Localized Green Building Standards: The Anti-Globalization Thesis

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Abstract*:* Despite going global, LEED certification is essentially a US tailored approach to encourage Green Building businesses and practices. The assumptions of incentive packages and tax breaks, points rewarded for the use of certain types of recycling, weights and points – all these have many local biases for US companies and practices. Before adoption in another country, these assumptions and biases have to be clearly spelled out and checked. In fact, a Green Building certification has to be home-grown to suit economical, cultural and technological conditions. This paper shows how different countries can adopt a customized Green Building Evaluation Code and still be recognized, the case study is Egypt Green Pyramid ranking system. The research aims to evaluate the adoption of the green building systems in Egypt and propose the suitable score and elements to the Egyptian society. Some localized issues for example are the increased encroachment on agricultural land, the abundant desert land, energy crisis and the reduced share of Nile water. The research briefly reviews the definition and the evolution of principles of green architecture. By making a comparison between global green building rating systems, the localization is highlighted. These chosen global systems are the BREEAM (Building Research Establishment Environment Assessment Method), [3]LEED (Leadership in Energy and Environmental Design), Egypt Green Pyramid and CASBEE **(C**omprehensive **A**ssessment **S**ystem for **B**uilt **E**nvironment **E**fficiency).
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1- Introduction

There has been a growing movement towards sustainable construction since the second half of the 1980s, leading to the development of various methods for evaluating the environmental performance of buildings. Methods developed overseas include BREEAM (Building Research Establishment Environmental Assessment Method) in the UK, LEED™ (Leadership in Energy and Environment Design) in the USA, and SB Tool (Sustainable Building Tool) as an international project. These methods have attracted interest around the world. This kind of assessment, together with the publication of the results, are one of the best methods now available to provide an incentive for clients, owners, designers and users to develop and promote highly sustainable construction practices.

Some of these systems were set up to suit one particular country, such as the Japanese CASBEE, while others were trying to spread all over the world like the US LEED (Leadership in Energy and Environmental Design) and the UK BREEAM (environmental assessment method). However, these systems which consider themselves global contain in fact many local biases and cannot be loosely generalized to apply in different contexts. To better serve local needs, standards that suit local development needs are to be added while excluding ones that do not.

In this paper, we will propose a green building rating systems in Egypt with the suitable scores and elements to evaluate buildings using available technology in the Egyptian environment.

2- The Evolution of Green Building Rating Systems

Many methodologies have been developed to establish the degree of accomplishment in achieving environmental goals, guiding the planning and design processes. In these earlier stages of the construction process. Planners can make decisions to improve building performance at very little or no cost, following the recommendations of the decision making tool.

The first of such tools was in 1990[1] the Building Research Establishment Environmental Assessment Method (BREEAM)[2].

After that, in 1998 other methodologies, such as the Leadership in Energy and Environmental Design

[1] http://www.breeam.org/about.jsp?id=66
[2] Baldwin R, Yates A, Howard N, and Rao S. 1998, **BREEAM (Building Research Establishment Environmental Assessment Method) 98 for offices**. Watford, UK.

(LEED) from the United States were developed and are currently widely applied.

In 2002, Green Star from Australia, and the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) from Japan was in 2005[3].

3- Basic Evaluation Criteria of Green Buildings

Five major areas are usually used in most rating systems that stem from the principles of green architecture. These are as follows:

3-1 Sustainable Site Design

The impact of site selection and design is no less important than the sustainable design of the building process itself. The two issues that are usually considered regarding sustainable sites are: Sustainable Site Selection, Sustainable Site Design.

3-2 - Water Efficiency

High efficiency systems are required to save water consumption. This begins with drinking water, rain water recuperated on the roof and used to flush toilets, and if necessary irrigate the garden, in addition to, waterless urinals.

3-3 - Energy Efficiency[4]

Saving energy from fossil fuels is considered one of the main measures of evaluating building performance. Reversible geothermal heat pump, heating and cooling through thermal mass concrete, production of hot water through recuperation of heat from Refrigerators, the energy consumption comes from renewable are some tools that are usually given high rating.

3-4 - Indoor Environmental Quality

A building and site that explicitly support a healthy work and Life style, interaction and innovation, controlled air supply system, and reduce CO2.

3-5 - Materials and Resources

Minimal use of materials, recycles and reuse, and locally sourced materials[5]

4- Comparing the Systems

How the classification system works: Rating system can generally be classified into two types: point rating systems like LEED & BREEAM, and Numerical modeling systems like CASBEE. (**Fig-1**)

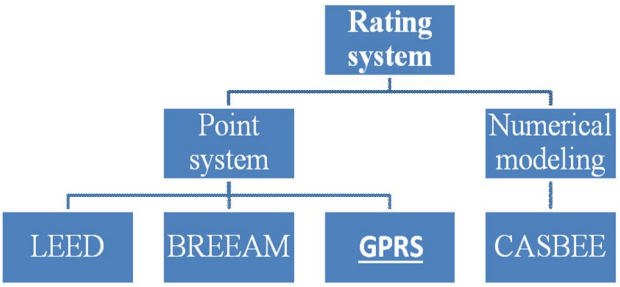


Fig-1: classification system (researcher)

4-1 LEED

LEED, or Leadership in Energy & Environmental Design, is transforming the way we think about how our buildings and communities are designed, constructed, maintained and operated across the globe. Comprehensive and flexible, LEED is a green building tool that addresses the entire building lifecycle recognizing best-in-class building strategies

At its core, LEED is a program that provides third-party verification of green buildings. Building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for the project[6] (**Fig- 2**)

4-1-1- LEED was developed according to the following policies

- Use key resources more efficiently.
- Contribute to healthier work environment, higher productivity and comfort.
- Enhances asset value over time.
- Encourage innovation of new technologies, products, materials and equipment.
- Establish national leadership in the building industry and marketplace.[7]
- Validate achievement through third party review process.
- Qualify for growing array of state and local government incentives.
- Contribute to growing green building knowledge base[8].

