

**Green building assessment methods, the importance of the context:
A comparison between Brazil and France.**

Andrea Sender, Architect

Karen Delchet-Cochet, Professor at ISC Paris

Summary:

Green building assessments introduced a new reality for the building sector. Nowadays they are becoming an industry standard. In the past twenty years, numerous methods have been developed all over the world, and they keep continuously evolving. This article treats the importance of the construction context when applying a Green building assessment method, once each construction is immersed in a particular climate, cultural, political and social reality, using the comparison between Brazil and France.

Key words: green buildings, assessment, certification, context, Brazil, France

Introduction:

The importance of sustainable development has been discussed for many years, since the Bruntland Report, and has gathered momentum, partly, as a result of major economic reports to governments in developed countries. At the final meeting of the World Commission on Environment and Development (WCED, 1987) stated that: “We remain convinced that it is possible to build a future that is prosperous, just, and secure. The possibility depends on all countries adopting the objective of sustainable development as the overriding goal and test of national policy and international co-operation”. If all sectors and actors have to consider sustainable development, some of them, as the building sectors, are particularly concerned.

The building sector has a major impact on the economic and social aspects of human activities but also on the natural and built environment. Since the UN habitat Conference of Istanbul (1996), the needed of a convergence between construction sector and sustainable development has been pointed out. This is the goal of the green building approach. “Green building is growing around the world and quickly becoming an industry standard. (Bernstein and Russo, 2013)

This study undertakes a comparison between the three major green buildings assessment methods adopted in Brazil and in France, in an effort to clarify the importance of considering the particular aspects of each project, and the context in which they are built in.

The Building Sector and Sustainable development

If all sectors and actors have to consider sustainable development, some of them, as the building sectors, are particularly concerned. The building sector has a major impact on the economic and social aspects of human activities but also on the natural and built environment. “Construction projects are often a key factor in urban regeneration, and also in maintaining or developing transport and communication infrastructure. Nevertheless, construction projects impact upon the environment in a number of ways, notably the change in land use, the consumption of materials and fuel, the production of waste, as well as noise, air emissions and health impacts.”¹

Environmentally harmful activities differ from one industry to another, but it is well known that the biggest contributor to GHG emissions is the built environment, accounting for up to 50% of global carbon dioxide emissions (Raynsford, 1999). The building construction

¹http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/General_construction_statistics_-_NACE_Rev._1.1

industry consumes 40% of the materials entering the global economy and generates 40–50% of the global output of GHG emissions and the agents of acid rain (CIWMB, 2000).

The construction sector is responsible for a high percentage of the environmental impacts produced by the developed countries. In the European Union, the construction and building sector is responsible for roughly 40% of the overall environmental burden (UNEP, 2003). As it is showed by UNEP, the construction industry is a highly active sector all over the world, and it is the largest industrial employer, accounting for 7% of total employment, and 28% of industrial employment. It is responsible for a high rate of energy consumption, environmental impact and resource depletion. Most European governments have introduced new policy instruments such as the European Community's energy performance directive for buildings (EPBD) in order to reduce the negative impacts from the building sector (Bowie and Jahn, 2002).

The importance of sustainable development for the professions of the built environment is a point that has been targeted in noticeable task forces worldwide. (DETR 1999a ; Egan,2004 ; and Dixon et al. 2008). In a context of scarce fossil fuels and of mitigation / reduction of greenhouse gas emissions, the building sector is a priority, given its energy savings potential. This sector is also at the forefront in thinking about adaptation to climate disruption balances. In addition, health issues resulting from indoor air pollution have become one of the most acute environmental problems related to building activities. (OECD, 2002). These factors alone provide enough proof that improvements on environmental policies for the construction activity could largely reduce the impact of the building sector on the environment.

To better develop this subject, it is important to precise the meaning of a green building.

The meaning of a green building and the benefits it could bring.

According to Robichaud & Anantatmula (2011) « There is no single, widely accepted definition for green building, but a survey of definitions reveals many common threads ». They identified 10 different definitions of green buildings with a number of common characteristics. The concept of green building (also known as green construction or sustainable building) refers to a structure that applies processes that are environmentally responsible and resource-efficient throughout the building's life cycle: from site definition to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation among the design team, the architects, the engineers, and the client at all project

stages. According to Environmental Protection Agency (EPA)², the Green Building practice expands and complements the classical building design concerns of economy, utility, durability and comfort.

