Environmental performance of building products: What is important in the most common building certification schemes

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A study from FORCE Technology, commissioned by Eurima, examines the most popular building certification schemes, their requirements with respect to environmental product information and the importance of this information in the scoring and rating of a building. The study also compares the product data requirements in the certification schemes to those of the upcoming European standards regarding building environmental performance.

Building certification schemes have very different requirements

The study shows that the Cradle-to-cradle (C2C) concept does not require or use quantitative life cycle environmental information at all. Basically, the lower grads of C2C certification only requires that the ingredients in the product are known, while more strategic elements like recyclability and use of renewable energy sources only become important elements in the assessment at the more advanced stages of certification. Seen from a scientific point of view the product documentation requested in the basic and silver categories of C2C certification is of limited value in an assessment of the sustainability of building products, not to mention assessment of whole buildings.

Also the current (2009) LEED certification scheme does not require quantitative life cycle information on individual building components. The criteria for materials and resources are, however, focused on decision-making using life cycle thinking, and the possibility of giving credits to whole building life cycle assessment of the structure and enclosure of a building is being examined in a public consultation. The LCA shall document minimum 10% reduction in at least three of six specified impact categories, compared to a reference building. Certification schemes like the French HQE, the UK-based BREEAM and the Germany-based DGNB require quantitative information about the environmental life cycle performance of building materials and products. The study shows, however, that the information is of relatively low importance in the overall picture, accounting for at most about 5% of the overall score for a building. The low importance in this context can be seen in the perspective of the expenses necessary to produce the information, often amounting to ten thousand EURO or more for a single product.

For businesses there are many benefits from producing quantified life cycle knowledge, but it is obviously a good idea if the results of any building product LCA can be used directly in all certification schemes. This has not been possible until now, because calculation procedures and data format requirements vary from one

scheme to the other. The new European standard EN 15804 on environmental product declarations of construction products may very well prove to be an important element in a long-term solution to this problem, having a relatively high level of detail in the calculations at the product level and allowing for an un-biased aggregation of LCA results at the building level. EPDs made according to the European standard will therefore most probably be readily accepted for use in DGNB and HQE certification. BREEAM has also declared their intention to align with EN 15804, but this may in practice be difficult because of the complex process of converting life cycle based information to a rating of a building product.

The study points to the Germany-based DGNB and the French HQE certification schemes as the currently best suited to utilize the environmental information expected to emerge when the European standards are finalized. The data handling requirements and the data format corresponds closely to the European standards, and exchange of data between DGNB, HQE and the European standards is therefore an obvious possibility, despite minor differences.

Many national building certification schemes – Two European standards

The environmental performance of buildings over their full life time is becoming increasingly interesting because of the emerging problems with respect to e.g. climate change and resource scarcity. Not surprisingly, however, there is little consensus as to how the performance shall be measured and assessed.

During the last two decades several privately owned building certification schemes have been established, starting with the UK-based BREEAM scheme in 1990 and followed by the US-based LEED in 1998. More recently, the Germany-based DGNB and the French HQE schemes have become serious players on the international scene, and an alleged “new” way of thinking, the Cradle-to-Cradle concept, have begun to address not only products but also whole buildings. All of these schemes operate with varying degrees of regulatory interest and support.

On the more official side, the European standardisation organization CEN has in 2011 published the first two preliminary standards in a larger complex regarding sustainability of construction works, addressing on the one hand “Environmental product declarations of construction products” in EN 15804 and on the other hand “Environmental performance of buildings” in EN 15978. The standards give detailed provisions regarding how the environmental performance is measured, but they do not contain guidelines regarding how the overall performance of a building shall be assessed and eventually compared to that of another building.

In the perspective of a building product manufacturer the important element in relation to building assessments is the importance of “my” products in the overall picture of life cycle performance: How do the environmental impacts from their production, use and disposal count in the overall picture? And can they possible improve the building performance because of good technical properties?

With the multitude of standards and certification schemes at hand, it is important for building product manufacturers to identify which approach gives most benefit in form of science-based environmental product information that can be used in a broad range of applications.

The environmental performance of building products is of limited importance in building certification

The US-based LEED certification scheme will from 2012 give a (small) credit to builders who can show that they have collected EPDs for a significant part of the building products they have purchased. The actual performance of the products is not considered, only the availability of the EPD information. Instead, LEED uses a qualitative approach, assuming that reused materials, a high recycled content and regionally sourced materials are beneficial for the environment. The benefits on the building level are not documented through an LCA, but by using the relative expenses of reused, recycled and locally sourced materials

Also the C2C concept does not make any life cycle related calculations at the product level. The concept operates with four grades of certification, and as of May 2011, more than 95% of the products only have a Basic or Silver certificate. To achieve a Silver certificate, the scheme requires that the ingredients in the product are assessed with respect to their potential impacts on human health and ecosystems, and it shall be documented that more than 50% of the ingredients theoretically can be recycled as biological or technical nutrients. Also, development of strategies for optimizing the use of problematic ingredients and materials and for the use of solar income for product manufacture and assembly is required. Finally, the company must adopt publicly available corporate ethics and fair labor statement(s).

