The absolute environmental performance of buildings

Our paper presents a novel approach for absolute sustainability assessment of a building's environmental performance. It is demonstrated how the absolute sustainable share of the earth carrying capacity of a specific building type can be estimated using carrying capacity based normalization factors. A building is considered absolute sustainable if its annual environmental burden is less than its share of the earth environmental carrying capacity. Two case buildings – a standard house and an upcycled single-family house located in Denmark – were assessed according to this approach and both were found to exceed the target values of three (almost four) of the eleven impact categories included in the study. The worst-case excess was for the case building, representing prevalent Danish building practices, which utilized 1563% of the Climate Change carrying capacity. Four paths to reach absolute sustainability for the standard house were proposed focusing on three measures: minimizing environmental impacts from building construction, minimizing impacts from energy consumption during use phase, and reducing the living area per person. In an intermediate path, absolute sustainability can be obtained by reducing the impacts from construction by 89%, use phase energy consumption by 80%, and the living area by 60%.

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