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources;
- Protecting occupant health and improving employee productivity;
- Reducing waste, pollution and environmental degradation.

We commonly understand that investing in a Green Building brings an over cost, but this is not 100% correct. Research shows that building green does not necessarily need to cost more, particularly when cost strategies, program management and environmental strategies are integrated into the development process right from the start (WGBC, 2013). Nonetheless, this initial higher investment will be amortized during the building lifecycle (the overall cost from the design until the demolition phase) by its long-term benefits and economies as shown in particular by Bouteloup and Aliii (2010).

When talking about green buildings, actors need common criteria to characterize them. Myers, Reed, and Robinson (2008) have shown that the value of a building can be related to the building's level of sustainability. The problem therefore lies with how to distinguish the level of sustainability in a construction, which will facilitate a direct comparison between each building. This is where sustainability rating tools can potentially play a major role.

Environmental certification systems in the building sector

Since the establishment of the U.K.-based Building Research Establishment (BRE) in 1990 and the U.S. Green Building Council (USGBC) in 1993, many organizations have been formed to promote green building around the world. The Toronto-based World Green Building Council (World GBC) currently recognizes more than 20 established green building councils around the world, with more than 40 other national-scale groups seeking similar status in the next few years.

All of these tools provide a broad ranging assessment of the environmental impact of a building. Each one features a suite of tools developed for different land uses such as

² <http://www.epa.gov/greenbuilding/pubs/about.htm>

commercial, industrial, retail, educational and health buildings. The issues covered include those relating to the global, local, and internal environments, focusing on design stage assessments (i.e. new build and refurbishment) and also to the ongoing operation and management of the building (i.e. buildings already in use). Each tool leads to a rating and a formal certification of the building.

The figure below presents some of the existing green building certifications and their country of origin.

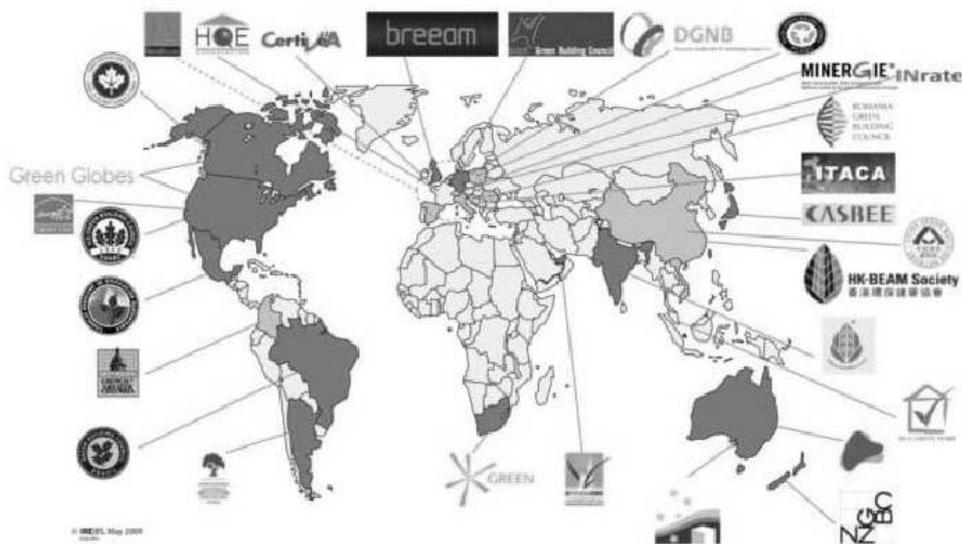


Figure 1: Green building certifications in the world, **Reed et al, 2009**

The assessment methods are a voluntary process, some of them being internationally recognized, which made them become an interesting tool for the private sector. "Certification is an activity whereby an independent recognized body issues written assurance that an *organization*, process, service, product or professional skills meet the requirements specified in a particular standard."³

The different certifications have some general principles in common. For the majority, the evaluation systems are based on “scores”. They are also based on similar or equivalent main issues, such as management of water, use of renewable resources and energy, health and well being, etc. Even though, the final ratings are not the same, making more difficult to the engaged actors to identify the differences between the numerous existing certifications. But why are there so many different certifications? What are their similarities and differences?

³ CERTIVEA: “HQE certification Give more value to your performance”, <http://www.certivea.com/assets/download/certification_HQE/en/939ee-prestype_HQE_site-EN.pdf>, 08/2013.

