CREDIBILITY OF BUILDING ASSESSMENT SYSTEMS

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Summary

In recent years a growing awareness campaigns and events promoting environmentally friendly construction are organized. The reports on assessments done under LEED, BREEAM, DGNB, CASBEE or similar system are available in many places, some particular objects have got a very good rate. There are numerous courses and seminars offered for those who would acquire the ability to perform such evaluations. In the trade press are published articles on various aspects of assessment methods. Rating systems are today considered so advanced that their commercialization takes place. In this article are presented problems associated with this fact, including issues involving the credibility of evaluation and responsibility of both client and entities performing such assessments.

Keywords: rating system, sustainability assessment, indicators, standardization

1 Introduction

Application of sustainability principles in different kind of human activities became a common approach in recent years. A growing awareness campaigns and events promoting environmentally friendly construction are widely organized. Reports can be found that a particular object has got a very good assessment by LEED, BREEAM, DGNB, CASBEE or similar system. There are many courses and seminars organized for those who would acquire the ability to perform such evaluations. In the trade press, and also at the Conferences on Sustainable Buildings articles on various aspects of assessment methods, e.g. [1] are published. Some rating systems are so advanced that their commercialization or market uptake are in place. In this article we present the problems associated with this fact, including issues involving the credibility of evaluation and accountability of both instructing and performing such assessments. It would be helpful to realize the potential benefit of performing the assessment, quality of information we can get, and finally the cost of building improvement, not to mention the cost of assessment.

Development of tools for assessment of environmental quality or sustainability of buildings is very complex process. Integrated tools for such complex assessment have been developed in many countries: BREEAM in the UK (1990), LEED in the U.S. (1998), CASBEE in Japan (2002), and DGNB in Germany (2008). There are several others tools developed in different countries [2] like HQE in France, DGNB in Germany, Protocollo Itaca in Italy, SBToolCZ in Czech Republic, SBToolPT in Portugal, E-Audit in Poland and others. Review the structure of these systems allows the identification of the strategies adopted and the structuring of the assessment process to identify the advantages and

disadvantages associated with these strategies. For example, the results of the evaluation indicators can be presented as the ratio of the quality of the building services to the resulting environmental loads (particularly CASBEE), may relate to different phases of the life cycle of a building (e.g. design, construction or use phase), pursue a different scale assessment (building, plot, surroundings), refer to the paradigm of sustainable development (economy, environment and society), apply to the object itself (the technical features of the building) or process (e.g. completion, construction or management).

Environmental indicators are usually organized by the midpoint impacts on the environment (climate change, depletion of resources) and environmental pressures (depletion of materials, energy and water consumption). Furthermore, the functional quality indicators such as health and comfort are often grouped in a separate (sub)categories, so that these results are clearly visible at the stage of semi-aggregate assessment. On the other hand, the technical aspects are not part of the evaluation, since it is assumed that the legal requirements must be met. Finally, only a limited number of systems include the economic dimension.

The problem of selecting the overall structure of the assessment should be related to the definition of its objectives and a set of criteria chosen in order to achieve these objectives. Selection of the main structure of the assessment in literature evaluation methodology is called top-down approach, in contrast to systems that are rating the attributes that simply can be assessed or which are important for other reasons, which is called bottom-up. The basic principle of top-down approach is described in [3].

2 Standardization – ISO and CEN

It should be noted the evolution of the main objective of the assessments from the impact on environment (the methods of the years 1990–2000) to the compliance with the requirements of sustainable development (modern methods). This has an important influence on the structure and way of communicating assessment outcomes.

Development of systems for complex assessment of buildings and their implementation into construction practice is very difficult, but increasingly important process. Present legislation in many countries does not still requests performing assessment. But the progress shows gradual interest, especially in countries with advanced economy. In some countries certification of quality of complex building became for some types of buildings development obligatory.

Methodological problems of matching assessment structures to assumed goals are multifaceted and ratings are subject to standards such as ISO and CEN, and still constitute the agenda for the standardization committees. Also, there are many international efforts toward harmonisation, adaptation to regional context and specifically focused.

A subcommittee ISO TC59 SC17 (Sustainability in buildings) was created in September 2002, in which among others the following standardisation documents were prepared:

ISO/NP TS 12720 Sustainability in buildings and civil engineering works – Guidelines for the application of the general principles on sustainability, ISO 15392:2008 Sustainability in building construction – General principles, the technical specification ISO/TS 21929-1:2006 Sustainability in building construction – Sustainability indicators – Part 1: Framework for development of indicators for buildings, ISO 21930 Sustainability in building construction – Environmental declaration of building products, ISO/DIS 21929-2:

Sustainability in buildings and civil engineering works – Sustainability indicators – Part 2: Framework for the development of indicators for civil engineering works [1].

In 2005, the Technical Committee CEN/TC 350 "Sustainable construction" ("Sustainability of Construction Works") was created, which is working on standards related to sustainable construction at the European level. The mirror Polish (since 2008) and Czech (since 2010) Committees for Standardization functions in relation to the CEN/TC 350.

