



# *Increased sustainability for wood construction by recycling*

*Henrik Heräjärvi, Ilkka Pirhonen, Tarmo Rätty & Pekka Saukkola*

*Finnish Forest Research Institute*

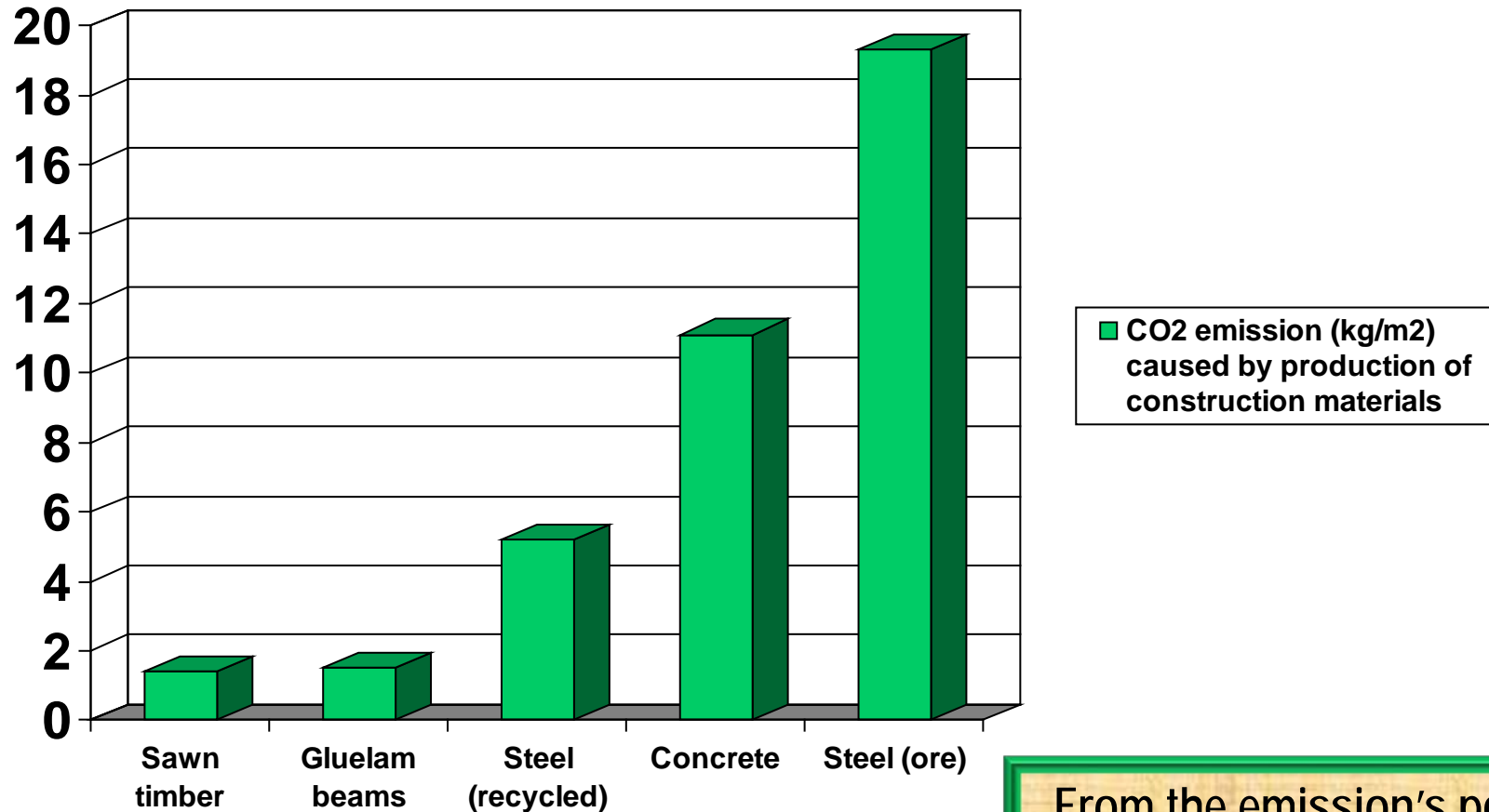
**METLA**

Metsäntutkimuslaitos Skogsforskningsinstitutet Finnish Forest Research Institute [www.metla.fi](http://www.metla.fi)

# Terminology

- **Re-use:** second hand utilisation of a product in the same end-use purpose than the primary life was
- **Recycling:** utilisation of a product in a different end-use purpose after its primary life
- **Recovered material:** material that has been collected for utilisation after its primary life
- **Landfill waste:** material that ends up to landfill
- **Energy efficiency:** minimised consumption of energy during the service life
- **Material efficiency:** minimised consumption of non-renewable resources, as well as resources in general, and increased rate of recycling
- **Sustainability/sustainable development:** "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland commission 1987)