And what kind of role plays the context in those certifications ?

In order to try to answer those questions, we will focus on 2 different countries, which have a quite different context and apply the green building assessments in a distinctive way: Brazil and France.

France and Brazil, 3 main certifications

BREEAM, LEED and HQE, common goals

3 certifications program are presents in our study area: BREEAM, LEED and HQE. First, we will present the main characteristics of each of them.

Among the first instruments for the assessment of sustainability of buildings is the BREEAM (Building Research Establishment Environmental Assessment Method). This system was developed in the UK, in 1990, by the BRE (Building Research Establishment) and represented a reference point for the elaboration of later methods. As the certification process is applied almost all over the world, besides the UK scheme, there are two international assessment methods. The “BREEAM Europe Commercial” assesses European countries. For the rest of the world, the “BREEAM Bespoke International” is applied, with some opened evaluation criteria depending on each country. The weighting of the evaluated criteria is also variable. The certification system provides formulations differentiated for a wide variety of project types: Offices, Retail, Industrial, Education, Healthcare, Bespoke, International, etc. Four different certification levels allow for variable quality standards based on individual targets and different options depending on the economic, constructional and technical conditions: Pass, Good, Very Good and Outstanding (BREEAM, 2009).

The LEED (Leadership in Energy & Environmental Design) was unveiled by the U.S. Green Building Council (USBG) in 2000 to promote the construction of cost-efficient and energy-saving green buildings. The certification system provides formulations differentiated for the following project types: New commercial construction and major renovation projects, Existing building operations, Commercial interiors projects, Core and shell projects, Homes and Neighborhood Development. The measures used represent a broad range of categories and criteria from energy to ecology. A specific level of certification is awarded depending on the sum of the credits earned in each of the six categories, which attests to the performance achieved by the building in terms of environmental sustainability: Base, Silver ,Gold,or Platinum (LEED, 2009). LEED is the certification system more widespread globally, present in more than 110 countries. “Pike Research notes that there are dozens of certification programs worldwide, but LEED is and will remain the single largest certification system,

covering approximately 22 billion square feet around the world by 2020 and representing over 40% of all green-certified space.”⁴

In France, the first national certification system is HQE (*Haute Qualité Environnementale*), promoted by the non-profit association “Association pour la Haute Qualité Environnementale” (ASSOHQE), founded in 1996. It is a voluntary process and it is applicable to new and existing buildings for different uses. AFNOR Certification manages the certification system with the official name of “NF ouvrage – Démarche HQE”. The certification system provides formulations differentiated for the following project types:

New construction, Renovated Buildings and Buildings in Use. The score system is divided in 14 categories. The client can choose which categories will be at each level, but the following has to be respected:

- At least 3 categories must be at the “high performing level”;
- At least 4 categories at the “performing level”;
- The rest, at the “basic level“ (maximum of 7 categories).

A specific level of certification is awarded depending on the sum of the awarded stars: Pass (0 star), Good (1 to 4 stars), Very Good (5 to 8 stars), Excellent (9 to 11 stars), Exceptional (12 stars and more). In Brazil, is based on France’s HQE certification program. The Brazilian version of HQE, AQUA (Portuguese acronym for High Environmental Quality), was developed and is supported by the Vanzolini Foundation (member of the Sustainable Building Alliance), based at the University of São Paulo. The partnership was made in 2008 and today there are around 50 certified projects in the country.

Even if each process is completely independent one from another, they consider globally almost the same aspects, with some differences of criteria and evaluation.

A summary of all main aspects of the three certification processes is present on the figure below.

⁴DAILY FINANCE: “Green building certifications by 2020”
<<http://www.dailyfinance.com/rtn/pr/nearly-half-of-all-green-building-certifications-will-be-for-existing-buildings-by-2020-according-to-pike-research/rfid368868340/>> , 08/2013.

