Carbon Footprint of Residential Construction Technologies in Japan

Topic: Input-output analysis for policy making II (Chair: Candi Clouse, Cleveland State University)
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To mitigate climate change, the residential building sector needs to reduce not only CO2 emissions caused by direct energy use phase at home but CO2 emissions triggered by construction supply chains. In 2020, 820000 units of houses were newly built in Japan. In the same year, the number of new wooden houses was 470000 units, accounting for approximately 60% of the new housing starts and thus the demand for wood-frame housing is higher in Japan. This study focuses on three types of technologies of wood-frame construction, steel-framed reinforced concrete (SRC) construction, and reinforced concrete (RC) construction and determines a functional unit of total floor area of an â€˜averageâ€™ house constructed by the specific technology. Based on the Construction Input-Output Table (CIOT) provided by the Ministry of Land, Infrastructure, Transport and Tourism and the Embodied Energy and Emission Intensity Data (3EID) for Japan Using Input-Output Tables provided by the National Institute for Environmental Studies of Japan, we estimated the carbon footprint from supply chains formed by constructing an average house with 113 square meters by the specific construction technology (i.e., wood-frame technology, SRC technology, and RC technology). Subsequently, we used a unit structure model with a focus on the specific construction technology and identified CO2 hotspots in the construction supply chains. We found that the wood-frame technology contributed to increasing the carbon footprint during the study period between 2005 and 2015 due to growth of CO2 hotspots for material sectors. It is crucial to implement a policy to reduce supply chain emissions with a focus on the CO2 hotspots identified in this study.