# Emissions caused by production of construction materials



Source: Swedish Forest Industries Federation, 2003

From the emission's point of view, wood is very sustainable construction material

# What is the sustainability of construction materials?

- Emissions during the production phase of construction materials is just one of the sustainability attributes. Also energy consumption has to be considered, and sustainability needs to be evaluated over the entire life cycle of the building:
  1. Material sourcing and production phase
  2. Construction phase, including necessary logistics
  3. Operation phase, including necessary fixing and repairs
  4. Demolition phase, including waste management (recycling, burning for energy, landfilling)

# Sustainability of wood?



Photosynthesis gave us a 2x4 piece of softwood lumber that is:

- The only industrially available, renewable construction material
- Insulation, load carrier and CO<sub>2</sub> sink in the same package
- The only construction material with certificate of sustainable sourcing, and the only construction material from which the consumers and dealers require these certificates!
- The only construction material that can be produced using the energy of its own side products (and some can be sold out...)
- Most often locally sourced construction material
- ...

# What about recycling or re-use?

Product	Recycling rate
Steel and non ferrous metals	~90%
Papers and paper boards	~50-75% in the EU
Glas	~20-90%
Plastics	~25-80%
Wood products	<1%?

*Burning of recovered wood is ok as far as the energy produced substitutes fossil fuels, but could it be postponed beyond another life cycle?*

# Characteristics of recovered wood

- Variable sources, heterogeneous structure => requires either efficient sorting procedures or homogenising by chipping or crushing
- Quality parameters:
  - Mechanical properties
  - Heating value
  - Moisture content
  - Content of chlorine, ash, and heavy metals
- The larger the size of recovered solid wood members, the more versatile possible future uses they have (e.g., utility poles)

# Re-use and recycling of wood and wood products

- There are three principal uses for recovered wood
  - Burning into energy
  - Particle/fibre board manufacturing
  - Recycling (only few countries have developed systems and markets)
  - (*Landfilling*)
- The European Union has an objective to turn into "waste free society" => increasing proportion of wastes should be utilised, and the proportion of landfill wastes minimised
- National laws and EU directives push the countries, the target is set in 2020
- Inventions (leading to innovations) are needed from the industries and R&D to be able to fulfil the normative requirements

# Flows of recovered wood

- Sources of recovered wood:
  - Construction and demolition, furniture, packaging
- Approximately 11% of the building construction and demolition waste is wood-based, *i.e.*, potentially recovered wood
- EU27 produced 89 million tons\* of dry wood-based waste in 2006
- As much as 80% of residential building demolition waste could be re-used or recycled
- Of the demolition wastes, only metals may have positive value if obtained in big quantities, all other materials cause expenses
- Modified and engineered wood products bring in totally new kinds of possibilities

\* Includes side products from forest industries

# Green building certificates

- *Green building materials* are environmentally responsible, even though impacts are considered over the life span of the product
- Factors that make these materials desirable for use in sustainable building are:
  - resource efficiency: low use of non-renewable resources
  - energy efficiency: materials, processes, operation, demolition
  - affordability: no matter the rate of marketing, price matters
- BREEAM (UK), LEED (US), Promise (Finland) set requirements for the raw materials used in construction or renovation
  - One of the indicators considered when applying for the certificate is the proportion of recycled materials used, and management of recyclable waste storage during renovation and demolition
- *In general, recyclability is not very visible in the certificates*

# Conclusions

- During the past few years, more and more people and nations have understood that sustainable growth is not anymore only dependent on funding or markets
- Instead, the true limiting factors are inadequate availability of natural resources and ecological capacity of the Earth
- Still, industrial and economic policies are widely based on traditional frameworks: quarterly planning, short-term profits, aiming at ever increasing sales, *etc.*
- *The focus of profit making will inevitably (but slowly) transfer to savings, energy efficiency, and durable products with high recyclability => in the long run, winners are here*

*“By purchasing products made from recycled wood, you not only prevent valuable waste from entering landfills, but you also contribute to the demand for manufacturers to continue producing these products” (Earth911.com)*



*Metla house, Joensuu, Finland: 0.77 ha, office for 220 people*

For more information, please contact:

Henrik Heräjärvi

Henrik.Herajarvi@metla.fi

[www.metla.fi/ohjelma/puu/index-en.htm](http://www.metla.fi/ohjelma/puu/index-en.htm)