IRG 39 – Istambul

Wood protection, a tool for climate change mitigation ?

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The era of procrastination of half measures of soothing and baffling expedients, of delays is coming to its close. In its place we are entering a period of consequences

Winston Churchill

The new realistic challenge :
to try to limit the changes to a level to which the human society can adapt to, within the coming decades

IPCC : Forest and Forest Products can play a role in climate change mitigation

Wood protection has a significant positive impact on the role of forest products and forest

FOREST AND FOREST PRODUCTS ROLES for CLIMATE CHANGE MITIGATION

1 - What is a carbon sink ?

-> a system that can uptake CO2 from the atmosphere
-> a carbon pool that is increasing, and can be further increased

- **Sustainable forest is considered as a carbon sink** (IPCC),
- National GHG emissions inventory system under the Kyoto protocol acknowledges this

- Northern hemisphere forest ecosystems
-> net carbon uptake (1990's). : 600-700 Mt C yr^{-1}
(Goodhale 2002)

- Global level, forest carbon uptake compensate 8 to 20 % of fossil fuel emissions in industrialised countries

2. Are wood products a carbon sink ?

- no physical process for uptaking CO2 from the atmosphere

- total uptake of carbon (Goodhale 2002) :
  - 210 Mt C/yr in living biomass
  - **80 Mt C/yr in forest products (HWP),**
  - 150 Mt C/yr in dead wood and 130 Gt C/yr in the forest floor and soil organic matter.

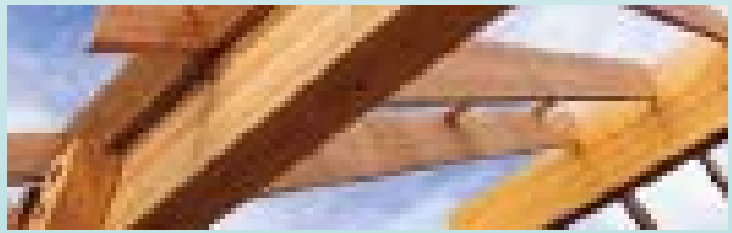
- role of wood products : to be considered in comparison to a non-use of harvested timber as products.

- **if the forest is stable or growing, wood products are carbon sinks because they avoid carbon emission** (natural degradation of forest or burning of forest production).

2. Are wood products a carbon sink ? *(cont.)*

- Up to now, the Kyoto protocol has not integrated wood products in the quantification of carbon sinks (as a possibility to fulfil the states commitments)

-> the accounting process considers that the harvested wood is oxidised to CO2 directly after harvest.



2. Are wood products a carbon sink ? *(cont.)*

- Whereas wood products represent carbon pools from harvesting to end of life,
- if this pool is growing, (amount of wood products incoming exceeding amount burnt or degraded),

  -> then wood products are a carbon sink

- UNFCCC technical Paper 2003/7 :

"…Wood products themselves are not sinks of carbon but rather reservoirs (or pools) to which the carbon resulting from photosynthesis is transferred. ***However decaying products are a source of greenhouse gas emissions principally CO2****. A distinction must be made between an increasing stock of carbon resulting from the accumulation of wood products and emissions resulting from decay of the products."*

2. Are wood products a carbon sink ? *(cont.)*

- **U.S.A : C sequestration in wood and paper products (Skog 1998**), large pools of C in wood/paper products in use, and in landfills, of increasing size

  Since 1910, **2.7 GtC** have accumulated in wood and paper products (forest trees 13.8 GtC and soils 24.7 GtC).

  - Net sequestration increasing in products, (increase in wood consumption)

- **Finland** (Pingoud 2001). :

  - C pool products : 11.5 Mt C in 1995;

  - **average annual increase : 2.0% in 1980s (0.20 Mt C /y) …**

  approximately 1.3% of the fossil fuel C emissions in Finland during the same period.

2. Are wood products a carbon sink ? *(cont.)*

- **Canada** (Apps 1999),

  - Forest sector C stock (1989) : 86.6 GtC : 71.3 GtC dead organic matter of litter and soils, 14.5 GtC in living biomass and only 0.8 GtC in Forest Products Sector(<1%).

  - **Forest products C stocks increase ~ +25 MtC/y** (1989).

- **France**

  (Paquet 2003) :

  -> 1990 - 2010 : **33% increase in 20 years** (105 MtCO2 – 28.6 MtC).

