

Article

A review of the effectiveness of Life Cycle Assessment for gauging environmental impacts from cement production

October 2021 · Journal of Cleaner Production
324(3):129213

DOI:[10.1016/j.jclepro.2021.129213](https://doi.org/10.1016/j.jclepro.2021.129213)

Since cement production is a complex process that uses enormous amounts of raw materials and energy, it is important to evaluate its environmental impact and investigate how the industry should follow best practices. Life Cycle Assessment LCA is a valuable method for assessing the environmental impacts of cement production. Due to these critical environmental considerations, many studies have used LCA for this purpose. This study aims to critically review the limitations/differences in the information provided for intended LCA applications such as system boundaries, functional units, sources of data and data quality assessments. The results show the levels of compliance with the International Organization for Standardization (ISO) standards and provide suggestions for possible improvements. The results obtained from cement LCA analyses are found to be affected mainly by system boundaries related to research costs and data quality. From the literature, 55% of the article used 1-ton of Portland ordinary cement (OPC), while 27% used 1-ton of clinker and 18% used (i.e., 1 kg of cement, 1kg of clinker or 20 bags of cement) as a functional unit. All the articles considered in this study use grave to gate approach as a system boundary. Therefore, detailed descriptions of system boundaries are required for better results. Other potential measures for improvement are using alternative fuel, energy efficiency, and material substitution because these measures are cost effective and technically sustainable. For a satisfactory result from a cement LCA, the data quality assessment is critical. This review highlighted the need for further studies on the data quality of cement LCAs. It is concluded that more work needs to be done to improve system boundaries, identify data sources, and data quality assessments.