

A Comparison of Sustainability-Based Labels in Building and Construction

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Introduction

The topic of sustainable building and construction is becoming increasingly important, not only in politics but also in the private and commercial sectors. In the political context, sustainability with regard to buildings is often understood in terms of CO₂-neutral energy supply and reduced energy consumption. In this connection there are already a number of projects in progress which are based on CO₂-reduction. Such projects can be both national and international. Examples of national projects include: "100 communities for protecting the climate", "100 sports clubs for protecting the climate" and "CO₂-free State Government (*Landesregierung*) by 2020". An example of an international project might be: "CO₂-free inner cities by 2050". Projects of this kind are primarily focussed on CO₂-reduction. In the private and commercial sector the scope is somewhat wider in that not only the ecological balance of a building is important, but the economic and sociocultural aspects as well. Without such considerations it is not possible to speak of sustainable building. In addition, it is necessary to look at the way in which building materials are extracted and produced. Is this done in a sustainable manner? What about the infrastructure as a whole? Especially in the commercial sector this aspect can be of great importance. All this has led to the creation of different sustainability-based labels within the framework of the "World Green Building Council". The following pages will examine four well-known examples: Breeam, LEED, CASBEE and DGNB.



Figure.1: International Green Building Labels

1. BRITISH QUALITY SEAL BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

The British quality seal pertaining to sustainable building, BREEAM, is the best-known and, at the same time, the oldest of the four big names. It was developed by the "Building Research Establishment" (BRE) and first used for the assessment and optimisation of an office building in 1990. Shortly afterwards other concepts followed which were applied to residential and other types of buildings. In 2006 the first buildings were certified according to the BREEAM International Standard.

1.1 Structure of BREEAM

When BREEAM was first introduced in 1990, it simply comprised the planning, construction and use of the actual building. As from 2008 the entire life cycle of the building was considered, which meant including a number of other aspects, e.g. importance of environmental factors, thus creating a more sophisticated level of assessment.

The new level in itself incorporates a number of points which have to be considered in all certification processes:

- Management
- Energy
- Water
- Land use and ecology
- Health and well-being
- Transport
- Materials
- Pollution

All these categories are subdivided into various individual points, of which some are mandatory and others a question of negotiation. In addition, there is a so-called level of innovation, whereby all improvements not stipulated in the certification system can be recorded. The advantage of such a system is that it defines a minimum standard, fixes a points system and offers an incentive to devise new energy systems and techniques. Assessment of the single categories is based on percentage values

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whereas the building as a whole is rated as Pass, Good, Very Good, Excellent or Outstanding.

