Sustainable Building Alliance

Research Project: "Piloting SBA Common Metrics"

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Context

The Construction sector is now irreversibly turned towards design, construction, maintenance and renovation of sustainable buildings. The application of sustainable development principles to buildings, and more specifically the study of their environmental performances, invites us to a change of scale in our analysis in terms of:

- Temporal scale, as we are now studying the full life cycle of the building impacts;
- Spatial scale, as we are taking into account the building in relation with its neighborhood and city, by analyzing the transport induced during the construction stage, the in-use phase, or the local energy production or storage;
- Complexity scale, as the environmental assessment is a multi criteria analysis, taking into account energy consumption (non renewable, renewable, …), waste production (hazardous, non hazardous, inert, …), resources use, air pollution, Global warming potential, water consumption, … and as we need to assess these impacts regarding the specific requirements (surface, comfort, safety, accessibility..), and functionality provided by different building contributors (structural elements, equipments), and design choices.

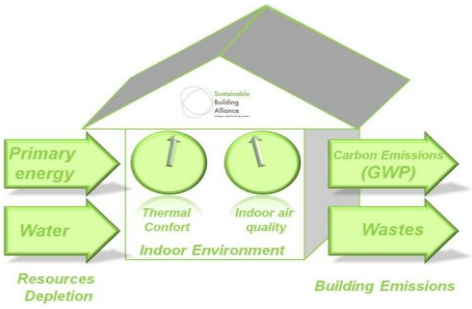
Under these perspectives, the LCA (Life Cycle Assessment) methodology has been recognized as a systematic tool for assessing the environmental performance in different contexts. It is thus more and more used in certification schemes all around the world in order to take into account the different impacts during the building lifecycle. While standards are developed on European level and internationally, there is still a strong need to ensure the operational harmonization and comparability of LCA results for buildings, for instance in terms of impacts, stages and contributors considered. A number of environmental and indoor environment indicators have been selected to start our work on common metrics and analyze its feasibility in terms of application, availability of data and comparability.

Work description

During 2009 and 2010, SBA WG “Indicators Core Group” (composed of BRE, CSTB, DGNB, QUALITEL and VTT) has prepared a draft Framework for Common Metrics to be calculated, used and communicated in a common way in the assessment of buildings.

The goal was to avoid developing a single new assessment system, but to cooperate for the development of a group of indicators that would be calculated with common rules and considering the same parameters, elements and building stages. This common approach to calculation should be integrated in the existing certification schemes for the promotion of comparability worldwide. Many of the current or new assessment schemes integrate LCA approaches or considerations for impact calculation: one of our objectives is thus to understand more precisely the different way to perform them.

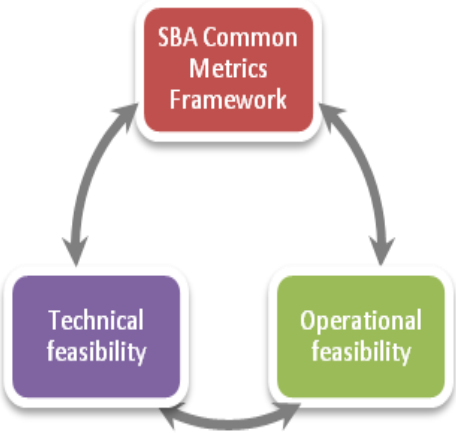
At its first stage, the Common Metrics[1] draft currently includes the following indicators, in compliance with CEN TC 350 standardisation work: 1) Global Warming Potential (GWP); 2) use of non-renewable primary energy; 3) Water use, 4) Solid wastes production; 5) Indoor environment quality (IEQ) (currently considering the Thermal comfort; Indoor air CO2 concentration and Formaldehyde concentration)



In 2011 this framework has been pilot-tested within existing assessment systems and in real projects, in order to allow:

- The analysis of the feasibility of the indicators calculation:
    - Existence of efficient and practical tools for the calculation of impacts (identification and description of existing tools);
    - Availability of data, EPD's and building description data, necessary for the calculation of the indicators for all the life-cycle stages of the building;
    - Availability and maturity of tools and measuring methodologies to assess the building environmental impacts
    - Practical tests and modelling on the common metrics documents (completeness of methodological aspects, scenarios description...), one in each country.

- The analysis of consistency and comparability of the proposed indicators, which will finally allow identification of potential improvements to be made as well as recommendations for future developments.



- Analysis of results of practical tests;
- Minimum requirements for consistency and comparability, for instance, in terms of contributors to be considered
- Recommendations for an improved version of SBA common metrics framework 2009, and recommendations to move forward towards compliant and adapted LCA and certification systems (phase 2)

- Generate recommendations on a common communication format to display the indicators results. (phase 2)

[1] Source: SB Alliance, A Framework for common metrics of buildings, Final Draft, V 1.7, 25 January, 2010.