No quantitative environmental information is thus available for products with a C2C silver certificate, and their environmental properties of a certified product can crudely be compared to those of a product from a manufacturer with a certified environmental management system like ISO 14001 or EMAS and a focus on recycling possibilities throughout the value chain. The silver certificate does thus not provide any guarantee that the product has a comparatively good environmental performance.

The UK-based BREEAM building certification system puts relatively much weight on quantitative environmental information for six selected building products, which altogether can account for more than 5% of the total available score for a building. In the environmental scoring and rating of a building the assessment of the importance of materials seems at the first glance to be simple, but the underlying data collection and data treatment procedures are very complex and can in practice only be done by the company's own consultants.

The basic LCA's in BREEAM shall be made according to the owners (BRE) private standard, and the results are subsequently subjected to a number of calculation steps that are not in accordance with the ISO 14040 standard on Life Cycle Assessment, e.g. subjective weightings are used twice in order to reach a final score for a product. The complexity of the many calculation steps makes the whole procedure very intransparent to people outside the BRE system. It is also noted that the rating of a product may change when new products are introduced to the market – or existing products are withdrawn. A consequence of this may be that building product manufacturers continuously strive to improve their products, but it is also possible that both manufacturers and builders find it difficult to find out how a product performs in relation to other products on the market. The intention of BREEAM to align with the European standards in future developments may therefore be difficult in practice

The Germany-based DGNB scheme is in comparison to BREEAM much more transparent in its calculation procedures. The basic LCA calculations are made according to modern interpretation of the ISO 14044 standard, corresponding closely to the provisions laid out in EN 15804 on Environmental Product

Declarations for construction products. Many more materials and products are included in the scoring, but the importance of the product life cycle performance in the overall building score is much lower than in BREEAM, about 3% at most. A weighting step using arbitrary weighting factors is used to reach the final environmental score. The step is fully transparent, but it can nonetheless never be regarded as an element in a science-based assessment, only as a political element in a decision process.

The French HQE certification scheme uses a management approach, where the focus is on being able to show that the requested documentation has been collected and the building process runs according to schedule, also with respect to environmental issues. Collecting significant amounts of environmental information in the form of EPDs is awarded, and using the information to document a choice of environmentally preferable products and/or the environmental performance of the building is also credited. It is, however, not obligatory to collect and use the information.

Product quality is in most schemes assessed by qualitative parameters, addressing some but not all aspects. For insulation products, knowledge about their fitness for use over the whole life time of the building is important. If an insulation product does not fit or loses its quality over time, e.g. by settling or rotting, the result is that the overall impacts of the building increases significantly because of an increase in heat loss. The French HQE scheme requires that the building materials are fit for use, while none of the other schemes include such considerations specifically when scoring and rating a building.

European building standards provides a common framework for data collection and data presentation

The building certification schemes have different requirements with respect to data collection, handling and presentation. This is not surprising, considering that the schemes have been established over a period of more than 20 years, with different approaches and standards being regarded as state-of-the-art at the time of conception.

Today (in 2012,rEN 15804 is emerging as a standard that will be commonly accepted all over Europe as the way of (communicating environmental performance of products, and it is therefore appropriate if also building certification schemes makes use of its provisions with respect to data handling and data format. The Germany-based DGNB scheme already does this and it is therefore very easy for product manufacturers to feed data into the scheme using the results obtained by a standard procedure. Also the French HQE scheme is aligning its data requirements with EN 15804. In contrast, the UK-based BREEAM requires its own special way of collecting, handling and presenting data, and it is therefore not at present possible to use data developed in EN 15804 for BREEAM calculations. Nor is it possible to use data developed in BREEAM as substitutes for EN 15804 data in assessment of whole building performance. Second generation building certification schemes like DGNB and the French HQE are therefore much better prepared for interaction with other data handling systems than the older schemes like BREEAM.

The LEED certification scheme and Cradle-to-cradle certification does not require quantitative environmental information to any significant extent, at least not in their current criteria documents. They are therefore not well suited as vehicles for presentation and exchange of environmental information other than basic qualitative knowledge.