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Localized Green Building Standards: The Anti-Globalization Thesis

Ayman M. Ismail[1], Maged M. Abo Elela[2] Eman B. Ahmed[3]

Professor of Environmental Architecture, Dept. of Architecture, Faculty of Engineering, Fayoum University, Egypt[1]

Lecturer of Architecture, Dept. of Architecture, Faculty of Engineering, Fayoum University, Egypt[2]

Assistant Lecturer of Architecture, Dept. of Architecture, Faculty of Engineering, Fayoum University, Egypt[3]

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.

KEYWORDS: Green Architecture , Building Rating Systems , LEED- Adaptation, Egyptian environment.

I. 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, LEEDTM (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.

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), LEED (Leadership in Energy and Environmental Design), and CASBEE (Comprehensive Assessment System for Built Environment Efficiency). 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.

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II. 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 (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]**.**

III. 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:

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.

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- 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.

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.

5- Materials and Resources: Minimal use of materials, recycles and reuse, and locally sourced materials.[5]**.**

IV. 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.

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.

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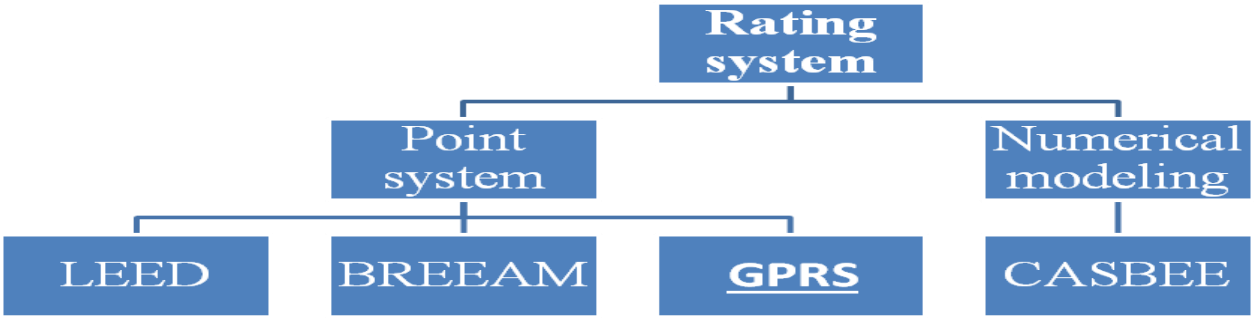

1-1- LEED was developed according to the following policies

- 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].

1-2-Criticism of LEED

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

- local credits like Certified Wood, Brownfield Redevelopment, Regional Priority: Specific Credit, and Site Development—Protect or Restore Habitat
- 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.
- 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.
- 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.
- 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.
- 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 energy use, and live a more environmentally aware lifestyle.[9].

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LEED 2009 for Schools New Construction and Major Renovations

Project Checklist

Project Name

Date

Y	?	N			
Sustainable Sites				Possible Points:	24
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	4
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	4
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Roon	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Ve	2
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			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
			Credit 9	Site Master Plan	1
			Credit 10	Joint Use of Facilities	1
Water Efficiency				Possible Points:	11
Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
			Credit 3	Process Water Use Reduction	1
Energy and Atmosphere				Possible Points:	33
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
			Credit 2	On-Site Renewable Energy	1 to 7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	1
			Credit 5	Measurement and Verification	2
			Credit 6	Green Power	2
Materials and Resources				Possible Points:	13
Y			Prereq 1	Storage and Collection of Recyclables	
			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 2
			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Element	1
			Credit 2	Construction Waste Management	1 to 2

Y	?	N			
Materials and Resources, Continued					
			Credit 3	Materials Reuse	1 to 2
			Credit 4	Recycled Content	1 to 2
			Credit 5	Regional Materials	1 to 2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1
Indoor Environmental Quality				Possible Points:	19
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Minimum Acoustical Performance	
			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	Low-Emitting Materials	1 to 4
			Credit 5	Indoor Chemical and 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 and Views—Daylight	1 to 3
			Credit 8.2	Daylight and Views—Views	1
			Credit 9	Enhanced Acoustical Performance	1
			Credit 10	Mold Prevention	1
Innovation and Design Process				Possible Points:	6
			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 2	LEED Accredited Professional	1
			Credit 3	The School as a Teaching Tool	1
Regional Priority Credits				Possible Points:	4
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1
Total				Possible Points:	110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Fig.2. Checklist of LEED certification, leed.usgbc.org

- 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..
- 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 .[10]**.**
- Increased cost :Owner bears an extra cost in order to obtain LEED certification . tab. 1.. [11]**.** Fig.3.