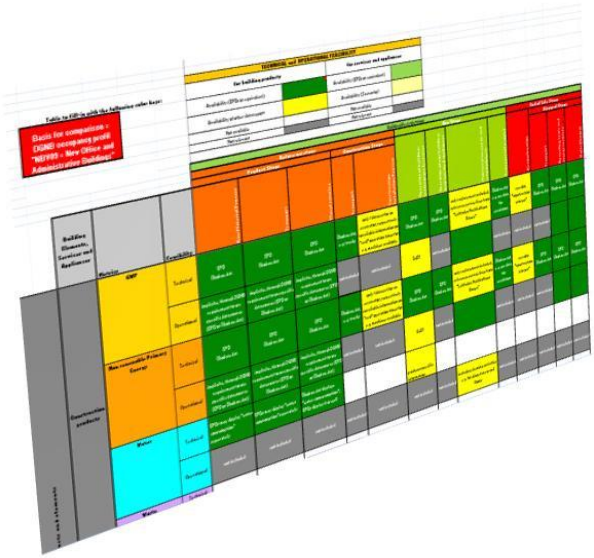
Because they imply different calculation and assessment methods, a distinction between the LCA-oriented indicators (GWP, energy, water and waste) and the indoor environment indicators has been made. The feasibility has been assessed according to two angles:

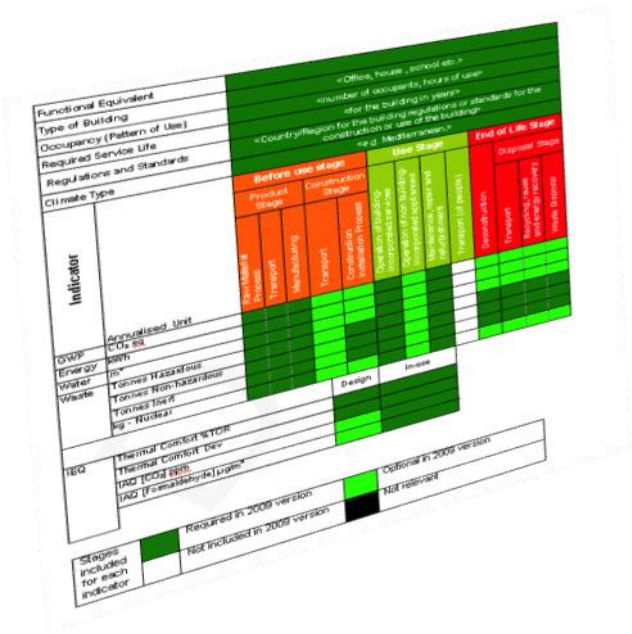
1) the **technical feasibility** indicates the availability of tools, data and methodologies (scenarios,…) in the market or for R&D activity to calculate the SBA indicators;

2) The **operational feasibility** assesses if these indicators are already taken into account in a quantitative way in the existing certification schemes (DGNB, HQE, LEED, BREEAM, Perfil de Calidad, PromisE, …).

Results

The first main results are the feasibility tables allowing us to define a common list of contributors; this is a key aspect for the comparability of the results. Each participating country and rating scheme has provided its own national tables and feasibility analysis, which is also displaying data sources and tools, and data availability details. Relevant differences in the selection of contributors and life cycle stages could be identified due to different conventions, which translates country related specificities or practices; however harmonisation will be possible.





The second set of results expresses the practical modeling operated on real building projects. The applicability of the calculation rules of the SBA indicators according to the SBA framework was given for some indicators (e.g. energy use) but varied in a relevant manner for other indicators (e.g. water use, waste amounts and definitions) for different LCA approaches. The variations were mainly due to differences in the scope of the contributions and stages regarded. The modeling exercise also displayed quantitative results of indicators for a first estimation of any deviations due to different modeling conventions or national regulation influence.

The modeling exercise offered an insight on how the definition of contributors or life cycle stages considered according to the first draft of the 2009 SBA framework influenced the accuracy of the indicators calculation (and in consequence, the comparability of results), and how these definitions

depend on the philosophy and scope of the LCA approaches and differences in the scopes of the programs. By using results from real buildings, the pilot test will permit the proposal of recommendations on how to consolidate the indicators for the rating tools participating in the test, as well as will allow a robust development of further common indicators, and a comparable communication of results. We are also highlighting the fact that the availability of homogeneous EPDs in each country is a strong need to take into account as many contributors as possible. As first recommendations for the next stages on common metrics works, we are advising to reset a restricted group of contributors (building elements considered in the common calculation scheme) which should be both ambitious and feasible for all participating assessment schemes and SBA members. This future list of contributors should be tested on one common building (based on the construction project's plans and written descriptions) to learn more about the comparability of results e.g. understand better variations linked to the specific requirements of the respective building assessment schemes or to national regulation factors. The future research will allow us to stay at the front line of practical research for building certification and further improve relevance and robustness of the SBA common metrics.

We have also come to the conclusion that the service life of the building products is a key issue for the building LCA results, thus we are proposing to collect and compare the service life of the building products regarded.

Finally, we are proposing the provision of a priority list for the next environmental indicators. Regarding the indoor environmental quality, we have identified the need for a deeper analysis of this requirement, which should be carried out by experts in the field.