Aalto University
School of Arts, Design
and Architecture

Sustainable design S8

Material futures – Plastic, Concrete and biomaterials

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22.5.2023

Agenda

Practicalities

Course Presemo

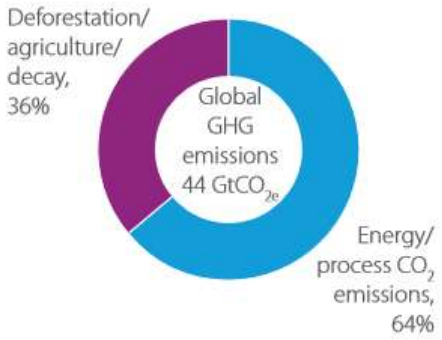
Pirjo Kääriäinen visiting the course. ‘Design and new materials’

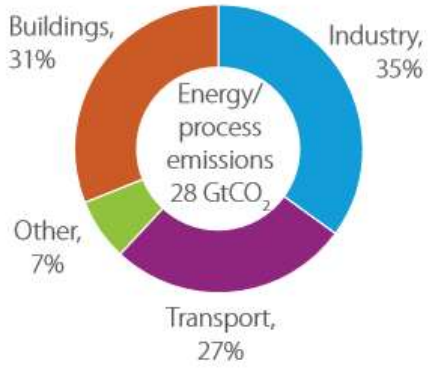
Break

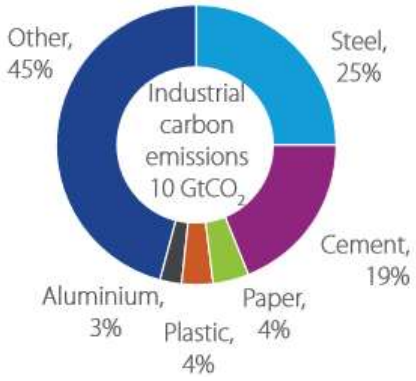
Three rounds of presentations: Plastic, Concrete and Biomaterials

Allwood et al ch2

- **Most of CO2 emissions are due to energy use and processes.**
- **Industrial processes are the single biggest source of CO2**
- **Steel, cement, aluminum, paper and plastics are most important materials ‘behind‘ CO2 emissions.**







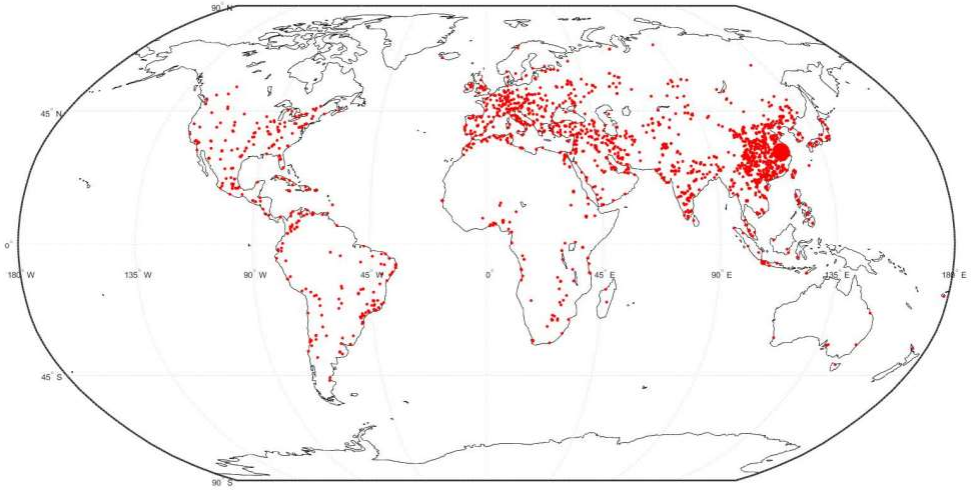
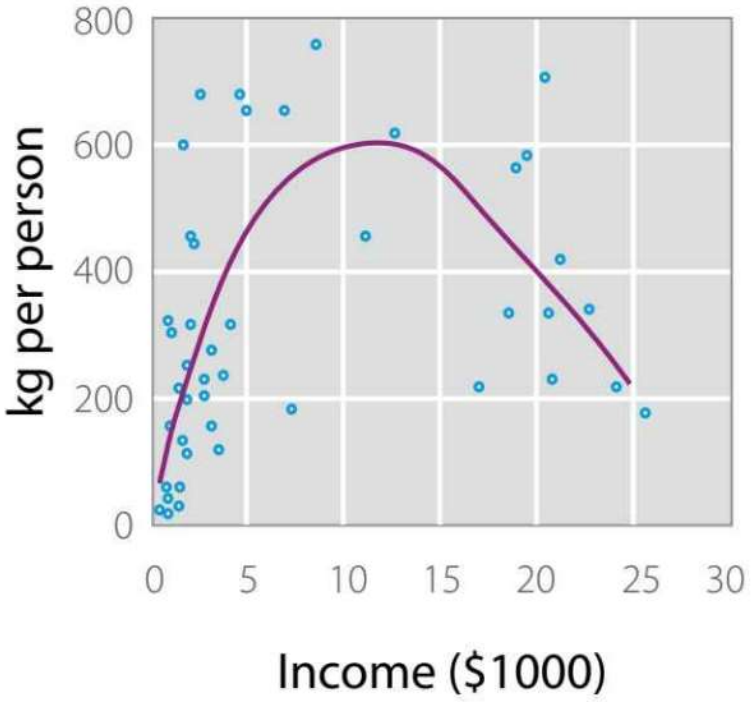