Developed by CEN/TC 350 standards apply to the two new non-technical areas related to the concept of sustainable construction: commercial property and social economic characteristics.

The standards elaborated in TC 350 were translated to Czech and Polish by national standardisation bodies establishing nomenclature and detailing framework for considerations for developing assessment systems.

Generally, the issues related to the evaluation can be a subject of actions and related to different entities, and may be exercised for management – ISO 9000, ISO Environmental Management – 14000 purposes or for declaration of the fulfilment of specific requirements.

3 European evaluation system

Standardization work is usually undertaken when the need to gather and organize the existing knowledge in the field is necessary. If knowledge is not closed the standardisation works are structuring and stimulating research directions. This occurs in the issues of conformity assessment with the requirements of building sustainable development. Standardization works of ISO are establishing the scope of the analysis, whereas in case of CEN the European preferred method of evaluation of the specific characteristics of the building is defined. In a view of the fact that there are numerous assessment systems, efforts of harmonisation are declared by several stakeholders (e.g. European Projects: LEnSE – FP6, OPENHOUSE – FP7, SuPerBuildings – FP7, SBA – Sustainable Building Alliance, Active House, SBTool – iiSBE – all descriptions of the projects available on the Internet) in order to propose a system of assessment that would be universal and could be used, adapted for national contexts. The concept of a common system of assessment is linked to the attempt to compare compliance with the requirements of sustainable development of buildings constructed in different countries. As part of these projects sought compromises on the structure of the assessment with the purpose of evaluation was defined as compliance with the requirements of sustainable development.

The main pillars of sustainable development is the environment, economy and society – in the literature, this division is called the scope of the assessment of sustainable development considerations. Breakdown of assessment issues are characterized by values and their stability. "Value" is the intrinsic merit of a resource or entity. Stability means ensuring that those values are maintained in a long term. For example, in the Environment assessment Value means the value of the resource and resource stability is the ability of its operation for a longer period. Evaluation of each of these ranges is the assessment for the final goal (end point) in the case of Environmental assessment of its condition. According to the considerations [4] easier to evaluate, because of the availability and accuracy of data, are interim targets (mid points), which are defined for the Environment as protected areas (Areas of protection). For example, the resource means that not only estimate the depletion of the resource is defined but its use within the building.

4 Reliability evaluation of existing tools

The considerations, so far, show that the problem of evaluation of sustainable development is the subject of research and discussion. In most countries the methods of assessment have research character. However, there are methods available in the market offered beyond the countries in which they were developed. These include the LEED and BREEAM schemes, which were globalized and, according to declaration of managing organizations, can be adapted to the conditions of any country. This adaptation involves, among others the administration of aggregated data, definition of local energy mix and emission rates derived from national statistical studies. In many countries, including Czech and Poland, such data are available for the whole economy or for sectors. In the specific case the emissions data from the local energy supplier can be used, but such data must be estimated using the technical documentation of power production. Estimates of emissions made up by professionals should be adopted in the framework of assumptions, and in addition must take into account local technological conditions. Energy mix is also important from the standpoint of the choice of technology e.g. in Polish conditions heat pump uses as much primary energy as a gas boiler, and it is more expensive. This is due to the fact that the ratio of primary energy input for electricity production in Poland is 3 (95 % of electricity produced from coal). In Switzerland, this ratio is about 1.5 that makes the primary energy consumed by the heat pump twice smaller than in the case of gas-fired boiler. Local conditions of energy are therefore influencing the selection of technological solutions in buildings, as a primary energy is often used as indicator in evaluation schemes. However, the general frameworks of assessments by LEED or BREEAM schemes are based on U.S. or UK standards, specific climatic and geomorphological conditions and local traditions, respectively.

It is also clear that examples of best practice from one country may not be in another place, and the best practices are contained in the so-called reference values. Taking into account only this fact the necessity of re-modeling of the reference values within the ratings is required. Although the LEED benchmarks are flexible enough that the building with 100 % of glass facade can be considered to be energy efficient in case of Poland or Czech.

Energy during the operation and the associated emissions are just one of many examples of difficulties in adapting assessment systems. Another is to estimate the embodied energy in materials, products and processes of the building. In the UK, this problem was solved by publication of method of determining environmental profiles [5]. Then a database of materials and construction products was created ENVEST2 [6], to which every producer could submit product (environmental declaration). In this way, more than 10 thousand were placed in a database. Using these data an environmental profile of the whole building can be developed. The ENVEST project took 10 years and was financed from the budget for scientific research. Therefore, estimation of the energy accumulated in materials in UK market is relatively simple. In Poland and Czech, there are just a few environmental declarations prepared for construction products, estimating embodied energy in such cases are biased with large uncertainties. The argument put forward by the bodies governing assessment systems is to use of available energy accumulated database developed in other countries, if the data is used consistently it can provide a relative assessment. The problem is that the primary energy (the most commonly used in these databases) depends on above mentioned energy mix, and this in turn may lead to erroneous recommendations of technology.