	BREEAM	LEED	HQE
Country of Origin	United Kingdom	USA	France
Date introduced	1990	2000	1996
Categories	<ul style="list-style-type: none"> 1 - MANAGEMENT 2 - HEALTH AND WELL BEING 3 - ENERGY 4 - TRANSPORT 5 - WASTE 6 - WASTE 7 - POLLUTION 8 - LAND USE AND ECOLOGY 9 - MATERIALS 10 - INNOVATION 	<ul style="list-style-type: none"> 1 - SUSTAINABLE SITES 2 - WATER EFFICIENCY 3 - MATERIALS AND RESSOURCES 4 - ENERGY AND ATMOSPHERE 5 - INDOOR ENVIRONMENTAL QUALITY 6 - INNOVATION IN DESIGN 7 - REGIONAL PRIORITY 	<ul style="list-style-type: none"> 1 - ECO-CONSTRUCTION: 2 - ECO-MANAGEMENT: 3 - COMFORT: 4 - HEALTH: <p>The SMO (Operation Management System) is also verified in order to obtain the certification.</p>
Certification Specificities	<ul style="list-style-type: none"> • Respect of "Minimum Standards" • International referential for projects outside the UK 	<ul style="list-style-type: none"> • Respect of all given prerequisites • Integration of the American norms (ANSI, ASTM, ASHRAE). The association counts to "de-nationalize" LEED abandoning the American references (ANSI, ASTM, ASHRAE) and creating tables of correspondence between the different standard systems. 	<ul style="list-style-type: none"> • All criteria must be attended : - At least 3 categories at the level "très performant" (high performance) ; - At least 4 categories at the level " performant" (performance) ; - The rest, at the level "base" (basic level) - maximum of 7 categories.
Certification	Documented	On Line	Presential Assessment (Certivea Assessor)
Evaluation	<ul style="list-style-type: none"> • Pass (> 30 %) • Good (>45%) • Very good (>55%) • Excellent (>70%) • Outstanding (>85%) 	<ul style="list-style-type: none"> • Certified: 40 - 49 points • Silver: 50 - 59 points • Gold: 60 - 79 points • Platinum : > 80 points 	<ul style="list-style-type: none"> • Pass (0 star) • Good (1 to 4 stars) • Very Good (5 to 8 stars) • Excellent (9 to 11 stars) • Exceptional (12 stars and more)
Average cost during Design Stage (considering a 10.000m2 building, in Europe)	<ul style="list-style-type: none"> • Administrative taxes = 4k€U • Environmental Consulting Firm + Technical Studies = 40k€U / 100k€U • Total Cost 45k€U / 110k€U 	<ul style="list-style-type: none"> • Administrative taxes (variable according the surface of the project)= 6k€U • Environmental Consulting Firm + Technical Studies = 40k€U / 100k€U • Total Cost 45k€U / 105k€U 	<ul style="list-style-type: none"> • Administrative taxes = 20k€U • Environmental Consulting Firm + Technical Studies = 50k€U / 120k€U • Total Cost 70k€U / 140k€U
Average overcost for the construction phase (considering a 10.000m2 building, in Europe)	+ 0% / + 15% (as soon the certification process begins, less overcost will be applied)	5% / + 15% (as soon the certification process begins, less overcost will be applied)	+ 5% / + 15% (as soon the certification process begins, less overcost will be applied)
Rights of using the brand	From Planning Assessment certification	From project registration	From project registration
Regulatory Reference	European and UK legislations (BRE Spoke uses the local policies)	American ASHRAE Standards (there are plans to adapt them to local policies)	European and French legislations
Mostly applied regions	UK / Europe	Present in more than 90 countries (mainly EUA, Canada, China, United Arab Emirates, Brazil)	France / Brazil
Visibility	International (mainly in Europe)	International (mainly in North America and Asia) -> Global tenants	France (mainly) / Brazil

Figure 2: Proposition of a comparison between 3 green building assessment methods
BREEAM, LEED and HQE

The certification assessments could be initially applied for new constructions, then, they increased their application for renewed buildings and after to buildings “in use”. Those assessments (BREEAM In use, LEED EBOM, HQE Exploitation) brought to the discussion of the “green building” the importance of the maintenance and the conscientious occupation of the built space to really have a sustainable and efficient construction. According to Sartori and Hestnes (2007), the efficiency of a certified building depends directly on the quality of the construction and the occupation phase, since it has been estimated that the use phase in conventional buildings represents approximately 80% to 90% of the life-cycle energy use, while 10% to 20% is consumed by the material extraction and production and less than 1% through end-of-life treatments.

But different approaches

As we can see from the comparison above, the more notable differences are presented between HQE and the other two assessment methods.