[3] http://www.ibec.or.jp/CASBEE/english/statistics.htm

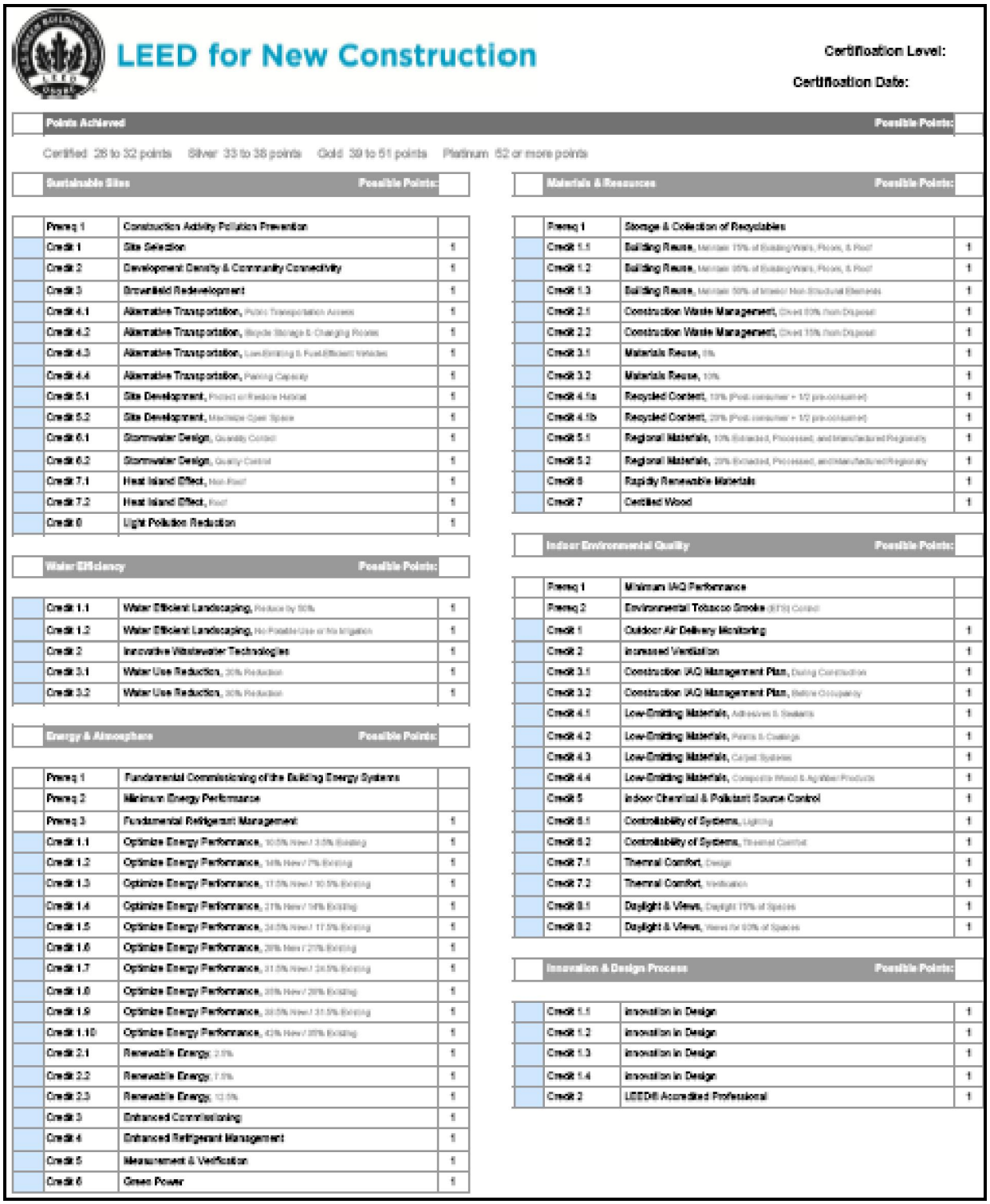
[4] **Building green standards,** Fact sheet on the new IUCN Conservation Centre, IUCN, WWW.IUCN.ORG

[5] Sherif Elattar, Eman Badawy, 2014, **TOWARDS THE ADAPTATION OF GREEN BUILDING MATERIAL SYSTEMS TO THE EGYPTIAN ENVIRONMENT,** Journal of Asian Scientific Research, Pakistan.

[6] http://www.usgbc.org/leed/rating-systems

[7] Kickoff Meeting & Round Table on Egyptian Green Building Council (EGBC) Initiation، Cairo، Egypt-

[8] Eddy Santosa، LEED (Leadership in Energy and Environmental Design) a real "green" building guide، University of Pennsylvania، 2007.



