

SUSTAINABILITY ASSESSMENT OF BUILDING – TOPICS, TRENDS AND AREAS OF APPLICATION

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1. INTRODUCTION

In connection with applying the principles of sustainable development in the construction and real estate industries, there is a great need for instruments and tools to support relevant actor groups both in integrating sustainability aspects in their planning and decision-making processes, and to support their sense of environmental and societal responsibility. In response to this need, systems will be and have been developed and used to describe, assess and pre-sent the contribution of single building structures to sustainable development.

The state of development, introduction and use of assessment and certification systems varies greatly from country to country. On one hand, some orient themselves to international systems, while others have developed or will develop and implement national systems or other system models. The growing number of such varied systems makes orientation and using results difficult.

The current need to further develop existing systems offers an opportunity for harmonizing the contents of these various systems while preserving the relative independence of existing systems. The need for further development arises from the following factors:

- the need for a crossover from just observing the ecological and social dimension of sustainability to a total and complex treatment of all aspects of sustainability. This requires an integration of economic, technical, design and urban development related aspects into the methods and tools of sustainability assessment
- the need for methodical further development through a reorientation from previous mainly qualitative assessments based on real estate features to a mainly quantitative as-

essment based on life cycle impact assessment results and life cycle costing

- the need for acceptance and consideration of the state of international and European standardization
 - changing the character of using sustainability assessment results away from a mainly marketing and image-driven approach to integrating sustainability assessment results into typical decisions and evaluations (value appraisal, risk analysis, financing, portfolio management).
- This article will address the state of standardisation as well as typical cases of applying sustainability assessments in order to provide indications and suggestions for further developing assessment and certification systems.

2. STATE OF STANDARDISATION

The subject of international and European standardisation are issues covering the description, assessment and presentation of the contribution of single building structures. For example, the works of ISO TC 59 SC 17 *Sustainability in building construction*¹ and CEN TC 350 *Sustainability of construction works*² accompanies and is reflected in the DIN Standards Committee's NA 005-01-31 AA *Sustainability in Building Construction*. Regular reporting takes place on the results of research that follows along standardisation activities³. ISO 15392:2008 *Sustainability in building construction – General principles* and EN 15643-

¹ Also see http://www.iso.org/iso/iso_technical_committee?commid=322621

² Also see <http://www.cen.eu/CEN/sectors/technicalcommitteesworkshops/centechinicalcommittees/Pages/default.aspx>

³ Also see <http://www.nachhaltigesbauen.de/normung-zur-nachhaltigkeit-im-bauwesen/grundlagen-und-ziele.html>

1:2010 *Sustainability of construction works – Sustainability assessment of buildings – Part 1: General framework* already indicate standards that provide key basic principles and formulate approaches and requirements. In the near future, these will be supplemented by further standardization sections within series of standards. An intensive observation and evaluation of this development is recommended. By using the example of EN 15643-1, the principal approaches of a sustainability assessment for single building structures can be described. The starting point is the requirements the building must have – here also see Figure 1. Requirements stem from user needs and are often formulated in the client / contractor's tender specifications. Requirements also stem from the legal requirements, which normally involve functional and technical specifications. However, already at the stage of developing a project definition, additional requirements involving economic quality (e.g. in the form of a budget), environmental quality (e.g. in the form of requirements to perform below respectively applicable energy saving regulations) and/or social quality (e.g. in the form of a required level of customer satisfaction) can be defined. The “functional equivalent“ can be developed from the requirements for technical and functional quality. This serves to describe the object to be evaluated and ensures a comparability of results. Comparing the results of a sustainability assessment is only permissible when the functional equivalent is correspondingly consistent. This is particularly the case with design variations (designed solution). The description of the functional equivalent is to be included in the sustainability assessment documentation of buildings and the results (also see the right section of Figure 1).

As seen in the left section of Figure 1, the object of the assessment is either a designed solution or an existing building. By doing this, the basic principles and processes of a sustainability assessment can be used in the planning of new buildings, the planning of modernisation or retrofitting activities, or assessing existing buildings. The starting point is the description and compilation of technical and functional features and characteristics. The level of consistency between the requirements for a building's technical and functional quality and its actual features and characteristics must be tested (performance testing), evaluated and presented in a separate assessment report using suitable methods – also see the right section of Figure 1.