- While BREEAM and LEED make all the audit process by the issue of documents and virtual exchanges between the client and the certification organization (BRE and GBCI), HQE audits are made in person, by a third part, hired by the certification organization.
- For the HQE, solutions are not prescribed. As the audit is made “in situ”, it makes easier for the certification responsible, to really evaluate if the solution is efficient and if it can be approved.
- For obtaining the HQE certification, the building needs to answer to all criteria, being capable to choose the level of performance of the project. On the other hand, LEED and BREEAM have some pre requisites (mandatory), but the client/design team can choose all other criteria, which will be applied on the project.

This bibliography approach has been completed by 3 interviews from professional of green building in France and Brazil. Two French interviews were made in person at Sinteo’s (Project Management Assistance for Environmental Issues), with two professionals responsible for the environmental project management. The Brazilian interview was made, with a professional responsible for the construction and project management. We can propose the main strength and weakness of each assessment method as presented below.

	BREEAM	LEED	HQE
STRENGTH	More academic and more rigorous	Simpler in its approach	Didactical process. Does not recommend the solutions
		Easier to be part of a global corporate policy	
	High focus on energy conservation, waste production and water consumption	High focus on energy conservation, waste production and water consumption, indoor environmental quality	Highly concerned with the health and well being of its occupants
	International visibility	International visibility	
	Less expensive project registration	Less expensive project registration	
	Local regulations are taken into account	Local priorities are stimulated	
	Biodiversity is taken into account		
WEAKNESS		Some categories are hardly achieved because they are not adapted for the local policies	
			High cost of project registration
			Recognized only in France and in Brazil
	Complex required documentation	Complex required documentation	
	Little attention to chemical lifecycles and human health	Little attention biodiversity and acoustic issues	

Table 4: Analysis of Strength and weakness of BREEAM, LEED and HQE assessments.

While in Brazil LEED is, by far, the most applied certification, in France we have a more homogeneity scenario between HQE and BREEAM. Nonetheless, LEED is gaining space, in order to have an international visibility outside Europe.

To try to explain those differences, we will analyze the context of those 2 countries.

Discussion: Brazil and France, two different contexts

Brazil and France are quite diverse countries: different from an environmental, economic, social, political and cultural perspective. As a consequence, the certification system has a distinctive role in those two regions.

Regulatory systems in Brazil and in France are quite different one from another. Once France is one of the countries with the most rigorous environmental law system, Brazil still has a lot to evolve. Building Codes in Brazil are applied through either Municipal or State laws. In big cities as São Paulo and Rio de Janeiro, there are already many sustainable measures that are taken into account when issuing a building permit, but since they are issued, there is no control or mensuration, which do not guarantee the real application during the construction phase of what was approved on conception phase. Some of the most important existing measures are related to soil and water contamination, permeable surfaces, preservation of

green areas and pollution emissions. As the Brazilian environmental laws are not as developed in the building sector as they are in France, the projects that do not apply for a certification, will not be as engaged in taking those questions into consideration as in the European country, since they are not obliged to incorporate sustainable measures.

Building codes in France (PLU – Plan Local d’Urbanisme) are also defined at the city level and quite developed regarding the sustainable development. As an example, Paris has the objective to be an example of sustainable city in France. To achieve that goal, different programs for the city urban planning were implemented. We could mention: “Projet d’Aménagement et de Développement Durable”, (Project of Planning and Sustainable Development), and the “Plan Climat” (Climate Plan). Objectives have been determined for the reduction of greenhouse gas emissions, energy consumption and for the development of renewable energies. In France, the regulatory environmental building system is one of the most constraining in the world (EC 2011). In 2007, the country has set up, after a large social debate, the *Grenelle de l’ Environnement*, an ambitious sustainability plan that in December of that year has been filled in. The targets with regard to energy saving and performance, and the built environment are far reaching for France. In this scenario, even if a project is not conceived to be a “green building”, many sustainable measures will be mandatory.

Climate: The climate and the development needs of each country are also really diverse. Brazil still needs to invest a lot of money in infrastructure projects, as sanitation and drinkable water, not having enough efforts towards the development of new techniques and technologies. On the other hand, Brazil has overcome the period of hyperinflation suffered during a period of the 1980s and 1990s and has emerged as a strong economy that is ranked 10th in the world⁵ (www.coneq.org.uk). In 2003, Goldman Sachs predicted that Brazil will become a major world economy primarily as a result of its wealth of raw materials. One of the reasons of this growth is the organization of the international events that will happen in the country: the world cup, in 2014 and the Olympic games, in 2016. The climate is a very important issue to be treated, since a building must be designed taking into account the natural elements (sun, wind, rain, etc). Brazil’s climate comprises a wide range of weather conditions across a large area and varied topography, but most of the country is tropical or subtropical, with most large built environments located in those climatic regions. There is no real dry season, but there are some variations in the period of the year when most rain falls.

