SUSTAINABILITY ASSESSMENT SYSTEM FOR UTILISATION AND OPERATION OF SINGLE BUILDINGS

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Summary

The sustainability of buildings can be influenced not only by decisions taken during the design and construction, but also by the nature of the utilisation and management. It is therefore necessary and appropriate to extend the scope of sustainability assessment to include a greater part of the life cycle. The systems for the description and assessment of the sustainability of individual buildings, which have been focused so far on new buildings, should therefore be supplemented by variations for the utilisation and operation phase.

The system module "Utilization and operation of existing office buildings" of the German Assessment System BNB is introduced. It is shown that this can be used to monitor the performance and continuous improvement of the building and its operation as well as for rough diagnosis of existing buildings prior to modernization and portfolio analysis of building stocks.

Keywords: sustainability assessment, existing building, operation, utilisation

1 The need for additional sustainability assessment modules

Systems for the description, assessment and certification of buildings were often initially developed for offices and for residential buildings. In recent years, many developers and providers of assessment systems have developed and introduced additional systems for other types of buildings and uses (e.g., hotels, shopping centres, educational buildings) to close existing gaps and to be able to assess particularly mixed-use buildings. At the same time, there is a recognisable trend to enhance the versions for the new buildings of selected types through modules that deal with the phase of operation and management or with the modernization or conversion of existing buildings. This is based on several reasons:

1) the implementation of principles of sustainable development requires the modification and further targeted development of existing building stocks through their adaptation, reconstruction, modernization or replacement.
2) The planned and implemented measures in new buildings require their performance to be monitored during the utilisation and operation phase. This is a prerequisite for the process of continuous improvement.

3) When preparing a modernization plan, the typical building diagnosis has to be expanded to include sustainability aspects. This additionally supports the option of undertaking “before and after” comparisons.
4) There is a need for fast and without much effort ways of assessing existing buildings in terms of their sustainability in the form of a rough analysis.
5) There is a need for ways of integrating sustainability issues into the portfolio analysis and of identifying and analyzing sustainability-related characteristics and features of large building stocks.
6) In case the building user or owner uses an environment management system, the sustainable building management is usually an important component of this. This requires a sustainability-oriented quality management of business processes, which makes possible for the operator to present his achievements in the field of environmental management to the owner or user in a transparent and objective way.

In principle, there is and should be no difference between the requirements for newly constructed and existing buildings. In this respect it is useful to keep all dimensions of sustainability into consideration. This also applies to the assessment criteria. The defined indicators can and should be different between new and existing buildings (e.g. energy demand versus energy consumption).

The article focuses on the notion of a module for describing and assessing the quality of building utilisation and operation in relation to sustainability issues. Specifically, applications in existing office buildings are discussed.

2 Perception of BNB-module “utilisation and operation”

BNB is the "Assessment System for Sustainable Building" that is used for government buildings. For other public buildings, it is just recommended for use. Upon the findings gained through research studies ([1], [2]) a module was developed and tested among others, which is to describe and assess the quality of building utilisation and operation in the use phase from the perspective of sustainability.

The module is in principle generally applicable, however, in terms of measurement standards and benchmarks it is initially provided only for office buildings. It draws on assessment elements and principles of new buildings. So it makes a distinction between a description and assessment of the quality of the object (inter alia based on consumption characteristic values and user satisfaction) and the quality of the operation processes. The indicators used are presented in Table 1.

The survey-based assessment of user satisfaction is newly introduced as part of the object quality. For this purpose, methods were developed and tested in separate research projects [3]. The identification and assessment of the amount of waste has been neglected. Although this indicator is used in comparable systems, from the perspective of the authors this is not considered as a building feature. Instead the behavior of users is actually measured. The applicable building feature "existence of possibilities of waste storage and separation" can already be examined in the design of new buildings. On the side of the concrete object quality the consideration of the operating cost is set aside. Due to large regional variations in prices for energy and water costs no reasonable generalized benchmarks can be formed. The comparison of project-specific target values and actual values was allocated to the process quality.

Basis for the assessment of the quality of the operation of the building is the presence of an appropriate management concept. New are e.g. the effects of cleaning process on the

environment and health. Great importance is placed among others on the existence of an actual object documentation (building certificate) and the active involvement of users. The management tasks (e.g. in the field of water, energy, costs) involve the determination of project specific targets, an ongoing monitoring with comparison of target and actual figures, the development of proposals for improvement measures including monitoring of their implementation and success.