LEED for New Construction

Certification Level:

Certification Date:

	Points Achieved		Possible Points:

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

	Sustainable Sites		Possible Points:
	Prereq 1	Construction Activity Pollution Prevention	
	Credit 1	Site Selection	1
	Credit 2	Development Density & Community Connectivity	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Site Development, Protect or Restore Habitat	1
	Credit 5.2	Site Development, Maximize Open Space	1
	Credit 6.1	Stormwater Design, Quantity Control	1
	Credit 6.2	Stormwater Design, Quality Control	1
	Credit 7.1	Heat Island Effect, Non-Roof	1
	Credit 7.2	Heat Island Effect, Roof	1
	Credit 8	Light Pollution Reduction	1

	Water Efficiency		Possible Points:
	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 30% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

	Energy & Atmosphere		Possible Points:
	Prereq 1	Fundamental Commissioning of the Building Energy Systems	
	Prereq 2	Minimum Energy Performance	
	Prereq 3	Fundamental Refrigerant Management	
	Credit 1.1	Optimize Energy Performance, 30.5% New / 3.5% Existing	1
	Credit 1.2	Optimize Energy Performance, 34% New / 7% Existing	1
	Credit 1.3	Optimize Energy Performance, 37.5% New / 10.5% Existing	1
	Credit 1.4	Optimize Energy Performance, 41% New / 14% Existing	1
	Credit 1.5	Optimize Energy Performance, 44.5% New / 17.5% Existing	1
	Credit 1.6	Optimize Energy Performance, 48% New / 21% Existing	1
	Credit 1.7	Optimize Energy Performance, 51.5% New / 24.5% Existing	1
	Credit 1.8	Optimize Energy Performance, 55% New / 28% Existing	1
	Credit 1.9	Optimize Energy Performance, 58.5% New / 31.5% Existing	1
	Credit 1.10	Optimize Energy Performance, 63% New / 35% Existing	1
	Credit 2.1	Renewable Energy, 2.5%	1
	Credit 2.2	Renewable Energy, 7.5%	1
	Credit 2.3	Renewable Energy, 12.5%	1
	Credit 3	Enhanced Commissioning	1
	Credit 4	Enhanced Refrigerant Management	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

	Materials & Resources		Possible Points:
	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, & Roof	1
	Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors, & Roof	1
	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1	Materials Reuse, 5%	1
	Credit 3.2	Materials Reuse, 10%	1
	Credit 4.1a	Recycled Content, 10% (Post-consumer + 1/2 pre-consumer)	1
	Credit 4.1b	Recycled Content, 20% (Post-consumer + 1/2 pre-consumer)	1
	Credit 5.1	Regional Materials, 10% Extracted, Processed, and Manufactured Regionally	1
	Credit 5.2	Regional Materials, 20% Extracted, Processed, and Manufactured Regionally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

	Indoor Environmental Quality		Possible Points:
	Prereq 1	Minimum IAQ Performance	
	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increased Ventilation	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Lighting	1
	Credit 6.2	Controllability of Systems, Thermal Comfort	1
	Credit 7.1	Thermal Comfort, Design	1
	Credit 7.2	Thermal Comfort, Verification	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

	Innovation & Design Process		Possible Points:
	Credit 1.1	Innovation in Design	1
	Credit 1.2	Innovation in Design	1
	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
	Credit 2	LEED® Accredited Professional	1

Fig-2: : LEED score sheet, from, leed**.usgbc.org/**

4-1-2- Criticism of LEED

There are some elements of existing local LEED system which is difficult to apply in the Egyptian system like:

1- local credits.

- Certified Wood
- Brownfield Redevelopment
- Regional Priority: Specific Credit

- Site Development—Protect or Restore Habitat

2- Local material

There are some local building materials available in the United States but not available in some other countries. such as the use of wood as well as forest conservation, there are no forests in some countries, so you will not get the point of conservation. And thus become some points missing in some countries and impossible to obtain.

3- Increased cost

Owner bears an extra cost in order to obtain LEED certification (tab- 1)[9] Fig-3

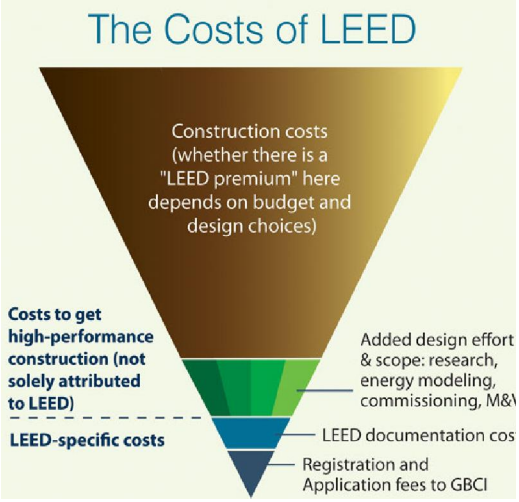


Fig-3: costs in LEED certification, leed**.usgbc.org**

tab- 1: costs in LEED certification, leed.usgbc.org

Design Review	
Members	$12,500.00
Non-Members	$15,000.00
Construction Review	
Members	$5,000.00
Non-Members	$7,500.00
Combined Design & Construction Review	
Members	$17,500.00
Non-Members	$22,500.00 [10]

Bvvvb

This leads to perverse economic incentives. Contractors are more likely to take advantage of the cheaper option. Remediating brownfields creates many positive externalities that reduce health problems in the neighboring community and support plant and animal life. But positive externalities are often not internalized within the costs of the building. Therefore many developers and contractors would choose the easier and cheaper option over the option that reaps the most positive externalities.