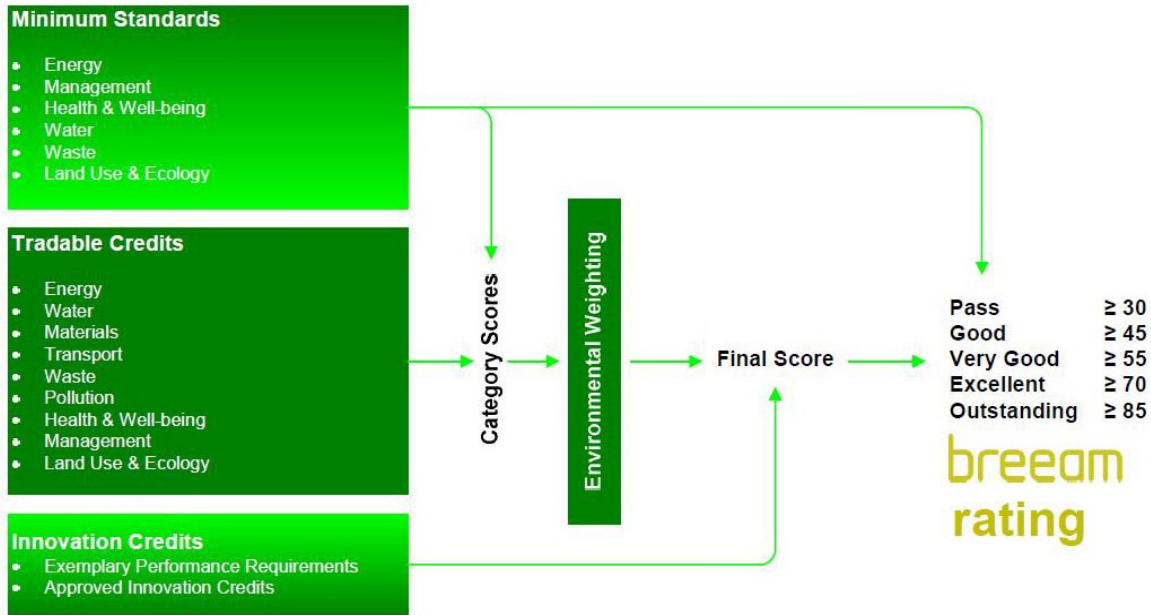


Figure 2: Assessment structure of the BREEAM certificate (Source: www.breeam.org)

For BREEAM certification to be successful the following procedure should be adhered to:

- a) The building must be classified according to the certification model. This step generally requires the support of a so-called BREEAM auditor who is familiar with the certification system and therefore can guarantee optimal procedures.
- b) The building is registered through an auditor.
- c) The auditor supervises the complete planning and building process and issues a provisional certificate, if required.
- d) On completion of the planning and construction phase the auditor files an application for certification.
- e) Once everything has been approved by the BRE, the official certificate is issued.

1.2 Which certificate for which building

The BREEAM certification system is subdivided into different types of buildings, the main purpose of which is to match certification with individual use. Thus the whole process can be carried out more accurately.

BREEAM Courts

BREEAM Prisons

BREEAM Ecohomes

BREEAM Ecohomes XB

Code for Sustainable Homes

The Code for Sustainable Homes applies to new residential buildings. It was first introduced in April 2007 in England and since 01 May 2008 has been

mandatory in many areas of the United Kingdom. In April 2007 the Code Ecohomes became the basis for assessing residential homes in England. The code is seen as a method of assessing the environmental standard of new houses and is based on Ecohomes of BRE Global.

The code itself subdivides buildings into seven key areas:

- Energy efficiency/CO₂
- Water efficiency
- Surface water management
- General waste management
- Household waste management
- Use of materials
- Lifetime of buildings

In these key areas there are some standards that have to be adhered to and some that are variable.

BREEAM Healthcare

BREEAM Industrial

With the help of BREEAM Industrial it is possible to assess factory buildings and workshops in terms of environmental effects concerning storage and distribution. In this context one distinguishes between “speculative” and “purpose-built”, depending on the relationship between the developer and the user. The term “speculative” signifies that the future user is unknown and thus the building has to have a multipurpose character, whereas purpose-built implies that the end-user is already known and consequently it is possible to carry out a more specific assessment with regard to production processes, storage, etc.

BREEAM International

BREEAM International is a system which is being developed and constantly improved outside the UK. As more and more firms are assessed according to BREEAM, new aspects are introduced into the certification process.

BREEAM Multi-residential

BREEAM Offices

BREEAM Retail

BREEAM Education

BREEAM Communities

This BREEAM certificate is a help to both planners and developers who wish to improve, measure and certify sustainability at the planning stage. In this connection special attention is paid to the surrounding area, e.g. distance from housing estate to businesses, shopping centres, schools and playgrounds.

BREEAM Communities assesses developments at the planning stage based on eight categories:

- Climate change and energy – flooding, urban microclimate, water use, renewable energies
- Community-oriented planning and development of the building zone, e.g. participation of future owners in decision-making processes, analysis of social-economic structure, communal involvement at all times
- Land development plan in relation to general structure, open spaces, social mix and illumination
- Planned certification of EcoHomes or Code for Sustainable Homes
- Transport and mobility – public transport, parking, pedestrians and cyclists, proximity of local amenities, traffic control
- Ecology – conservation, improvement, cultivation
- Use of land, water sources, composting of organic waste, noise pollution
- Competitive business, business activities, employment, types of firms

BREEM Domestic Refurbishment

This certificate deals exclusively with existing buildings that are in need of redevelopment or modernisation and thus have to be improved in terms of their sustainability. Such processes require a standard which can be applied to assess the respective environmental impact.

BREEAM Other Buildings

BREEAM Other Buildings comprises all those buildings which are not covered by any other certification process. In this connection it is possible for international companies to develop their own standards and to apply them at a later date to new buildings or redevelopment measures.

