Julie L Skullestad, J Earth Sci Clim Change 2018, Volulme: 9
DOI: 10.4172/2157-7617-C1-039

5th World Conference on
CLIMATE CHANGE AND GLOBAL WARMING
May 23-24, 2018 | New York, USA

High-rise timber buildings as a climate change mitigation measure

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Statement of the Problem: Buildings account for a large share of the global GHG emissions. UN Habitat estimates that 3 billion people will need a new home in the next 20 years due to population growth. The climate change impact (CC) of construction and operation of buildings may triple by 2050 if business as usual is practiced meeting the demand. Extensive migration to cities combined with emission reduction targets calls for dense urban areas with high-rise buildings. This allows for efficient energy use and less transport. However, building tall comes with a "CO_2-premium": Tall buildings of steel and concrete require stronger structures, and have greater use of materials per floor area than low buildings. It is therefore crucial to use materials with lower CC. Long-lived timber materials act as a carbon storage and require less energy in production.

Methodology: Life cycle assessment (LCA) has been utilized to compare the CC of functional equivalent load bearing structures in timber and concrete for high-rise buildings. The structures are analyzed with several LCA methodologies, covering both attributional and consequential LCA.

Conclusion & Significance: Constructing with timber has a great potential of reducing the CC of high-rise buildings, compared to concrete structures. The CO_2-premium of building height is substantially less significant for timber structures than concrete structures. Hence, the CC saving potential is increasing with building height for tall structures. The reduction potential varies with regions and production technologies for material production. However, most cases show a significant reduced CC for the timber structures. If the potential for recycling and reusing the materials after the building's life cycle is taken into account, the timber structures have an even greater advantage, as the materials can be incinerated with heat recovery to substitute other means of heat production.

Biography

Julie L Skullestad has her expertise in Life Cycle Assessment (LCA) and Sustainable Architecture and Infrastructure. She has finished her studies in Environmental Sciences and Industrial Ecology at NTNU (Norwegian University of Science and Technology) in 2016. Her research related to her Master's thesis has gained national and international attention, as she produced the first study on the climate change impact of high-rise timber buildings. The study was published in *Energy Procedia* and presented at the conference "Build Green Renovate Deep) in Tallinn in 2016. She is currently working as an Environmental Advisor in the Norwegian Company Asplan Viak, where she is advising architects, builders, municipalities and the government in emission reduction strategies, alongside participating in research and development of LCA methods and tools. She has also had several lectures and presentations in Norway related to LCA and climate friendly construction materials.

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