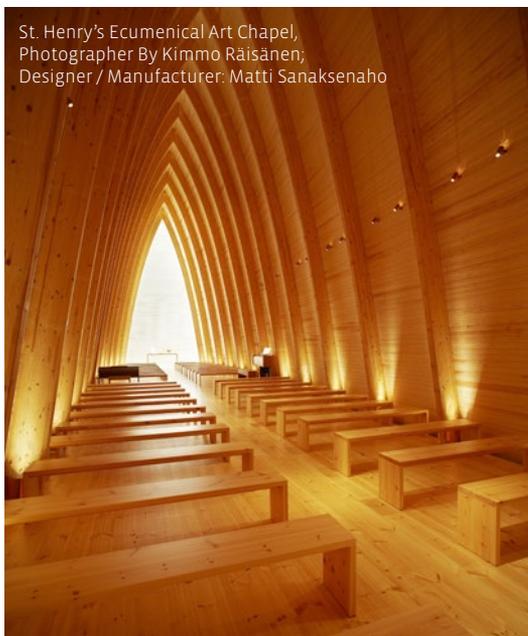
Children's playground building,
Photographer: Mikko Auerniitty;
Designer / Manufacturer:
Architectural Office Ilkka Tukiainen



© Astrata by Decospan



© D'Hondt Interieur



St. Henry's Ecumenical Art Chapel,
Photographer By Kimmo Räisänen;
Designer / Manufacturer: Matti Sanaksenaho



© Europlay NV

6.3 Wood and the science of Life Cycle Assessment

Carbon calculators can be key tools in the evolving science of Life Cycle Assessment (LCA), which has also attracted increasing interest as political and popular focus on climate change has intensified.

LCA is a method for analysing the environmental impacts of products holistically, from production to disposal. Also known as cradle-to-grave analysis, LCA involves recording energy and material inputs into a product throughout its life. It also calculates environmental releases, which could be in the form of gaseous emissions, liquid pollutants or solid residues in processing or disposal. The potential impacts associated with different inputs and releases are evaluated and the end results used in design, manufacturing and procurement policy decisions.

Designers and specifiers can use the process to 'critique' and fine tune products to minimise their environmental impacts. Contractors, end users, clients and others can use it in product selection and assessing the impact of products' interaction when used in combination.

LCA has gained particular momentum in construction, where specifiers are being increasingly required by regulation and clients to consider the wider long-term consequences on the environment of using a product, component or building system. They must consider aspects from its manufacturing process, source of origin, and mode of transport to market, to its performance in use in a structure and subsequent reuse, recycling and disposal. And LCA is also increasingly used in association with Building Information Modelling (BIM) and in LCA-based tools such as Environmental Product Declarations.

6.4 Whole Life Costing

LCA is often employed in conjunction with another increasingly used construction and manufacturing discipline, whole life costing (WLC).

Product and building development must increasingly ensure a balance between long-term value for money and environmental impact. WLC is a method for making comparative cost assessments for a product or project over a period of time. It takes into account relevant economic factors, assessing initial capital and future operational costs, to give the total cost of a building, or its component parts, throughout their life. This includes costs of planning, design, acquisition, operation, maintenance and disposal, less residential value.

Combined with LCA, WLC can provide a thorough economic and environmental analysis to guide procurement strategy and in manufacturing and construction decision-making. Timber products and systems, once more, generally come out ahead, with lower cost alternatives to wood often proving more expensive over their service life or on disposal.

A study co-commissioned from EY Climate Change and Sustainability Services by the Royal Netherlands Timber Trade Association (NTTA)/Centrum Hout and FSC Netherlands³² demonstrated the superior LCA performance of timber used in pile planking for waterway protection.

Researchers looked at a range of environmental impacts of 5mx50mm pile planking in tropical timber, steel and plastic in typical marine applications over a 30-year life cycle. The wood used was certified tropical hardwood; azobé, okan and red angelim.

The outcome was dramatic. According to the variety of timber used, recycled plastic impacts were four times as great and steel sheet pile caused up to 140 times as much environmental damage.

Man-made materials required considerably more energy in manufacturing, with the process also releasing pollutants, a factor which 'barely registered in the case of certified timber use'.

7. Decarbonising construction

7.1 Timber buildings aim high

Timber-based buildings are scaling new heights across Europe and wood is increasingly seen as the prime construction material for a low carbon, bioeconomic future.

Architects throughout the region are rediscovering wood as a medium and exploring its potential in modern building design.

In particular, there is growth in wood-based medium to high-rise multi-storey wood buildings. Not only are architects pushing the design envelope ever upward, significantly planners are approving their increasingly bold projects. For instance, France has a public-private sector collaborative body, Adivbois, specifically focused on spreading multi-storey wood building across the country, with the target of an exemplar project in every region.

7.2 Construction environmental impact

There are a number of core drivers for the increasing and increasingly diverse use of timber in construction in Europe and around the world.

Paramount is the need to improve the environmental performance of the construction process and buildings.

The construction sector is a major and widely regarded as often a wasteful consumer of a range of resources. It accounts for 40% of all energy demand and 36% of greenhouse gas emissions. It is also responsible for 33% of all generated waste. As a result, it is facing some of the most urgent calls of any industry, and increasingly regulation, to reduce its environmental impact and adopt a low carbon strategy.

36%	40%	50%	21%
of all CO ₂ emissions	of energy consumption	of all extracted materials	of total water abstracted

Figure 15 – Environmental impact of construction sector in the EU. Source: European Commission

In 2011, the European Commission published its ‘Roadmap for moving to a competitive low-carbon economy in 2050’. This built on the Europe 2020 initiative, which focuses on driving resource efficiency across industry.