⁵ www.coneq.org.uk

Temperatures average 25 °C, with more significant temperature variation between night and day than between seasons.

On the other hand, France climate comprises a wide range of weather conditions, but temperature is mainly colder and rainy seasons are longer in most part of the country. In this scenario, when planning a building in Brazil, the focus has to be given to the air-conditioning and ventilation system in order to guarantee the indoor comfort for its occupants, completely the opposite of the countries on the north hemisphere, including France, where the biggest challenge is to keep the heat inside the building, in order to use less energy with the heating system. This is only an example of the several differences between the various regions of the world that are going to be analyzed by an “international” assessment method that does not necessarily understand the particularities of each country / project.

A cultural perspective: While in France, people are more engaged in sustainable measures when they are obliged to, most Brazilians seem extremely connected to nature, and want to protect and restore the environment. “There are many competent designers, engineers, builders and public servants of good will, attuned to the currents of the world. On the other side, there is the weight of the past: a cynicism born of years of corrupt government, oligarchy, the recent history of military dictatorship and the much older shadows of slavery and colonial domination. That past will get in the way time and time again, skewing construction contracts, moving projects away from the competent in favor of the connected” (Di Giulio, 2010). In this scenario, in Brazil, the assessments can be a more trustable tool to guarantee the green building aspects.

These examples show that each project in each country must be contextualized, once the needs and existing infrastructure of a country are unique and a building is always in contact with its surrounding climate. They also help to make clear the need to take into account the political, cultural, economic and climatic diversities of each project, since the three analyzed labels were created in developed countries of the northern hemisphere.

International recognition versus regulation

While internationally financed sustainable projects in Brazil struggle for LEED certification, AQUA is the second most applied certification in the country. BREEAM has two processes under development and with the system BREEAM Bespoke (an adapted assessment to each country), the perspective is that it will become more widely employed.

Since the AQUA scheme is more open and adaptable to local regulations, it was the first to be applied in the country. Nonetheless, as its visibility is mainly in Brazil, the system did not really develop. LEED is by far the most applied certification in Brazil thanks to its international image and to the creation of the Brazilian green building council, which translated all LEED support material and its continually trying to adapt the assessment method to local conditions. Another important point that gave more power to the LEED certification is that all stadiums of the 2014 world cup were obligated to be certified.

HQE, being a French certification based on the country's regulations and context, is more easily applied in France. Besides that, if a governmental building wants to have a green building certification, it must be the French system.

The HQE certification is the most expensive one, mainly because of the audits that happen in person. The high prices caused an interesting effect on the green building scenario in the country. As some enterprises want to have a green building, once they understood that this kind of construction is going to bring benefits to its occupants and will also raise the value of the construction, they employ all the recommendations of the "Demarche HQE", but they don't really apply for the certification. That can be considered as showing a stronger awareness for the subject, but also as reflecting the crisis, making more difficult to invest in an expensive process as it is the HQE certification.

BREEAM and LEED are becoming more developed in the country, once they have higher international visibility. Nowadays it is very common in France for a construction to have both certifications, HQE giving a national visibility, and BREEAM (or LEED), an international one.

Toward an international perspective

The assessment methods gave a new dynamic for the building sector, putting the green building in the center of the discussion. Nevertheless, « the proliferation of rating tools, both internationally and domestically and the variances in metrics used, has led to significant confusion in this crowded market »(Warren, 2009, Reed et al., 2011). In order to help clarify this confusion, an international non-profit organization, the Sustainable Building Alliance, brings together the main industry stakeholders. The purpose of SB Alliance is accelerating the adoption of sustainable building practices through the promotion of shared indicators for building performance assessment and rating. This global set of 'benchmark' parameters could be established for building a common/international rating tool. Once the criteria and evaluation level would be unique, the barriers between international markets and

the confusion of comparing each assessment level would fall apart. Nonetheless, if a global certification exists, certain flexibility must permit the analysis of each criterion considering the context of the project.

The individual characteristics of each country must not be overlooked when seeking to standardize rating tools. For example, the energy used for the heating/cooling system is a climate difference issue: in France due to the high use of heating system, and in Brazil due to the need of air conditioning / ventilation systems. Accordingly, it is not possible to use the same criteria in each country. As countries have different needs, the importance to each criterion must be relative. In some countries, one criterion can be much more relevant than another, so the process needs to be coherent with the reality of each project⁶.