4- Marketing USA material

LEED system encourages some industries in the USA. and forcing other countries to buy them (green material) It is possible that contain some of the material on the same local characteristics and thus reduce costs but in this case does not get the credits.

LEED system is biased towards US factories. It requires other countries to import such products. If local products have the same standards, they may be used, but LEED score will not be granted, even if cheaper.

5- Limited creativity

A large part of the green building process is the organic design and creation. LEED stifles the creative process by providing strict guidelines on what to build.

6- Top of Form

Another disadvantage (or grievance) of LEED is that it promotes green building that, in some cases is not actually 'green'. In October of 2010, Henry Gifford filed a class action lawsuit against USGBC in the Southern District of New York filed a lawsuit against the USGBC. The suit alleges abuses of the Sherman and Lanham Acts for "deceiving users" of the LEED system about whether LEED buildings use less energy than conventionally-built buildings..

7- admonition about LEED credits

there is a lot of discrepancy about the weight of certain credits. The same amount of points are given to installing a bike rack outside the building as you would receive if you redeveloped a brownfield site. You can even receive a credit point for involving a LEED AP (Accredited Professional) Installing a 10 person bike rack is quite cheap, whereas revitalizing a brownfield site over a conventional site is extremely expensive because of bioremediation[11].

The LEED certification system also does not address the user awareness and education of inhabitants or visitors of its buildings, besides for a certification plaque placed on a recognizable place on or within the building. Without user awareness and education, inhabitants are not cognizant of the green building aspects within the building. By making inhabitants aware, they are more likely to conserve

[9] Review and Critique of LEED, from http://ecobrooklyn.com/review-critique-leed/

[10] Review and Critique of LEED, from http://ecobrooklyn.com/review-critique-leed/

[11] Auden Schendler, Top green-building system is in desperate need of repair, from http://grist.org/article/leed/

energy use, and live a more environmentally aware lifestyle.[12]

4-2 -Breeam

BREEAM is the world's foremost environmental assessment method and rating system for buildings, with 250,000 buildings with certified BREEAM assessment ratings and over a million registered for assessment since it was first launched in 1990[13].

BREEAM sets the standard for best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building's environmental performance. It encourages designers, clients and others to think about low carbon and low impact design, minimising the energy demands created by a building before considering energy efficiency and low carbon technologies.[14]

The main difference between the two systems is the process of certification. BREEAM has trained assessors who assess the evidence against the credit criteria and report it to the BRE, who validate the assessment and issue the certificate[15].

While LEED does not require training, there is a credit available if an accredited professional (AP) is used. The role of the AP is to help gather the evidence and advise the client. The evidence is then submitted to the US-GBC which does the assessment and issues the certificate.

Both schemes share common components (Table 1). Early involvement of the assessor or AP at the design stage is beneficial to the project and the final rating. Both schemes drive the market to improve building design. The judging criteria also keep pace with legislative developments and current best practice.(**Fig- 4)**

So it appears that BREEAM delivers a higher rating for the same building in both the US and the UK. That said, it would be more accurate to compare LEED with BREEAM 2008, as the latter now has a mandatory post-construction review, something LEED has had for a while. With previous BREEAM schemes most buildings were only assessed at a design stage.

The main differences between LEED and BREEAM (courtesy Eszter Gulacsy)Others are more cautious. “Europe thinks that LEED is an easy win, but it isn’t if the paperwork and evidence is not in place,” says Eszter Gulacsy. “There is a danger of complacency,” she warns.[16]

4-2-1- BREEAM was developed according to the following policies

1. market recognition for low environmental impact buildings,
2. confidence that tried and tested environmental practice is incorporated in the building,
3. inspiration to find innovative solutions that minimise the environmental impact,[17]
4. a benchmark that is higher than regulation,
5. a system to help reduce running costs, improve working and living environments,
6. a standard that demonstrates progress towards corporate and organisational environmental objectives[18].

4-2-2- Criticism of BREEAM

The same criticism that face to LEED system.

4-3 The Green Pyramid Rating System (GPRS) (public review)

In January 2009,Establishment of Egyptian Green Building Council, green construction would be the desired goal for all new building projects and building energy efficiency codes would be the materials, tools and road map to achieve the desired goal.

present green construction as a financially logical and appropriate course of action that integrates important global and national concerns to produce viable sustainable products that meet the short term and long term needs of people.