There is another reason for the carrying out of evaluations methods by BREEAM or LEED is burdened with uncertainty, it is a matter of weighing indicators. Well, these weights are determined by experts from the countries of origin of the method. Reflect the expertise and the perception of the main elements of discussion. For example, in countries where drinking water is difficult to access, the weight of water consumption will be assigned a high importance, in countries with large resources of its opposite. Both scoring systems have predefined weights; even if they are change to local preferences we do not know how this will affect the final assessment.

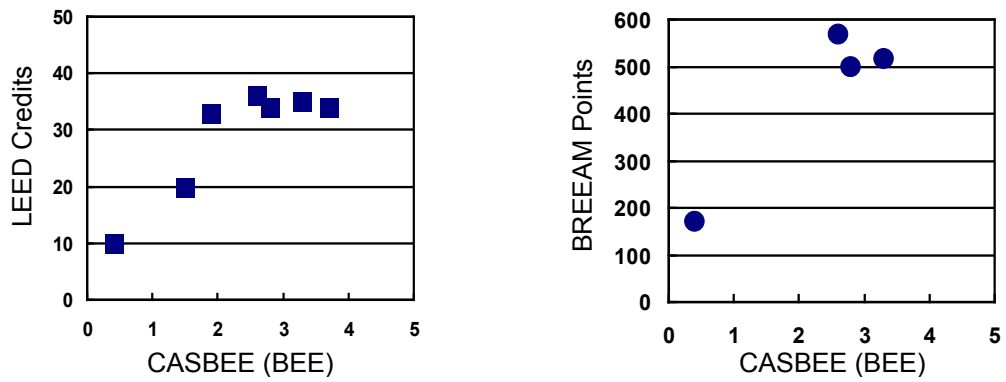

Fig. 1 *Comparison of assessments of the same buildings: CASBEE, LEED and BREEAM*

The cited systems were created in 90 BREEAM and in 98 LEED. The priority of this time was to assess the impact on the environment BREEAM, whereas the main goal of LEED development was promotion of American industry. Since then, the issue of methodology of assessment and also the standardization work extended the scope of assessment to the other elements of sustainable development. Although LEED and BREEAM were during this period updated several times, the environment is still the main objective of the evaluation. LEED structure is very similar to BREEAM; six of the eight assessment categories of LEED correspond to categories of BREEAM, with minor variations of names. Both systems have one level of assessment category, which distinguishes them from the most recent proposal of evaluation methods. There are other few differences such as e.g. the LEED category accounting regional differences can provide extra points by allowing the choice of indicator which may have special significance. Such extra indicator can be taken from the pre-defined in LEED, but it is not possible to define their own one.

The differences between each method can be seen by analyzing the results of the assessment made for buildings located in Japan using three methods LEED, BREEAM and CASBEE. Figure 1 shows that the assessments made by different methods are different. So, what is really measured by performing an assessment, what is the purpose of such assessments, whether their performance will improve the quality of buildings and will contribute to satisfy the requirements of sustainable development? How reliable are such assessments?

5 Summary

The aggressive marketing policy by management organizations of LEED and BREEAM systems makes more and more buildings assessed with their participation. This is not so

much due to market needs but due to investment policy of investing entities (some funds internal policy states that only green building can be subject of their investment projects). Trainings are worldwide offered and graduates acquire the following week course and passing the right to perform evaluations the title of Certified Assessor.

Ratings are broad disciplinary in scope and require the work of a team of specialists; assessor role is to coordinate the evaluation process. Another issue is the considerable cost of making the assessment. In these cases, the question whether such expenditure is justified and what in return gets the client. It seems that in our case, the promotional activities. Although the decision of the evaluation at the design stage can help designer to draw attention to an important practices and overlooked specific aspects of the building. Appraisal systems can be treated as a list of issues that should be considered in design, construction, operation, or demolition processes of a building. There are also widely available such ratings systems developed in Poland as EKO ITB (Polish Building Research Institute) or E-STEP (SBTool spin off) developed at the Warsaw University of Technology.

The Czech Republic followed the international group Green Building Challenge since 2005 and participated on development of international assessment framework SBTool. The research centre CIDEAS at the Czech Technical University in Prague in cooperation with International Initiative for a Sustainable Built Environment (iiSBE) provides a localized national version of the tool called SBToolCZ [7] for wide usage in building practice in the Czech Republic. SBToolCZ provides assessment method for design phase, which shows potential improvements of building design in specific regional conditions of Czech Republic in Central European area. Methodology respects climatic conditions, geomorphology, material and technology basis, available local natural resources, population density, traditions and cultural aspects. SBToolCZ is not just an assessment methodology with a certificate as an output, but it is possible to use it also as a guideline for the better design of a building in a concordance with sustainable construction principles.

It is worth to mention SBTool system can be downloaded from www.iisbe.org is conceived as a system adaptable to the context of any country, like happened in Czech Republic, Poland, Portugal or Italy. However the adaptability attribute is expressed by all of recently develop systems.

Everyone interested in learning more about performance accountability ratings refer to the article [8], which described a case of the assessed building LEED, which proved to be not as good as was the score.

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