The actual sustainability assessment in a narrower sense as found in EN 15643-1:2010 contains a treatment of the ecological, social and economic dimension of sustainability. Part 1 of the series concentrates exclusively on basic principles and general conditions and goes on to refer to subsequent standardisation subsections. Section 1 provides suggestions for system limits, describes the functional equivalent, how to

record the entire lifecycle and the requirements for documentation and reporting.

A correct sustainability assessment can only be found if all three dimensions are covered. The results are to be presented in a report arranged into sustainability dimensions. A building's compliance with requirements for ecological, social and economic performance standards and building quality can be checked, evaluated and presented separately as far as these criteria were already provided in the project definition or tender specifications.

The remaining results and intermediate results of international and European standardisation determine the type of development, application of assessment criteria and principal approaches in describing and evaluating the ecological, economic and social qualities of single buildings. There are no requirements provided for an assessment in the sense of declaring benchmarks.

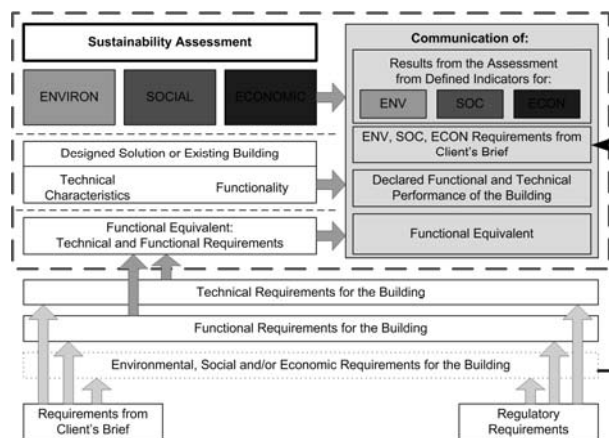


Figure 1: Concept of a sustainability assessment for buildings (EN 15643-1:2010)

3. RECOMMENDATIONS FOR A NEXT GENERATION OF ASSESSMENT SYSTEMS

Many existing assessment systems face a transition from an approach that is predominantly focused on environment and health issues of buildings, which we refer to here as a first generation system with bottom-up approach, to an approach that encompasses all sustainability issues. Furthermore, they evolve from a predominantly qualitative approach based on building characteristics to a quantitative, performance oriented approach, which is based on LCC and LCA. This can be driven by a need to restructure and adapt existing systems to emerging standardisation, for which recommendations are given in the following section.

Existing indicator-driven "bottom-up approaches" often do not cover the full range of sustainability issues. In particular the following problems were found:

- indicators often do not cover the full range of sustainability issues,
- indicators may be overlapping and
- indicators may be of different value in terms of significance.

Using a top-down approach ensures that all current key issues are given due consideration. By covering the full breadth of sustainability issues, the likelihood is increased that all concerns of various stakeholders are covered. At the same time, the necessary complexity of a sustainability system that implements the key principles of sustainability and all related aspects is met. The point of departure for developing any assessment system that follows a top-down approach are the certain overarching concerns that are being addressed. These concerns are often referred to by the term "areas of protection", which is commonly found in literature on life cycle analysis (LCA).

It is recommended that the subjects of concern should follow the three "dimensions" of sustainability: the environmental, economic and social dimension. Different stakeholders may have different interpretations of these three dimensions. However, since this is the starting point for all sustainability assessments, a common definition should be determined. At a generic level each dimension can be seen in terms of the actual value of each subsystem and its stability (in relation to trends resulting in future positive or negative changes), leading to the following high-level subjects of concern:

- Environmental values (e.g. resources, biodiversity, clean air, clean water and soil)
- Stability / health of environment / ecosystem
- Social and cultural values (including health and comfort)
- Stability of the social systems / social equality
- Economic values
- Stability of the economic systems / economic prosperity

In this context "value" is the intrinsic merit of a resource or entity. Stability means ensuring that these values will persist long term, that their state is robust. It is necessary to know the actual value of each subsystem and its stability (in the form of trends) to predict its future values. For buildings this means, for instance, that not only should their ability to meet future technical and functional requirements be assessed, but also their adaptability to anticipated future regulatory demands regarding environment and health.

