



'Carbon spike' caused by construction is considerable

The greenhouse gas emissions from the construction of new houses are so high that they exceed the emissions from three decades of use, a Finnish study has found. The research is based on houses complying with recently introduced, energy efficient building regulations. According to the authors, as buildings become more efficient this 'carbon spike' associated with construction is more important than has been suggested by previous studies.

In 2010, Finland adopted a new National Building Code that increased demands on construction companies to create sustainable housing, for example, through heating energy consumption requirements that would represent a reduction by about half compared to the current average in Helsinki.

However, the study suggests that the construction phase will make a considerable impact on total emissions associated with housing, contributing nearly half of all emissions over a 25 year time frame. Previous studies reported the contribution of construction at around 10% (for all types of buildings). The length of time it would take to emit the same amount of carbon just through living in the houses would be over 30 years, according to the researchers.

The researchers conducted a life cycle analysis for greenhouse gas emissions based on plans for development in the Helsinki Metropolitan Area, which is experiencing rapid population growth. They focused on the first 25 years of the buildings' life-cycle. This time frame was chosen partly because it is at around 25 years of use that major renovations, for example, renewal of building automation systems, tend to be needed. These renovations also cause a surge in emissions, but it is less significant than for construction and the refurbishment can mitigate emissions from use of the property thereafter.

The population in the area is predicted to increase by more than 100,000 in the next decade. Specifically, calculations accounted for the building of accommodation for 1,100 residents. 70% were in detached houses and the remaining 30% in low rise apartments, with construction costing €140 million.

The researchers assumed that those living in detached houses would emit more greenhouse gases, for instance, by consuming more heating energy, resulting in average carbon equivalent emissions of 4.9 tons per person per year, compared to 3.6 for apartment residents. However, these operating emissions would not exceed those for the houses' initial construction, which averaged 125 tons per resident – for many years.

Concrete was the largest source of emissions during the construction phase, followed by masonry, construction site energy and steel. In the use phase, heating and electricity accounted for most of the emissions.

The researchers also considered how three different carbon management strategies could affect building emissions, but none had a significant effect. They suggest that this was because all housing was assumed to meet the requirements of the new building regulations, which will reduce energy consumption by 20%, and further improvements will be difficult. The three strategies tested were: use of alternative construction materials, building low-energy houses such as passive houses, and alternatives to fossil fuels for local heating and power production. All resulted in less than a 10% reduction in emissions.

The researchers say they have also developed a framework for combining assessment of construction and use phase emissions that can be used in policymaking for urban development. Until now, most research has focused either on construction phase or on use phase, rather than on the whole picture.

Source: Heinonen, J. Säynäjoki, A., and Junnila., S. (2011). A Longitudinal Study on the Carbon Emissions of a New Residential Development. *Sustainability*. 3: 1170-1189. This study is free to view at: www.mdpi.com/2071-1050/3/8/1170/pdf

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