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A Review of International Green Building Certification Methods: A Roadmap for a Certification System in Turkey

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Abstract
Stakeholders in the construction industry are demonstrating their commitment to solve environmental problems by building in a more environmentally friendly way through using environmental standards for their buildings. The construction sector's sense of social responsibility is also generating a demand for certification systems to measure the environmental performance of buildings. This paper summarizes the approach used by some of these rating methods, demonstrates a comparative approach between these rating systems, and discusses the minimum conditions available in Turkey that will enable the effective use of these standards. The authors aim to provoke a discussion about whether Turkey needs its own green building accreditation system. They suggest developing a system which better aligns with sustainability principles and free flows of information based on the lessons learnt from other certification systems.

Keywords
Green building certification system, Turkey, LEED, BREEAM, DGNB, GREENSTAR, SBtool sustainability, Climate change, Green buildings

1. Introduction

The negative effects of climate change and the increase in the public's environmental awareness are creating pressures on every industry to come up with creative solutions to reduce GHGs. Stakeholders of the construction industry are demonstrating their commitment to solve environmental problems by building in a more environmentally friendly way through using environmental standards for their buildings.

As voluntary standards there are a number of environmental accreditations for buildings around the world. The most popular accreditations are GBC (Green Building Challenge), LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment

Environmental Assessment Method), GREENSTAR (developed based on LEED and BREEAM by Australia Green Building Council), BEES (Building for Environmental and Economic Sustainability), SBtool (Sustainable Building Tool) from Canada, ECO-QUANTUM (a simulation based tool), ECOPROFILE (for existing office buildings), LCAid (based on Life Cycle of a building), and CASBEE from Japan. From the colder climates of North America and to Eastern Europe to warmer Mediterranean and humid Dubai and central Japan climates, these accreditations are widely used. As such, multi-national companies must adhere to numerous certification systems depending on the culture of their origin. A global standard may seem an attractive, efficient prospect, especially for these multi-nationals trying to coordinate uniform design teams. However, a green global standard is not currently possible to achieve, given the different circumstances of each country, from climate to the availability of materials and land, and opportunities for power generation, culture adaptation, and legislative support. Therefore, these systems are not designed to be used across different regions and countries and their respective requirements represent local conditions.

In this paper we are going present a detailed comparison table (see table 1) for LEED, BREEAM, CASBEE, GREENSTAR and SBtool. We will then discuss the differences between two most widely used tools, LEED and BREEAM, and what improvements will allow their implementation in Turkey. Similar efforts are currently underway in other countries. For example, BRE Global recently initiated Pan-EU BREEAM, in which the British-based BREEAM system was adapted to each multiple countries' local conditions (The system's newness prevents the authors from making any conclusions at this time).

Comparisons: LEED and BREEAM are the world's most recognized and rigorous tools for the assessment and recognition of "green" buildings.[1] Each system offers a list of auditable criteria against which prospective green buildings can be assessed. In this regard, these systems are in large part both responsible for a consensus about the meaning of a "green building," and the proliferation of its use to describe building which meet basic criteria of sustainability.[2]

The question of legitimacy is critical for adopting or adapting a green building rating system to Turkey, both from an environmental and political standpoint. In this respect, LEED and BREEAM offer reliable paths forward. However, in their current form, their impact on Turkey's building sector is minimal. Having matured in the United States and Great Britain, respectively, these systems are tailored to the strengths of these countries' specific building industries. They are only beginning to adapt to international realities of climate, resource availability, and construction sectors. Most local projects in Turkey cannot meet the systems' criteria due to lack of human and material resources. Therefore, only a marginal amount of internationally designed and financed projects can realize the environmental benefits of LEED and BREEAM, and push the market forward.

This section hopes to assess LEED and BREEAM's strengths and challenges with regard to their implementation in Turkey. In addition to the reasons listed above, these systems are selected among others for their global brand recognition. However, they should be considered only guides

[1] Fowler, K.M. and E.M. Rauch. Sustainable Building Rating Systems: Summary. Pacific Northwest National Laboratory, July 2006. Accessed https://www.usgbc.org/ShowFile.aspx?DocumentID=1915 (January 3, 2009).

