



Short Study

Potentials of Sustainable Building and Construction in Germany:

Analysis of International Structures



Universität Stuttgart
Lehrstuhl für Bauphysik (LBP)



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Potentials of Sustainable Building and Construction in Germany: Analysis of International Structures

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1 Introduction

The topic of „Sustainable Building and Construction in Germany“ is pushed ahead by various activities and groups in this country at present, while different motivations, objectives and backgrounds are of significant importance. Yet the standard of quality of stakeholders and individual actors concerning the concept and previous solutions for implementation can be principally regarded as very high.

Experience shows that buildings, which were constructed according to the criteria of sustainability, have many advantages in comparison to conventional buildings. The most important factors are:

- lower life cycle costs and insurance contributions
- higher value of real estate and higher productivity
- enhanced image
- lower risks
- better influence on the health of residents and users
- reduced effects on infrastructure, environment and local economic structures

To realize sustainable construction in Germany and to promote design and execution considering the principles of sustainable construction, an adequate system and structures must be established, pooling previous activities and involving all actors.

To realize this end it is suggested to establish an organisation, which is active under the umbrella organisation of the World Green Building Council (World-GBC) and orients itself to the principles, as well as reflects and addresses German framework conditions with regard to solutions.

The success of this kind of organisation form in other countries proves that it is this way, which must be followed in Germany, too, meaning

- to channel the flow of activities and
- to implement them in the activities of an organisation for the entire German building sector.

The most important implementation tool is an assessment system for buildings, simple to apply, offering scope for business models, promoted by industry, as well as comprising previous progress and future development.

The assessment system for buildings proves for owners or users by means of a certificate that design and execution strictly followed the criteria of sustainability and that the building complies with the objectives of sustainable construction.

There is need for further action now: The challenges caused by the climate change and this year's German Presidency of the EU Council emphasize the roll of the building sector in the present discussions on sustainability.

This short study summarizes:

- **which activities** with similar objectives are successful in other countries and
- **which requirements** do exist for sustainable construction in Germany.

The study aims at providing background knowledge and analysing requirements to pave the way leading to a successful implementation of sustainable construction in Germany.

2 Background

2.1 The Organisation Form of Green Building Councils

During the last five years we observed a worldwide enormous expansion of the sustainability movement in the building sector. This is partly due to a continuously increasing knowledge of global climate changes as well as to a rising consciousness of the great contribution of buildings in the total energy consumption of a country. This may explain the pioneering roll in countries with high energy consumption.

The foundation of the World Green Building Council (World-GBC) was for the first time announced in Nagoya, Japan in 1998 to coordinate and push ahead the work of national GBCs. The World GBC is granting assistance in the worldwide development of standards, technologies, products and projects. It is also considered to be an apolitical global forum for discussions on sustainability in the building sector.

The vision of the World GBC is:

„The peak global not-for-profit organisation working to transform the property industry towards sustainability through its members national GBCs“

As a non-profit organisation and worldwide leading institution for national members the World GBC aims at promoting the real estate sector towards sustainability.

The World GBC expresses as direct objectives of its foundation the provision of technical knowledge and progress of country-specific information on sustainable construction as well as the dissemination of technologies and design practices for sustainable construction. Moreover, one of the most important objectives of the World GBC is to try to win members worldwide, including developing countries.

Besides assistance and promotion, the World Green Building Council (World-GBC) also provides guidelines for the foundation of further Green Building Councils. The guidelines suggest that the membership should reflect the national geographic environment as well as a multitude of actors. The US GBC, for example, has more than 7,200 members at present with a tendency to rise. Already existing national GBCs are funding themselves by individually graded membership fees and are well accepted and assisted by the building industry.

The World GBC currently comprises nine member countries with their own Green Building Councils (Australia, India, Japan, Canada, Mexico, New Zealand, Taiwan, US, United Arab Emirates) and other countries, working for the foundation of their own GBC.