4. AREAS OF APPLICATION FOR A SUSTAINABILITY ASSESSMENT

The following sections present and discuss the possibilities of application, the process and the results of a sustainability assessment. The various options are interpreted as additional benefit, which transcend awarding the contributions of an above-average single building and move into the realm of sustainable development. The opportunity to open up this kind of added value presumes that systems being used that all fully cover topics involving related aspects when describing, evaluating and presenting buildings' sustainability. The second generation of assessment and certification systems, for example, are included here. On one hand, these systems systematically derive criteria from protected natural resources and protected targets while following a top-down approach. On the other hand they also include economic performance factors in their descriptions and assessment along with the ecological and socio-cultural dimensions of sustainability.

The author sees the added value of processes and results of a sustainability assessment in the following points, among others:

- *Basis for developing an understanding of sustainability*
Within segments of the real estate industry, developing and formulating a specific understanding of sustainability tailored to an actor's own object of observation and evaluation has not yet been completed. An interpretation and application of the term sustainability remains ambivalent in part. Many concepts and approaches in the field of energy efficiency (low energy building, net zero energy building), compliance with environmentally-friendly and health safety standards (green building) and sustainable building planning, construction and operation make orientation and underlying content, assessment criteria and assessment standards more difficult. Developing and applying sustainability assessment systems would make orientation and opinion setting easier. The chance to view lists of criteria, as far as public availability is possible, would help clarify the complexity of sustainability and serve as a basis of understanding for interested parties.
- *Support of target setting and creating legal and contractual security*
A system of classification for describing and assessing a property's key features and characteristics with special reference to sustainability issues – as needed for forming the basis of a sustainability assessment – can in the sense of a checklist contribute to the understanding of key project targets for both the client and various contract partners. A checklist will initially en-

sure that a discussion of sustainability issues is complete. The assessment criteria listed would provide an orientation for the targeted quality issues, each broken down by levels of quality. This would support target setting for selected features and characteristics. A precise agreement between contact partners over agreed features and characteristics as well as the type and scope of verification and testing can contribute to improving legal and contractual security.

In relation to this, the author does not recommend a contractual agreement on the overall quality to be achieved (e.g. Gold or Silver), nor does the author recommend this to be the sole aspect regarding contractually-agreed quality. Rather, the sub-qualities must be defined and agreed on the basis of individual criteria.

- *Planning instrument*

One application within the planning stage occurs in terms of supporting the planning process by using a list of criteria to assist in properly embracing the complexity of sustainable planning and construction. Currently there are discussions about the extent to which concrete planning decisions are influenced by individual criteria or a system of assessment. From the author's perspective, decisions are in part influenced by the type of assessment process used (e.g. either accompanying the planning stage or taking place after the planning stage). During the initial phase of using sustainability assessment systems, the application of processes after the planning stage was typical. Planning decisions were mapped and evaluated using this approach. During application that takes place during the planning stage – something which now has become the normal case – an orientation to individual criteria or to an assessment system can have direct effects on planning. The criteria and assessment standards can be understood as target variables which must be realised using means of planning and construction. As a result, the criteria serve both to help set goals and to check whether the desired or agreed qualities are being achieved already during the planning stage.

On an international basis, the difference between the number of projects registered for certification and the number of properties actually certified indicates that during the planning stage there is an orientation to assessment systems without always achieving an actual certification. Important for further supporting this function is additionally developing documentation handbooks and creating concrete planning instructions for individual aspects based on the criteria lists. Suitable approaches must be developed for the early phases of planning and design competitions.

- *Support of quality assurance during planning and realisation*

An active contribution towards quality assurance in planning and realisation can be achieved by formulating project targets which affect, for example, aspects of property quality, and by checking whether targets are being reached. Here an assessment system is found in the form of a checklist.

- *Quality signal*

Providers can signal a building's quality to target consumers (buyers, tenants). A corresponding market demand is a prerequisite for this.

The signalling of quality and qualities is a means to overcome an adverse selection or to transition from a price competition to a quality competition. By describing, assessing and communicating qualities, target consumers are able to actively seek desired features (screening). Buyers, investors, tenants and consumers prefer this and it contributes to improved transparency. By presenting quality aspects, willingness to pay is awakened.

