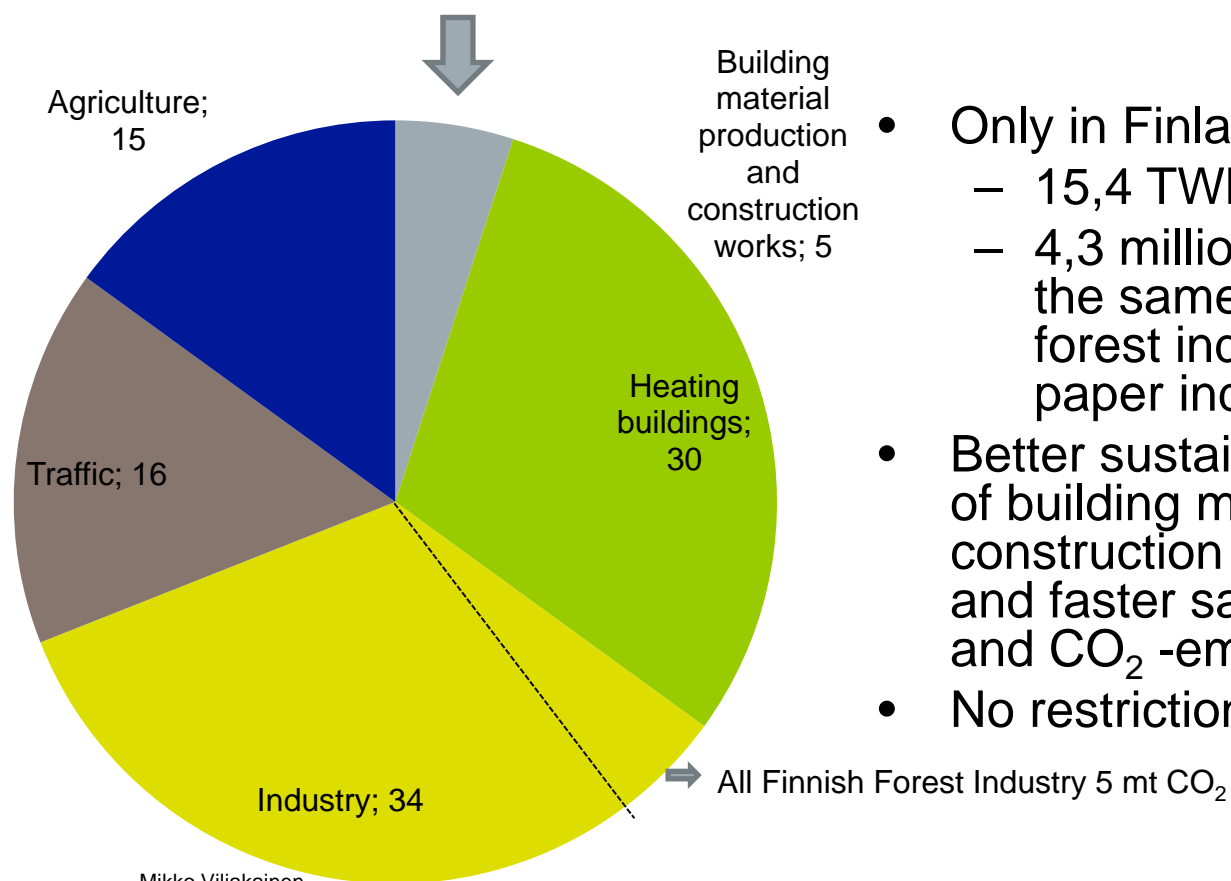




**Sustainability of the building material
production and construction works
- use of raw materials, energy and CO2 -
emissions**

Mikko Viljakainen, Lis. Tech.

Production of building materials and construction works cause only 5 % of energy consumption and CO₂ –emissions, but...



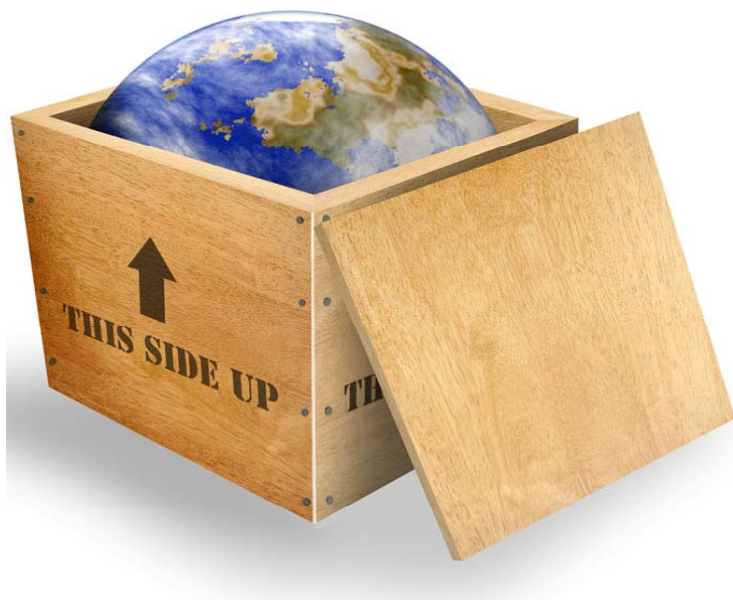
- Only in Finland it means
 - 15,4 TWh energy consumption
 - 4,3 million CO₂ –tons that is almost the same than the whole Finnish forest industry including pulp and paper industry causes (5 Mt).
- Better sustainability and energy efficiency of building material production and construction works would create bigger and faster savings on energy efficiency and CO₂ -emissions.
- No restrictions are presented so far!