1.3 Training the auditors

In order to become a BREEAM auditor or be entitled to sign a BREEAM certificate, an individual needs approximately six months. Prior to the actual training, participants are required to attend a two-day seminar at BRE in England, the purpose of which is to become familiar with the different models of BREEAM certification and the basic principles behind the certification process.

This is followed by a three-month learning phase leading up to a test. The results of the test are published after about 14 days and the licence to certify is issued 4-6 weeks later.

2. AMERICAN QUALITY SEAL LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN: LEED

The American Quality Seal was introduced in 1998. It was developed by the U.S. Green Building Council (USGBC), which was founded in 1993. The USGBC is an association of engineers, architects, owners of buildings, financial accountants, manufacturers and government officials. The aim of the organisation is to bring about significant changes in the way of designing, constructing and using buildings.

USGBC has four main aims:

- a) Lower energy consumption
- b) Reduction of CO₂ emissions
- c) Reduction of water consumption
- d) Avoiding waste

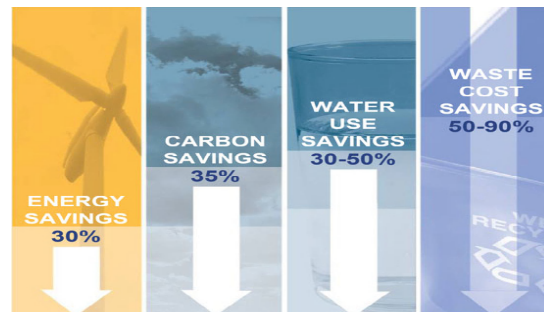


Figure.3: Aims of LEED (Source: www.usgbc.org)

2.1 Structure of LEED

Before LEED v1.0 could be introduced in 1998 the quality seal had to be adapted no fewer than five times. These adaptations were necessary because of the increasing number of considerations relating to the different kinds of buildings.

The chronological development was as follows:

- 1998: LEED v1.0
- 2000: LEED v2.0
- 2002: LEED v2.1
- 2004: Extended to include three new aspects
 - Interior work in offices

- Existing buildings
- Building shell
- 2005: LEED v2.2
- 2009: LEED v3.0

Before a building can be certified according to LEED, it must first of all be registered with USGBC. This entails the following costs: members of USGBC pay USD 900.00 whereas non-members pay USD 1,200.00. Once the building has been successfully registered, the certification process can begin. To begin with, a number of documents have to be drawn

up and presented to USGBC. This constitutes the basis for calculating the costs of certification. The costs themselves depend on the type of building and its surface area. They may range between USD 2,200.00 and USD 22,500.00. Since 2008 certification procedures have been coordinated by the Green Building Certification Institute (GBCI), which, in turn, commissions third-party organisations to carry out the actual certification. This helps to guarantee a rapid and uniform process worldwide. When the individual phases have been successfully completed, the certificate is issued.

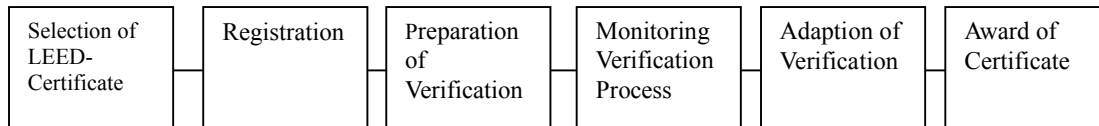


Figure 4: Project Certification LEED

Certification can be carried out either online or with the help of an Excel sheet. The auditor awards points in line with certain criteria. Altogether a total of 100 points can be achieved in the standard categories. In addition to the standard points, which are awarded for

all kinds of buildings, it is also possible to gain up to ten bonus points for particularly innovative ideas. The following diagram illustrates the different categories for which the 100 standard points are awarded.

