Item 5 (c) Urban forestry and land matters

Draft policy guidelines/principles on advancing low carbon construction in cities

ECE/TIM/2023/12

San Marino, 22 November 2023

Objective

- Developed under the project E416 “Forests and Forest Knowledge for Resilient, Low-Carbon Urban and Rural Communities”.
- Overview for policymakers and decision takers on how sustainably grown **wood can contribute to the efforts of cities to reducing the carbon footprint in the built environment.**
- **Overview on the carbon and other technical advantages of an increased use of wood** as low carbon construction material in cities in the ECE region and beyond.
- It further provides **guidance on how various actors could contribute** to facilitating an increased utilization of wood from sustainable sources as a key raw material in low carbon construction in cities.
- **No technical guide on wood construction**.

Outline

I. Objective

II. Background

III. Carbon emissions and the built environment

- A. Embodied emissions
- B. Sufficiency of buildings
- C. End of life

IV. Indirect carbon effects

- A. Lightweight material (vertical extension)
- B. Seismic resilience
- C. High precision
- D. Reduced risk

V. Low carbon construction and forests

- A. Forest in the ECE – wood supplier and carbon sink
- B. Increased wood construction's impact on forests in the ECE region

VI. Enabling conditions

- A. Legislate a framework
- B. Lead by example
- C. Communicate
- D. Educate, innovate, standardize
- E. Finance
- F. Measure

VI. Key messages

VII. Way forward

CO_2 emissions from construction material

Production of common construction materials, such as concrete and steel cause very high carbon emissions. The production of cement, a key ingredient in concrete, is alone responsible for 8% of all global CO_2 emissions. **If the cement industry were a country, it would be the world's third-largest emitter.**

CO_2 emissions from construction material

The Centre for Industrialised Architecture at the Royal Danish Academy for Architecture, Design, Conservation compared the Global Warming Potential of functional units (e.g. 3m load-bearing columns) and found that **wood is the only building material for structural application that has a negative carbon footprint** (i.e. stores more carbon than is emitted during the processing and lifetime) from material extraction up to production ("cradle-to-gate")

choose impact category

Global Warming Potential (GWP)