Figure 2: Global cement production sites. Larger circles represent production sites of significantly higher capacity than the others. Data are obtained from [24, 25].

Demand for cement

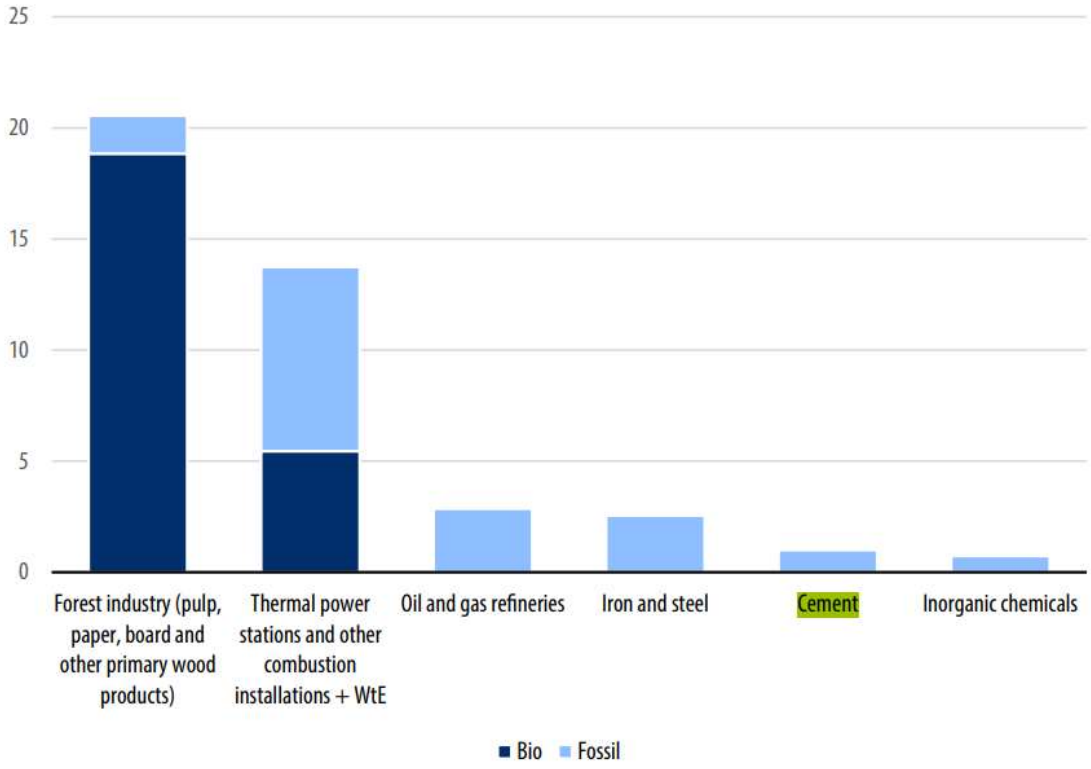


x 3-4 for concrete

Demand for conrete Finland about 1 m3/capita

Globally about 1,5m3/capita

Figure 11. Industrial CO_2 emissions from facilities in Finland 2020. Data from EEA (2023a).



