

EUROPEAN WOOD FACTSHEETS

3. WOOD PRODUCTS AS CARBON STORES

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and the
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saved through
substitution

Forests and the carbon sink

The Kyoto Protocol

The Kyoto Protocol, signed in 1997, set targets for man-made greenhouse gases. Signatories are legally bound not to exceed those levels. While the most effective way of reducing greenhouse gases, and particularly CO₂, is to reduce emissions, increasing the absorption of these gases by carbon sinks can also help. Here both forest products and forests themselves have an important role to play.

What is a carbon sink?

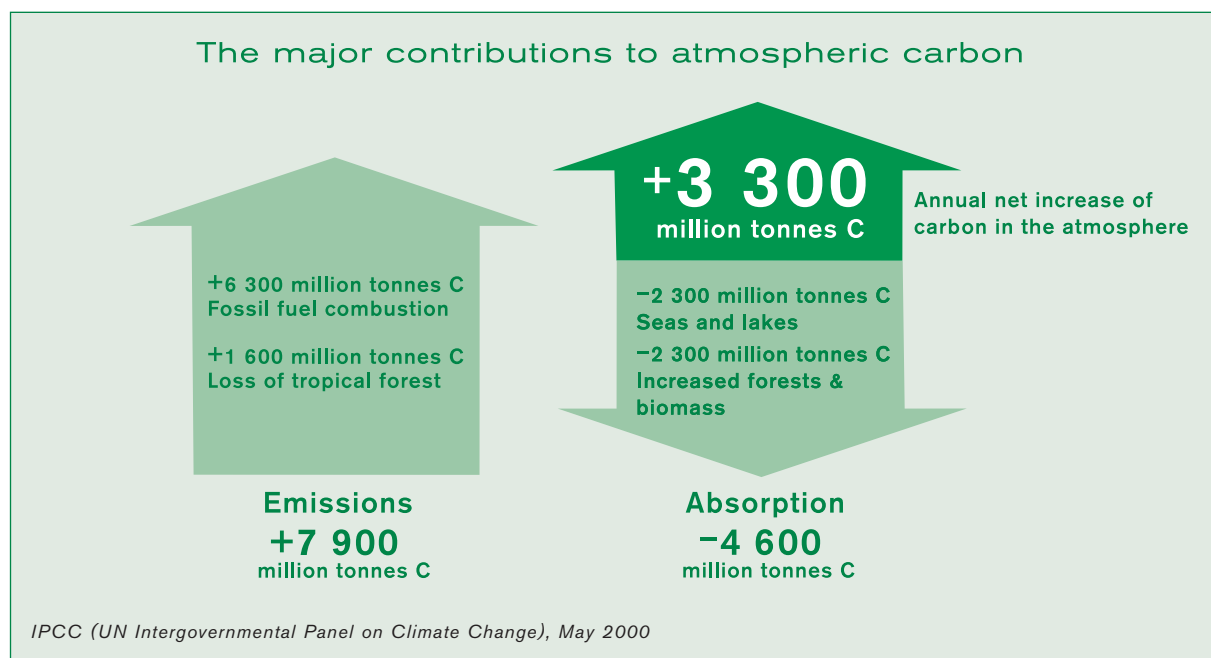
Carbon is present in our environment in different forms and in many different places that act as carbon reservoirs: in the oceans (dissolved in water), in the biomass (vegetal and animal), in the atmosphere (mostly in the form of CO₂), in rocks (limestone, coal...), etc. The regular exchange between these places is known as the carbon cycle.

What are commonly known as carbon sinks are in fact sinks of carbon dioxide (CO₂), the elements of the cycle that can absorb and store CO₂, thereby reducing the carbon concentration in the atmosphere that is one of the main causes of Global Warming.

The main carbon sinks are the oceans and the biomass - forests and plants.

Atmospheric carbon

The concentration of carbon in the atmosphere is currently increasing by 3 300 million tonnes of carbon a year. While loss of tropical forest contributes a significant amount of this, it is more than balanced by the afforestation and increased biomass which occurs in other parts of the world - especially in Europe.



Wood as a carbon store

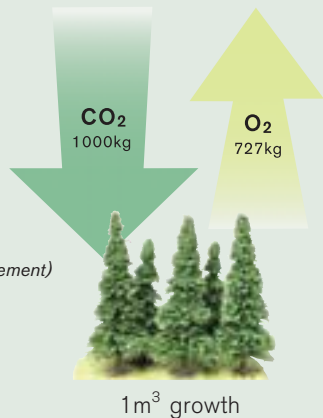
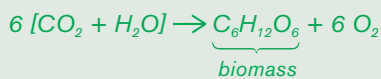
Forest contribution

Trees absorb CO₂ from the atmosphere through photosynthesis, fixing it as carbon in their organic matter and releasing the remaining oxygen back into the atmosphere.