Purpose of the study



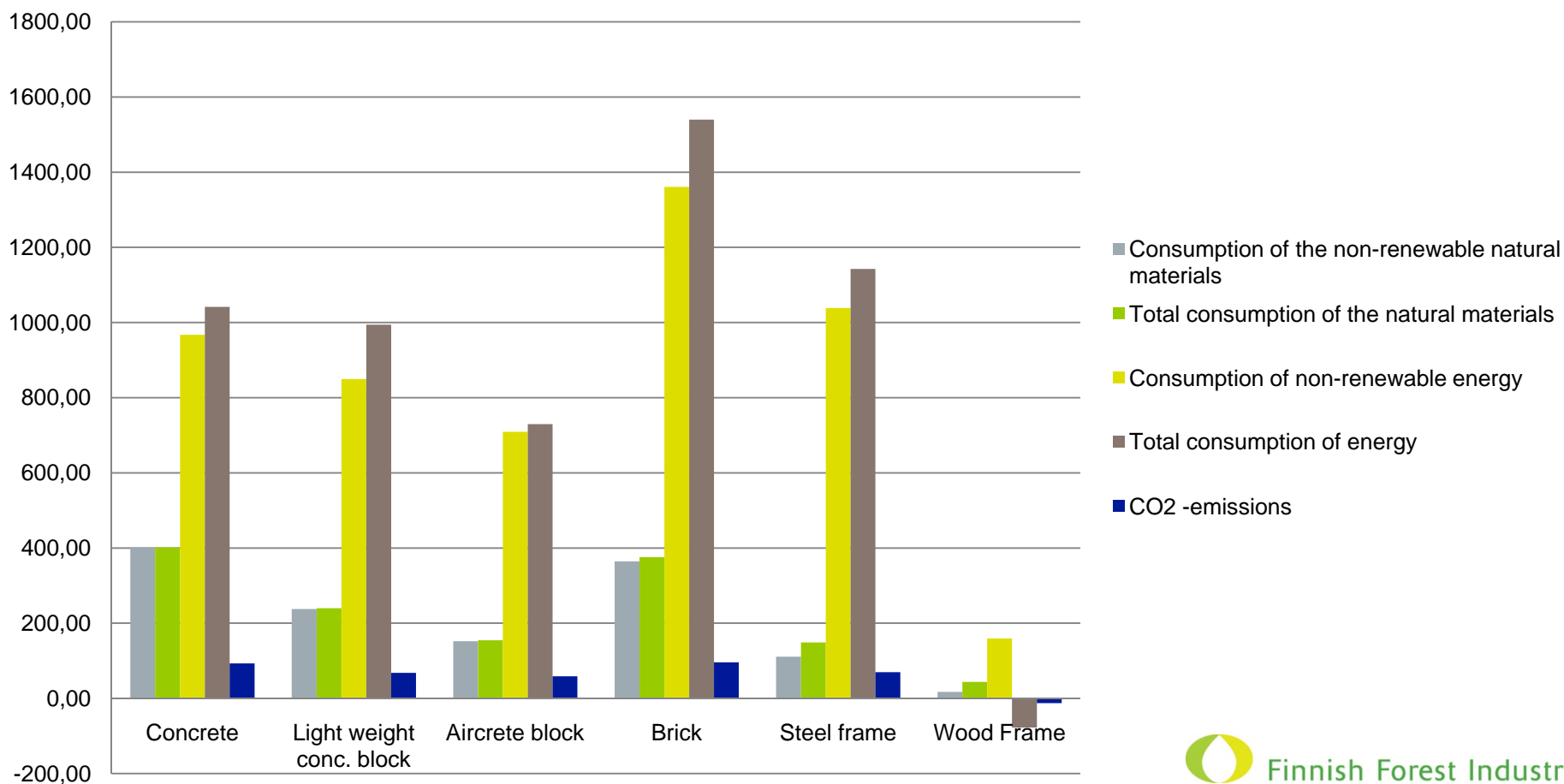
- What does the 5 % share of energy consumption and CO₂ -emissions consists of?
- What are the environmental impacts of comparable structures compared to each other?
- What impacts the new 2010 energy efficiency regulations (40 % better efficiency) will have on the emissions of the building material production and construction works?
- What significance the reduction of the energy consumption and CO₂ -emissions of the building material production and construction works would have compared to the better thermal energy efficiency of the buildings.

Basics of the study



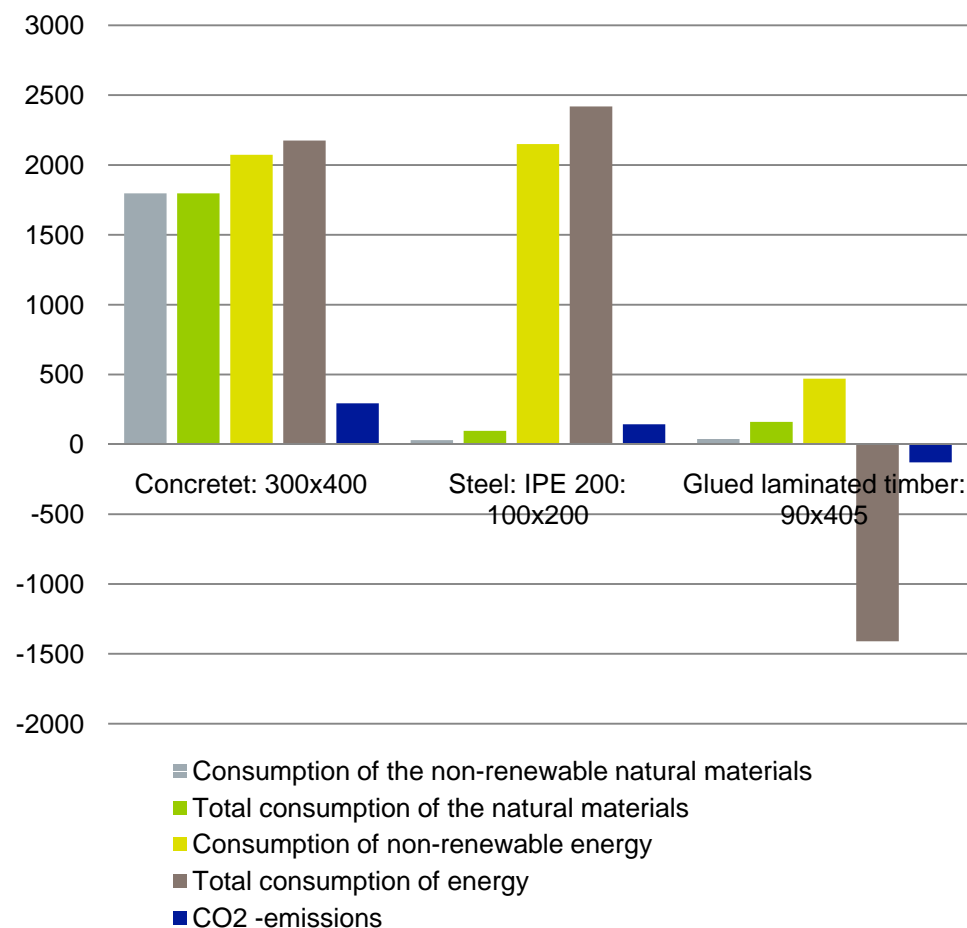
- The study includes the comparison of technically comparable exterior and interior walls, beams and exterior cladding.
- The main sources for information are the RT Environmental Declaration, which are based on the national methodology following the basic principles stated in the ISO standard series 14040 and 14020. The method considers also the preliminary results achieved within ISO CD 21930.
- The fuel value and accumulated carbon dioxide have been included into wooden structures.
- Comparison are made with 5 indicators:
 1. Consumption of the non-renewable natural materials
 2. Total consumption of the natural materials
 3. Consumption of non-renewable energy
 4. Total consumption of energy
 5. CO₂ -emissions