Carbon dioxide use and removal : Prospects and policies (valtioneuvosto.fi)

Manufacturing process

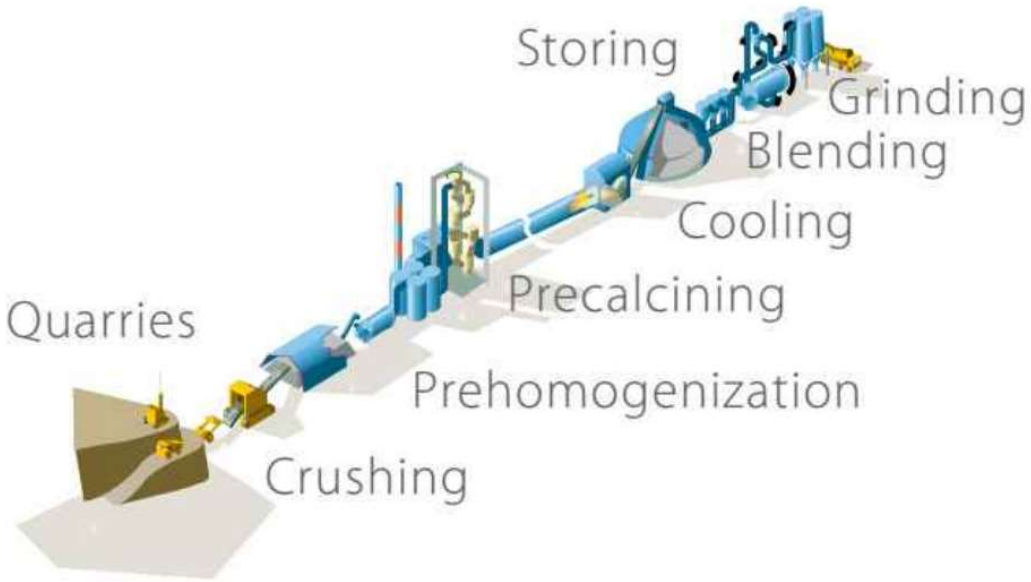


Figure 20.8—**Cement production process**[26]

New directions

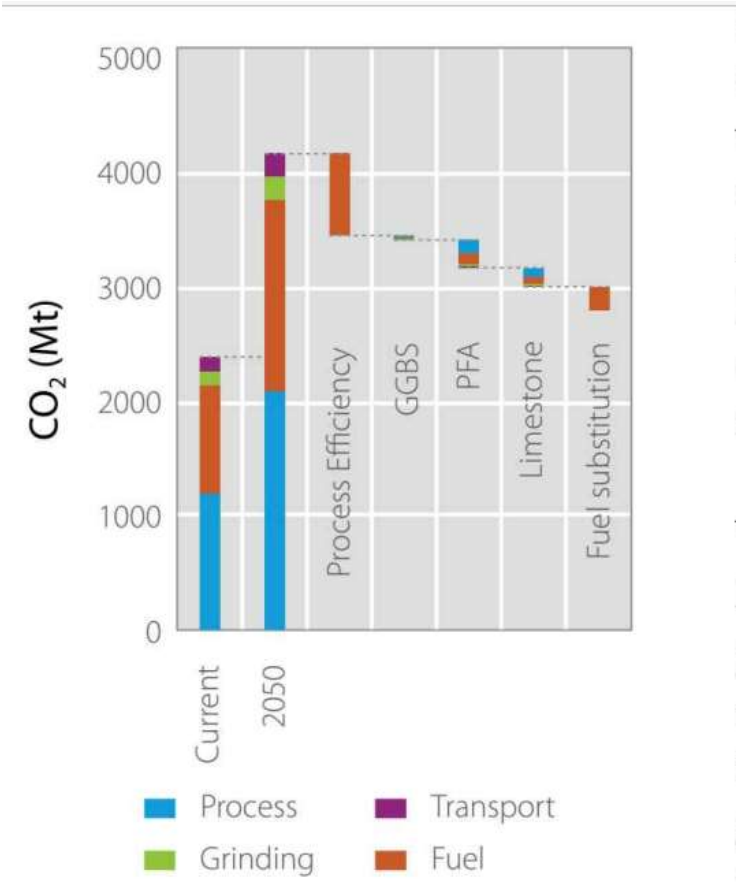
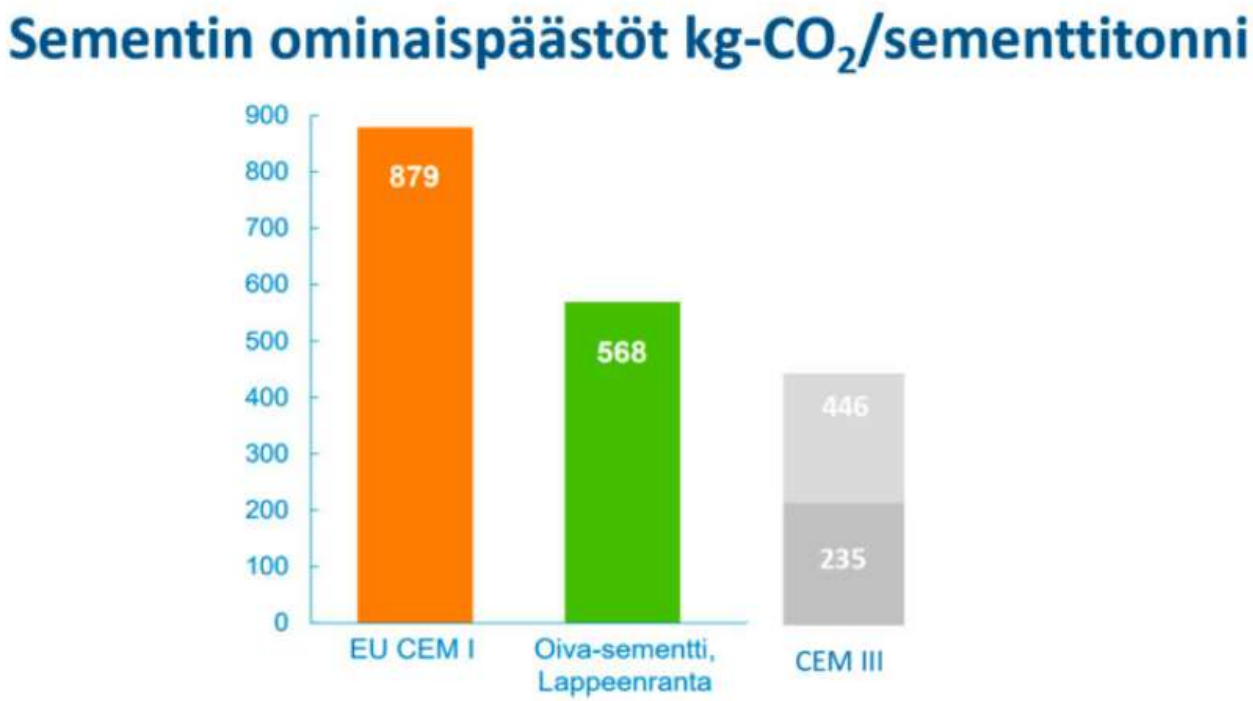


