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Cradle-to-Gate Sustainable Target Value Design: Integrating Life Cycle Assessment and Construction Management for Buildings

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2 **Construction Management for Buildings**

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8 **Abstract**

9 Building stakeholders cannot easily quantify the environmental impacts of buildings as
10 they accrue during construction. The goal of this work is to demonstrate a method to measure
11 and manage the cradle-to-gate life cycle environmental impacts by linking environmental targets
12 with modern construction management methods, to enable buildings to meet sustainable target
13 values (STV). In this work, a construction activity-based computational framework was
14 developed to enable stakeholders to reliably and efficiently construct cradle-to-gate life cycle
15 models capturing environmental impacts including carbon and energy associated with material
16 extraction, manufacture, transport to site, and construction. These models allow stakeholders to
17 measure and manage impact accrual so as to not exceed STVs; without this framework,
18 construction managers and other building stakeholders do not possess adequate environmental
19 management tools to deliver projects consistently at or below STV. Specifically, the components
20 developed are: (1) time dependent impact accrual budgets during construction and (2) impact
21 measurement during construction. These benchmarks are used to determine whether a specific
22 project is above or below target values, similar to methods for cost and schedule variance
23 analysis. Two case studies were used to test this framework. This integration provides a life

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