Egypt-GBC, a whole-building approach to sustainability by recognizing performance in Seven key areas: Sustainable Sites Development, Water Saving, Energy Efficiency and Environmen, Materials Selection and Construction System

Indoor Environmental Quality, Innovation and Design Process, Recycling of Solid Waste.

in April 2011, issued a draft of the first edition, And has not yet been completed. **(Fig- 5)**

[12] Gaby Abdalla,Ger Maas and Jules Huyghe ,Dr. Mieke Oostra MSc, **Criticism on Environmental Assessment Tools, 2011 2nd International Conference on Environmental Science and Technology**

[13] Ding, G. K. C. 2004, "The developpment of a multi-criteria approach for the measurement of sustainable performance for built projects and facilities"

[14] http://www.breeam.org/about.jsp?id=66

[15] https://www.bsria.co.uk/news/article/breeam-or-leed/

[16] BREEAM or LEED - strengths and weaknesses of the two main environmental assessment methodsFebruary 2009, from https://www.bsria.co.uk/news/article/breeam-or-leed/

[17] Tracie J Reed M.St. IDBE, LEED AP, Peggi L Clouston P.Eng., Ph.D, Simi Hoque Ph.D. [3], Paul R Fisettan Analysis of LEED and BREEAM Assessment Methods for Educational Institutions, from http://www.journalofgreenbuilding.com/doi/abs/10.3992/jgb.5.1.132.

[18] http://www.ipcbee.com/vol6/no2/98-F30037.pdf.

Credit	BREEAM 2008 credit description	% available per credit
Man 1	Commissioning	2.4
Man 2	Considerate Constructors	2.4
Man 3	Construction Site Impacts	4.8
Man 4	Building User Guide	1.2
Man 8	Security	1.2
Hea 1	Daylighting	1.15
Hea 2	View out	1.15
Hea 3	Glare control	1.15
Hea 4	High frequency lighting	1.15
Hea 5	Internal and external lighting levels	1.15
Hea 6	Lighting zones & control	1.15
Hea 7	Potential for natural ventilation	1.15
Hea 8	Indoor air quality	1.15
Hea 9	Volatile organic compounds	1.15
Hea 10	Thermal comfort	1.15
Hea 11	Thermal zoning	1.15
Hea 12	Microbial contamination	1.15
Hea 13	Acoustic performance	1.15
Wst 2	Recycled aggregates	1.07
Wst 3	Storage of recyclable waste	1.07
Wst 6	Floor finishes	1.07
LE 1	Re use of land	1
LE 2	Contaminated land	1
LE 3	Ecological value of site AND Protection of ecological features	1
LE 4	Mitigating ecological impact	2
LE 5	Enhancing site ecology	3
Ene 1	Reduction of CO2 emissions	11.7
Ene 2	Sub-metering of substantial energy uses	0.78
Ene 3	Sub metering of high energy load areas and tenancy	0.78
Ene 4	External lighting	0.78
Ene 5	Low or zero carbon technologies	2.34
Ene 8	Lifts	1.56
Ene 9	Escalators	0.79
Tra 1	Provision of public transport	2.4
Tra 2	Proximity to amenities	0.8
Tra 3	Cyclist facilities	1.6
Tra 4	Pedestrian and cycle safety	0.8
Tra 5	Travel plan	0.8
Tra 6	Maximum car parking capacity	1.6
Wat 1	Water consumption	3
Wat 2	Water meter	1
Wat 3	Major leak detection	1
Wat 4	Sanitary supply shut off	1
Mat 1	Materials specification (major building elements)	3.84
Mat 2	Hard landscaping and boundary protection	0.96
Mat 3	Re-use of building façade	0.96
LE 6	Long term impact on biodiversity	2
Pol 1	Refrigerant GWP - Building services	0.83
Pol 2	Preventing refrigerant leaks	1.66
Pol 4	NOx emissions from heating source	2.49
Pol 5	Flood risk	2.49
Pol 6	Minimising watercourse pollution	0.83
Pol 7	Reduction of night time light pollution	0.83
Pol 8	Noise attenuation	0.83

Fig- 4: BREEAM score sheet, from WWW.BRE GLOBAL .COM

4-3-1- (GPRS) was developed according to the following policies

green pyramid evaluation system aim to spread a set of objectives like:

1. One of the objectives for establishing this council is to provide a mechanism to encourage building investors to adopt BEECs as well as other sections of existing codes that satisfy both energy efficiency and environmental conservation.

2. By focusing on new construction, the Egypt-GBC could use its leverage as a professional organization to educate and convince engineers, builders, contractors and owners about the benefits of green construction to the individual, to the community, to the nation and most significantly to the bottom line.

3. Provide a reference sets environmental standards required in buildings in Egypt.

4. raise the level of awareness of the benefits of low environmental impact buildings.

5. encourage innovative solutions that reduce environmental impacts.

To promote the design and construction of green and sustainable buildings, to achieve energy efficiency, materials, water and environmental conservation use.[19]

4-3-2- Criticism of Green Pyramid Rating System (GPRS)

1. Green pyramid system collect all the elements of the existing standards in the global systems to create an integrated Egyptian system, but some of these elements is not compatible with the Egyptian Environment.

2. High cost of technologies of renewable energy, put a lot of points in this elements means forcing the property owner to increase costs, leading to rise building prices in Egypt more than it is now, and so the Egyptian society may refuse the green pyramid, which contributed to the growing problem of housing.

3. Give some points on the recycling materials of construction material and this industries not found in Egypt, so these points are considered missing for all buildings.

4. the local environment Did not give the importance of Japan's system, but an internal component inside the sustainable site, as well as in the materials and resources where prevent points on the use of local materials.

So this Criticism must be in mind when making the development of the system before the issuance of the pyramid Green Edition, which will be referred to comply with the building code.