Figure 20.9—**Forecast for emissions reductions in the cement industry**

New directions



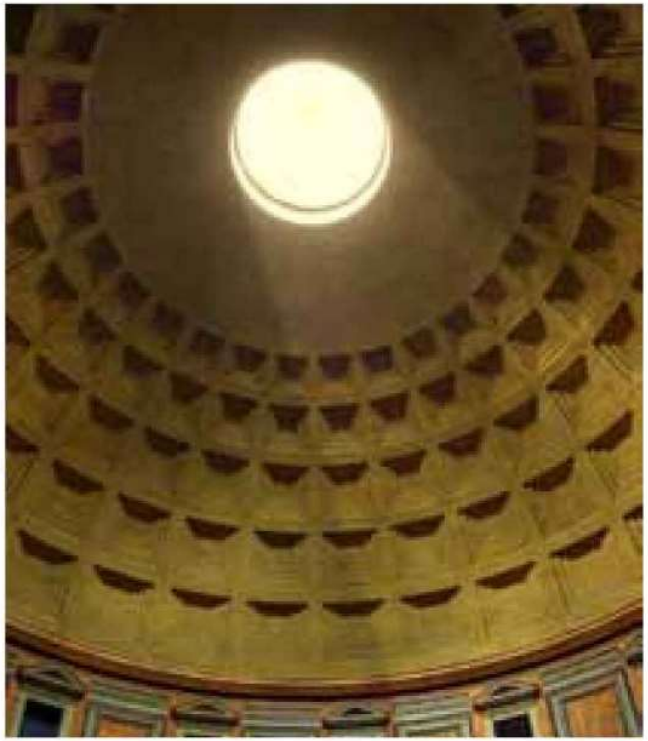
Sementti ja kasvihuonekaasupäästöt - Betoni

Cement

In use for a long time, e.g. the Pantheon

In 1824, a patent for Portland cement

Steel-reinforced concrete is in structural uses coupled with urban infrastructure



The Pantheon Dome

Non-structural use

Opportunities for sustainability improvements in Concrete and cement

Alternative chemistry for concrete

Capture of CO2 from cement manufacturing

Capture of CO2 by mineralizing processes in cement

Uses of concrete –with both eyes open