[2] United Nations. 1987."Report of the World Commission on Environment and Development." General Assembly
Resolution 42/187, 11 December 1987.

for an eventual Turkish green building rating system. Such a system should strive to achieve comparable environmental benefits and market viability while accepting the realities of the Turkish building sector, at least in the short term.

LEED is perceived to have a higher uptake in the US than BREEAM does in the UK. One reason may be the way these systems are administered. It is recommended that BREEAM assessors are included in the earliest stage of design. BREEAM provides two stage certification system; design and construction. Including BREEAM assessor as part of the design team and also as an assessor may cause conflict of interest.

It is highly recommended that LEED AP is also involved from the beginning of the design process. The professional accreditation process is easier for LEED AP, and depends only on passing an exam (until the end of June 2009). Requirements for becoming a BREEAM assessor includes attendance at an official BREEAM training seminar provided by BRE Global, passing a test, and completing several training projects on an independent basis.

Measuring buildings' ongoing performance and aligning to international energy assessment standards are critical to adapting a green building rating systems to Turkey. Currently, both LEED and BREEAM base their assessment purely on the building's pre-occupancy design. For example, the only post-occupancy LEED credits require a contract for verifying building performance after one year. BREEAM, however, is currently developing standards for verifying efficient operation over the course of a building's life. This is critical to reducing long-term energy consumption.

BREEAM has also aligned its energy requirements to the EU's Energy Performance Certificate (EPC) system. This way, BREEAM awards points to buildings based on the results of a standard EPC analysis, allowing the adoption of industry-wide building assessments for energy. LEED requires an energy model, but methods may vary between industry professionals. Turkey also has adopted the EPC as mandatory for buildings passing a certain square meter threshold. This suggests one of the most environmentally critical aspects of BREEAM, energy analysis, would be easier to implement. Despite legislation, however, significant progress has yet to be made in widespread adoption of the EPC in Turkey, let along BREEAM.

On the other hand, LEED provides a high degree of standardization to design teams, making LEED easier to implement in practice. The LEED reference manual is a useful document which LEED assessors may use to deepen their knowledge of their subject. BREEAM also provides online resources, but the assessor is more independent agent in the design process. With legitimacy and accountability being cornerstones of these systems, the use of standardized materials may improve efforts at transparency in Turkey.

2. Social and Economical Factors

It is common to accept the 'triple bottom line' approach of integrating environmental, economic, and social aspects of sustainability. Many people have criticized LEED and BREEAM because they are lacking in systematic economic and social aspects. But it is important to remember that the focus of these certification systems is environmental impact. Bringing wider factors may dilute these systems' effectiveness at producing environmental improvement. On the other hand, one may say transport and ecology are also wider factors (beyond the building), but incorporating them reduces GHGs and eventually help the user to reach to the goal of reducing GHGs which is the fundamental reason for building green. Fundamentally, the environment is a science while

social and economic factors are judgments. The latter therefore require proxy indicators. If incorporated, economic considerations should include both economic value and the costs of development.

3. Green Building Council's Role in Turkey and Suggestions for GB Certification

The Green Building Association in Turkey, established in October 2007 and intending to become a formal Green Building Council, may act as a sound governance board that overseas certification development in Turkey. As of January 1st 2009, there were only 4 LEED APs and 2 BREEAM assessors in Turkey (Ref 3). The market is new and capacity building must be a priority for the council in partnership with other NGOs, academia, government and private sector for increasing the number of green building experts.

To accommodate the climate differences across Turkey's regions; a category weighting approach should be adopted since local factors can cause significant variations. Local industry practices, government processes and cultural factors should be considered.

In Turkey Pan-EU BREEAM can be adopted by making some additions like creating a "BREEAM Accredited Designer". This person becomes part of the design team like a LEED AP. BREEAM accredited Designers and BREEAM assessors take part in two different stages of the project – design and construction. It should be noted that conflict-of-interest makes these two roles mutually exclusive for one person. LEED offers faster access to professional accreditation status and resources, and so it may be easier to increase market presence in Turkey.

4. Conclusion

This paper summarizes the approach used by some of the rating methods and demonstrates a comparative approach between these rating systems and discusses the minimum standards available in Turkey to be able to effectively use these standards. The authors aim to provoke a discussion if Turkey needs its own green building accreditation system. They suggest developing a system which better aligns with sustainability principles compared to the above mentioned standards with credits dealing directly with practices that impact climate change. They also suggest addition of Earthquake parameters to the Turkish Certification System will increase the demand to use the system and also make it a more meaningful system for an earthquake country like Turkey.

