

RATING THE SUSTAINABILITY OF BUILDINGS – EUROPEAN APPROACHES

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Summary: Planning, creating and using buildings in a sustainable way is a complex and challenging task for society. In order to support decisions in this field, a variety of sustainability rating schemes for buildings has been developed. This paper gives an insight into different European systems and illustrates the broad spectrum as well as common ideas. An overview of current European standardization on this topic is given as well as an outline of most recent developments in Germany, where a new rating system is currently being established.

1 INTRODUCTION

Sustainability is the keyword of the 21st century. It has become a central issue for governments worldwide. The ambitious goal of sustainable development is to provide humankind with satisfactory living conditions, now and for generations to come. In order to break down this aim into operable steps, great parts of the scientific community agree that sustainability has to comprise three areas: environment, economy and social aspects. These aspects should be considered equally important. However, since urgent environmental problems, from acid rain to global warming, are prominent on the political agenda, efforts traditionally have been focussing on preserving a capable environment. It is only recently that a shift to a more comprehensive view can be observed.

The built environment plays an important role in terms of sustainable development. This is not only true for infrastructure, but especially for buildings. The European Environment Agency (EEA) and Eurostat report that housing accounts for one quarter of the final energy use in Europe [1]. Over the past years the number of households has been increasing as has the average size of dwellings [2]. Households spend one-fifth of expenditures on rent [3] and the construction industry contributes to 6 percent of the gross value added within the Eurozone [4]. These facts and figures underline the importance of buildings with respect to environmental and economic impacts. Apart from that, buildings also have a big influence on their occupants, their neighbours and the communities they are situated in. The fact that all of us spend the largest amount of our living time inside buildings, leads to the conclusion they influence our well-being constantly.

Designing and constructing buildings therefore not only means facing big responsibilities but also being offered immense opportunities. It encompasses manifold possibilities of leading the right way – from global issues down to an individual's perspective. Accordingly, aims range from reducing greenhouse gas emissions to providing healthy indoor conditions. Widely acknowledged strategies are for instance: increasing energy efficiency, closing recycling loops, diminishing life cycle costs or adding value for occupants.

Awareness for sustainability increases and planners are faced with the question, just how “sustainable” a given building is. In order to give an answer, assessment schemes are needed. This paper will give an account of current rating systems in Europe as well as recent developments. The scope of this paper is limited to the assessment of buildings: assessing urban planning or infrastructure projects will not be covered. The following section is intended to give an overview of sustainable building in Europe and of the work in CEN, the European standardization organization. The next chapter introduces a selection of well established rating schemes from different countries in detail. The last chapter will relate the latest developments in Germany where a rating system is currently being established.

2 SUSTAINABLE DEVELOPMENT IN THE EUROPEAN BUILDING SECTOR – AN OVERVIEW

2.1 PLURALITY OF APPROACHES AND COMMON IDEAS

Research on sustainable building and construction has a long tradition throughout Europe. The EC-funded “Thematic Network on Sustainable Construction and City Related Indicators” CRISP [5] revealed that in 2002 a number of twenty-five systems to measure sustainable buildings existed. Theoretical expertise is complemented by practical experience and has led to a number of fully elaborated certification schemes for buildings which today are applied on a regular basis in some countries.

Simultaneous work, each based on different country-specific settings, has led to a plurality of coexisting systems in Europe. These systems differ considerably, which is unsurprising since each of Europe's independent states has tailored its system to its specific needs. It depends on regional context, national policy and scientific ideas, how much importance will be assigned to single issues. However, a common philosophy underlies all building assessment schemes: They intend to foster sustainable development by promoting “more sustainable” buildings. While it is not possible to sum up the European countries' national policies on the topic of Sustainable Building, a common share of ideas certainly does exist. A good overall picture is conveyed by the “European strategy for sustainable development” [6], which was updated by the Council of the European Union in June 2006. It should be noted, however, that not all European countries are part of the European Union.

Key objectives of the European strategy for sustainable development are environmental protection, social equity and cohesion, economic prosperity and meeting international responsibilities. They apply for all fields of life and thus include housing and building as well. Overall objectives and operational targets for Europe embrace limiting climate change, raising the share of renewable resources and improving energy-efficiency. Resource efficiency and the reduction of waste are topics on the agenda as well as reuse and recycling. Minimizing im-

pacts from transport noise and improving indoor air quality are tangible aims for the building sector. On a more general level Europe wants to promote sustainable consumption and production patterns and gain and maintain a competitive advantage through the promotion of eco-efficient innovations. It can be observed that the majority of available assessment schemes is in line with this strategy, putting protection of the environment and user health at the top of the agenda.