Conclusion

Besides the adaptability of the certification process, one thing must be understood for all those who decide to invest in a green building assessment: The certification must not be seen as the final goal. Investors must evaluate and set overall sustainability goals with their design teams before filling out a certification score-sheet. This way the goals will be clear to all involved and team members will not become obsessively focused on getting credits, regardless of whether or not they add environmental value.

Once the assessment methods will be adapted to the reality of each country, the positive impact of this tool could be even more efficient. If the actions adopted to the project really take into account its context, sustainable measures will be meaningful for investors, clients and occupants, and the certification process could be a way to educate and encourage people towards a more sustainable way of living.

Having a green building is not having a completely automatic system. When the lights turn on and off without any human commitment, where the ventilation and heating systems are also automatic, the occupant becomes a simple coadjutant in the sustainable efficiency of the building. The building must be seen as a learning place for the human being to be the main actor of a new way of thinking and using the spaces that we occupy.

⁶ <https://www.bsria.co.uk/news/article/breeam-or-leed//>

Bibliography

Bernstein, H, & Russo, M., 2013. “Report Shows Green Building Is Growing Around the World”, ENR: Engineering News-Record, 270, p. 1

Bouteloup, Carassus & Alii, 2010. “The potential for differentiation in favor of “Green Buildings””.

Bowie, R. Jahn, A., 2002. “The New Directive on the Energy Performance of Buildings”; European Commission, Directorate General for Energy & Transport: Brussels, Belgium

BREEAM, 2009. “BREEAM Europe Commercial Assessor Manual, SD5066A: ISSUE 1.1, BRE Global Ltd

CIWMB California Integrated Waste Management Board, 2000. Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction. California Environmental Protection Agency: California, CA, USA

DETR 1999a. “Building a Better Quality of Life. A Strategy for more Sustainable Construction”. <http://www.berr.gov.uk/files/file13547.pdf>

Di Giulio, S., 2010. « A report on the Brazil Green Building » Conference, São Paulo September 1- 3, 2010

Dixon et al. 2008. “The privatization of sustainable infrastructure: Implications for the governance and management of multi-owned residential developments.”
http://web.sbe.hw.ac.uk/staffprofiles/bdgsa/11th_International_Conference_on_Urban_Drainage_CD/ICUD08/pdfs/248.pdf

Egan, 2004. “The Egan Review. Skills for Sustainable Communities”
http://dera.ioe.ac.uk/11854/1/Egan_Review.pdf

EC European Commission, 2011. “The lead market initiative and Sustainable construction: lot 1, Screening of national building Regulations. France Country Report »

EC 2013 EUROPEAN COMMISSION, “General construction statistics - NACE Rev. 1.1”,

LEED, 2009. “LEED Reference Guide for Green Building Design and Construction: For the Design, Construction and Major Renovations of Commercial and Institutional Buildings Including Core & Shell and K-12 School Projects”

Myers, Reed, and Robinson, 2008. Investor Perception of the Business Case for Sustainable Office Buildings: evidence from New Zealand.

http://www.prres.net/papers/myers_investor_perception_of_the_business_case.pdf

OCDE, 2002. “Design of sustainable building policies: scope for improvement and barriers », The OECD environment programme

Reed, Bilos, Wilkinson, and Schulte, 2009. International Comparison of Sustainable Rating Tools. <http://www.josre.org/wp-content/uploads/2012/09/JOSRE-Volume1-20091.pdf>

Raynsford, N. 1999. The UK’s approach to sustainable development in construction. Build Res. Inf. 1999, 27, 419-423.

Robichaud, L., Anantatmula, V., 2011. “Greening Project Management Practices for Sustainable Construction”, Journal Of Management In Engineering, 27, 1, pp. 48-57

Sartori, I., Hestnes, A.G., 2007. “Energy use in the life cycle of conventional and low energy buildings: A review article”. ENB

UNEP United Nations Environment Program, 2003. “Sustainable Building and Construction”, Division of Technology, Industry and Economics: Paris, France

WCED, 1987. World Commission on Economic Development. “Sustainable Development”; United Nations: New York, NY, USA ; p. 363

WGBC World Green Business Council, 2013. “ The business cas for green building”