“The EU Energy Performance of Buildings Directive requires that new buildings in the EU from 2021 onwards be nearly zero energy, carbon-efficient designs.”



“Whether in structural or non-structural applications, for new construction or for renovation, wood can help improve the energy performance of buildings on a life-cycle basis by harnessing its insulating properties to reduce heat loss and so reduce energy costs”

Blueprint for EU Forest-based Industries 2013

It identifies the built environment as especially important in providing short- to long-term and low-cost opportunities to reduce emissions. In fact, the Roadmap states that construction could cut its emissions from energy use alone by 90% by 2050. This further reinforced the rulings of the EU Energy Performance of Buildings Directive, which requires that new buildings in the EU from 2021 onwards be nearly zero-energy, carbon efficient designs³³.

Due to its biogenic origin and renewability, using more wood in construction, is seen as having the potential to make significant contributions to achieving the Roadmap aims. It can produce CO₂ savings in terms of greenhouse gas emission cuts, embodied energy and energy efficiency.

7.3 New wood building techniques and technologies

House developers are exploring the developmental possibilities of timber-frame and other types of wood construction, notably, but not exclusively, for multi-occupancy and social housing.

For self-builders too, wood is one of the materials of choice and it is gaining a growing following in hospitality and health-care construction. The rapidly expanding elderly residential care sector is another growing exponent of timber building.

The housing market share taken by timber frame construction, using a wide variety of wood-based panel and timber-based systems for floors, walls, ceilings and floors, has been growing especially rapidly. Key attractions for builders and developers are its energy performance, plus the relative light weight of the components, which helps cut transport costs and increases speed of build.

To drive construction efficiency and cope with the loss of traditional building site skills, such as brick laying, plastering and site carpentry, offsite manufacture for housing is spreading too. Here core structural and other elements, such as wall panels with windows, doors, services and even fixtures, such as bathroom and kitchen fittings installed, are prefabricated indoors in controlled-environment, closely quality-managed factories using advanced and often automated technology. The prefabricated building elements then ensure rapid erection on site. Wood construction products and timber-based build systems, notably timber frame, are particularly widely used by the offsite sector, with their lightness and low energy requirement in processing once more providing key advantages.

Wood construction is also gaining momentum thanks to development of new generation engineered timber building materials previously described, such as cross laminated timber panels (CLT), glulam and laminated veneer lumber (LVL).

These multi-layer, laminated products are as uniform and technically predictable as materials such as steel and concrete. They can match or even beat rival products in terms of strength to weight, enabling timber to compete head on in increasingly demanding applications.

Among outcomes of engineered timber development in particular are increasingly tall and clear-span wood-based buildings.

Tall timber towers in particular have caught architects' and media attention. The tallest currently in Europe are the 14-storey Treet apartment block in Bergen (see below), comprising glulam beams and CLT panels, the 18-storey Mjøstårnet building, featuring a similar materials palette, in Brumunddal, also in Norway, and the 24-storey HoHo tower, a timber-concrete hybrid commercial-residential development in Vienna. And even taller structures are envisaged.

7.4 Urbanisation drives wood housing

Accelerating global urbanisation is giving timber construction added impetus. It is estimated that by 2050, 75% of the world's population will live in towns and cities. This mass migration, plus population growth, requires siting ever more new buildings in already densely developed urban areas and, according to international structural engineers Arup, an estimated two billion square meters of new building stock will be required every year between 2019 and 2025 to keep pace. Architects are increasingly turning to wood as the medium for the job³⁴.

The fact that timber is light and lends itself to prefabrication means less invasive foundations, fewer building component deliveries to site, the possibility of craning even large structural elements over surrounding buildings, quick construction times and less waste. Combined these factors are proving significant advantages in busy, congested urban centres with complex underground infrastructure.

Timber is also relatively quiet to build with, another benefit where construction may be going on in town centres metres from occupied homes and offices.

Timber-based building is additionally proving increasingly popular when it comes to adapting and modernising existing



structures and adding to their capacity, again particularly in urban settings.

Wood-based, modular build systems are ideal for light-weight, highly insulated horizontal extensions to buildings. Increasingly, prefabricated timber pods which can be craned into position, are also being used for loft conversions.

Whole modular additional storeys are also being built on top of existing structures, providing significant extra residential or workplace capacity. This so-called 'airspace' development is again a particularly valuable construction route for urban centres as it means more living and working space can be accommodated on the same building footprint, allowing for increased construction densification.

European urban planning authorities are increasingly in favour of this sort of development. In fact, some local governments are exploiting the airspace above their own buildings to help ease urban housing shortages.

“Wood’s unique cellular structure makes it 10 times more insulating than concrete, 400 times more than steel and 1700 times more than aluminium.”



7.5 Wood in energy efficient construction

Timber construction components are not just long-term, high capacity carbon stores. As mentioned earlier, wood is also an inherent insulant, so the ideal material for the low energy buildings that business and government are increasingly demanding. Wood's unique cellular structure makes it 10 times more insulating than concrete, 400 times more than steel and 1700 times more than aluminium. A 2.5cm thick timber wall panel provides better thermal resistance than an 11.5cm brick wall³⁵.

Consequently, besides timber producing better insulating walls, multi-glazed windows perform better in wood frames, while timber floors also provide better thermal insulation than concrete.

7.6 Versatile and high performance

Timber structures have to meet the same performance and safety standards as those built in other materials. In some respects, they can exceed them. In fire, for instance, in many cases wood behaves more predictably and modern fire-retardant treatments and use of barrier materials, such as gypsum board, can also enhance timber's inherent fire resistance.