Distribution of LEED-award

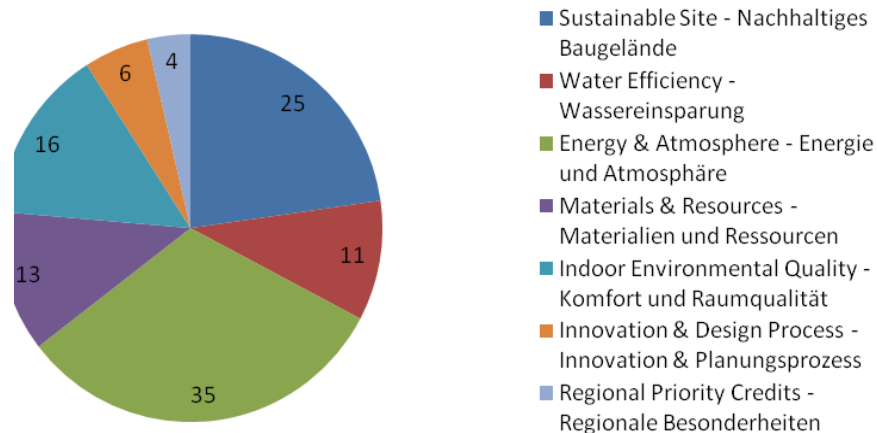


Figure 5: How points are awarded according to LEED

Final evaluation is split into four different rankings:

- LEED Platinum is used for buildings that have more than 80 points.
- LEED Gold is used for buildings that have between 60 and 79 points.
- LEED Silver is used for buildings that have between 50 and 59 points.
- LEED Certified is used for buildings that have between 40 and 49 points'

Figure 6: LEED certificates (Source: www.usgbc.org)



2.2 Buildings qualifying for certification

At present (as of August 2010) there are seven different kinds of LEED certificates, each of which applies to the specific purpose of the building and/or the respective surroundings.

- LEED for New Construction**
- LEED for Schools**
- LEED for Core and Shell**
- LEED for Existing Buildings: Operations and Maintenance**
- LEED for Neighbourhood Development**

LEED for Neighbourhood Development combines the basic principles of urban growth and environmentally friendly buildings to create the first nation-wide system of neighbourhood design in the UK. The LEED certificate incorporates independent surveys indicating that the plans for extending an urban area are acceptable in terms of development and design and that there is a high degree of environmental sustainability. The certificate itself was worked out jointly by USGBC, the Congress for Urban Development (*Kongress für Stadtentwicklung*) and the Council for the Protection of Natural Resources (*Bodenschätze-Verteidigungsrat*).

- LEED for Commercial Interiors**
- LEED for Retail**
- LEED for Healthcare**
- LEED for Homes**

LEED for Homes applies to the certification of apartment houses, especially buildings which have been constructed in an effective manner with a high degree of sustainability.

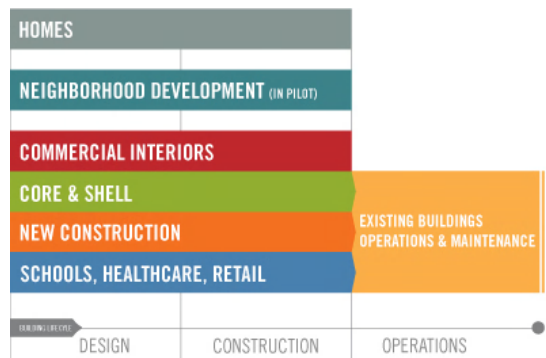


Figure 7: Assessment criteria for LEED programmes (Source: www.usgbc.org)

With the help of all these methods of certification it is possible to assess nearly every kind of building. The following figure shows the individual phases which are important for the certification procedures.

2.3 Training the auditors

The training programme for the auditors comprises

three levels. The first level is Basic. At this level auditors are still not entitled to issue certificates by themselves, although they are responsible for documenting and planning the individual projects. However, all processes must be supervised by an Advanced Professional. In order to become an Advanced Professional one must first survey the construction of at least five different kinds of buildings. After that the aspiring Advanced Professional can file an application with an Extraordinary, who checks what has been achieved so far and, if it is sufficient, can award the title of Advanced Professional. In order to become an extraordinary one must take an examination with USGBC, which is only possible after having been in charge of at least five further projects and attended special courses of further education.

3. JAPANESE QUALITY SEAL COMPREHENSIVE PERFORMANCE EVALUATION SYSTEM FOR BUILDING ENVIRONMENT, CASBEE

The Japanese quality seal, CASBEE, was developed in 2001 by four Japanese institutions

- MLIT Ministry of Land, Infrastructure, Transport and Tourism
- IBEC Institute for Building Environment and Energy
- JSBC Japan Sustainable Building Consortium
- JaGBC Japan Green Building Council

3.1 Structure of CASBEE

In order to develop CASBEE the JaGBC established key principles which had to be fulfilled in addition to the sustainability test.