choose unit

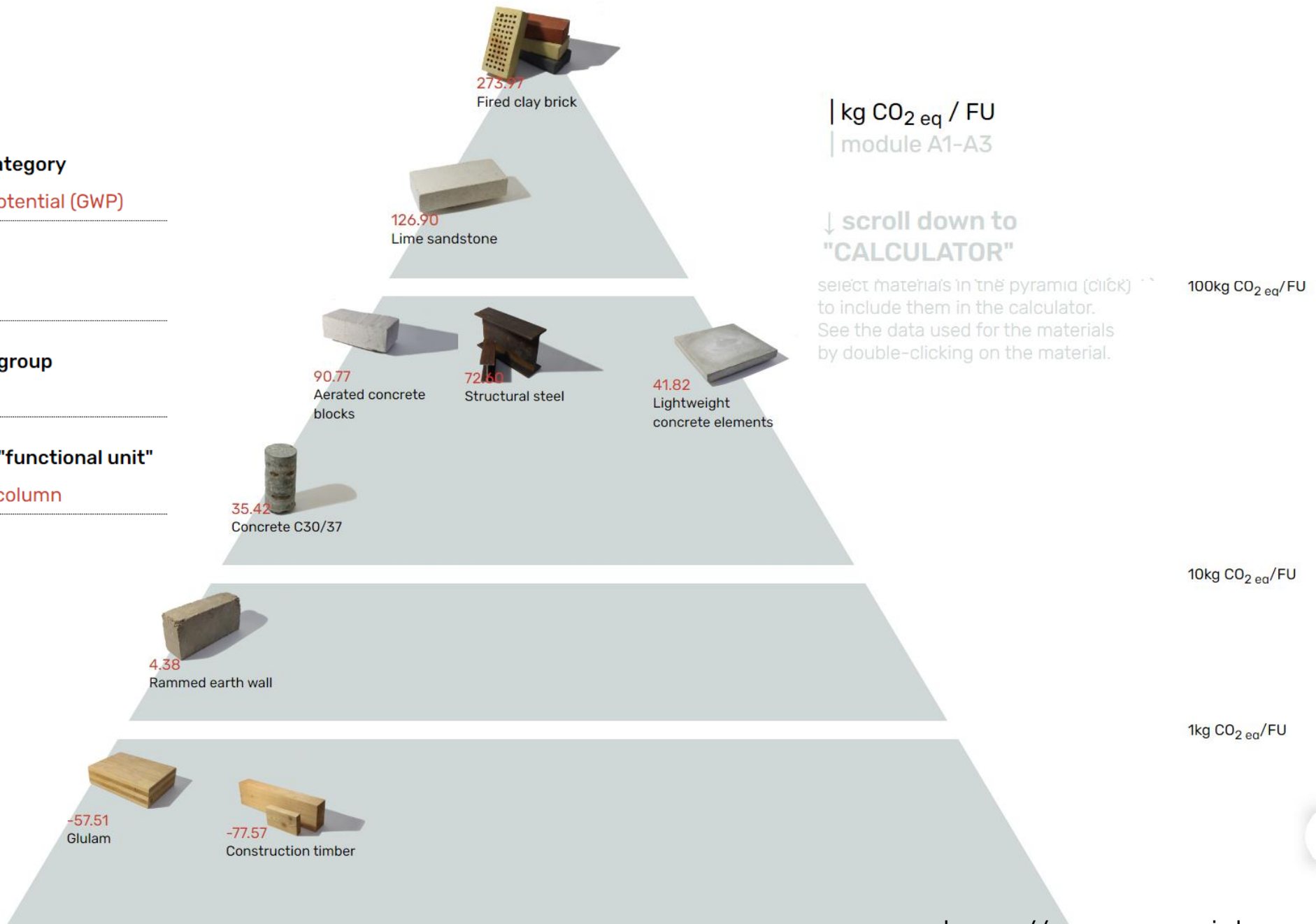
m^3

filter by material group

no filter

filter and sort by "functional unit"

3m load-bearing column



https://www.materialepyramiden.dk/#

Sufficiency

Good insulation materials minimize the loss of energy from a building. (…)

Untreated wood is a natural champion among structural materials in terms of insulation capacity (…)

Structural elements of modern wooden construction maintain the low energy conductivity of the raw material.

More interior space

In contrast (to wood), concrete, steel, glass and aluminum have extremely poor insulation capacities. (…)

these buildings often require thick additional layers of insulation (…)

Modern **wood construction with similar insulation efficiencies can have thinner walls and thus provide up to 10% more interior space with the same exterior dimensions** than other construction materials.

choose impact category

Global Warming Potential (GWP)