Exterior walls – the environmental impact of wooded structures is minimal compared to the other structures



Other construction examples provide same conclusion

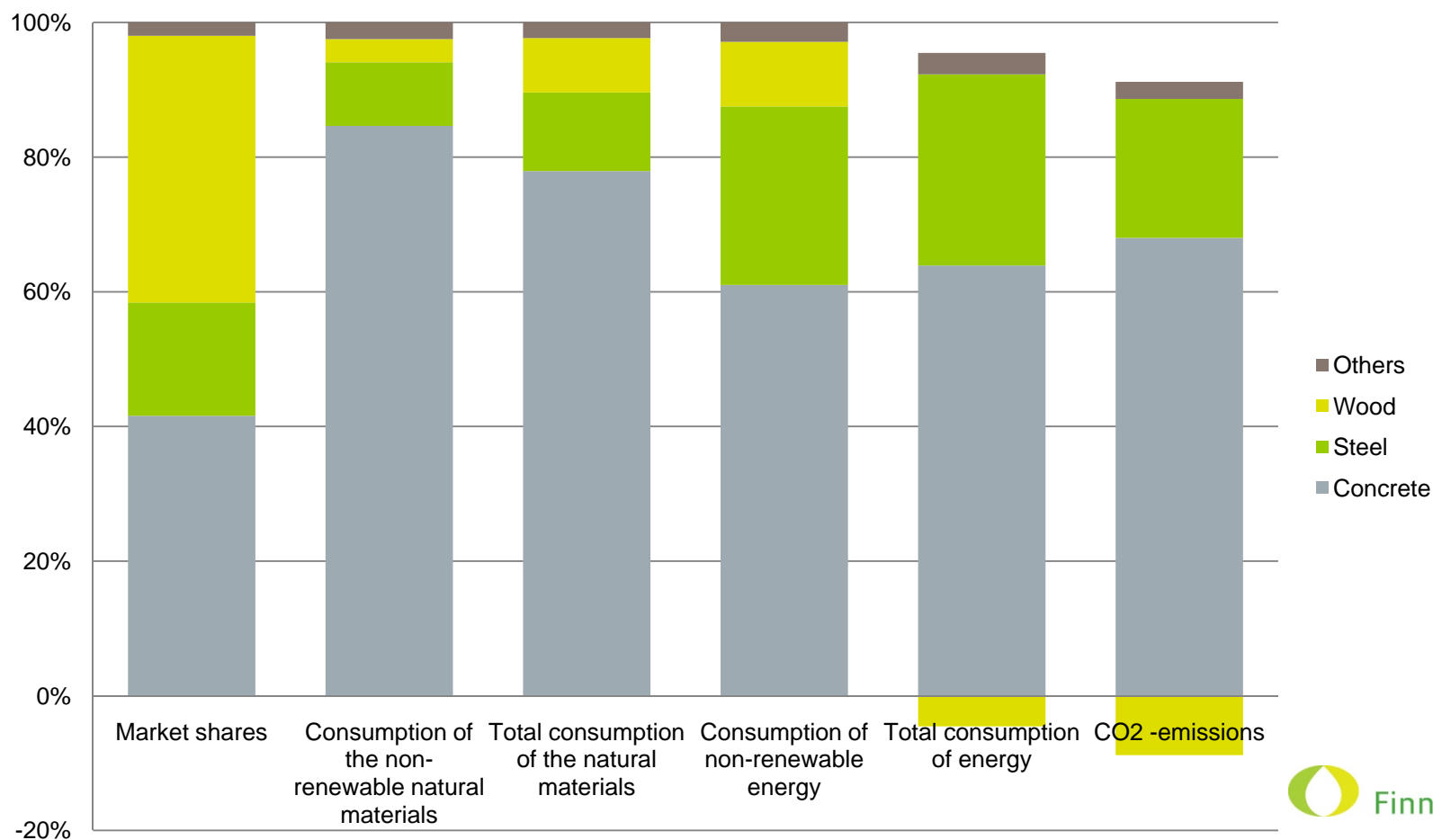
Comparison of alternative beams



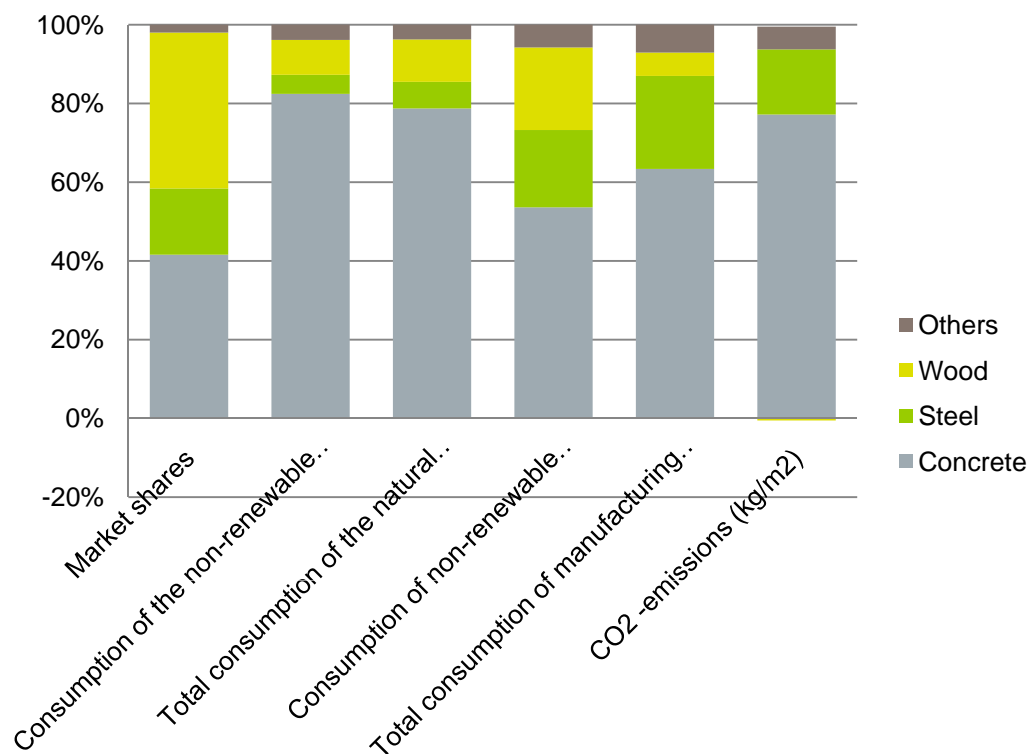
- Net energy consumption and CO₂ -emissions of wooden structures are even negative.
 - Wooden structure can produce more energy than it takes to manufacture and construct.
 - The wooden houses are carbon dioxide sinks.