4-4 CASBEE

CASBEE is a tool for assessing and rating the environmental performance of buildings and built environment. *From Eco-efficiency to Built Environment Efficiency (BEE)*

The concept of Eco-efficiency has been introduced for CASBEE to enable the integrated assessment of two factors, inside and outside the building site. Eco-Efficiency is normally defined as "Value of products and services per unit environmental load. Efficiency is commonly defined in terms of input and output quantities, so a new model can be proposed for an expanded definition of Eco-Efficiency, as "(beneficial output) / (input + non-beneficial output)." As Figure 4 shows, this new model of environment efficiency can be extended to define Built Environment Efficiency (BEE), which CASBEE uses as its assessment indicator.[20]

The main different between CASBEE and other system is that it did not specify the points of the evaluation, but the development of an equation to assess the efficiency of the building through the environmental efficiency of the building. A technique gives more accurate results, as well as the development of the local environment, a key criterion in the evaluation to confirm its importance.

Such and similar to them in the development of energy use, and efficient use of resources, and environmental value in terms of the internal loads, and thermal loads, and lighting (ventilation - the use of recycled materials - ventilation rate), as criteria for evaluation. (**Fig- 6)**

4-4-1- **CASBEE was developed according to the following policies:**

1) The system should be structured to award high assessments to superior buildings, thereby enhancing incentives to designers and others.

The assessment system should be as simple as possible.

2) The system should be applicable to buildings in a wide range of building types.

3) The system should take into consideration issues and problems peculiar to Japan and Asia.[21]

4-4-2- Criticism of CASBEE

Very complicated to understand, and limited to spread

4-5 Egyptian Current rating system

There are some local elements shall be in the Egyptian model

Comparison between green building rating systems

(Tab-2) shows a comparison between the various green building rating system like ***BREEAM***, ***LEED*** and CASBE in Requirements

To understand the comparison we should take into consideration that:

1- Some elements have the same means in a different vocabulary, such as Sustainable site equal to Ecology equal to Local environment.

2- Similar means have same colors in the various rating systems.

3- All system includes elements about Sustainable site, Energy, Materials & Resources Efficiency, and Indoor Environmental Quality.

4- All system include elements about Water Efficiency except the CASBE.

[19] مدحت مصطفي خورشد (2010)، **آليات النظام القومي لتصنيف البناء الأخضر المصري**، مؤتمر الأسكان العربي الأول أستدامة البناء في المنطقة العربية وخاصة البيئة الصحراوية، مركز بحوث الاسكان والبناء، مصر.

[20] http://www.ibec.or.jp/CASBEE/english/backgroundE.htm

[21] http://www.ibec.or.jp/CASBEE/english/overviewE.htm

	Category / sub-category	✓ as appropriate Credits expected	Evidence available
1	SUSTAINABLE SITE, ACCESSIBILITY AND ECOLOGY		
	1.M.1 Project Design and Implementation Plan		
	1.1.1 Desert area development		
	1.1.2 Informal area redevelopment		
	1.1.3 Brownfield site redevelopment		
	1.1.4 Compatibility with National Development Plan		
	1.2.1 Transport infrastructure connection		
	1.2.2 Catering for remote sites		
	1.2.3 Alternative methods of transport		
	1.3.1 Protection of habitat		
	1.3.2 Respect for sites of historic or cultural interest		
	1.3.3 Minimizing Pollution during construction		
2	ENERGY EFFICIENCY		
	2.M.1 Minimum Energy Performance Level		
	2.M.2 Energy Monitoring & Reporting		
	2.M.3 Ozone Depletion avoidance		
	2.1 Energy Efficiency Improvement		
	2.2 Thermal Comfort Strategies		
	2.3 Energy Efficient Appliances		
	2.4 Vertical Transportation Systems		
	2.5 Peak Load Reduction		
	2.6 Renewable Energy Sources		
	2.7 Environmental Impact		
	2.8 Operation and Maintenance		
	2.9 Optimized balance of Energy and Performance		
6	MANAGEMENT		
	6.M.1 Integrated Plan and Method Statement for site operations		
	6.M.2 Compliance with Health & Safety and Welfare regulations		
	6.M.3 Demolition Method Statement[24]		
	6.1.1 Containers for site materials waste		
	6.1.2 Employing waste recycling workers on site		
	6.1.3 Access for lorries, plant and equipment		
	6.1.3 Identified and separated storage areas		
	6.2.1 Project Waste Management Plan		
	6.2.2 Engaging a company specialized in recycling and disposal		
	6.2.3 Protecting water sources from pollution		
	6.2.4 Waste from mixing equipment		
	6.2.5 Control of emissions and pollutants		
	6.3.6 Providing a Building User Guide		
	6.3.7 Providing a Periodic Maintenance Schedule		