choose unit

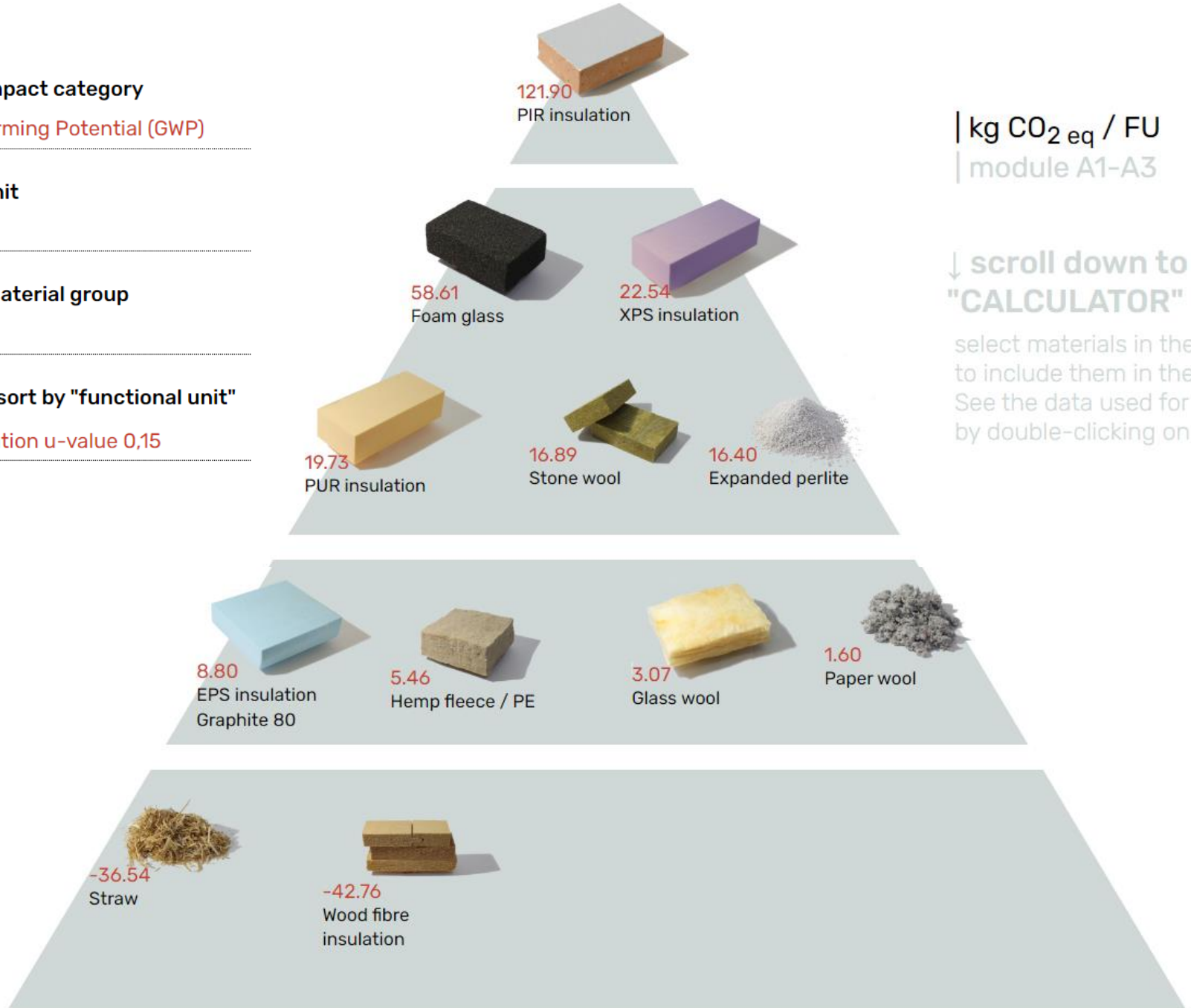
kg

filter by material group

no filter

filter and sort by "functional unit"

1m^2 insulation u-value 0,15



| kg $CO_{2\ eq}$ / FU

| module A1-A3

100kg $CO_{2\ eq}$/FU

↓ scroll down to "CALCULATOR"

select materials in the pyramid (click) to include them in the calculator. See the data used for the materials by double-clicking on the material.

10kg $CO_{2\ eq}$/FU

1kg $CO_{2\ eq}$/FU

https://www.materialepyramiden.dk/#

Earthquake proof mid-rise buildings

The weight to strength ratio of modern wood construction and its capacity to flex make wood the material of choice for earthquake proof buildings.

Recent shake table tests by woodworks indicate that wooden buildings remained damage free even after receiving seismic shocks from two simulated seismic events with 6.7 and 7.7 magnitude on the Richter scale (like the 1994 Northridge earthquake and the 1999 Chi Chi earthquake).

The Turkish State Forest Service used wood structures to rebuild 97 thousand square metres of their administrative buildings in the region that was struck by the 2023 Turkey-Syria earthquakes which had 7.8 and 7.6 magnitudes.