On average a typical tree absorbs, through photosynthesis, the equivalent of 1 tonne of carbon dioxide for every cubic metre's growth, while producing the equivalent of 727kg of oxygen.

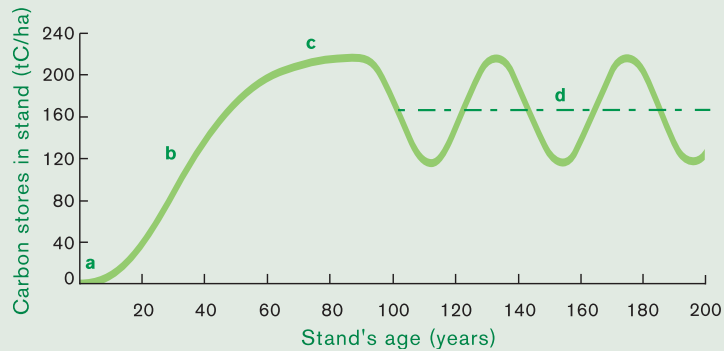
ECCM (Edinburgh Centre for Carbon Management)

Photosynthesis:



As shown in the diagram below, without management, a forest reaches a state of carbon equilibrium at around 165 tC/ha, where growth is balanced by natural losses.

Carbon accumulation in a stand of trees



- a. establishment phase
- b. full-vigour phase
- c. mature phase
- d. long-term equilibrium phase

Nabuurs, G.J., et al., 2002

If the forest is managed, the harvested timber will be used to create added-value timber products which continue to store carbon. Meanwhile more trees are planted and the carbon sink effect of the forest is maintained.

The total carbon stored in Europe's forests, excluding the Russian Federation, is estimated at 9 522 million tonnes C, increasing annually by 115,83 million tonnes C. The vast forests of the Russian Federation store an additional 37 000 million tonnes C, increasing annually by 440 million tonnes C (MCPFE/UNECE-FAO State of Europe's Forests 2003).

Product contribution

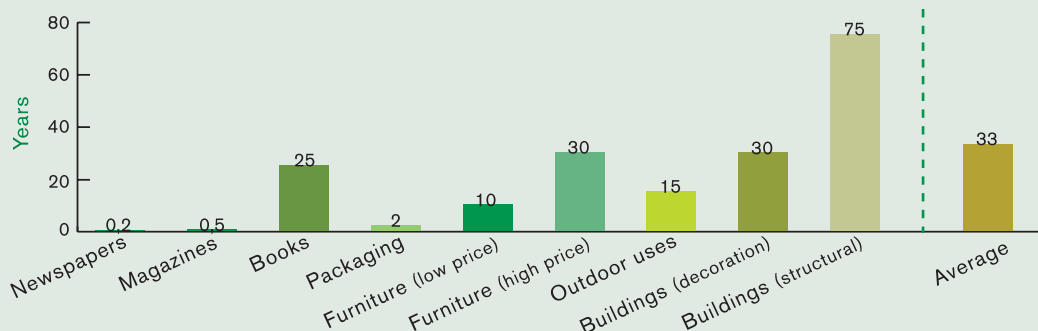
Wood products are carbon stores, rather than carbon sinks. Their carbon continues to be stored through their lifecycle: use, re-use, recycling and recovering by burning or decay. Carbon accounts for about 49% of the mass of a wood product.

With an estimated European wood product stock of about 60 million tonnes, the carbon stored in wood products has a significant role to play in reducing Climate Change (see Factsheet 5).

Extending the carbon store

After wood products have been used in one application, they can often be re-used or recycled, then eventually burnt or left to decay in landfills, when the stored CO₂ is returned to the atmosphere. The longer the life of these products, the greater the benefit to the environment. According to recent estimates, the average life of wood products varies from 2 months for newspapers to 75 years for structural timber (see below).