For further information see: www.worldgbc.org

2.2 Sustainability of Buildings in the Focus, Assessment Systems of other Countries and Success Factors

In the last few years, various successful assessment systems for buildings were developed worldwide and expanded via the umbrella organisation of the World GBC. Among them are:

- BREEAM Building Research Establishment Assessment Method (England)
- CASBEE Comprehensive Assessment System for Building Environmental Efficiency (Japan)
- HQE Haute Qualité Environnementale (France)
- LEED Leadership in Energy & Environmental Design (US)
- LEED Canada (Canada)
- Green Star (Australia)
- Green Star NZ (New Zealand),
- TGBRS TERI'S (The Energy and Resources Institute) Green Building Rating System (India)

Many assessment systems are based on other systems (e. g Green Star and LEED on BREEAM), and further developed or adjusted to national specifications. The relative profit of the various assessment systems is widely discussed among users and scientists. As a matter of fact, consensus on the 'best system' cannot be achieved, as comparability frequently neither exists nor is an objective of application of the systems anyhow. But from the point of view of planners and architects there are numerous possibilities to achieve the desired effect, to measure and assess the generated effect in order to allow a presentation to investors, owners and users of buildings.

Four assessment systems for buildings are described in short in the following passages. The table in the annex lists the systems for a better overview.

BREEAM (England)

BREEAM was designed, monitored, distributed and further developed by BRE (Building Research Establishment Ltd.). The BREEAM assessment scheme is available for offices, industry, schools, law courts, prisons, multi-family houses, hospitals, houses (ecological houses), already existing housing estates and residential houses.

BREEAM awards an ecological seal of quality after testing the building performance with regard to a series of ecological categories. These categories assess the impacts of the building on the environment at a global, regional, local and indoor level. Pre-defined points are allocated for certain performance criteria.

Thus, architects and planners are encouraged to observe categories and performance criteria as soon as possible to enhance the chance for a good BREEAM assessment.

Points are principally allocated in each category, but the combination is playing an important role as well. Different ecological weighting allows the combination of points to make up a total assessment amount. This number of points achieved is expressed as general evaluation and classified in the categories of „perfect“, „very good“ and „good“ or „average“. The building can be classified in this scale and the certificate can be used by the owner for promotion. Until now, approx. 65,000 buildings were certified according to BREEAM and 270,000 were registered.

For further information see: www.breeam.org

CASBEE (Japan)

The JSBC (Japan Sustainable Building Consortium) developed CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), which classifies the ecological performance of buildings in an application-related way.

CASBEE was designed according to the following guidelines:

1. The systems are to be structured in a way that high ratings of paramount buildings are achieved to increase the incentive for architects and others.
2. The assessment system should be as simple as possible.
3. The system should be applicable for a multitude of buildings.
4. The system should include specific tasks and problems of Japan and Asia.

CASBEE comprises four assessment tools corresponding to the life cycle of a building: CASBEE for design, new buildings, existing buildings and renovations. Each tool is designed for separate application with a specific goal of utilisation as well as for various applications (office buildings, schools, residential buildings etc.). Within the near future, CASBEE will be used in the life cycle of buildings on a national level to promote sustainability in the building sector.

For further information see: www.ibec.or.jp/CASBEE/english/index.htm

HQE (France)

Growing ecological requirements in offers and building proposals show that in France the demand is rising for applying „HQE practices in construction. The French HQE (Haute Qualité Environnementale) corresponds to the usual rules, reflecting experience with HQE.

The approach of HQE aims at promoting ecological rethinking and optimisation with the clients (building owners and building contractors). This is a completely voluntary approach to include ecology in the logic of all persons involved.

The HQE method has been tested in building projects since 1994 (residential buildings and other building constructions) and was finally structured by the HQE Association in 1997. The scheme has 2 dimensions:

1. the ecological management of building projects,
2. the sustainable building design assessing more than 14 aspects involved, from „Property and Construction“, „Management“ (operative phase) to „Comfort“ and „Health“ of users.

The knowledge of ecological impacts of building products is based on an EPD (Environmental Product Declaration) and a selection is recorded in the ecological criteria. This is also necessary with regard to health aspects (e. g. emissions and indoor air). HQE covers three phases: order, design and realisation. Audits are carried out at the end of the three phases. At present, 25 projects are certified, 17 private and 8 public buildings.