Modern timber buildings readily comply with sound insulation standards too due to a combination of their cellular make-up and the use of layered structures with other acoustic materials.

Prefabricated timber structures can additionally be designed for demountability, so are ideal for temporary buildings, and can be readily dismantled at end of life. Timber building modules can be recovered, reused, recycled into other materials such as wood-based panels, and ultimately rendered into renewable wood fuels for heat and power generation. The fact that timber is lightweight compared to steel and concrete also saves on transport emissions and costs. Because

it's lighter, wood-based building requires fewer component deliveries to site, so fewer transport miles and haulage fuel use. It also means less massive and invasive foundations.

As a result of these numerous factors, wood is increasingly seen as *the* material for modern, comfortable, high performance carbon-efficient construction.

7.7 Quantifying building carbon efficiency and EPDs

Environmental performance information for construction products is in growing demand, from architects, developers, legislators and increasingly consumers. The information required has also become more detailed and complex, with integrated environmental assessments of buildings required at tender stage, in architectural competition and under building certification schemes, such as LEED and BREEAM, which require evidence of performance such as Environmental Product Declarations (EPDs). The timber sector is focused on meeting this need.

The conclusion now is that construction products' environmental performance can only be assessed in the context of the whole building, taking into account its full life cycle, from production, through construction, performance in use, disposal, recycling and energy recovery.

This demands that product environmental information has to be provided transparently and in a structured way, consistent with the relevant building assessment scheme. To satisfy this requirement, several EPD and related building assessment initiatives have emerged for construction products and buildings.

The European standards for construction's environmental performance are EN15978, *Sustainability of construction works, assessment of environmental performance of building* and EN



Building for the future

Timber construction has the potential to offer sustainable solutions to the EU's housing challenges. It is not enough to focus on building near-zero energy buildings. The payback time of carbon emissions from the production of building materials should be considered. Wood products keep the carbon sink in forests active and atmospheric carbon can be stored in buildings for centuries. Green building schemes and reporting formats such as Level(s) must duly consider and recognise the low impact of wood construction sites on urban environment, carbon stored in buildings constructed with wood and their substitution effect.

15804, *Sustainability of construction works, core rules for the product category of construction products*, rules on how to quantify and structure building level.

Assessment of building environmental performance under EN15978 must include a variety of indicators on environmental aspects and impacts of a product, among them Global Warming Potential (GWP).

It must cover both greenhouse gas emissions and removals related to materialisation of the building, including maintenance, repair and refurbishment, plus emissions from operational energy use. This facilitates assessment of a building's energy balance and calculation of trade-offs between emissions from materialisation and energy use.

An additional operational module can contain information on 'burdens and benefits beyond the life cycle of the building'. This allows reporting of substitution effects, including those associated with energy recovery from wood replacing fossil fuels.

EN 15804 provides the basis for uniform calculation and declaration of product-related environmental data Europe-wide. But the core rules for EPDs must be applicable to specific circumstance.

Wood construction product suppliers have been frontrunners in specifying core rules for goods. Standard EN16485, *Product category rules (PCR) for wood and wood-based products for use in construction*, was consequently the first PCR to pass the formal CEN vote. This is regarded as a key step, marking acceptance of specific wood rules in EPDs, in particular in terms of biogenic carbon as a material-inherent property of wood. This allows depiction of the temporal carbon storage capacity of wood as part of quantification of global warming potential on both product and building levels.

7.8 Wood's multiple construction applications

Wood in renovation

The value of the building renovation and maintenance sector in Europe is higher than the new build sector – and timber products and wood-based structural systems for extensions, conservatories, and loft conversion, are proving to have a range of advantages over alternatives.

Besides their aesthetic appeal, these products are light weight, so easy to handle on site, quick to install and provide thermal insulation benefits.

Wood in infrastructure

Wood is also extensively used in infrastructure construction. Europe has a number of historic timber bridges, and new ones are being built using cross-tensioned designs in compliance with Eurocodes. Motor vehicle bridges are also being built featuring glulam, with surfaces in asphalt, concrete or wood.

Equally timber is used for platforms, raised decks, noise barriers and other outdoor applications. For exterior use, particularly when in ground contact, wood is generally preservative impregnated, and wood plastic products are also finding increasing use in these product areas. Certain species like larch and cedar have an inherent long service for such applications, as does thermo-treated timber.

TIMBER BUILDING CASE STUDIES

Treet building, Bergen

When constructed, the 14-storey Treet tower in Bergen, Norway, was the tallest residential timber building in the world. It subsequently surrendered that title to the Mjøstårnet building in Brumunddal in the same country and to the HoHo complex in Vienna (below), but it remains a ground-breaking structure.

Designed by architects Artec, Treet blends various timber-based structural approaches, combining timber frame, cross laminated timber modules and glulam beams.

The 63-apartment building comprises four-storey stacks of timber and engineered wood-based apartment modules. These are enclosed in a structural glulam frame, which effectively comprises a series of 'upended bridge trusses'.

Every fifth-storey comprises a glulam-reinforced 'platform' floor fixed into the frame. This then acts as the foundation for the next four storeys of apartment modules above. Not only is this system very strong, it is very quick to build, with the prefabricated modules craned into place and bolted into the frame.

Treet's stairwells and lift shaft are also in CLT and in total, the building's timber elements store 2,000 tonnes of carbon.

Because it's built on the sea front and exposed to very harsh weather, Treet's skin is a mix of glass and steel cladding. But internally much of the timber is left expo-

sed and project architect Per Reigstad said he'd like to build a similar structure in a climate where more wood could be expressed on the exterior.