  -> possible impact of public policies (construction and energy) : **38%** (120 MtCO2 – 32,6 MtC),

  (Vial 2008) :

  -> 2005 annual increase is **4.6 MtCO2 – 1,3 Mt C**

2. Are wood products a carbon sink ? *(cont.)*

- **UNFCCC 2003** “Estimation, reporting and accounting of harvested wood products”,

  - Estimated changes in carbon stocks resulting from global wood products in use :

o *“ …. Data based on FAO suggest **an increase of 40 Mt C / y and a 2000 global stock of 3000 Mt C.”***

- - Trends in production/consumption and use of wood products :

o *“ Statistics compiled by FAO since 1960 show that **the production of wood products has shown an increasing trend since then. ….”***

2. Are wood products a carbon sink ? *(cont.)*

All this allows the statement :

***wood products act as carbon sinks* :**

- **-** wood products represent durable carbon stocks, at a macro-economical level (countries level)
- - these stocks have been increasing, are and can be increased, therefore becoming active carbon sinks.

- **General recognition of this carbon sink role through the work of the UNFCCC and some countries climate change mitigation policies.**
- **Kyoto protocol : wood products are not considered up to now, mainly because of a lack of agreement on measurement and accounting methods.**

2. Are wood products a carbon sink ? *(cont.)*

Comments :

A) Amounts of carbon fluxes for products ~ one order of magnitude less than for forest on a world scale;

- carbon storage in wood products is not be considered as a large scale answer to the climate change issue.

- efforts on the development of wood products on the market may have an impact on the development of the forest carbon pool and on a reduction of fossil C emissions by substituting more fossil energy costly materials.

B) Management factors enhancing this carbon sink function:

- increasing recycling *and land-filling* in controlled conditions (reducing the decay rate),

- developing the use of wood on the market

- ***increasing the lifespan of wood products***

3 -The substitution effect of wood products

- Bibliographic study 2003, (Deroubaix & al, 2003) to assess environmental statements on wood :

  -> “using wood is good for the climate”.

  - Comparative studies :
    - 3 single family houses, 2 three storey buildings, 3 window frames, 3 flooring materials (Germany),
    - walls, roofs, floors, 3 houses (Australia),
    - 2 Four storey buildings (Sweden),
    - 2 floors (Norway),
    - 3 three storey buildings (Canada),
  - Comparative calculations :
    - 3 window frames
    - 3 warehouse frames.

3 -The substitution effect of wood products (cont.)

The conclusions supported the following statement:

- "The energy used in construction, (manufacturing, transporting and erecting buildings), is considerably lower for wood-based products than for other building materials".
- Study results : this was established for materials, components as well as buildings.
- In many cases *"The main energy source used for manufacturing of sawnwood products is renewable bio-energy".* (supported by different studies covering namely German, Norway and Finish cases). The indications are that into the wood industry, there is more renewable energy use than in competing materials sectors.

3 -The substitution effect of wood products (cont.)

- Combination : lower energy consumption + higher share of non fossil energy in the industry :

  -> "*The emitted CO2 amount linked to energy consumption for manufacturing, transport and use in construction, is lower for wood than for substitutes like steel, concrete, aluminium and PVC*".

- Importance of waste handling at the end of life on the whole life energy balance of the wood products.

- Literature study results and calculations show **that wood is the most favourable material as far as Global Warming Potential (GWP) for production and construction is concerned**.

3 -The substitution effect of wood products (cont.)

- Wood products :

  - manufacturing = important part of the energy cost of the products

  - GWP result depends on the electricity model of the country.

  - Glues and transportation are also important contributors to the energy and GWP profile

  - Important transportation distances (international trade of materials) may result in significantly higher GWP

Conclusion : wood products have “low carbon intensity” (compared to competing materials); the substitution of competing materials by wood is therefore a way to reduce CO2 emissions

The present and possible roles of wood protection for climate change mitigation

1 - Developing the carbon sinks

1.1 – Helping the forest carbon sink

Forests = carbon sinks <u>if managed in a sustainable way</u>

Literature :

- all changes from forest to other land uses are detrimental to the C balance of the land.
- maximum C storage in forest ecosystems

+ sustainable supply of wood sector with wood products

=> soils fertility is the limiting factor.

1 - Developing the carbon sinks *(cont.)*

1.1 – Helping the forest carbon sink *(cont.)*

- more efficient options to reach a positive C budget :

  (1) sequester C in low fertility sites,

  (2) protect old-mature forests (Harmon 1990)

  (3) optimise wood-yield and harvest regimes in high fertility sites (Marland 1997) (Agren 2003).