What does the 5 % share of energy consumption and CO₂ -emissions consists of in Finland?

Exterior walls

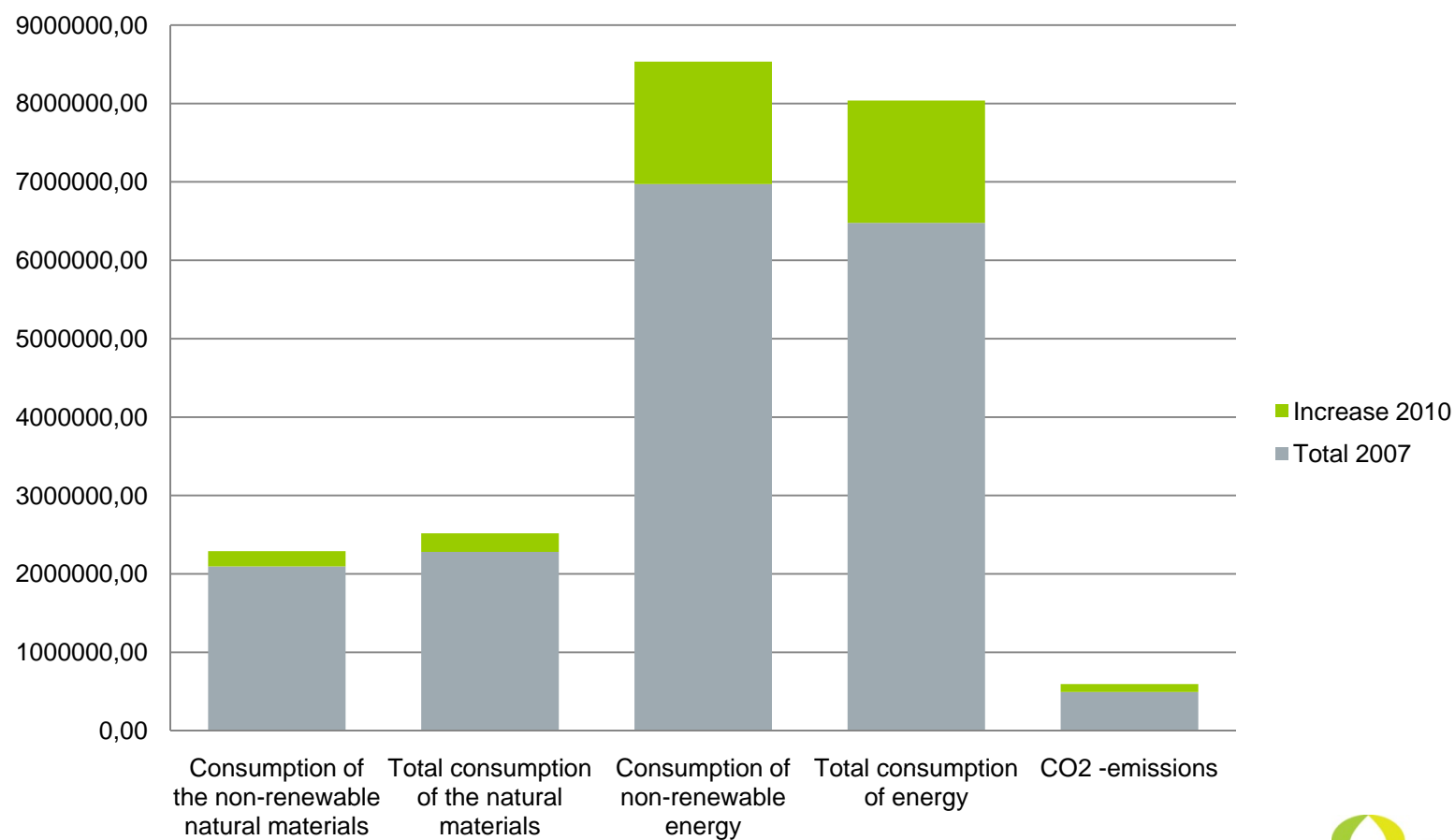


Again: different indicators give similar results.