HoHo, Vienna

The 24-storey HoHo combined commercial and residential building in Vienna is a hybrid engineered wood-concrete structure.

The building, which is around 84m high, includes apartments and office space over 25,000m² of floor area.

Costing €65 million, it was developed by Kerbler Holdings and designed by architects Rüdiger Lainer + Partner, which says that the development comprises 74% timber, distributed between structural elements, interior build and external cladding.

According to the designers, the blend of materials combines the environmental and structural benefits of using 3,600m³ of Austrian spruce, comprising a frame in glulam beams and cross laminated timber panels, with the rigidity and thermal mass of concrete.

"The timber gives a CO₂ saving of 2,800 tonnes compared to building purely in steel and concrete," said a Rüdiger Lainer spokesperson. "At the same time, we avoid compression issues of using only engineered wood in such a tall building. The glulam columns, to which the CLT is fixed, rest on concrete beams. The wood composite floors also link to reinforced concrete core structures and extend out to the façade, where they're supported by wood columns."



HoHo_Wien_Aussenvisualisierung Ho Ho Wien and Ho Ho next
© RLP Ruediger Lainer und Partner, source proHolz Austria

“The timber in the HoHo building gives a CO₂ saving of 2,800 tonnes compared to a building purely in steel and concrete.”

Rüdiger Lainer Architects

The façade is also innovative. Manufactured by Zublin Timber, it comprises a “solid wood panel and mineral shell sandwich”.

Fire safety is dealt with through a range of measures. Interior solid wood surfaces are left unclad for ready inspection, concrete and timber structures are mutually supportive, but separated, and protective systems include sprinklers and forced draft staircases and elevator shafts. As a result, the architect said HoHo’s fire risk is comparable to its equivalent in concrete and steel.

The building won the best mixed-use building category in the International Property Awards and Rüdiger Lainer said it planned to use the know-how gained on the structure in future projects. These, it maintains, could be taller still.

Dalston Works, London

As the world’s largest cross laminated timber (CLT) building, Dalston Works in London was described by award-winning architects Waugh Thistleton as a landmark project in its ambition to roll out use of timber construction in high-density urban housing, across London and beyond.

The manufacture of the timber frame for Dalston produced less than half the carbon emissions of an equivalent concrete structure and it stores a total of 3,756 tonnes.

Due to the high level of prefabrication and lightness of the timber panels, the project required just 111 component deliveries to site. It is estimated that an equivalent concrete structure would have needed 700.

The brick-faced building comprises 121 dwellings, plus retail, restaurant and workspace areas.

The CLT panels, comprising 4,649m³ of timber, form walls, floors, roofs, stairs and lift shafts. Lower grade wood and offcuts from the production process were used as biomass fuel by the manufacturer. And the material was derived from a total of 2,325 trees, a volume of timber that is replaced in just 3 hours in the German and Austrian forests where it grew.

Dalston Works achieved an ‘Excellent’ classification under the BREEAM building sustainability assessment scheme and architect Andrew Waugh has described CLT as ‘the new concrete for the 21st century’.

7.9 Wood and Wellness

It is also increasingly recognised that timber-based buildings and interiors can contribute to the psychological and even physiological well-being of people living and working in them.

In its new publication, *Rethinking Timber Buildings*, structural engineers Arup dedicate a chapter to the topic. It concludes that use of wood in the interior of a building has benefits that mimic the effect of spending time outside in nature.

“Much like indoor plants and green façades, timber itself represents a close link to trees and nature, whether used as cladding on the outside of a building, exposed as structure or used for fittings and furniture or equipment” states Arup.

It says too that ratings schemes such as WELL and the Living Building Challenge ‘reward building designs that promote occupants’ physical, mental and emotional health, and realise the benefits of biophilic environments (those connected with nature)’.

“Research points to increased positive feelings and decreased stress in buildings using natural materials, implying reduced risks from depression and impaired immune system functioning, and improved long-term health,” states Arup.

On reduction in stress levels, it adds, studies have looked at blood pressure, pulse rate, skin conductance, muscle tension, and electrical activity of the brain.

Arup also points out that efforts are underway to reduce use of substances and materials in conjunction with wood that may counterbalance its natural health benefits. This has included switching to more environmentally benign adhesives in engineered wood products, reducing wood to adhesive ratios, using plant such as soya-based glues and also developing wood-based panels with lower formaldehyde content.

Durability of wood products is also being enhanced through environmentally benign thermo treatment, or modification processes such as acetylation and furfurylation using naturally occurring, low environmental impact substances.

There is also a movement, says Arup, toward laminated timber products that use wood or steel connectors rather than glue.

Wellness – the architects’ perspective

“By the sustainability of using timber in building, we not only mean that it’s renewable, energy efficient, carbon rich and all those other good things, but that it helps achieve sustainability in the broadest sense. The sustainability of a building is also about the wellbeing of people – and people feel better in a place featuring natural materials. Foster + Partners Archi-





Panels and moldings, material wood and / or MDF Photographer By Jaakko Niemela,
Designer / Manufacturer ET Listat Oy company profile

“Research points to increased positive feelings and decreased stress in buildings using natural materials, implying reduced risks from depression and impaired immune system functioning, and improved long-term health.”

Arup

jects used to be known for our use of steel and glass, but the commercial market is changing and we’re using more timber generally. Businesses now want their buildings to have a different sense of personality and be more responsive to people who work in them. Timber is rather successful in delivering both these things. People warm to it and it also makes them feel better about their environment.”