For further information see: www.assohqe.org

LEED (USA)

LEED is an assessment method, developed by the US GBC to assess sustainability, when designing a building, and to integrate the objectives of sustainability. This is a voluntary national standard, based on a general vote. LEED is aimed at creating a 'healthier' environment and more efficiency concerning resources.

The members of US GBC, representing all sectors of the US building industry, developed LEED on the basis of BREEAM and continue further development. The objectives of LEED are to define sustainability by means of a conventional standardized assessment system, to promote integrated and holistic design practices, to reflect the pioneering role of the building industry concerning ecology, to initiate competition with regard to sustainable construction, to improve the consciousness of consumers as concerns the profit of sustainable buildings as well as to modify the market towards sustainability. The LEED system can be applied in three different ways to improve the sustainability of a design for a building.

- LEED may be interpreted as design guideline for a planning team to integrate ecological criteria in the design of a building.
- LEED assessment reports allow clients and other stakeholders to prove that ecological criteria are integrated in the design.
- The design for a building can be certified by a US-American or Canadian Green Building Council.

The LEED guidelines were accepted by 50 US federal states (most frequently applied in California). Since the beginning in 2000, more than 1,400 projects with different assessment stages have been registered. Until now, the market is dominated by administrative buildings or buildings for the government as well as by the non-profit sector (approx. 75 % of all LEED-registered projects). Office buildings, schools and university buildings are most frequently assessed by LEED. The assessment schema allows a classification in „certified“, „silver“, „gold“ or „platinum“ awards.

For further information see: www.usgbc.org/LEED

Success Factors of Assessment Systems

Summarizing all existing assessment systems, with the leading role of LEED in the US, the following success factors can be derived:

- **Channelling:** The US GBC united the US Green Building movement by means of the assessment tool LEED, which was established on the market, and channelled activities.
- **Simplicity:** Successful assessment systems can be easily applied and the results of the assessment may be simply communicated.
- **Business Models:** In line with the activities of the non-profit organisation of US GBC, a market evolved offering opportunities for various business models for the actors in building industry.
- **Demand:** High-light projects stimulated the demand for certifications by means of assessment tools.

2.3 Sustainable Construction in Germany

At present, actors are trying in Germany to cope with the topic of sustainable construction by means of many individual approaches and only a few pooled activities, by a multitude of methods and guidelines. The scope is as wide as there are opinions on the correct concept.

Actors may be found in all sectors of the building industry: Planners and architects, industry, policy and science. In December 2001, the Round Table for Sustainable Construction was founded and is now an institution, which was established by the BMVBS to regulate sustainable construction of the German government. Representatives of associations of the building industry, of building administrations and of academia discuss the general guidelines of sustainable construction as well as the studies on the topic, and try to integrate the results in the implementation in the construction processes of the Federal Government.

The scope of **implementation concepts** for sustainable construction is as wide as the ideas and possibilities of the actors involved, comprising

- concrete (technical) concepts of architects and planning teams addressing specific problems of sustainability in their designs or realize the „Green Building concept “ according to their own rules,
- results of scientific work transposed into application tools and planning instruments, and
- activities in building industry to communicate the sustainability of products on the basis of indicators.

As already mentioned in the introduction, the standard of quality concerning the contents of the concepts is generally very high. So far, neither a consensus could be found on sustainability indicators as a parameter for sustainability, nor is there any agreement on the calculation method to be applied for the assessment of buildings. A very successful instrument of industrial stakeholders is the environment product declarations (EPD) according to ISO 14025, addressing an important aspect of sustainable construction.

But a widespread implementation of sustainable construction and a successful modification of the market did not result in more sustainability in German so far, despite many discussions among the various groups involved, the existence of technical concepts and a solid scientific basis to define objectives.

Yet the potentials for a successful and appropriate implementation are particularly high in Germany, as the following factors are playing a significant societal role:

- great responsibility
- availability of technical solutions
- carefulness
- preservation of values

3 Summary and Perspective

A consequent pursuit of sustainability in building in Germany is necessary, if building industry, architects and planners, investors and users of buildings want to achieve an economic, environmentally friendly, healthy and secure construction.

