CERIS : Civil Engineering Research and Innovation for Sustainability

Communication of environmental life cycle assessment results – application to materials for pitched roofs

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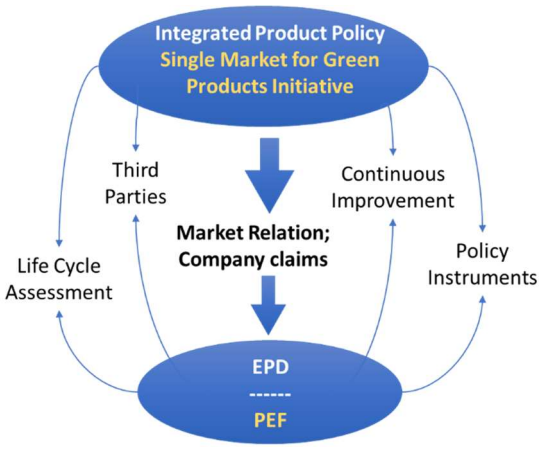
Summary

The environmental performance of construction products and assemblies is determinant for the sustainability of buildings. Increasing willingness of stakeholders in the construction sector for green procurement, better-informed decisions and higher concern with environmental aspects, increase the need for information on the environmental performance of construction products. Life Cycle Assessment (LCA) is one of the most commonly accepted methodologies to calculate the potential life cycle environmental impacts of a product. In what concerns the communication of environmental information, Environmental Product Declarations (EPD) based on the European standard EN 15804 are used in the construction sector since 2012.

One of the main objectives of this thesis was to develop scientifically validated data on the environmental performance of building materials and assemblies used in pitched roofs in Portugal. Moreover, this research work intended to critically analyse two standardised methods for LCA calculation, applied to construction products and assemblies. A literature review was performed about LCA methodology and its calculation and communication methods, sources of LCA information, and the characteristics and composition of pitched roofs. LCA, based in site-specific data from national producers, was performed for a set of seven products. This data was complemented with LCA results from previous studies or from databases, to calculate potential environmental impacts for selected pitched roof solutions. It was possible to compare traditional and innovative solutions, including some recent innovative products, and to compare the results obtained with generic data and results from previous studies. For the analysed pitched roof solutions, it was concluded that the environmental impacts of lightweight lining assemblies were lower than the alternative solutions. The innovative GFRP panels showed the worst environmental performance, not because of the additional amount of insulation material, but mostly because of their design and materials incorporated. The EPD and PEF assessment and reporting methods were critically analysed, including an analysis of their advantages and limitations. It was concluded that, at the product level, EPDs are more suitable to be used in business-to-business communication, because reported impacts allow their sum (if obtained with similar assumptions and assessment methods), into total impacts at the assembly or building level. PEF is more suitable for business-to-consumer communication and direct comparison because it reports the impacts of a fixed assembly containing the assessed product, and not only the product. For that, it may become an interesting calculation and communication tool of environmental performance when it becomes more comprehensive (in PEF product category rules available). Furthermore, the development of environmental LCA studies, using specific data from national producers, provided scientifically validated results that contribute to the development of a national database of LCA for the construction sector.

Keywords

Life cycle assessment (LCA), environmental product declaration (EPD), product environmental footprint (PEF), environmental impacts, construction materials and assemblies, pitched roofs.



Framework of the LCA calculation and communication methodologies EPDs and PEFs.