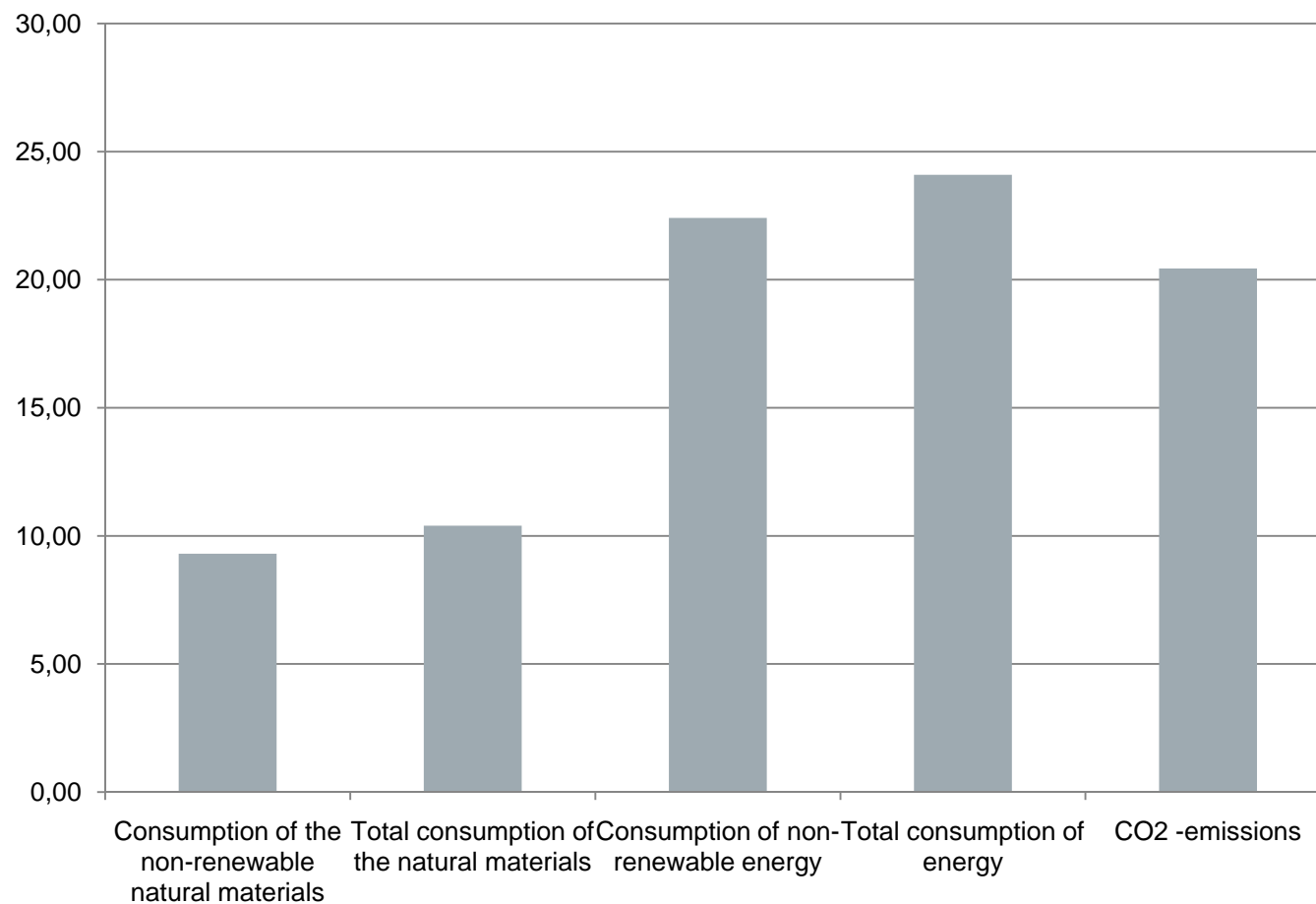


- Even if market share of wood in construction is very big in Finland wooden structures cause only very limited share of environmental impacts.
- The market share of the concrete in construction is the same as the market share of wood but still the concrete causes the major part of environmental impacts.

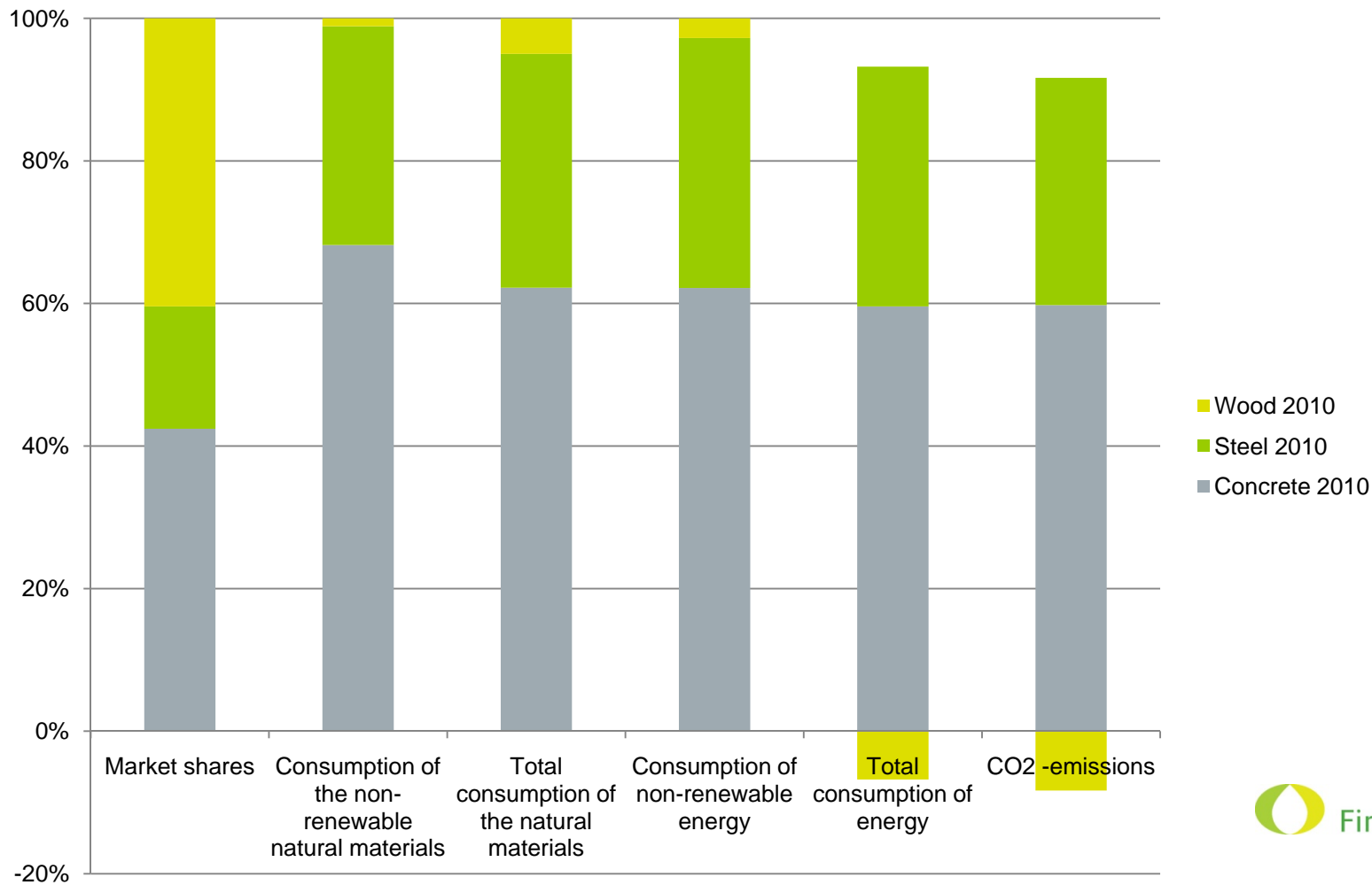
Impacts the new 2010 energy efficiency regulations on the emissions of the building material production and construction works?