Michael Jones, Foster + Partners, project architect on Bloomberg’s new European headquarters in London, which features 37,000 m² of American red oak flooring, 1858 m² of cladding and 125 m³ of glulam.



Gosta Pavilion at the Serlachius Museum of Art,
Photographer: Mikko Auerniitty;
Designer / Manufacturer: MX_SI Architectural studio,
Huttunen - Lipasti - Pakkanen Oy

Wood and human health

Wooden surfaces in interior use hold potential for improving human health. The antibacterial properties of wood might reduce the possibility of cross-contamination from surfaces. In a recent scientific study at the Aalto University in Finland³⁶ solid wood surfaces showed clear antibacterial properties. Several human pathogens, including methicillin-resistant *Staphylococcus aureus*, proved to be susceptible to contact with pine heartwood and sapwood in particular, and, to some extent, spruce. Similar results have been shown in Austrian studies. These properties open new possibilities for use of wood in schools and hospitals.

8. The EU Wood Industry – engine of growth and development

8.1 The EU's fourth largest manufacturing industry

The timber and woodworking industries rank as the EU's fourth largest manufacturing industry by number of enterprises.

The woodworking industries alone employ over 1 million people and contribute €133 billion to EU GDP. Add the furniture sector, and the workforce rises to nearly 2 million (6% of EU total manufacturing employment) and annual turnover to €243 billion³⁷.

Germany, Italy, France the UK and Sweden have the largest timber industries, but the sector is a significant engine of the economy across the EU.

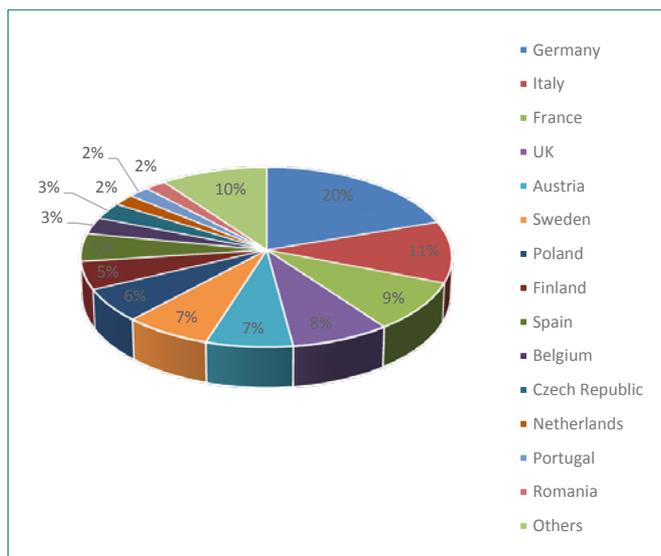
The timber business comprises large numbers of small to medium sized enterprises. In fact, throughout the EU there are estimated to be some 170,000 companies in the sector. Many are also in rural areas where they are especially valuable sources of employment, as well as a vital component of commerce and drivers of local development.

The woodworking sector is also a key export earner. Around 35% of production is exported, with 70% accounted for in intra-EU trade. Sales outside the EU were worth €11.8 billion in 2017, with leading markets including the US, Japan and China.

The industry also has a positive trade balance of some €3 billion, with the EU importing around €8.8 billion of wood products in 2016. Lead suppliers are China, Russia and the USA.



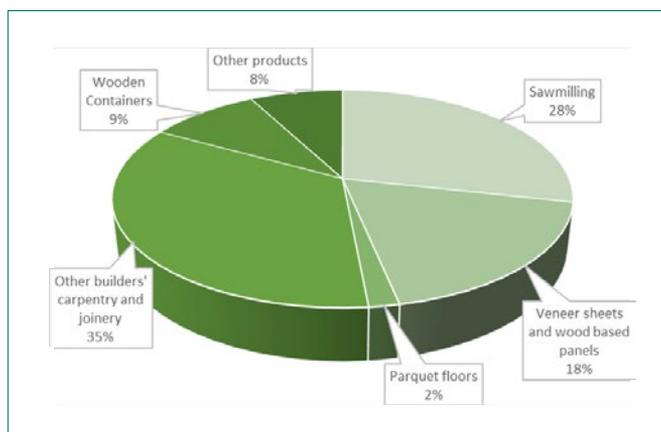
Figure 16 – Production value of Woodworking industry by EU Country, 2016.
Source: Eurostat



8.2 Industry diversification

Timber and woodworking companies are also highly diverse, producing a wide range of different products and focusing on different stages of timber processing along the supply chain. They include sawmills, planing operations, preservative and fire-retardant treatment specialists, flooring manufacturers, plywood and other wood-based panel producers, makers of veneer, joinery, carpentry, construction products, pallets, packaging and more.

Figure 17 – Relative importance of wood-working subsectors, EU28 2016.
Source: Eurostat



8.3 Sawnwood at the cutting edge

With production value of around €35 billion, the EU sawnwood sector accounts for around 28% of the wood industries' overall production value. It comprises some 34,500 businesses and employs 250,000 people³⁸.

Softwood dynamism

EU mill output of sawn softwood, comprising timber from non-deciduous trees, such as spruce, pine, fir and Douglas fir, in 2017 was 99.9 million m³. The bulk of this is sold in the EU, but European mills are also exporting increasing volumes around the world. Key markets include the Middle East and North Africa and increasingly East Asian countries.