- a) Whenever possible, optimal buildings should be assessed so as to act as an incentive for architects and engineers.
- b) Assessment should be kept as straightforward as possible.
- c) The system should apply to a broad spectrum of buildings
- d) The system should take into consideration the conditions prevailing in Japan and Asia.

In order to fulfil these key principles it was decided to develop a process for examining all the important steps from the preliminary stage through to monitoring the construction of the building.

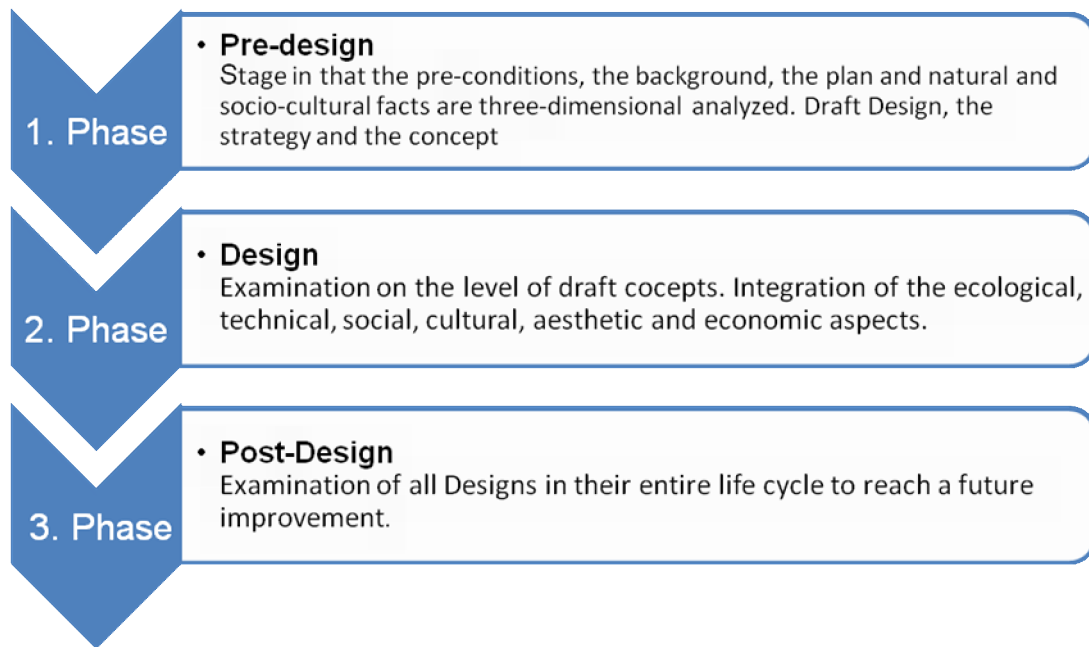


Figure 8: Design phases of CASBEE certification

3.2 Buildings qualifying for certification

CASBEE attempts to keep the number of groups of buildings qualifying for certification as low as possible. For this reason just four groups were created, to which each building can be assigned.

- CASBEE for Pre-Design
- CASBEE for New Construction
- CASBEE for Existing Buildings
- CASBEE for Renovation

3.3 Training the auditors

The training of the auditors is not yet transparent shown by the information provided by the association.

4. The GERMAN SUSTAINABLE BUILDING CERTIFICATE – Deutsche Gesellschaft für Nachhaltiges Bauen – DGNB

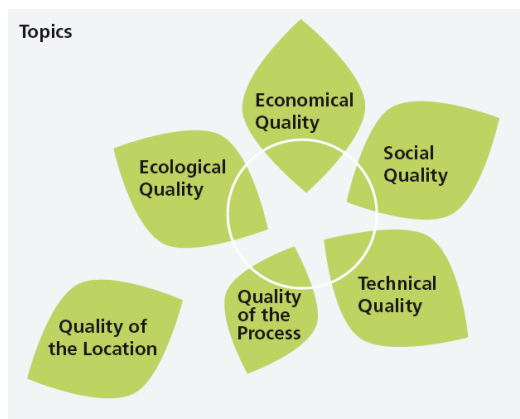
“The German Sustainable Building Certificate was developed by the German Sustainable Building Council (DGNB) together with the Federal Ministry of Transport, Building, and Urban Affairs (BMVBS) to be used as a tool for the planning and evaluation of buildings in this comprehensive perspective on quality. As a clearly arranged and easy to understand rating system, the German Sustainable Building Certificate covers all relevant topics of sustainable construction, and awards outstanding buildings in the categories bronze, silver, and gold. Six subjects affect the evaluation: ecology, economy, socio-cultural and functional topics, techniques, processes, and location.

