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A Comparison of Local and Global Databases for the Environmental Impact of Residential Buildings

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ABSTRACT

The construction sector significantly contributes to global greenhouse gas emissions, particularly relevant in emerging economies such as Brazil, where urban development and housing demand continue to rise. In this context, the Brazilian initiative of SIDAC (Construction Environmental Performance Information System, in Portuguese) and the development of new national tools aim to provide local data for assessing environmental impacts. One example of a tool that uses such data is the Whole Building Life Cycle Assessment (WBLCA). WBLCA is a systematic method for evaluating a building's environmental impact throughout its life cycle, offering a holistic perspective on resource consumption, emissions, and waste generation. However, due to the complexity of obtaining local data for WBLCA studies, the Ecoinvent database has been widely used due to its comprehensive dataset, even though its applicability to the Brazilian context can be limited due to regional variations in production processes and materials. This study compares the performance of national (SIDAC) and international (Ecoinvent) databases using simplified WBLCA models for embodied carbon. The assessment focuses on phases A1 to A5, covering the embodied impacts from the extraction of materials to the construction. Three single-family residential buildings were assessed. Each building corresponds to a different construction standard, i.e. a social housing, a house for the middle class and a high-standard house. The expected outcomes aim to identify the differences between national and international databases and to analyse their implications for designers' decision-making, especially in light of future environmental constraints.

Keywords: Carbon emission; climate change; ecoinvent; houses; whole building life cycle assessment.