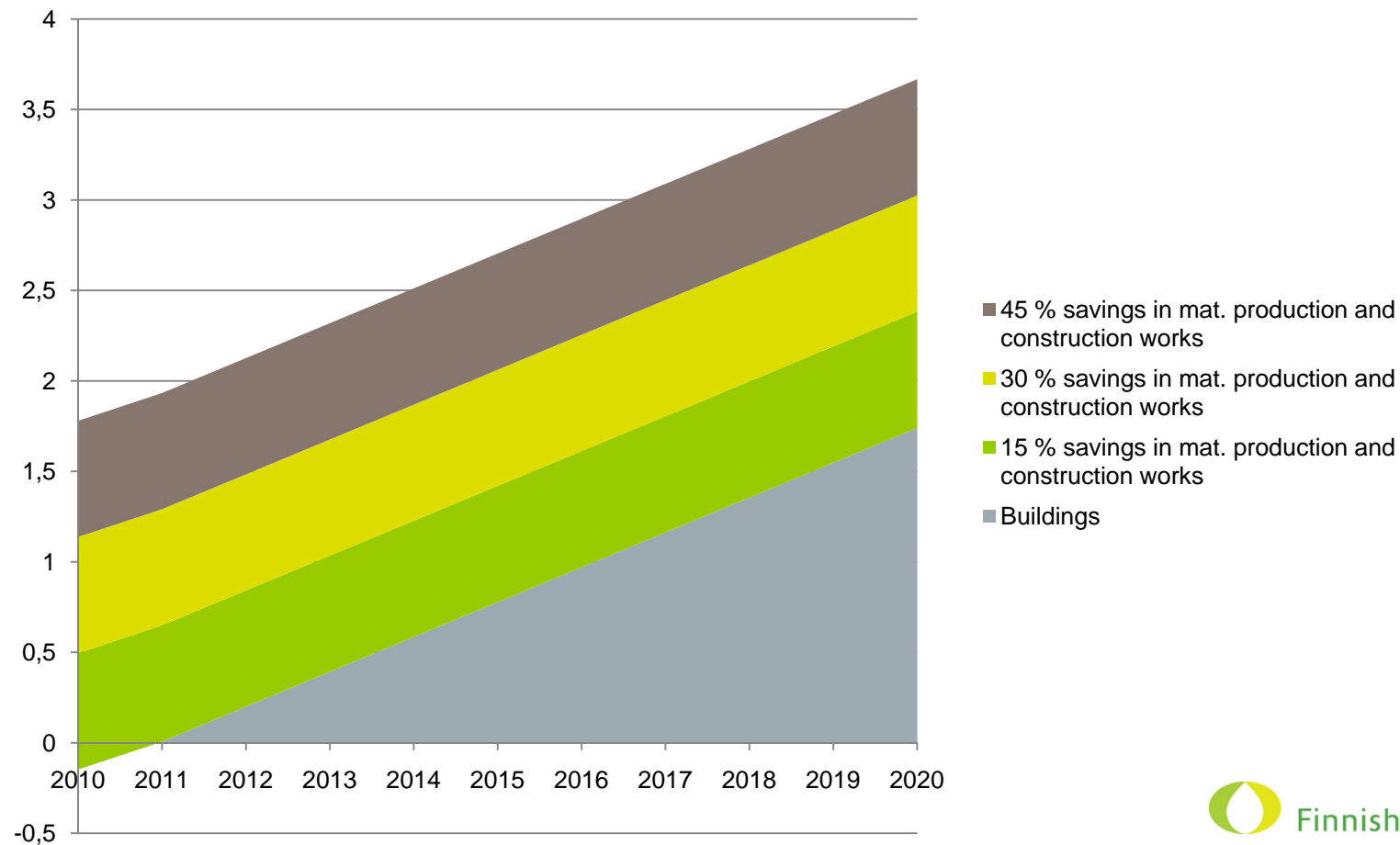
Relative growth of impacts (%): With present market shares new regulations increase CO₂ – emission annually 0,30 – 0,45 tons



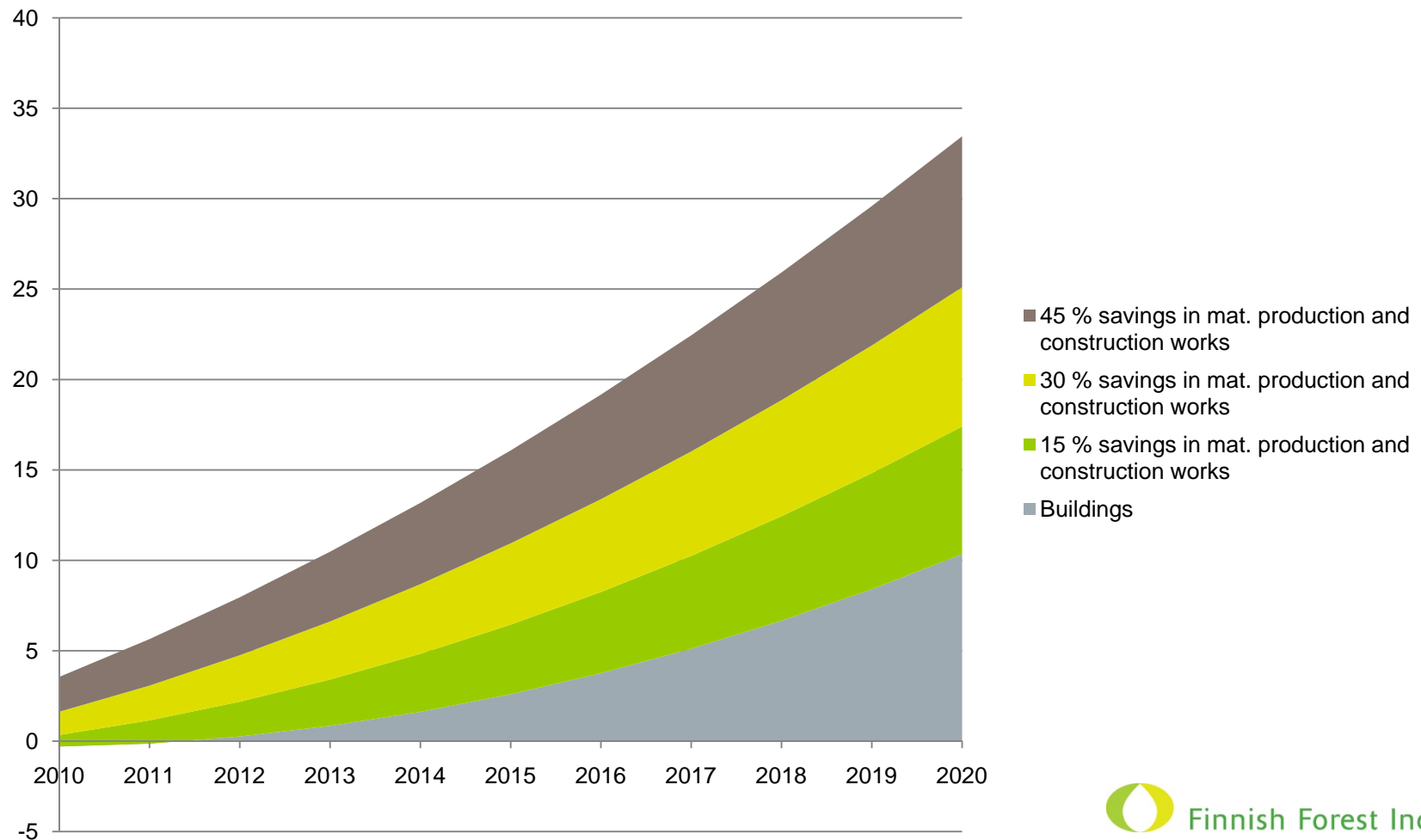
Where does the change come from? – it is the concrete and steel that matters.