They also suggest building dual or multi certification pilot projects in Turkey in different climate regions to compare the effect of "home territory regulatory effects" and develop a tool customized to Turkish market, climate, social, governmental, and other regional conditions. The widely used LEED, BREEAM and CASBEE may provide a starting point, but adaptation of these tools to local conditions will be needed. BRE-GLOBAL's newly launched PAN-EU BREEAM, which has developed to incorporate local conditions, can be used as a start.

5. References

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6. www.casbee.org
7. www.sbtool.org
8. www.gbca.org

Table 1: Comparison of Green Building Systems

Full Name	Acronym	Origins	Priorities	Data Requirements
Comprehensive Assessment System for Building Environmental Efficiency	CASBEE	Japan Green Building Council/Japan Sustainable Building Consortium worked on the system since 2001. JaGBC/JSBC is continuously developing and updating the CASBEE system. Started giving certification on 2005.	(1) Energy efficiency (2) Resource efficiency (3) Local environment (4) Indoor environment These four fields are largely the same as the target fields for the existing assessment tools in Japan and abroad, but they do not necessarily represent the same concepts, so it is difficult to deal with them on the same basis.	Q (Quality): Building Environmental Quality & Performance: Evaluates "improvement in living amenity for the building users, within the hypothetical enclosed space (the private property)." L (Loadings): Building Environmental Loadings: Evaluates "negative aspects of environmental impact which go beyond the hypothetical enclosed space to the outside (the public property)
BRE Environmental Assessment Method	BREEAM	BREEAM was established in 1990 as a tool to measure the sustainability of new non-domestic buildings in the UK [1]. It has been updated regularly in line with UK building regulations and underwent a significant facelift on 1 August 2008, called BREEAM 2008[2].		Construction Records Architectural Drawings/Diagrams Engineer Calculations Energy Model report/Energy Performance Certificate Project narratives/declarations Site Visits BREEAM Tool filled out
Leadership in Environmental and Energy Design	LEED	Founded by USGBC and NRDC in 1994. Consensus-based, broad-spectrum, voluntary approach. Regularly updated and requirements strengthened.	Physical Site, Community, Transportation, Heat Island, Light Pollution, Water Use, Sewage, Energy Efficiency, GHG emissions, Commissioning, Green Power, Materials, Waste, Air Quality, Fresh Air Quantity, Occupant Comfort	Constructions Records Engineer Calculations Energy Model report Owner/Developer narratives and declarations Project drawings and diagrams

Sustainable Building Tool	SBTool	SBTool, formerly known as GBTool, is designed to assess the environmental and sustainability performance of buildings. SBTool is the software implementation of the Green Building Challenge (GBC) assessment method that has been under development since 1996 by a group of more than a dozen teams. The GBC process was launched by Natural Resources Canada, but responsibility was handed over to the International Initiative for a Sustainable Built Environment (iiSBE) in 2002.	Drawings/Diagrams Specifications Energy model report Project narratives/declarations Construction Records Consumption records (water, fuel, etc) SBTool filled out
Green Star	-	Green Star is a voluntary environmental rating system for buildings in Australia. It was launched in 2003 by the Green Building Council Australia.	Drawings Specifications Material (Safety) Data Sheets ProjectTimeline Design Intent Document Waste Management Plan (WMP) Copy of Third-Party Documents Contract Project narratives/declarations
Comprehensive Assessment System for Building Environmental Efficiency		Research and development of CASBEE have been carried out as a cooperative project between industry, government and academia with the assistance of Japanese Ministry of Land, Infrastructure and Transport. Newly-formed JSBC (Japan Sustainable Building Consortium) and its affiliated sub-committees provide overall management of CASBEE, and the secretariat is set within the Institute for Building Environment and Energy Conservation.	Structure of CASBEE-NC tool To operate the system, the assessor fills out two assessment forms at each design stage: the Main Sheet and the Score Sheet. The assessment results for each assessment items are given as scores for Q; Building Environment Quality & Performance and LR; Reduction of Building Environmental Loadings on the Score Sheet. Here the indicator LR is assessed, representing not the L: Building Environmental Loadings itself, but the level of performance in minimizing building environmental loadings imposed outside the hypothetical boundary. The Assessment Result Sheet mainly displays the result of the assessment of a building using CASBEE. Uses a weighted scoring system.