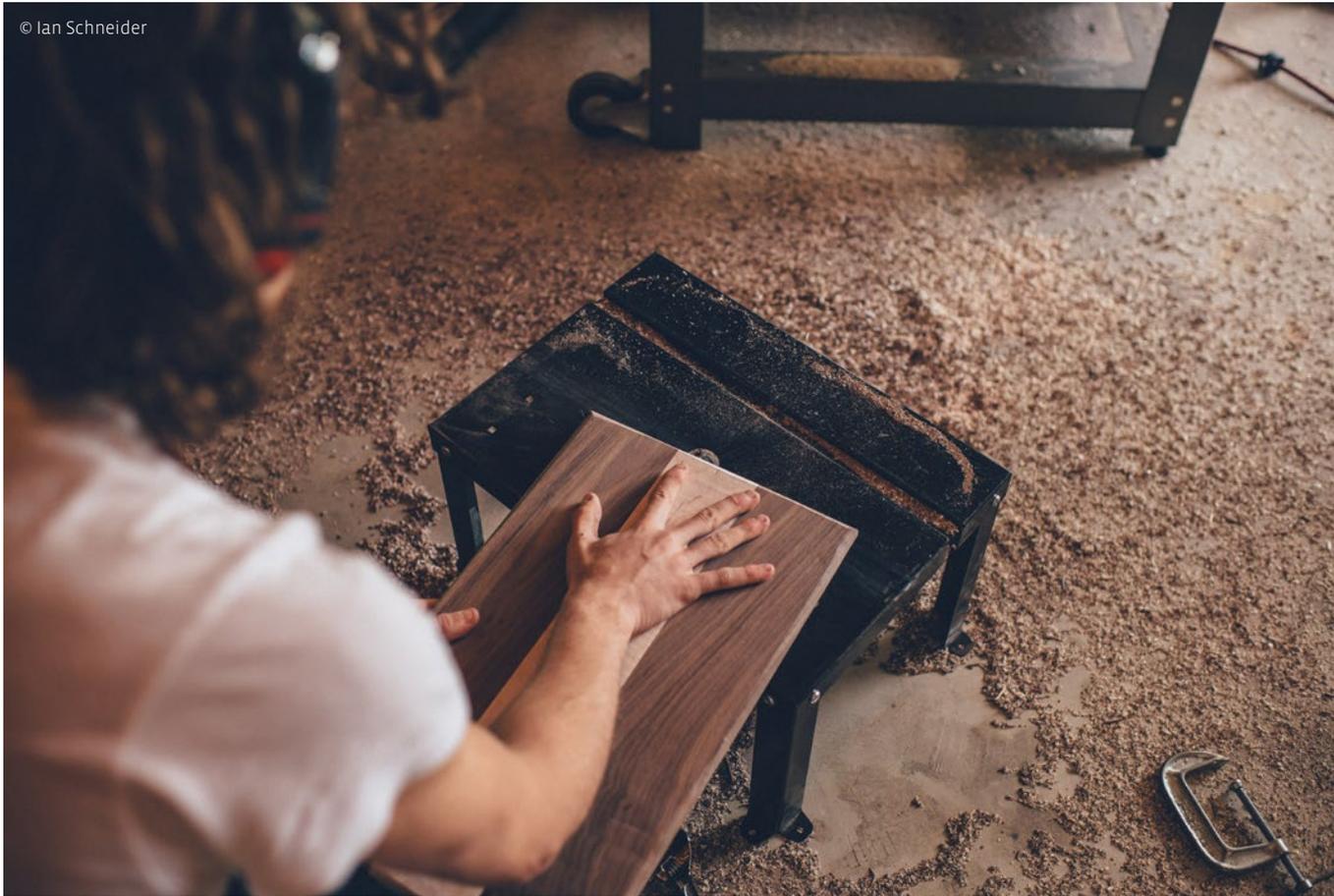
China in particular looks set to become an increasingly key market in the years ahead. Given that Asian softwood consumption per capita is relatively small in global terms there is major scope for growth throughout the region.

Softwood end uses include construction (the largest consumer), joinery, furniture, flooring, packaging and industrial applications. Sawnwood producers are also key suppliers to home improvement retail and of wood residues for fuel, wood-based panels and paper pulp.

The softwood sawmill industry comprises a mix of very large operators and small to medium sized enterprises. The former tend to be increasingly export-oriented and focused on adding value, although smaller businesses can be highly dynamic too, targeting domestic and export markets. Some of the largest operations also now view themselves more as diversified bio-forestry businesses, with a product portfolio ranging from sawn timber, through pulp, to wood biofuels, advanced cellulose fibres and energy.

By country, the largest sawn softwood producers are Germany (accounting for 22% of EU output), Sweden (18%), Finland (12%), Austria (9.5%) and France (6.5%).

© Ian Schneider



Hardwood specialists

The European sawn hardwood sector, using timber from deciduous trees such as oak, ash, beech, walnut, birch and elm from European forests, is arguably even more multi-faceted. It comprises a very large number of small to medium sized operations, but serving local, regional and national markets.

For this sector too, exports outside the EU are becoming increasingly significant, particularly to China and countries of the Middle East and North Africa. Total EU sawn hardwood production in 2017 was 10.5 million m³.

End uses include furniture, flooring and internal and external joinery, with hardwood tending to be more resilient and durable in a wider range of environments than softwood. The most sought-after species is oak, which is particularly appreciated for flooring. Beech is also widely used. And the sector is also evaluating ways to create more market demand for other hardwood species.

Europe's biggest hardwood producers are Romania (accounting for 16% of EU output), Croatia and France (both 13%), Germany (10%) and Latvia (6%).

8.4 An engineered timber future

Engineered timber products are made from pressure bonding layers of solid wood in boards or panels, veneers, strands or fibres. The result are strong materials that can match man-made products in terms of resilience, durability and predictable performance and beat them on versatility and strength to weight.