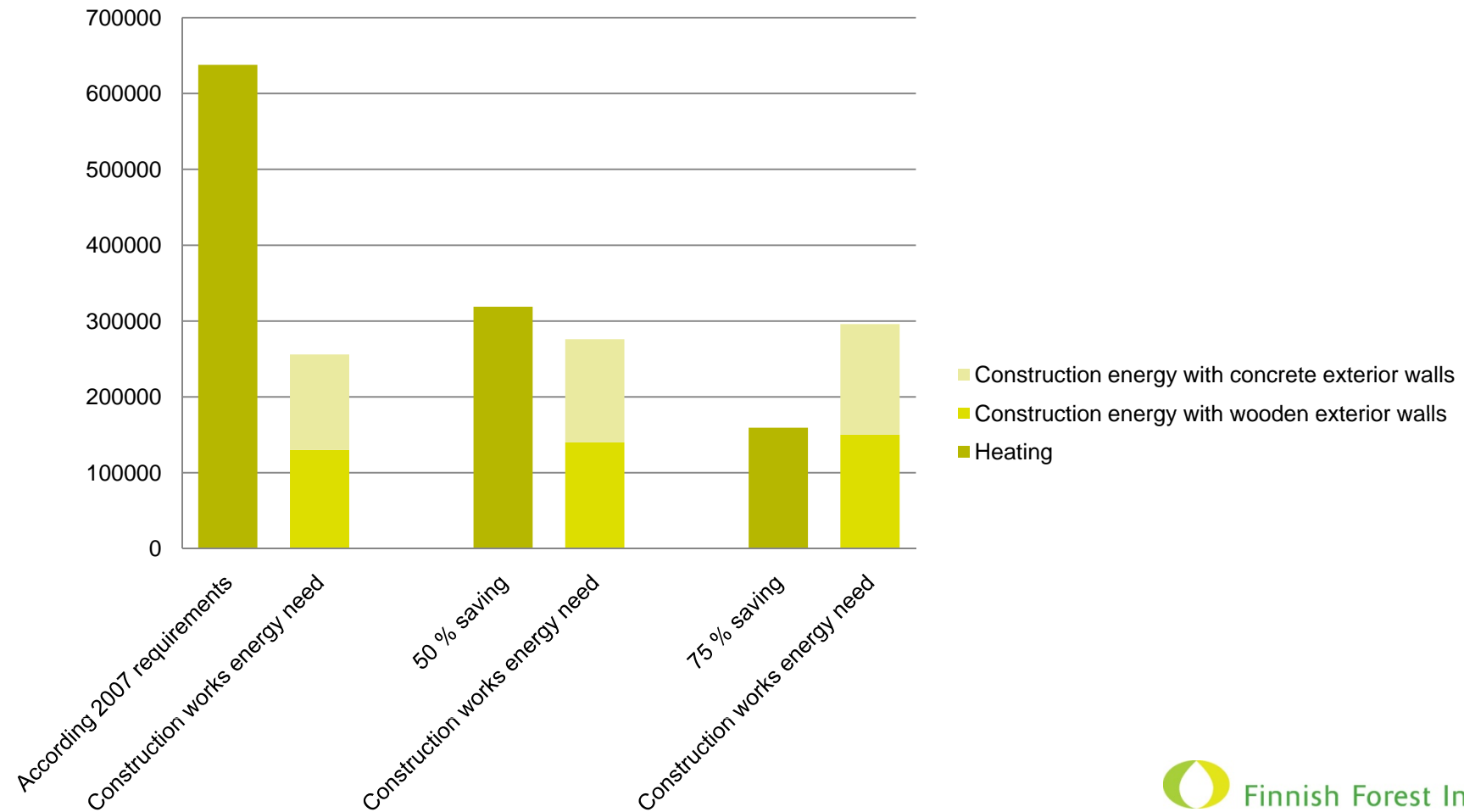
Annual CO₂ -emission savings with alternative scenarios