Full Name	Administrative Infrastructure	Administrative Process	Validation Criteria	Scoring/Weighting Systems
BRE Environmental Assessment Method	The BRE Global "Sustainability Board" oversees BRE's guides, publications, standards and certification schemes in the area of "green buildings", energy, waste, sustainability and the environment. Current standards and schemes include BREEAM, EcoHomes, Environmental Profiles and ISO 14001. The Board meets three times a year to review these issues. BREEAM guide, tools, and references BREEAM Assessor. The Assessor must be trained by BRE for a fee of roughly 1,500 British pounds.	BRE is a British organization which administers the BREEAM system. All buildings attempting a BREEAM qualification require the full services of a certified BRE Assessor. The Assessor compiles all project data which will show the building meets BREEAM criteria. The Assessor may assist in design guidance and project management as well. BRE staff will perform two audits of the material submitted by the Assessor. BRE has the option to perform a Site Audit to ensure the as-built project meets design criteria. (assessor certification)	Two stages of data collection and audit process: Design and Construction BRE may perform an in-depth audit of the project as well. Any project outside the UK must show undergo a pre-qualification showing that local codes are equivalent to BREEAM criteria.	Unlike LEED, a weighted system. Possible scores are: Pass Good Very Good Excellent Outstanding
Leadership in Environmental and Energy Design	USGBC is umbrella organization. LEED Technical Committee and LEED Steering Committee. LEED AP Certificate required for one person on each LEED project. Green Building Certification Institute grants LEED AP Certification for $300-$400. Each LEED building type requires separate manual for $150-$200. Upon completion of documentation, approval can take 6 months.	The LEED AP on the project coordinates resources from the design team. The LEED Reference Guide and USGBC website resources provide all guidelines. Once finished, all documentation is compiled and submitted online to the USGBC. One set of comments will be issues, and corrections can be made. The full review process can last 6 months. Comments are detailed and technically specific.	Data collection can be easily split between design and construction phases. There is no on-site visit.	Each topic receives one point. Awards are given according to the range of points within which the projects' point tally falls. Platinum Gold Silver Certified

Full Name	Administrative Infrastructure	Administrative Process	Validation Criteria	Scoring/Weighting Systems
Sustainable Building Tool	iiSBE HQ (International Framework Committee) Local iiSBE Teams Assessors	iiSBE HQ provides SBTool framework. Local iiSBE defines scope, context, weights & benchmarks in A file. Design team defines basic and detailed project characteristics in B file (Simulations and other external calculations). Design team enters performance targets and official self-assessment values in C file. Independent assessor reviews self-assessments in C file. Local iiSBE reviews. iiSBE HQ does quality assurance and issues certification. Certification.	To have an official result, the assessment must be performed by a local iiSBE.	A weighted scoring system is being used. Possible scores are: -1 = Deficient 0 = Minimum acceptable performance +3 = Good Practice +5 = Best practice
Green Star	Technical Working Group (TWG): The TWG is an all-volunteer group of Green Building Council members who offer their environmental and industry expertise to create the Green Star rating tools Assessment Panel Assessors: There are currently 3693 Accredited Professionals. The Assessor must be trained by Green Star Faculty for a fee of 1000-1350.	Verification of Eligibility Project Registration Round 1 Submission Round 1 Assessment Round 1 Assessment Results Round 2 Submission Round 2 Assessment Rating achieved	A project can be assessed if it is located in Australia. To be able to assessed, a project must meet the prerequisites: Space Use, Spatial Differentiation, Conditional Requirements, Timing of Certification If the results of the assessment have validated the project's achievement of a score of 45 or above, the GBCA will award a Green Star Certified Rating	A weighted scoring system is being used. Projects under score of 45 do not achieve any rating. 4 Star Green Star Certified Rating (score 45-59) signifies 'Best Practice' 5 Star Green Star Certified Rating (score 60-74) signifies 'Australian Excellence' 6 Star Green Star Certified Rating (score 75-100) signifies 'World Leadership'