

A Consumption-Based Hybrid Life Cycle Assessment of Carbon Footprints in California: High Footprints in Small Urban Households

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Abstract : Higher density reduces distances, private car dependency and thus reduces greenhouse gas emissions (GHGs). As a result, increased density has been given a central role among urban development targets. However, it is not just travel behavior that changes along with density. Rather, the consumption patterns, or overall lifestyles, change along with changing urban structure, particularly with changing housing types and consumption opportunities. Furthermore, elevated consumption of services, more frequent flying and less intra-household sharing have been shown to potentially outweigh the gains from reduced driving in more dense urban settlements. In this study, the geography of carbon footprints (CFs) in California is analyzed paying close attention to the household size differences and the resulting economies-of-scale advantages and disadvantages. A hybrid life cycle assessment (LCA) framework is employed together with consumer expenditure data to assess the CFs. According to the study, small urban households have the highest CFs in California. Their transport related emissions are significantly lower than those of the residents of less urbanized areas, but higher emissions from other consumption categories, together with the low degree of sharing of goods, overweigh the gains. Two functional units, per capita and per household, are used to analyze the CFs and to demonstrate the importance of household size. The lifestyle impacts visible through the consumption data are also discussed. The study suggests that there are still significant gaps in our understanding of the premises of low-carbon human settlements.

Keywords : carbon footprint, life cycle assessment, lifestyle, household size, consumption, economies-of-scale

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