3	WATER EFFICIENCY	
	3.M.1 Minimum Water Efficiency	
	3.M.2 Water Use Monitoring	
	3.1 Indoor Water Efficiency Improvement	
	3.2 Outdoor Water Efficiency Improvement	
	3.3 Efficiency of Water-based Cooling	
	3.4 Water Feature Efficiency	
	3.5 Water Leakage Detection	
	3.6 Storm Water Harvesting	
	3.7 Passive Distillation Systems	
	3.8 Waste Water Management	
4	MATERIALS AND RESOURCES	
	4.M.1 Schedule of Principal Project Materials	
	4.M.2 Elimination of exposure to hazardous and toxic materials.	
	4.1.1 Regionally procured materials	
	4.1.2 Materials fabricated on site	
	4.1.3 Use of readily renewable materials	
	4.1.4 Use of salvaged materials	
	4.1.5 Use of recycled materials	
	4.1.6 Use of lightweight materials	
	4.1.7 Use of higher durability materials	
	4.1.8 Use of prefabricated elements	
	4.1.9 Life Cycle Cost (LCC) analysis of materials in the project	
5	INDOOR ENVIRONMENTAL QUALITY	
	5.M.1 Minimum Ventilation and Indoor Air Quality	
	5.M.2 Control of Smoking in and around the Building	
	5.M.3 Control of Legionella and other health risks	
	5.1 Optimized Ventilation	
	5.2 Controlling emissions from building materials	
	5.3 Thermal Comfort	
	5.4 Visual Comfort	
	5.5 Acoustic Comfort	

Fig- 5: GPRS score sheet, fromwww.hbrc.edu.eg/gbc.html

$$\text{Building Environmental Efficiency (BEE)} = \frac{\text{Q (Building environmental quality and performance)}}{\text{L (Building environmental loadings)}}$$

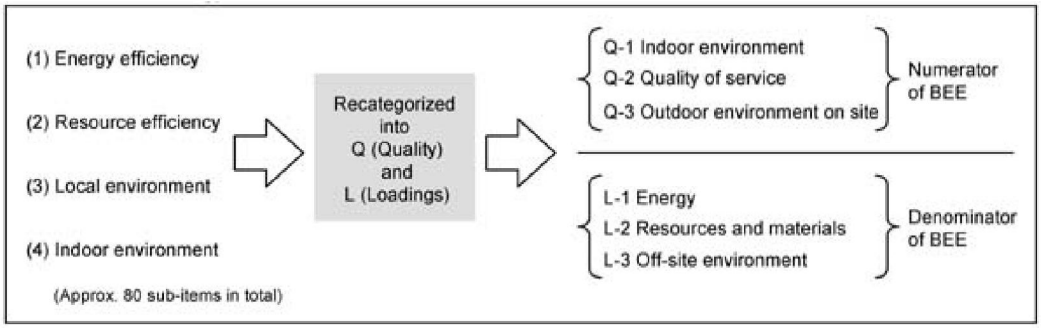


Fig- 6: Classification and rearrangement , from 2006 Japan Sustainable Building Consortium (JSBC

Tab -2: Comparison between the various green building rating system like *BREEAM*, *LEED* and CASBE in Requirements (researcher)

	LEED	BREAM	CASBE	The proposed system in EYGPT
1	Sustainable site	Ecology Land Use Transport	Local environment	Sustainable site
2	Energy & Atmosphere	Energy	Energy Efficiency	Energy
3	Water Efficiency	Water		Water
4	Materials & Resources	Materials Waste construction resource Management	Resources Efficiency	Materials & Resources Efficiency
5	Indoor Environmental Quality	Health and Wellbeing Pollution	Indoor environment	Indoor Environmental Quality

4-5-1- Requirements in the Egyptian system (Tab-3) includes Requirements should be added and not suitable in the Egyptian model, after Exclusion of requirements with similar meanings.

It is important to mention that Some Requirements are not suitable in Egypt because of:
The Limitation of industry in Egypt in some requirements like Recycling Waste Storage.
Some materials are not found in Egypt like Certified Wood.

Tab -3: Requirements should be added and not suitable in the Egyptian model

(researcher)	**Requirements should be added in the Egyptian model**	**Requirements not suitable in the Egyptian model**	**The reason**
Sustainable site	a. Out of the areas Overcrowding b. Not to build on agricultural land. c. Non-infringement on the Nile. d. Compatibility with development plan. e. Development of slums	Alternative Transportation, Bicycle Storage	not suitable because of Cultural background
		Site Development—Protect or Restore Habitat	Specific Credit in USA
		Regional Priority	Specific Credit in USA
		1. Brownfield	Specific Credit in

	Requirements should be added in the Egyptian model	Requirements not suitable in the Egyptian model	The reason
		Redevelopment	USA
Energy	a- natural ventilation b- natural lighting c- The use of renewable energy sources compatible with the site	Green Power	Limited industry in Egypt and high cost
Materials	1. The use of local materials (clay - a stone) 2. The use of recyclable materials 3. The use of renewable materials 4. Economical use of building materials	**Recycling Waste Storage**	Limited industry in Egypt
		Recycled Content	No industry in Egypt
		Certified Wood	Not available locally therefore not suitable
Water	Rainwater harvesting Groundwater use	Innovative wastewater technologies.	Limited industry in Egypt
Indoor Environmental Quality			

4-5-2- Importance and credit in the Egyptian system

(Tab- 4) Including the range of score for each element, and proposing the suitable score to the Egyptian society.