They include LVL, glulam and CLT, all making the most significant market impact, notably, as we have seen, in increasingly large-scale construction. They feature as the sole structural element, such as in Bergen's Treet building, and in hybrid buildings with man-made materials, such as Vienna's HoHo tower.

Given the scale possible in these products and the fact that they use large volumes of timber, they are prime carbon stores and increasingly seen as a route to low environmental impact construction.

Glulam comprises layers of dimensioned lumber bonded with durable, moisture resistant structural adhesives. It tends to be used for beams, pillars, posts and rafters. Beams can achieve spans of 100m and beyond. Glulam can also be curved with no loss of integrity. These attributes make glulam a favourite for warehousing, retail and arena construction, school, office and sports and leisure hall building.

Leading European glulam producers are Austria (at 1.5 million m³ in 2017³⁹), Germany and Finland (both producing around 330,000m³ annually). The biggest national markets are Germany, Italy, Austria, France and Japan.

CLT comprises large dimension panels made from glued layers of solid sawn lumber. These are laid on top of the other, so the grain in one runs transversely to the next layer. This gives the material great strength, stability and uniform performance.

CLT panels can be used for many construction types but they are inevitably attracting most attention among architects, because of their suitability for medium to high-rise construction.

Global CLT production was estimated at 1 million m³ in 2016, with European production at around 680,000 m³ and the biggest producers being Austria, Germany and Switzerland. In 2017, output in the "DACH" region (Germany, Austria and Switzerland), in Czech Republic and in Italy grew 15% and strong increases were reported in the Nordic countries. Overall European output is forecast to grow at 15.1% a year to 2025⁴⁰.

8.5 Manufactured wood products

Wood-based panels

Wood-based panels are among the most widely used and most versatile of all wood products and are found in a broad range of applications.

They are a key material for the furniture sector, used in flooring, throughout construction, in packaging, vehicle bodies, billboards and building site hoarding.

They are made from fine wood particles and fibre (particle board, hardboard, softboard, Medium Density Fibreboard (MDF)) or larger strands (oriented strand board (OSB)) and can be produced in large dimensions.

The raw material is either virgin wood, from small dimension logs and branches, residue from sawmills and wood processing, or post-consumer recovered wood products. It is bonded with resins under pressure to form strong, durable end products.

Another key panel product, plywood, comprises veneers of wood, sliced from the log, which are stacked and bonded. It is





Mladinski Hotel Punkl, Slovenia, architecture Marusa Zorec, Uros Rustja, Martina Tepina, Mitja Novak, Structural design Arrea doo, source proHolz Austria

also used across manufacturing and construction and, in the form of marine plywood, is a core material for boat-building.

The panel industry is strongly focused on its environmental performance. It has increased its use of more inert chemicals and resins and is working on end-of-life recovery, recycling and reuse to develop its role in the circular economy

It accounts employs around 92,000 people and accounts for 18% of the European wood industries' production value, with sales of €23 billion a year.

Flooring

After several years of a challenging market conditions, the EU wood flooring (parquet) sector really began to pick up in in 2016 and advanced further in 2017. EU parquet consumption reached nearly 80 million m² that year⁴¹.

The same year total European production of wood flooring – including solid, multilayer or engineered and mosaic products - was 87 million m² and output has now been growing for five years⁴².

New build is a core wood flooring consumer, but the renovation market is also significant. Competition from wood-

look flooring products, such as vinyl, is intense and the widespread misuse of the words 'parquet' and 'wood floor' in labelling and promotion causes consumer confusion. However, timber continues to take 5% of EU flooring market share.

In 2017 multilayer products accounted for 81% of production, followed by solid (including lamparquet) with 17% and mosaic flooring 2%. Of species used, 80% of output is in oak.

Builders' carpentry and joinery

The EU joinery sector, including all types of carpentry and manufacture of products such as doors, windows, roof trusses and a range of other construction products, is also a sizeable industry.

It comprises around 93,700 businesses, with a large proportion of SMEs, employs 415,000 people and contributes €43 billion to EU GDP annually.

Pallets and packaging

Wood pallets and packaging facilitate transport of goods worldwide. Manufacturers use around a fifth of European timber output in the form of solid softwood and wood panel products – a total of 25 million m³. They produce 500 million pallets a year, and there are around 4 billion in circulation, storing an estimated 108 billion kg of carbon⁴³.

There are approximately 10,000 businesses in the sector, employing 95,000 people directly, with a further 300,000 working in recovery, repair and recycling.

Pallet and packaging recovery, repair and reuse is a major sector in its own right, with significant pallet pooling logistical operations for product collection and redistribution. End of use applications for the timber include recycling into wood particleboard, animal bedding, mulch and fertiliser, or use as biomass fuel.

The timber treatment sector

Apart from a few, mainly tropical species, untreated wood products can be vulnerable to insect and fungal attack and resulting bioterrorism.

This compromises timber's technical performance and can mean economic loss. It also impacts its sustainability and circular economic credentials. It can lead to early product failure, premature disposal and consequent release of carbon.

However, modern wood science can accurately predict the likely performance of wood species in their various uses based on their structural characteristics, assuming best practice in design, construction and maintenance. Taking into account the environment the wood is used in and performance demanded enables correct specification of protection required.

Wood durability can be increased by applying and impregnating substances that provide added longevity and limit or prevent biodeterioration. This helps underpin both market confidence in timber's performance and sustainability.