Tab. 1 *The concept of the indicators*

Actual object quality	Process quality
Energy consumption	Management of user satisfaction
Greenhouse gas emissions	Energy- and water management
Water consumption (potable water)	Cost controlling (operating cost)
Indoor air quality and hygiene	Inspection, maintenance and safety precautions
User satisfaction (based on survey)	Cleaning technology and products
	Management of technical operation
	Object documentation throughout life cycle
	Information and motivation of users

3 Assessment and assessment results

Internationally, a clear trend towards developing and using assessment possibilities, systems and tools for the use phase of buildings is recognizable. Frequently only a few parameters such as energy consumption, water consumption, etc. are detected that can be usually assigned to, but do not completely cover, the environmental dimension of sustainability. However, when focusing on the use phase, where the parameters are easily understandable, topics, such as environmental and health compatibility of integrated building products or LCA, are omitted. Therefore, in overall not all vital issues for a sustainability assessment are addressed. The authors oppose explicitly the attempt to assess the sustainability of existing buildings by covering only a few parameters from the use phase. Therefore, the results of the BNB module will be not specifically used to assess the sustainability of the building in a broader sense. The module will be used either (individually or as part of a portfolio analysis) for a rough diagnosis before a modernization project, the ongoing monitoring of existing buildings, including the use and operation processes, or for monitoring the success of any new construction or retrofitting. With that said, on the one hand the outcome of the sustainability assessment of a new building or a renovation project can be completed and approved in terms of a performance monitoring or on the other hand, the quality of the management processes and their impact on the structure can be assessed. In this way not only the quality of the structure but also the quality of its operation earns recognition, which is essentially marked by the utilisation and operation processes. For presenting the quality of the building operation secondary requirements in relation to the total object quality need to be always considered, such as optimal energy consumption, appropriate energy quality of the building, etc. Whether and to what extent a low building performance in the use phase has consequences on the sustainability certificate obtained earlier at handover is still under discussion.

4 Analysis options

Results from the observation and monitoring of existing buildings constitute a great source of experience and form the basis for the development of characteristic values for the

planning and assessment (benchmarks). In the BNB-module utilisation and operation parameters are recorded such as the energy and water consumption, the operational cost and others. Part of the system is the duty of passing on of this information to a central spot for data analysis. In this way, a data pool is set up with information on the behaviour of public buildings in the use phase and is made available.

5 Outlook

At present the first experiences of the application and analysis of the BNB-module "utilisation and operation" are still gathered based on first demonstration projects and tests. The continued progress and results are regularly reported. The information is available at www.nachhaltigesbauen.de.

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References

[1] Bundesministerium für Verkehr, Bau und Stadtentwicklung – BMVBS – Berlin (Auftraggeber); Bundesinstitut für Bau-, Stadt- und Raumforschung – BBSR – Forschungsinitiative 'Zukunft Bau', Bonn (Herausgeber); LÜTZKENDORF, T., Karlsruher Institut für Technologie – KIT – Lehrstuhl Ökonomie und Ökologie des Wohnungsbaus (Ausführende Stelle); Forschungsprojekt 10.08.17.7–08.19, November 2010: *Transferring the Assessment System Sustainable Building (BNB) for Office Buildings to the Building Stock* WWW:http://www.bbsr.bund.de/cln_032/nn_340582/BBSR/DE/FP/ZB/Auftragsforschung/2NachhaltigesBauenBauqualitaet/2010/UebertragungBNB/01__start.html?__nnn=true

[2] Bundesministerium für Verkehr, Bau und Stadtentwicklung – BMVBS – Berlin (Auftraggeber); Bundesinstitut für Bau-, Stadt- und Raumforschung – BBSR – Forschungsinitiative 'Zukunft Bau', Bonn (Herausgeber); THIEL, D., EHRLICH, M., MARONDE, Y., Schmidt Reuter Integrale Planung und Beratung GmbH (Ausführende Stelle); Forschungsprojekt 10.08.17.7–11.29, 15.10.2012: *Assessment System for Sustainable Building – testing of the moduls "Existing Buildings/ Refurbishment" and "Use and Operate" for existing office buildings* WWW: http://www.bbsr.bund.de/cln_032/nn_340720/BBSR/EN/RP/FutureBuilding/2SustainableBuildingQuality/2012/BNBTesting/01__Start.html

[3] WAGNER, A. , Karlsruhe Institute of Technology – KIT – funded by the the research programme "Future Building", German Federal Ministry of Transport, Building and Urban Affairs (SF – 10.08.18.7-10.8), November 2011: *Occupant satisfaction as an indicator for the socio-cultural quality of sustainable office buildings* WWW: http://www.irbnet.de/daten/kbf/kbf_e_F_2813.pdf