2.2 CURRENT EUROPEAN STANDARDIZATION PROJECTS

Technical standards reflect the state-of-the-art of science and technology and are an important tool in harmonisation of products and processes. The European Committee for Standardization (CEN) has launched the Technical Committee CEN/TC 350 “Sustainability of Construction Works”. According to its scope [7], it “shall be responsible for the development of voluntary horizontal standardized methods for the assessment of the sustainability aspects of new and existing construction works and for standards for the environmental product declaration of construction products. [...] The standards will describe a harmonized methodology for assessment of environmental performance of buildings and life cycle cost performance of buildings as well as the quantifiable performance aspects of health and comfort of buildings.” All work within CEN/TC 350 is coordinated with international standardization of ISO/TC59/SC17 “Sustainability in Building Construction”. CEN/TC350 is an important board for discussion between science and industry and for discussion amongst the European countries. A suite of standards is under development as can be seen in Table 1.

Table 1: Standards under development in CEN/TC 350 Sustainability of Construction Works” (from [8], July 2007)

Title: Sustainability of construction works – ...	envisaged date of availability
Framework for assessment of integrated building performance - Part 1: Environmental, health and comfort and life cycle cost performances	2007-09
Assessment of environmental performance of buildings – Calculation methods	2008-11
Environmental product declarations - Product category rules	2010-02
Environmental product declarations - Communication formats	2010-04
Environmental product declarations - Methodology and data for generic data	2009-01
Description of the building life cycle	2009-01

3 ESTABLISHED RATING SCHEMES

3.1 GENERAL ASPECTS

As stated in the headline, the purpose of this paper is to give an overview of different European approaches for the assessment of sustainable buildings. Due to the great number of existing systems it is not possible in this context to introduce them all. The following paragraphs therefore will illustrate the variety on a small selection of three systems from Austria (TQB), Great Britain (BREEAM) and Switzerland (Minergie Eco). These schemes were chosen, because they (a) stand exemplary for the great range of approaches, (b) are being used in practice and (c) include a building certificate. Apart from that, reporting on all systems is obviously most comprehensively available in their native language. The following systems, for that reason, are not to be introduced in detail:

Green Calc from the Netherlands calculates and displays hidden environmental costs of buildings. A building's performance is rated in relation to the performance of a reference building as it would have been built in 1990. (For more information see www.greencalc.com).

GPR Gebouw, also from the Netherlands, rates a building in terms of environment and health. A building is assigned to categories from one to five stars. (For more information see www.gprgebouw.nl)

PIMWAQ from Finland, dating back to 1998 is one of the early building rating systems. It focuses mainly on environment, defining minimum ecological levels for residential buildings. (For more information see http://cic.vtt.fi/eco/pimwaq_a.pdf)

HQE (Haute Qualité Environnementale) has been developed in France. In HQE, certification of residential and non-residential buildings requires sustainable management as well as health and comfort. (For more information see <http://international.cstb.fr/>)

ECOprofile or Økoprofil has been developed and applied in Norway. (For more information see www.byggsertifisering.no)

Many more systems, like Escale, Equer, Team (all France), Beat (Denmark) and others could be mentioned.

3.2 AUSTRIA: TOTAL QUALITY BUILDING

Austria's Total Quality Building (TQB) is based on an assessment system that was commissioned and supported by Austrian Ministries. It has constantly been developed since 1998, the latest progression being the integration of Austrian building passports and housing subsidies. It is designed to promote construction of user friendly, environmentally friendly, and cost efficient buildings. The purpose of TQB is to optimize buildings and award buildings owners' efforts with a certificate. Consequentially, TQB includes a comprehensive guideline on design of high performance buildings plus a computer-based automatic assessment procedure.

Organized in ten topics of sustainable building, TQB assesses various criteria that cover environment, costs, function and social aspects equally. The topic "Resource Consumption" deals with the building's energy demand, soil, fresh water and efficient use of building material.