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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.[11].

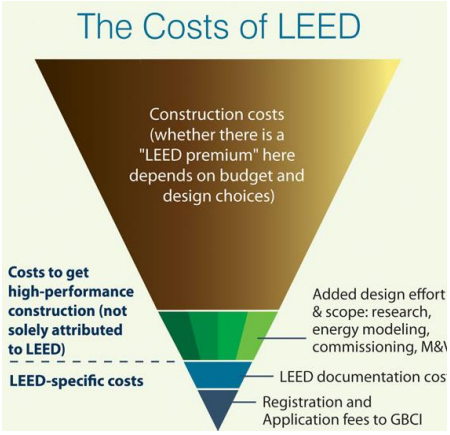

Fig.3. costs in LEED certification, leed.usgbc.org

2- 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 .[12].

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. 4.

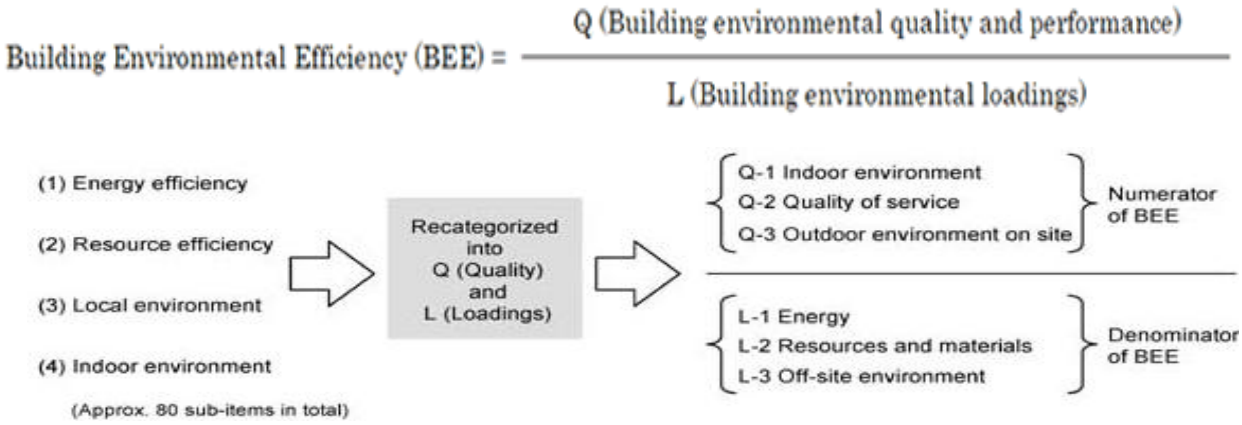

Fig. 4. Classification and rearrangement , from 2006 Japan Sustainable Building Consortium (JSBC

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2-1- CASBEE was developed according to the following policies:

- 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.
- The system should be applicable to buildings in a wide range of building types.
- The system should take into consideration issues and problems peculiar to Japan and Asia [13].

2-2- Criticism of CASBEE

Very complicated to understand, and limited to spread

3- 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 :

- Some elements have the same means in a different vocabulary, such as Sustainable site equal to Ecology equal to Local environment.
- Similar means have same colors in the various rating systems.
- All system includes elements about Sustainable site, Energy, Materials & Resources Efficiency, and Indoor Environmental Quality.
- All system include elements about Water Efficiency except the CASBE.

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	Local environment	Sustainable site
		Land Use		
		Transport		
2	Energy & Atmosphere	Energy	Energy Efficiency	Energy
3	Water Efficiency	Water		Water
4	Materials & Resources	Materials	Resources Efficiency	Materials & Resources Efficiency
		Waste construction resource		
		Management		
5	Indoor Environmental Quality	Health and Wellbeing	Indoor environment	Indoor Environmental Quality
		Pollution		

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3-1- 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 Redevelopment	Specific Credit in 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			

3-2- 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.

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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[1]	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%	

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.

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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.

V. CONCLUSION

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

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