The prerequisites for implementation in this country are very favourable. Germany is a country, where there is great expertise for solutions and a high motivation of stakeholders to change the situation with regard to ecological and social significance. The building industry is gaining in importance especially as concerns the more aggravated situation to achieve more effectiveness in climate protection and to reduce dependence on resources.

Other countries tried to promote sustainability in construction by means of an assessment system for buildings. The LEED system proved to be very successful especially in the US. The success factors are: channelling of activities, simplicity in applying assessment systems, opportunities for business models, stimulation of demand via „high-light projects“.

To improve the situation in Germany and to get building industry to contribute to achieve German sustainability objectives, adequate structures and systems must be established. An organisation should be established under the umbrella organisation of the World Green Building Council, acting as national institution to promote the design and construction of sustainable buildings as well as to assist the movement of sustainable construction. Experience in other countries and especially the identified success factors of actual activities serve as an excellent basis for the establishment of an organisation, which is successful in Germany.

There is already initiative for necessary action. The objective is to implement sustainable construction in Germany successfully. Pooling the power of all stakeholders is a first important step to move the building industry towards effective sustainability.

There is necessity as well as feasibility.

Annex

Assessment system	Assessment	Application in the planning process	Most important categories
BREEAM (England)	<p>Measurement of sustainable performance of a building</p> <p>Assessed according to various criteria results in a total number of points</p> <p>„Pass, good very good, excellent”</p>	<p>Guideline for the design team during the design and management process</p>	<p>Management aspects (general procedure), health and comfort (indoor and outdoor aspects), energy (energy for operation and CO₂ emissions), water (consumption- and loss-related aspects), materials (ecological impacts on materials used), property ecology (aspects of the ecological value of a property), pollution (aspects of air and water pollution), transport (CO₂ emission and local influences), land use</p>
CASBEE (Japan)	<p>Check system for self-assessment</p> <p>Assessment is based on the specification of design and performance to be expected</p> <p>Environmental efficiency of a building (BEE= Q/L)</p> <p>The higher Q and the lower L, the higher is the efficiency and sustainability of the building</p> <p>“S (excellent), A, B⁺, B⁻, C (poor)”</p>	<p>Applicable in any phase of the life cycle of a building, design, construction, operation and renovation, demolition</p>	<p>Energy efficiency, efficiency of resources, local and indoor environment</p> <p>Q (Quality): ecological quality of the building and performance (indoor quality, operational quality, environment)</p> <p>L (Loadings): ecological impact of the building (energy, resources, materials)</p>

<p>HQE (France)</p>	<p>Certificate: „NF Batiments Tertiaires-Demarche HQE“</p> <p>Technical procedure with 2 certifications:</p> <p>1.SMO (management system during the procedure)</p> <p>2.QEB (sustainable quality of the building)</p> <p>Criteria assessed according to:</p> <p>„Base, Performant, Très performant“</p>	<p>Three different phases of the procedure:</p> <p>order, design, construction with audits at the end of each phase</p>	<p>14 criteria: 7 environment- and 7 user-specific:</p> <p>eco-construction: harmonious relation of the building towards the vicinity, integrated selection of building methods and building products, building elements with minimized emissions</p> <p>eco-management: energy, water, waste, maintenance and operational management, to create a healthy and comfortable indoor climate</p> <p>Comfort: hygrothermal, acoustical, visual, odour-related comfort</p> <p>Health: quality of the premises, air and water quality</p>
<p>LEED (USA)</p>	<p>9 minimum conditions, 60 selective points in 6 categories</p> <p>minimum requirement: prerequisites and a minimum of criteria</p> <p>„LEED certification (26-32 points), LEED silver (33-38 points), LEED gold (39-51 points) and LEED platinum (52-69 points).“</p>	<p>Guideline to measure and document success in any phase of the life cycle of a building:</p> <p>design, construction, renovation, operation, maintenance and demolition</p>	<p>6 categories (5 key sectors for the health of human beings and nature): sustainable land (14 points), water efficiency (5 points), energy and atmosphere (17 points), materials and resources (13 points), indoor air quality (15 points), innovation and design (5 points).</p>