The category “Environmental Loadings” treats emissions to air, waste reduction, waste water, reduction of users’ traffic, emissions from building material, radon, electromagnetic pollution and mould. “Indoor Environmental Quality” covers indoor air quality, thermal comfort, daylight, winter sun, noise protection and building automation. “Durability” is assessed by flexibility of construction, building operation and maintenance. “Security” encompasses burglary, fire protection, safety from accidents, barrier-free design and external risks. The quality of the design process and that of the construction process are considered separately. “Quality of amenities and site” include local infrastructure and amenities in apartments. Finally, construction costs and life cycle costs are taken account of.

In the certification process, design team and client define targets for the building and the scores they want to achieve. All necessary data is collected and provided by the building owner. On entering data into the TQTool, credits are given for criteria, weighted and added automatically. The certification body, ArgeTQ, examines the assessment file, ensures that all information used for assessment is correct and awards a certificate.

Judging from the information provided, Total Quality is a very transparent tool. Comprehensive information in German language is freely available. Also, certificates for buildings can be looked at on the web-page (see <http://www.argetq.at>). The four-page certificates give detailed information on the building, relating all relevant information in short form. From its start in 2001 up to 2005, Total Quality certified 19 buildings. Although a TQ Building Certificate is not mandatory in any way, the certificate can comprise proof of eligibility for three different Austrian housing subsidy programmes. Apart from that incentive, TQ Building is recognized by property developers both as a quality management tool for construction and a marketing benefit. According to ArgeTQ, Austrian communities show increasing interest in TQB also as planning aid for sustainable urban development.

3.3 SWITZERLAND: MINERGIE-ECO

Minergie-Eco is a combination of two established Swiss labels, namely the Minergie label plus an Eco amendment. Over 7000 buildings have been granted the Minergie label and another 10 buildings are Minergie-Eco labelled. The combined scheme is available for newly built schools, multi family houses and administrative buildings. Schemes for single family houses and existing buildings are to follow. Schemes are based on and compatible with Swiss design tools, e.g. SIA recommendation 112/1 on “Sustainable Building” [10].

The Minergie-Eco label is designed to honour best practice buildings with good working respectively living conditions and low environmental impacts during the complete lifecycle. The first part of the label (Minergie) focuses on energy, in terms of comfort and efficiency, while the second part (Eco) assesses health and environment. Assessed criteria are thermal comfort, daylight conditions, noise protection, indoor air quality, low energy consumption (preferably renewable energy), low resource consumption for building material, use of materials with small environmental impact and improved recycling possibilities. There are a number of minimum requirements that need to be fulfilled in order to receive the label. Use of certain materials is banned, e.g. filling or fitting foam, biocides for indoor use and wood without sustainability certificate from outside Europe. Use of recycled concrete is mandatory, where locally available. In addition costs for Minergie-Eco labelled buildings must not exceed

those for “normal” buildings by more than ten percent. (For more information see www.minergie.ch)

The certification process is based on a freely available software tool which processes a checklist of questions, filled out by the building owner. For all criteria, credits are given and weighted with additional bonus credits for certain favourable solutions. The certificate is awarded when, in addition to all minimum requirements, at least two third of all achievable credits are met for each field (Minergie and Eco). The certification board verifies the building owner’s self-declaration, especially on material choices. Spot checks on construction site are possible.

Judging by the number of certified buildings in Switzerland, the Minergie label is remarkably successful with the Minergie-Eco label standing behind. A Swiss Marketing Association appraised Minergie for its consistent marketing and consumer communication. The fact that, in some districts, financial aid is granted for buildings with Minergie label and that some banks grant special condition mortgages for Minergie-buildings certainly adds to its success.

3.4 GREAT BRITAIN: BREEAM

The BRE Environmental Assessment Method, BREEAM, was developed in the early 1990’s in the UK in response to requests for the assessment of new buildings. It is long established, regularly updated, and widely used. According to BRE [9], 65 000 buildings have been certified and more are registered for assessment. The assessment scheme is generally applicable to both new and existing buildings and available for different types of buildings as e.g. homes and apartment buildings, offices, industrial buildings, schools, retail buildings, etc. even for courts and prisons.

