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ECO-INDICATOR 99, RECIPE, AND ANOVA FOR EVALUATING BUILDING TECHNOLOGIES UNDER LCA UNCERTAINTIES

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Abstract

The Eco-Indicator 99 (EI99) method and the ReCiPe method are used to determine the fundamental uncertainties in the life cycle impact assessment (LCIA) model through the configurations of the following six methodological options: egalitarian/egalitarian (e/e), egalitarian/average (e/a), hierarchist/hierarchist (h/h), hierarchist/average (h/a), individualist/individualist (i/i), and individualist/average (i/a). In this study, the aforementioned options were presented as (i) a set of methodological options with their particular weighting set (e/e, h/h, and i/i) and (ii) a set of methodological options with the average weighting set (e/a, h/a, and i/a), thereby creating a hierarchical design of both the EI99 and ReCiPe methods. The first goal of this study is to provide the appropriate statistical test as a supplemental method to EI99 and ReCiPe for the evaluation of the different environmental damage caused by four building technologies. The second goal is to compare the two damage oriented methods of EI99 and ReCiPe when the same building technologies are compared. Two-stage nested mixed ANOVA rather than a t-test is recommended as a supplemental method in both evaluations of EI99 and ReCiPe due the hierarchical structure of the methodological options. ReCiPe rather than EI99 is suggested as a damage oriented method of building technologies due to its extended list of impacts of the ecosystems damage category and its accounting for more reliable cost parameters in the resources damage category instead of the vague supplement of the energy requirement in a distant future that is applied in EI99.

Key words: hierarchical design structure, LCIA uncertainty, sampling design

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