Tab-4: Importance and credit in the Egyptian system (researcher)

	LEED		BREAM		Propos for Egypt		comment
	credit	importance	credit	importance	importance	Credit % in	
Sustainable site	26	2	12 +8[22]	2	2	20%	To increase the encroachment on agricultural land after the revolution of January 25
Energy	35	1	22	1	1	30%	To the growing energy crisis and the interruption of electricity
Water	10	5	10	4	1	30%	To reduce Egypt's share of Nile water and the construction of a dam Renaissance
Materials	14	4	14	3	3	10%	The importance of saving material
Indoor Environmental Quality	15	3	14	3	3	10%	The importance of providing thermal comfort and acoustic and optical
Innovation and Design Process	6	6	0	0	0	0	Included in all elements
Regional Priority Credits	4	7	0	0	0	0	Included in all elements
management	0	0	10	4	0	0	Included in all elements
transport	0	0	8	5	0	0	
Pollution	0	0	10	4	0	0	Included in energy
total	110	-------	100	-------	---------	100%	

[22] Transport+ Sustainable site

Evident from (Tab-4) the relative importance of the criteria and weights proposed for the Egyptian system, which takes energy highest importance in all systems previously dealt with, and take the same importance in Egypt, but their equivalent in importance to maintain the water, as a result of entering Egypt at the stage of water poverty resulting from the pursuit of the upstream countries the establishment of dams on the headwaters of the Nile River to generate electricity in addition to the desire to agricultural expansion, which increased the size of the problem and poor relations between Egypt and the countries of origin and the exploitation by Israel of this problem.

And the importance of preserving different materials in Egypt from the other to the high prices of construction materials in Egypt and increase the amount of waste in the construction materials as a result of reliance on traditional methods.

Some of the foundations and the criteria upon which the assessment systems in Egypt is different from the others because of the different economic conditions, social, as well as techniques, and lack of awareness of its importance.

Results and Recommendations

1- Green building rating systems help the designer to choose the right design.

2- Evaluation criteria in different systems are specific to each state individually and are difficult to be circulated from one country to another because of the different economic conditions and local materials availability.

3- All rating systems having points to evaluate the use of local materials, indicating its importance.

4- Requirements should be added in the Egyptian model in **Sustainable site** like Out of the areas Overcrowding, Not to build on agricultural land, Non-infringement on the Nile, Compatibility with development plan, and Development of slums. Requirements not suitable in the Egyptian model like Alternative Transportation, Bicycle Storage, Site Development—Protect or Restore Habitat, Regional Priority, and Brownfield Redevelopment.

5- Requirements should be added in the Egyptian model in **Energy** like natural ventilation, natural lighting, and The use of renewable energy sources compatible with the site**.** Requirements not suitable in the Egyptian model like Green Power.

6- Requirements should be added in the Egyptian model in **Materials** like The use of local materials (clay - a stone), The use of recyclable materials, The use of renewable materials, and Economical use of building materials. Requirements not suitable in the Egyptian model Recycling Waste Storage, Recycled Content, and Certified Wood.

7- Requirements should be added in the Egyptian model in **Water** Like Rainwater harvesting, and Groundwater use. Requirements not suitable in the Egyptian model like Innovative wastewater technologies.

Reference

1. Building green standards, Fact sheet on the new IUCN Conservation Centre, IUCN, WWW.IUCN.ORG.
2. Baldwin R, Yates A, Howard N, and Rao S. 1998, BREEAM (Building Research Establishment Environmental Assessment Method) 98 for offices. Watford, UK.
3. http://www.usgbc.org/leed/rating-systems.
4. Kickoff Meeting & Round Table on Egyptian Green Building Council (EGBC) Initiation، Cairo، Egypt- January،2009.
5. Eddy Santosa، LEED(Leadership in Energy and Environmental Design) a real "green" building guide، University of Pennsylvania، 2007.
6. Review and Critique of LEED, from http://ecobrooklyn.com/review-critique-leed/
7. Auden Schendler, Top green-building system is in desperate need of repair, from http://grist.org/article/leed/
8. Sherif Elattar, Eman Badawy, 2014, TOWARDS THE ADAPTATION OF GREEN BUILDING MATERIAL SYSTEMS TO THE EGYPTIAN ENVIRONMENT, Journal of Asian Scientific Research, Pakistan.
9. Gaby Abdalla,Ger Maas and Jules Huyghe ,Dr. Mieke Oostra MSc, Criticism on Environmental Assessment Tools, 2011 2nd International Conference on Environmental Science and Technology
10. Ding, G. K. C. 2004, "The developpment of a multi-criteria approach for the measurement of sustainable performance for built projects and facilities".
11. http://www.breeam.org/about.jsp?id=66.
12. https://www.bsria.co.uk/news/article/breeam-or-leed/.
13. BREEAM or LEED - strengths and weaknesses of the two main environmental assessment methods February 2009, from https://www.bsria.co.uk/news/article/breeam-or-leed/.
14. Tracie J Reed M.St. IDBE, LEED AP, Peggi L Clouston P.Eng., Ph.D, Simi Hoque Ph.D. [3], Paul R Fisettan Analysis of LEED and BREEAM Assessment Methods for Educational Institutions, from http://www.journalofgreenbuilding.com/doi/abs/10.3992/jgb.5.1.132.
15. http://www.ipcbee.com/vol6/no2/98-F30037.pdf.
16. http://www.ibec.or.jp/CASBEE/english/backgroundE.htm.
17. http://www.ibec.or.jp/CASBEE/english/overviewE.htm.