- "Bali discussions" (December 2007), preparing the post Kyoto period, the forest sector talks have focused on tropical forest protection

1 - Developing the carbon sinks *(cont.)*

1.1 – Helping the forest carbon sink *(cont.)*

- **How is wood protection useful in that context** :

  - by allowing the use of large sets of non naturally durable species, and timbers coming from sustainably managed forests, and therefore **helping restricting the use of tropical hardwoods coming from non sustainable forestry**

  - by **giving the possibility to use species growing faster than most durable species** : helps managing forest resource, at a time when the pressure on the wood resource is growing.

  -> strong policy in EU for the development of bio-energy, the competition between material and energy uses is already tangible.

  - by **increasing the service life** of wood products, wood preservation is also **saving forest resource consumption**.

1 - Developing the carbon sinks *(cont.)*

1.2 Helping the wood products carbon sink

- Increasing the lifespan of wood products is one way of enhancing the wood products carbon sink.

- ex : construction products carbon stock :

Construction sector “in service products” yearly variation

= amount of incoming new products

- amount of wood disposed off

Increasing the life span of products will therefore reduce the amount of wood disposed off and increase the stock growth.

(Vial & al., 2008) on carbon stocks in wood products: sensitivity analysis : changing the assumption on mean service life of structural timber in France from 40 to 75 years results in a change of the 2005 “CO2 stock increase” from 2.1 to 2.6 Mt.

2 - Keeping the low carbon intensity of wood products

- Most competing materials have longer service life than most non durable species.
- One replacement of a wood cladding necessary to reach the service life of a plastic façade ?

  => GWP of wood cladding doubled before comparing to the GWP of plastic façade (comparison for the same service life)
- If wood preservation allows the wood cladding to last as long as the plastic façade, without adding a significant use of energy or GHG emissions, then it helps dividing by two the carbon intensity of the product in its function.
- if wood protection allows the wood product to need less maintenance during the service life, it saves the CO2 emissions generated by these maintenance operations.

=> Wood protection is therefore a tool for enhancing the “low carbon intensity advantage” of wood products.

2 - Keeping the low carbon intensity of wood products

- Wood preservation can also allow the use of more or less local species,

  -> limits the long distances transportations of timber.

  long distances transportations make sometimes the highest CO2 emissions step of the wood products life cycle (Bucket 2004).

3 - Conditions for wood protection to be acknowledged as a tool for climate change mitigation

- Possibility to recycle is important in establishing the longer carbon storage as possible.
- When recycling becomes technically impossible, recovering energy from biomass will be requested.

=> wood protection must integrate these issues in order not to be a barrier to recycling nor to energy recovery.

- Proactive communication on the benefits of preserved timber for climate change mitigation -> **need to document the GWP profile of the products.**

  -> establishing databases on the “carbon footprint” of treatments, products and processes,

  -> being able to forward the information to the timber product manufacturer.

- FCBA project, preparing Environmental Product Declarations (EPD) for treated timber produced in France, based on LCA, and which will encompass GWP data for antisapstain treated timber, UC2 dip treated timber and UC4 impregnated timber.

  Funded by french certifications schemes CTB P+ (preservatives manufacturers) and CTB B+ (treaters); EPDs to be released end of 2008.

- Global warming is not the sole question of sustainability that our world is facing and that the consumer will want information on.
- EPDs will probably be requested soon in different countries,
- Precise information on health and safety aspects will certainly be needed,
- Maybe, in a sustainable development perspective, social and societal benefits of wood protection will also have to be documented – What can we say on societal benefits of preserved wood ?

Conclusion

- Wood protection has positive aspects for the mitigation of climate change :
  - lowering the pressure on naturally durable species
  - making the best use of forest resources, favouring sustainable forestry, in line with carbon sequestration possible strategies in forests.
  - helping to develop the wood products carbon sink, by extending their service life
  - reducing the carbon intensity of wood products by this service life extension (reducing replacement needs)
  - avoiding long distance transportation of timber in some cases by helping using local non durable species.

Conclusion

- All these positive aspects of wood protection are certainly true in many situations,
- limited detailed scientific work to exemplify and prove it is available,
- Need to go further and get figures to back these assertions,

  => Comparative GHGs focused LCA of treated wood and alternative options.

  => first steps : carbon footprints of treated wood.