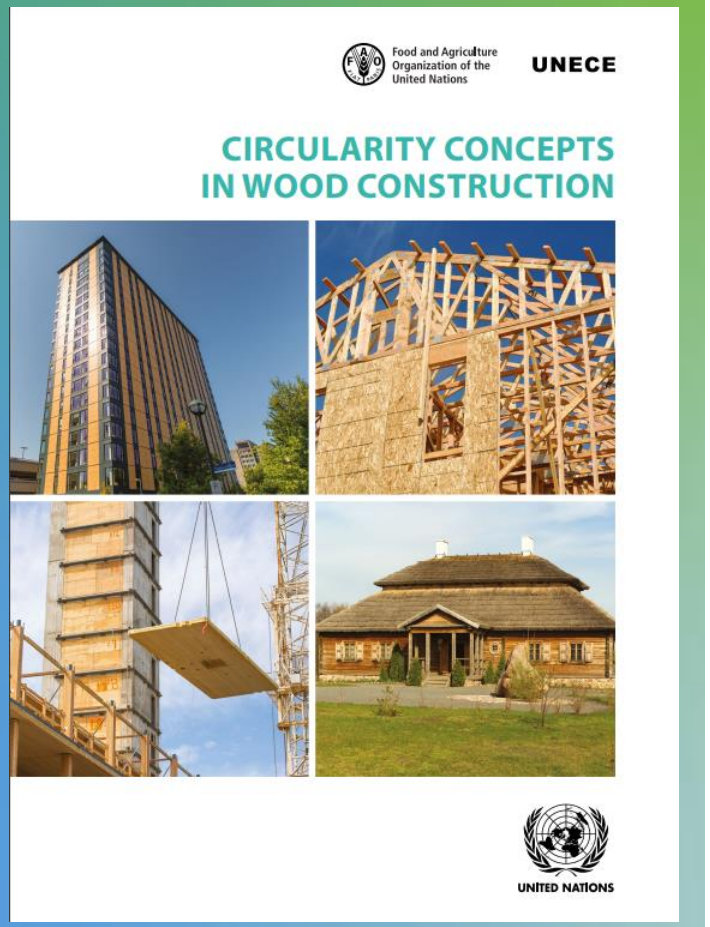
https://www.kpbs.org/news/science-technology/2023/05/09/10-story-wood-building-passes-earthquake-test

Raw material availability

The ECE/FAO Forest Sector Outlook Study, 2020-2040 found that forest in the ECE region will further increase the carbon stock in any scenario by 2040.

There is a **very high probability that even under the most dynamic scenarios for wood construction (Europe or China), forests in the ECE region will stock more carbon in 2040 than today.** ECE's member States have tools at hand to monitor sustainable management regularly and report their trends to the Forest Europe or the Montreal processes every five years.

Raw material availability



Considering the non-destructive re-use of wood construction elements in new constructions today will help to decrease demand for fresh fibres from forest in the future.

Ideally the cities become storehouses of carbon and wood construction elements so that future demand for wood construction modules can be satisfied by both forests and the obsolete buildings in cities.

Key messages

(Summary of key issues of the brief)

- Minimize new construction where possible.
- Maximize substitution of construction materials with high embodied emissions.
- Take into full consideration embodied emissions of materials at any stage of a building's lifecycle.
- Maximize global material efficiency.
- Maximize sufficiency of any building.
- Strive for destruction-free deconstruction at the end of life of buildings or building modules.
- Improve global standardization of (wooden) construction elements.
- Prevent any methane emission at the end of life of organic construction materials.
- Allow for clever mix of materials.
- Keep the supply of raw material as local as possible to maximize creation of local
- livelihoods and minimize embodied emissions from transportation.
- Innovate.
- Educate.
- Communicate.
- Measure.

Way forward

Member States are invited to comment and provide guidance on the structure and content of the document and consider providing a mandate to the secretariat for publishing the final version as an official publication.

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Thank you

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