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Abstract

Integrated BIM-based LCA for road asphalt pavements†

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In the latest years, Building Information Modeling (BIM) tools have increased the productivity of infrastructure projects through more efficient information management and by fostering communication between different actors of the process. At the same time, the growing need to introduce sustainability indicators calculated through the life cycle assessment (LCA) methodology has prompted an increase in the amount of data to be managed throughout the life cycle of an infrastructure project. The present work consists of developing a BIM-based LCA tool aimed at the calculation of several environmental indicators through the informative content of a road pavement BIM; the tool is specifically designed to avoid errors in LCA calculations during the early design stages, reduce the engineer's effort through automation and support sustainable decision-making in the infrastructure domain. A LCA-based pavement information model was developed by defining and adding several customized property sets, respectively containing the specific road pavement materials' features and some selected environmental impact categories; a bidirectional information exchange path was established between BIM and the LCA-tool to automate the LCA calculations and dynamically update the mentioned environmental indicators property sets whenever the geometry of the pavement and the asphalt materials' features change. The developed tool allowed to practically integrate pavement-related environmental sustainability requirements into BIM projects, with specific reference to asphalt pavement solutions that apply circular economy principles (i.e. secondary raw materials and cold recycling technologies), in light of more environmentally-friendly pavement construction practices.

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