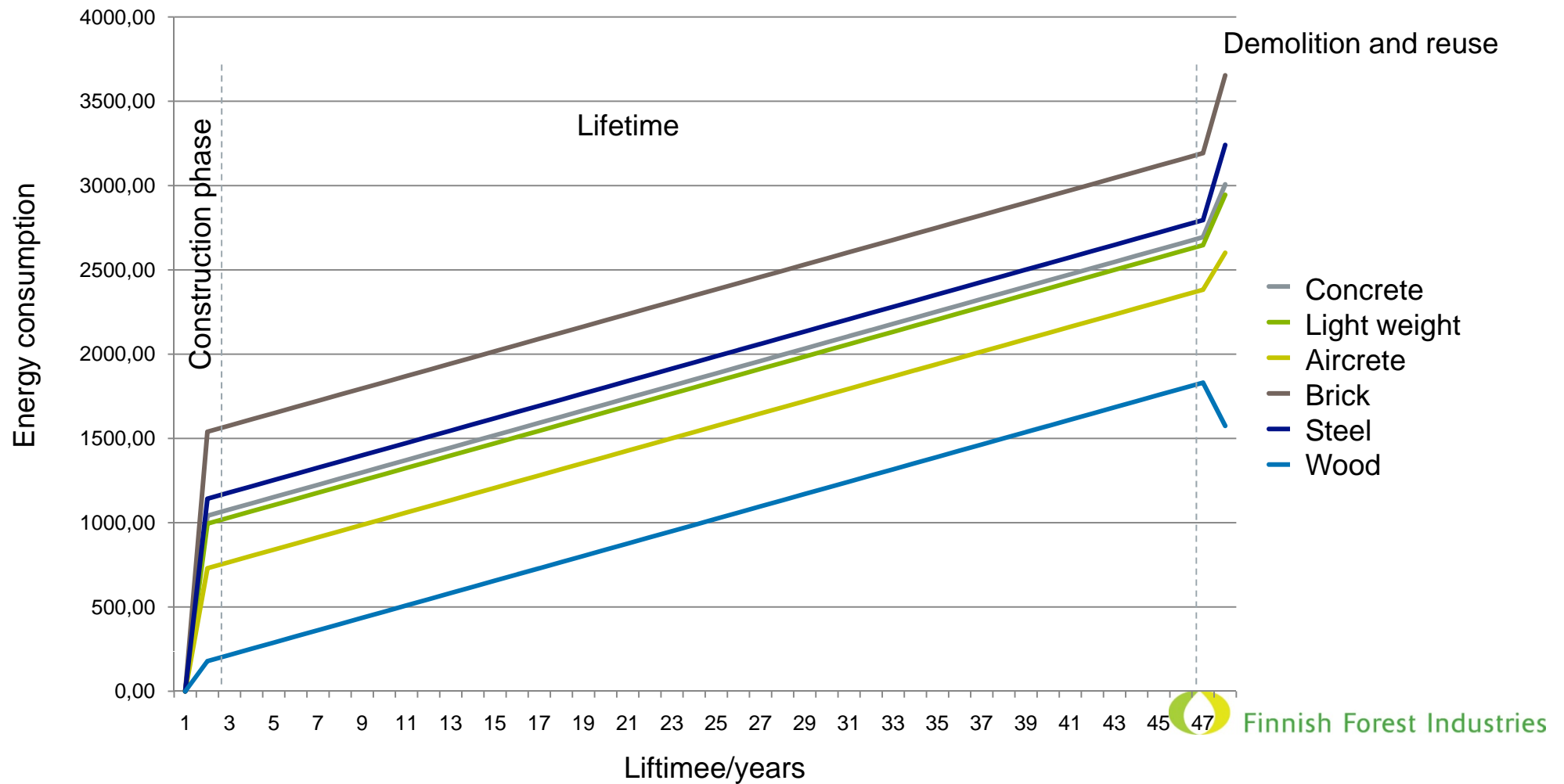
Potential of accumulated CO₂ -emission savings with alternative scenarios



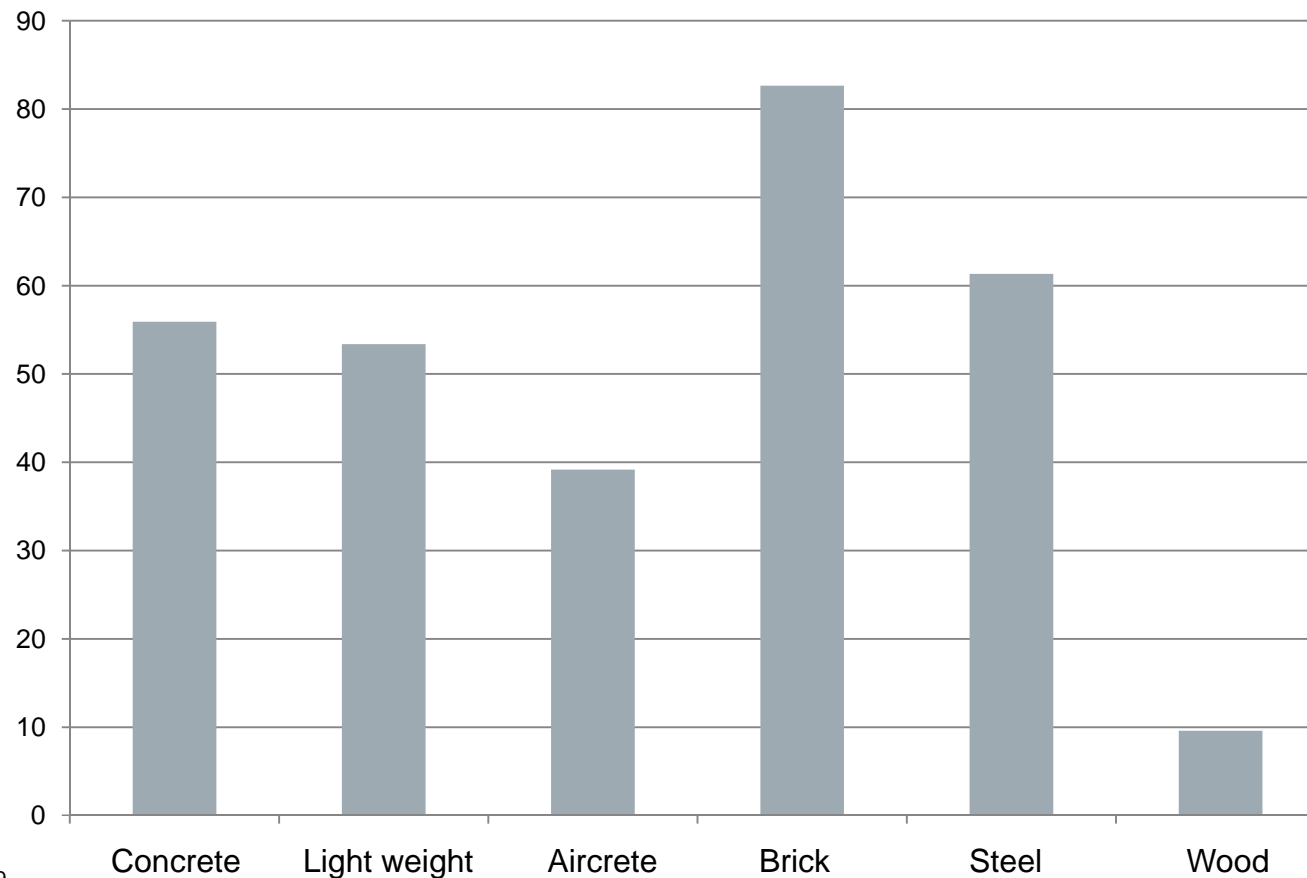
Choice of exterior wall type has radical impact on whole life time energy consumption of the 120m² detached house in 50 years service life



Exterior wall energy balance(MJ/m²) in low energy house 50 years lifetime



Share of the manufacturing energy of the structures compared to the 50 years using period (annual use of energy 60 kWh/m²)



6.2.2009

Conclusions: increased use of wood in construction would decrease energy consumption and CO₂ -emissions significantly



- Best way to reduce energy consumption and CO₂ -emissions would be to favour wood always when possible.
- There is huge potential on European level since the present market share of wood in Europe is very limited compared to Finland.
- Restrictions and targets into the energy consumption and CO₂ -emissions of building material production and construction works should be considered and set.
- There is a need for environmental declarations of the whole structures. Product based declarations are too complicated to use in daily practice.