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The Australian Industrial Ecology Virtual Laboratory and multi-scale assessment of buildings and construction.

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Abstract –

As global population and urbanization increase, so do the direct and indirect environmental impacts of construction around the world. Low-impact products, buildings, precincts and cities are needed to mitigate the effects of building construction and use. Analysis of embodied energy and greenhouse gas (GHG) emissions across these scales is becoming more important to support this direction. The calculation of embodied impacts requires rigorous, flexible and comprehensive assessment tools. Firstly, we present the Australian Industrial Ecology Virtual Laboratory (IELab) as one such tool discussing its structure, function and wide scope of application. Secondly, we demonstrate its potential high level of resolution in a case study: assessing embodied GHG emissions in an aluminium-framed window by combining product-specific life-cycle inventory data. The input-output analysis at the core of the IELab is mathematically comprehensive in the assessment of direct and indirect impacts and the tool can be applied at a range of scales from building component, to precincts and cities, or to the entire construction industry. IELab uses a flexible formalism that enables consistent harmonisation of diverse datasets and tractable updating of input data. The emissions and energy database supporting IELab has detailed data, aligning with economic accounts and data on labour, water, materials and waste that enrich assessment across other dimensions of sustainability. IELab is a comprehensive, flexible and robust assessment tool well positioned to respond to the challenge of assessing and aiding the design of a low-impact built environment.

Keywords: input-output analysis, embodied energy, embodied emissions, environmental footprint, low-impact buildings, building component

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