

<https://doi.org/10.7250/CONNECT.2026.079>

# BEYOND ENVIRONMENTAL LCA: INTEGRATING WORKER SOCIAL RISK INTO THE SUSTAINABILITY ASSESSMENT OF CONSTRUCTION MATERIALS

**Davide DE VITO<sup>1</sup>, Irene MAZZEI<sup>2</sup>, Elisabetta PALUMBO<sup>3\*</sup>**

<sup>1,3</sup> *Department of Engineering and Applied Science (DISA), University of Bergamo, Viale G. Marconi, 5, 24044 Dalmine (Bergamo), Italy*

<sup>2</sup> *York School of Architecture, Piazza Building, Deramore Lane, Heslington, York, YO10 5GJ, United Kingdom*

\* **Corresponding author.** Email address: [elisabetta.palumbo@unibg.it](mailto:elisabetta.palumbo@unibg.it)

**Abstract** – The selection of construction materials is becoming increasingly central in building-scale sustainability assessments. However, such evaluations still predominantly focus on environmental aspects. Some certification schemes, such as the EU Ecolabel for the “Hard Coverings” product group, address social aspects related to worker safety and labour conditions by requiring evidence of policies, procedures and operational measures that ensure worker protection throughout the quarrying process. These aspects, however, are not extended to other product families within the same category, despite involving activities that entail comparable occupational risks. Previous studies conducted in the Italian context on worker safety within the steel and concrete supply chain have shown that relying solely on environmental metrics may obscure critical social risks embedded in material production, particularly those related to labour conditions and accident rates. These studies demonstrate that integrating social and environmental life cycle perspectives enables a more comprehensive understanding of sustainability performance, supporting material choices that address not only carbon reduction but also the well-being and protection of workers throughout the supply chain. A practical way to integrate social considerations into Environmental Life Cycle Assessment (E-LCA) is to adopt a combined assessment framework that complements traditional impact categories with social risk indicators derived from sector-specific data. Building on this approach, integration can be achieved by coupling standard E-LCA with elements of Social Life Cycle Assessment (S-LCA), using worker-related metrics – such as accident frequency and severity rates and documented safety conditions – as quantitative indicators of social performance. By analysing accident databases, national labour statistics and information on working practices, these indicators can be normalised and incorporated into the interpretation phase of the LCA, allowing social risks to be assessed alongside environmental burdens. This enables a systematic comparison of construction materials not only in terms of emissions or resource use, but also with respect to the human cost embedded in their supply chains. Starting from the requirements introduced by Criterion 2.5 of the EU Ecolabel for natural stone (personnel safety and working conditions at the quarry), this contribution proposes a methodological approach to integrate social assessment alongside E-LCA for construction materials subject to similar risks. The aim is to outline a way to complement existing environmental impact labels, such as Environmental Product Declarations (EPDs) – third-party labels based on E-LCA studies – by making them more comprehensive. To illustrate the applicability of the proposed method, the study integrates E-LCA analyses conducted on hard covering products with risk indicators

related to worker safety. Future developments include extending the proposed approach to its direct application within production processes, enabling companies to integrate social indicators into internal sustainability assessment practices and to monitor worker-related risks alongside environmental performance.

***Keywords – EU Ecolabel; Life cycle sustainability assessment; working conditions; workers health and safety; worker and labour conditions***