Additional indicators for the Assessment of Environmental Sustainability of Construction Works

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February 2014

Executive Summary

The goal

The goal of this study is to find out which environmental impact categories would be additionally important for the Life Cycle Assessment of construction products and if there are recognized models of calculation for them. The focuses are the indicators and impact categories used to assess environmental impacts of construction works. While there are several well established impact categories that are internationally recognized, other important impact categories are not considered yet in the standardization.

The approach / Methodology

A review of the literature is done on the state of the art of indicators for sustainability assessment for construction products. In addition to the theoretical analysis a case study is carried out. The relevance of additional indicators is analysed by assessing the environmental impacts of building products. The case study is divided into two parts: in the first part, the impacts of a building out of three variants of building, materials are calculated. In the second part, two different wall types are investigated.

Results

In the case study two different Life Cycle Impact Assessments are performed, one for a senior care building and the other one for two different wall types. The indicators used for the LCIA are included in EN 15804, Product Environmental Footprint, Ecoindicator 99 and ReCiPe. The results for all impacts have been normalized with the average impact of one European citizen per year, so that it is possible to determine if the impact in one category is comparatively high or not.

The results of the case study show that there are several impact categories that have a significant impact for the senior care building and the wall systems. Some of the indicators used in the different methods aim at the same environmental impact. The following list contains the type of impacts that should be assessed additionally to the indicators included in EN 15805 according to the case study:

- Human Toxicity, cancer effects
- Freshwater Ecotoxicity
- Particulate Matter
- Ionizing Radiation (HH, E)
- Respiratory Inorganics
- Fossil Fuels

Conclusion

Finally, according to the study, it is shown that the impacts of similar impact categories are very different in the four methods investigated. This indicates that there are uncertainties for many impact categories. The uncertainties of the study are the methods for calculating the impacts, the database, the normalization value and the method for normalization. Therefore for some impact categories the results could change if different approaches are used.

Recommendations

Concluding we have found several additional environmental impact categories that represent impacts to the environment that are not covered by the currently used 7 indicators of EN 15804. That is why we suggest including more impact categories. However the results include many uncertainties and therefore should be regarded critically. Further studies could include a wider range of building material and have a closer look at the methods and normalization values used for performing the Life Cycle Impact Assessment.