Although the method was primarily designed as an environmental assessment, it addresses also economic and social aspects of sustainable building. Topics include global, local and indoor impacts. They cover management (general procedure), energy use (energy for operation and CO₂ emissions), health and well-being (indoor and outdoor), pollution (air and water), transport (CO₂ emission and locality influences), land use (greenfield and brownfield sites), ecology (ecological value of a site), materials (environmental impacts of materials used) and water (consumption and efficiency).

Assessments are carried out by trained and licensed assessors who can be organizations or individuals. Each topic is assessed by means of a checklist with credits rewarded according to the performance of the building. Via environmental weightings, credits are added to display a single overall score. A building certificate is issued which rates the building on a scale of “Pass”, “Good”, “Very Good” or “Excellent” (For further information see <http://www.breeam.org>).

Given the numbers of certified buildings and the number of licensed assessors, it is reasonable to call BREEAM a very successful rating scheme. Its success lies in a simply understood, broadly applicable assessment scheme in combination with an established business model. The certificate is attractive to building owners and some official institutions require buildings to have a certain rating.

Critics disapprove that building owners are easily tempted to collect credits for the envisaged rating in the most cost-effective way instead of keeping a sustainable building in mind. The certification scheme contributes best to sustainable development when assessors are involved in the design process from the early stages, guiding the design team through the design and managing process. At that moment the assessment scheme can result in further positive effects than “only” a certificate, e.g. better functionality and durability, lower embodied and operational environmental impacts, high user satisfaction, better quality and control. Accordingly, BREEAM encourages developers and designers to consider sustainability issues at the earliest opportunity.

4 NEW GERMAN BUILDING RATING SCHEME

Environmental awareness has a long history in Germany. The idea of sustainable buildings is well recognized by policy and science; technical solutions and best practice examples are ample. In different research projects, tools have been developed to assess the sustainability of a building, most of them based on complex Life Cycle Assessment (LCA). Despite (or possibly due to) high aspirations, it has not been possible to find a consensus on establishing a nationally agreed-on building assessment scheme. Recently, a renewed interest in sustainable buildings among private companies has heightened the need for a certification scheme in Germany. Federal policy is proactive, planing a mandatory system for governmental buildings.

Accordingly, Bundesministerium für Verkehr, Bau und Stadtentwicklung has commissioned a research project, which is carried out by Prof. Dr.-Ing. C.-A. Graubner, Technische Universität Darmstadt and Prof. Dr.-Ing. habil. Thomas Lützkendorf, Universität Karlsruhe.

The aim of the scheme is to support sustainable planning for all newly constructed or renovated buildings owned by the federal government. Its universal character will ensure that it can be employed by private and commercial owners as well. The scheme will be applicable to new and existing buildings. It is designed for office and administrative buildings, an expansion to housing will follow.

First steps towards the new system have already been accomplished. There are some unique characteristics of the German approach that differ from most other established building assessment schemes:

- In addition to the three aspects of sustainability (environment, economy, society) the functional quality of a building will be added as a fourth aspect. The scheme will hence be structured by four main performance aspects: environmental, economic, social and functional performance.
- These four topics are considered equally important. Therefore the German building assessment scheme will not emphasize environmental aspects alone, in search of a holistic, balanced view on sustainable buildings.
- The German approach will concentrate on the building itself. Therefore, criteria like “Availability of public transportation” will not be taken into account.

- The certificate consists of a single label and a short folio, which gives details on the rating to ensure a transparent assessment.
- The assessment of environmental performance will be strictly based on Life Cycle Assessment, guaranteeing unambiguous and reliable results. Consequently, the scheme will be compatible to Environmental Product Declarations (EPD), which are standardized by CEN.

In the course of developing the assessment scheme, recommendations from a workshop of national experts are taken into account. Details on the certification process have not yet been finally set. The scheme is expected to be published by the federal government in due time and to be installed soon.

5 CONCLUSION

This paper has given an account of current European rating systems for sustainable buildings. In an overview, this paper illustrated the great variety of approaches, which today's Europe has to offer. Different needs in individual countries have led to creative, custom-made solutions. A common frame is only recently set by European Standardization Body CEN. A few countries already have an established rating scheme installed while others are in the course of developing their own system. Latest activities, like the development of a German rating scheme, lead to the conclusion that the future of building rating systems has only just begun. It will be interesting to watch these European approaches and see how they will contribute to a new, more sustainable construction routine in Europe.

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