In Europe, these substances are governed and authorized for use under the Biocidal Products Regulation or equivalent national legislation. These address their potential health, safety and environmental impacts.

Preservative products that improve wood's biological durability and moisture resistance generally require use of chemicals. They are applied under very strict controls in closed systems in conformance with European and national regulation.

Pressure-treated timber for construction, agriculture, landscaping, garden products, marine, railway and many other applications enjoys an extended service life. Life cycle assessment has also shown that it offers superior environmental characteristics over alternative non-wood materials⁴⁴.

8.6 Global timber traders

The timber trade is a significant component of the European economy and operates worldwide. EU imports of timber and woodworking products amounted to €8.8 billion in 2017, an increase of 4% compared to 2016, with the lead suppliers including China, Russia and the USA.

The timber trading industry is strongly focused on ensuring legal and sustainable supply and since 2013 has been subject to the European Timber Regulation (EUTR). This obliges importers to undertake extensive due diligence risk assessment on all suppliers to ensure material derives from legal sources. Where more than non-negligible risk is identified, they must undertake further risk mitigation measures.

Global free trade in legal and sustainably harvested timber is of core importance to the European timber sector, particularly at a time when free trade and multilateral cooperation between countries are subjects of heated debate. This trade, the industry believes, is not just an engine of economic growth for both supplier and buyer countries, it can incentivize and underpin the spread of sustainable forest management worldwide, promote further increase in use of the most renewable, low carbon manufacturing and construction material known to humankind and support development of a global bioeconomy.



ANNEX – EU Policy and Legislative Framework

What follows is a non-exhaustive list of the policies and legislation at EU level affecting the wood industry.

Climate and Energy

- › Communication 2016/0860 - Clean Energy For All Europeans
- › Communication 2018/773 - A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy
- › Directive (EU) 2018/410 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814
- › Directive (EU) 2018/844 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency
- › Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources
- › Directive (EU) 2018/2002 amending Directive 2012/27/EU on energy efficiency
- › Regulation (EU) 2018/841 - Inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU
- › Regulation (EU) 2018/842 - Binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

Environment

- › Communication 2011/244 - Our life insurance, our natural capital: an EU Biodiversity Strategy to 2020
- › Communication 2014/0398 - Towards a circular economy: A zero waste programme for Europe

- › Communication 2015/0614 - Closing the loop - An EU action plan for the Circular Economy
- › Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
- › Directive 2009/147/EC on the conservation of wild birds
- › Directive (EU) 2018/850 amending Directive 1999/31/EC on the landfill of waste
- › Directive (EU) 2018/851 amending Directive 2008/98/EC on waste
- › Directive (EU) 2018/852 amending Directive 94/62/EC on packaging and packaging waste

Employment and Social affairs

- › Communication 2016/0381 – A new skills agenda. Working together to strengthen human capital, employability and competitiveness
- › Directive 89/391/EEC – Health and Safety at work Framework Directive
- › Directive 2003/88/EC on Working Time
- › Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work
- › Directive (EU) 2019/130 of the European Parliament and of the Council of 16 January 2019 amending Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work

Forest-related policies

- › Communication 2003/0251 - Forest Law Enforcement, Governance and Trade (FLEGT). Proposal for an EU Action Plan
- › Communication 2008/645 final - Addressing the challenges of deforestation and forest degradation to tackle climate change and biodiversity loss
- › Communication 2013/0659 - A new EU Forest Strategy: for forests and the forest-based sector

- › Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community
- › Regulation (EU) 995/2010 - laying down the obligations of operators who place timber and timber products on the market

Industrial Policy

- › Commission Staff Working Document 2013/343 – A Blueprint for the EU Forest-based industries (woodworking, furniture, pulp & paper manufacturing and converting, printing)
- › Communication 2012/0433 - Strategy for the sustainable competitiveness of the construction sector and its enterprises
- › Communication 2017/0479 - Investing in a smart, innovative and sustainable Industry. A renewed EU Industrial Policy Strategy
- › Communication 2018/673 - A sustainable Bioeconomy for Europe. Strengthening the connection between economy, society and the environment.

Product policy

- › Commission Recommendation 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations
- › Communication 2008/0400 - Public procurement for a better environment
- › Communication 2013/196 - Building the Single Market for Green Products. Facilitating better information on the environmental performance of products and organisations
- › Communication 2014/445 on resource efficient opportunities in the building sector
- › Directive 2001/95/EC on General Safety of Products
- › Directive 2014/24/EU on public procurement

- › Regulation (EC) No 1907/2006 on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- › Regulation (EC) No 66/2010 on the EU Ecolabel
- › Regulation (EU) No 305/2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- › Regulation (EU) 528/2012 on Biocidal products
- › Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food

Trade

- › Communication 2015/0497 - Trade for All. Towards a more responsible trade and investment policy
- › Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and the Common Customs Tariff
- › Commission Implementing Regulation (EU) 2018/396 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff
- › Commission Implementing Regulation (EU) 2018/507 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff
- › Regulation (EU) 2015/478 on common rules for imports
- › Regulation (EU) 2015/755 on common rules for imports from certain third countries
- › Regulation (EU) 2016/1036 on protection against dumped imports from countries not members of the European Union
- › Regulation (EU) 2016/1037 on protection against subsidised imports from countries not members of the European Union
- › Regulation (EU) 2017/2321 amending Regulation (EU) 2016/1036 on protection against dumped imports from countries not members of the European Union and Regulation (EU) 2016/1037 on protection against subsidised imports from countries not members of the European Union

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Metla House, Photographer By Kimmo Karsanen,
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Notes

A series of horizontal dotted lines for writing notes.



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