The certificate is based on the concept of integral planning that defines, at an early stage, the aims of sustainable construction. In this way, sustainable

buildings can be designed based on the current state of technology, – and they can communicate their quality with this new certificate.” (www.dgnb.de)

4.1 Structure of DGNB

The structure of the German quality seal is based on a three column Model. Here are the ecological quality, the economic quality and the socio-cultural (including functional quality) the three main criteria. Every criterion has a weighting of 22.5 %. In addition the technical quality of a building and the process quality of building and construction are defined. These two subsections are examined on the basis of three groups of main criteria. The technical quality is proportional possessed of likewise 22.5%, which is distributed over all three groups of main criteria. The process quality is considered with 10% total evaluation. In addition to the above mentioned qualities the quality of the location is evaluated. This has however no effects on the certificate, but is separately proven.



4.2 Way of DGNB certification

The way to the certification is in following steps defined:

- a) Registration of the property at DGNB
- b) Defining of goals for characteristics of the building according to gold, silver, or bronze
- c) Using of the pre-certification for marketing purposes
- d) DGNB auditors check the planning- and construction documentation
- e) Use of the German Sustainable Building Certificate for marketing purposes

4.3 Training the auditors

The training of the auditors is organized by the German society DGNB. At first the candidate must register with the DGNB. In the second step the society examines the registration, registers the candidate and permits the person to take part in training lessons. This training is divided into two categories. On the one hand there are variable modules and on the other hand there exist mandatory modules. The variable modules are defined to cover individual knowledge of the candidates, whereby the mandatory modules are compelling for the training.

5. SUMMARY

Due to the complexity of the individual quality seals it is extremely difficult to compare them with each other. Nevertheless, certain factors are common to all.

5.1 Ecological balance

At first sight, ecological balance appears to be the most important factor regarding a sustainable building. This includes energy consumption, CO₂ emissions, energy supply, use of surplus energy, etc. Such aspects apply to all quality seals. Especially the Japanese and the German quality seal consider not only the exterior of the building, but also internal structures.

5.2 Sociocultural balance

This factor is likewise part of all certificates. However, it is not related directly to the building itself. LEED and BREEAM have developed a special certification system which applies to the whole building zone. New buildings should be in harmony with urban development and the microclimate in general and not just limited to once specific building zone. On the other hand, DGNB und CASBEE focus to a greater extent on the building which is to be certified.

5.3 Economic balance

Both the individual building itself and the whole planning process need to show a positive economic balance. The costs for certification should be covered by the money saved and the value added. Regarding the American system this is only the case with buildings which are classified at a high level (e.g. gold or platinum) due to the extremely high costs for registration.

Improving interior quality standards is, at present, only possible with LEED and BREEM. Tenants who want to organise the interior processes in an effective and sustainable manner can only do this with the help of these two certificates.

5.4 Infrastructure

This factor also plays an important role in assessing the sustainability of a building. With the help of excellent infrastructure it is much easier to optimise many processes as well as to reduce person-related CO₂ emissions significantly. This point appears in DGNB under standard quality and is of special importance when a building takes on a new use during its lifetime.

6. CONCLUSION

It must be said that, in terms of assessing buildings, the German quality seal (*Nachhaltiges Bauen*) lives up to what was originally intended. On the one hand, a holistic approach has been achieved and, on the other hand, gaps in other certification systems have been covered over. However, on looking more closely, we can see that with the German system it is still the building itself which is given the main focus. It is not possible to optimise all processes using this system. In order to do that, one has to apply other systems as well, although the structure of DGNB does not really provide for this. Therefore it is advisable, before entering the planning phase to get some information about the various certification systems and to select the one which seems most suitable for the purpose. Only by choosing the most appropriate certification system with all its facets is it possible to optimise the entire process and achieve sustainable development in future.

7. LITERATURE

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