An active signalling of single property quality provokes the question of the quality of other properties on offer.

In the medium term, a type of standard for presenting key features and characteristics is formed, which should be generally used from the point of individual actor groups.

- *Signal of perceiving responsibility for environment and society*

In building, purchasing and using a property with a positive / above-average sustainability assessment result, a signal can be sent that environmental and societal responsibility has been acknowledged, public image can be boosted and reputational risk can be lowered.

In particular, the public sector on a national and international basis is highly interested in living up to its function as a role model and signalling and documenting the sustainability of properties it uses.

The same applies especially for large companies that are active in part on an international basis. These companies are often interested in internationally-recognized, prestigious systems or in finally harmonising the contents of existing systems, in order to ensure comparability. Current research projects (e.g. SuPerBuilding, OPENHOUSE), industry initiatives (e.g. SB Alliance) and standardisation (e.g. CEN TC 350, ISO TC 59 SC 17) support a development in this direction.

- *Information sources for third parties*
Information and assessment results can serve as sources of information for third parties such as appraisers, experts, banks, insurance companies etc. and can be made actively available and referenced by them. These parties are generally not interested in highly aggregated information. Instead, they want to select the information relevant for them and transfer it into their own systems (e.g. value appraisals and risk analysis). This places high requirements on the documentation quality and level of detail in describing and assessing buildings. This detailed approach is necessary, since not all aspects currently relevant to a sustainability assessment have a direct influence on value appraisal and risk evaluation.

The expert knowledge of participating actor groups (e.g. appraisers) can directly be incorporated into active collaboration in designing the information to be collected and passed on.

- *Basis for third party decisions*
In addition to its function as a source of information, information and assessment results can serve as an additional, supplementary basis and decision-making tool for buying, acquiring and leasing properties etc. This information can be integrated into financing and funding decisions. In particular, the following decisions may be supported:

- Purchase, leasing or acquisition
- Including properties into a sustainable real estate fund or green REIT
- Funding decisions
- Financing decisions
- Granting special conditions for financing and insurance

The results of a sustainability assessment are particularly important as a source of information and decision-making basis for third parties when these results cover regional and national requirements, special features, legal groundwork, calculation standards etc. Here there may be a possible conflict of aims involving an international comparison of results. Particularly for internationally positioned real estate funds, a suitable solution must be found.

- *Information source for own decision-making and steering processes*
Information and assessment results for single properties can be included in a company's own portfolio analysis and support portfolio management activities. As a result of this, within the real estate sector there is a growing interest in assessment and certification systems for existing buildings. These systems are also suitable for an analysis of larger portfolios of hold-

ings, respective of the type and scope of analysis efforts needed.

- *Component of sustainability reporting*
Information and assessment results for properties in a company's own portfolio can be integrated into the company's sustainability reporting and positively influence both the public perception and company's own image.

In summary, it can be determined that the sustainability assessment in various fields of application is useful, can fulfil various tasks and generate added value for individual actor groups. This is achieved particularly through synergy effects that occur by providing and using information and checklists to better handle the complexity of a sustainability assessment.

Different stakeholders use sustainability assessment systems and their outputs in various ways. Assessment results in particular should be prepared and presented to suit these stakeholders. Different types of results are:

- Fully aggregated results of the entire assessment (in the shape of a label or certificate)
- Partially aggregated results (results per criteria group, per theme group...)
- Assessment results for individual criteria
- The actual project information (documentation) supplied to fulfil individual criteria.

Results should be provided in a range of aggregation levels:

- Raw building data behind the assessment (e.g. energy consumption in kWh)
- Aggregated into an assessment result at indicator level (the score achieved for this indicator, e.g. in %)
- Aggregated results at indicator group level (the score or the percentage fulfilled across a sub-group of indicators)
- Aggregated results at main group level (the score for each of the main categories: environmental, social, economic, technical and location)
- Results aggregated into one main result.

5. OUTLOOK

With a growing use of sustainability assessment results for various cases, systems that address regional and national special features, general framework conditions and legal foundations will increase in importance. For systems used internationally, this means that minimally they will have to experience a local adaptation, at least in parts. With the current need for further development already present (e.g. adaptation to the state of standardisation) there is an opportunity to implement this

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