Average life time of wood products in Germany



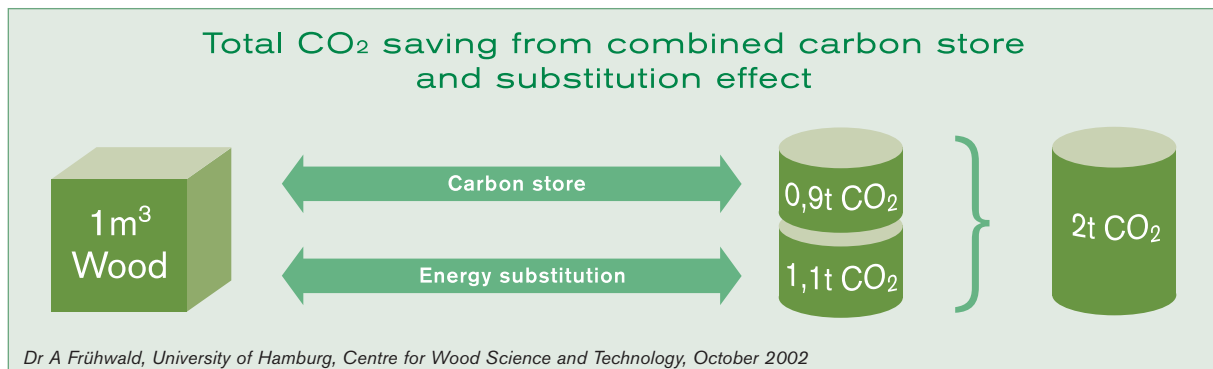
Dr A Frühwald, University of Hamburg, Centre for Wood Science and Technology, October 2002



Carbon saved through substitution

Substitution for other materials

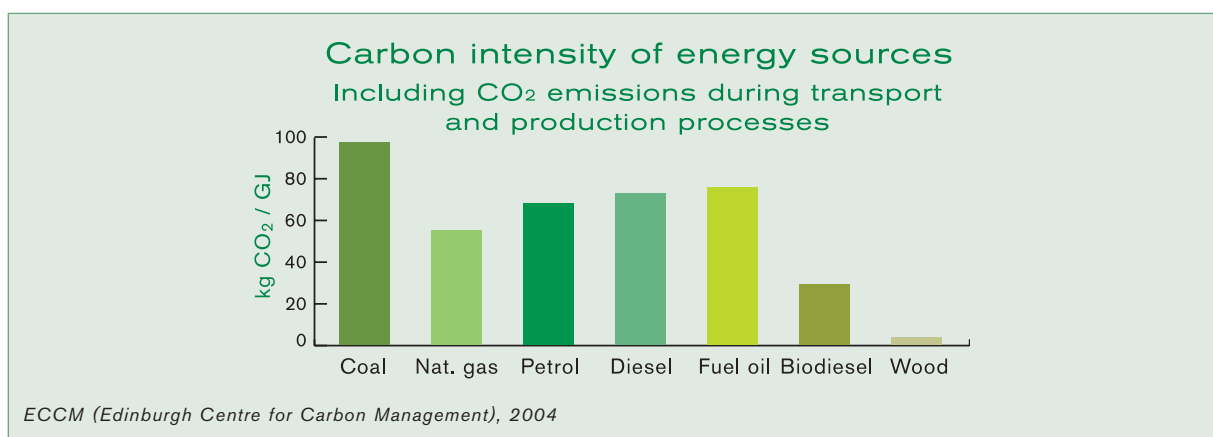
While the carbon store effect of wood products helps keep CO₂ out of the atmosphere, an even greater carbon gain comes from the substitution effect of using wood in place of other, more fossil fuel-intensive, materials. Data differ according to material as well as to country (because of differences in energy sources), however all agree that considerable CO₂ savings can be made by using wood where appropriate instead of other materials. On average, the production of a cubic metre of wood creates around 1,1 tonnes less CO₂ emissions than the production of an equivalent amount of fossil fuel-intensive materials, such as steel, concrete or plastics. This amount, coupled to the 0,9 tonne of CO₂ stored in the wood, means that every cubic metre of wood substituting for fossil fuel-intensive materials saves a total of roughly 2 tonnes of CO₂ (see below).



Substitution for fossil fuels

After it has been used as a product, wood can be combusted to produce energy that can replace fossil fuels, releasing the solar energy it had stored chemically, as well as the CO₂, without any effect on the global balance.

Wood as a source of energy is not only renewable, it is also low in CO₂ emissions, as can be seen from the graph below.



Summary

Wood products are an efficient way of extending the storage of the forest carbon sink. To increase their efficiency and have them play a greater role in the mitigation of Climate Change, we need to:

- increase the market share of wood products through promotion and technical innovation
- extend the life of wood products
- recycle more wood products to extend their carbon storage still further
- recover the energy stored in wood by burning at the end of the use of the products.



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