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Protect the Planet through Sustainability Rating Systems with Local Environmental Criteria - LEED in the Middle East

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Abstract

Sustainable design becomes a mandatory as a result of environmental requirements. Furthermore, LEED as a rating system has started to be a tool in many countries in the world. The research objective is to push all architects to protect the environment through their architectural designs and concepts by applying the most effective sustainable criteria. The methodology will be focused on evaluating LEED in the Middle East region compared with a local rating system in the Middle East. The outcome will be focused on the importance of creating a rating system for each region, which considers local environmental challenges.

Keywords: Rating systems; sustainability, ptotect the planet; LEED in the Middle East

1. Introduction

The aims of creating any rating system are to mitigate the life cycle impacts of buildings on the environment, to enable buildings to be recognized according to their environmental benefits, to provide a credible environmental label for buildings and to stimulate demand for sustainable buildings(1). Each Rating System has been developed to meet the following underlying principles: (1)

- Ensure environmental quality through an accessible, holistic, and balanced measure of environmental

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(1) BRE. *BREEAM New Construction, Non-Domestic Buildings, Technical Manual.2011.* (SD5073 – V.2.00), P.13

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impacts.
- Use quantified measures for determining environmental quality.
- Use best available science and best practice as the basis for quantifying and calibrating a cost-effective performance standard for defining environmental quality.
- Reflect the social and economic benefits of meeting the environmental objectives covered.
- Provide a common framework of assessment that is tailored to meet the 'local' context, including regulation, climate, and sector.

Based on above items, we can recognize that regional environmental challenges are the most important items to have a rating system. Each part of the world is suffering from lack of one or more resources. Countries in a desert area such as the Middle East countries are suffering from lack water resources and hot weather, which need cooling devices. However, they have plenty of energy resources. On the other hand, European countries and North America are suffering from lack of energy more than water resources, and they have cold weather, which needs warming devices. Moreover, the whole world is suffering from Global Warming Potential (GWP) and Ozone Depletion Potential (ODP). That means any region of the world will have specific credits, which measure the environmental priorities and challenges. Besides, it will have some general credits that serve the global challenges.

2. Research Problem

The procedures of getting LEED certificate certified, silver, gold, or even platinum is based on collecting points and achieving some very few prerequisites. After studying all prerequisites, we will find no one of them is focused on the regional environmental problems even inside the US. The problem is focused on some consultants who want to get LEED certificate in the Middle East and their concern of collecting points regardless of the importance of this point to the environment. For example, having LEED AP, having bicycle racks and lockers in a desert climate which is very rare to have transportation using bicycles. That means Middle East countries should have adequate rating system, which reflects theirs environmental needs**.**

3. Research Methodology

The methodology is focused on comparing the LEED principals as rating system and local one, which is Green Pyramid. The comparison will evaluate each principal against local environmental changes and clarify the need of using local sustainable rating system for each region.

4. Sustainable Design Concept in LEED as Rating System

The Sustainable Design Concept is based on specific design structures that reduce the overall negative impact of the built environment on human and the natural environment by [(2)]:
- Efficiently using energy, water, land, and materials.
- Protecting occupant health and improving employee productivity
- Reducing waste and pollution from each green building.

The above main strategies could be applied everywhere and could be described as demand for our planet to save it. The difference between a region and other one will be focused on the importance of each item. For example, the efficiency of land and materials will be various from Japan to Saudi Arabia. The

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[(2)] Green Building Education Services, *LEED Green Associate study guide*, 2010

weight of credits related to this strategy and number of points for the same credit should be different according to its location. Starting from above basic items LEED specifies seven main categories to can determine if the building is sustainable or not (Table 1).

Each category from the seven categories has credits with certain points for each, and some of them have prerequisites. The prerequisite does not count in points, but they should be achieved otherwise the whole project will be refused if one of them does not.

5. Sustainable Design Categories in LEED & Local Rating System

In this part, the research will describe the main categories of sustainable design in LEED and Green Pyramid as a local Egyptian rating system. As shown, the comparison will present each category weight. The seven categories approximately are the same even in the word phrasing. The whole categories in each rating system have (110 points).

Table 1. LEED categories & their weighting [(2)]

LEED Categories	Category weighting	Percentage
Sustainable sites	26 points	(23.6%)
Water efficiency	10 points	(9.1%)
Energy & Atmosphere	35 points	(31.8%)
Material & Resources	14 points	(12.7%)
Indoor Environmental Quality	15 points	(13.6%)
Innovation in Design	6 points	(5.6%)
Regional priority	4 points	(3.6%)
SUM	110 points	*(100%)*

Table 2. Green pyramid categories & their weighting [(3)]

Green Pyramid Categories	Category weighting	Percentage
Sustainable Site, Accessibility, Ecology	15 points	(13.6%)
Water efficiency	30 points	(27.3%)
Energy Efficiency	25 points	(22.7%)
Material & Resources	10 points	(9.1%)
Indoor Environmental Quality	10 points	(9.1%)
Innovation and Added Value	10 points	(9.1%)
Management	10 points	(9.1%)
SUM	110 points	*(100%)*

[(2)] Green Building Education Services, *LEED Green Associate study guide*, 2010

[(3)] The Housing and Building National Research Centre, *The Green Pyramid Rating System, First Edition* – April 2011, for public review (First Revision: following Draft document dated May 2010)

Tables (1) and (2) clarify the need of a local rating system for each region. However, both have approximately the same categories but the weight of each category reflects the importance and the need of each region for this category. For example, Water Efficiency has only (9%) in LEED, but it has (27%) in Green Pyramid as an Egyptian rating system. It means that Egypt is worried about the suffering of draught. Therefore, sustainable design will be the one, which saves water as much as it can. Each region in the world should define its problems based on itself environmental and ecological studies to set the attributes of its rating system.

5.1. Category one: Sustainable sites

Sustainable Sites as a statement in LEED includes its goal to protect the virgin lands from human attacks. It has 26 points, and the weight of this category is 23.6% as presented in Table (1). It seems from its weight that it is one of the heaviest categories for LEED as a rating system.

5.1.1. Sustainable sites prerequisite, credits& their points:

The only prerequisite is "Construction Activity Pollution Prevention" and the following the credits of this category and number of points given for each credit Table. 3

Table 3. Sustainable sites credits & their weighting [(2)]

No.	Sustainable Sites credits	Credit points	Percentage of credit per 110 points	Percentage of strategy per 110 points
1	Site Selection	1 point	(0.01%)	(0.01%)
2	Development Density and Community Connectivity	5 points	(0.05%)	(0.05%)
3	Brownfield Redevelopment	1 point	(0.01%)	(0.01%)
4.a	Alternative Transportation - Public Transportation Access	6 points	(0.05%)	
4.b	Alternative Transportation - Bicycle Storage and Changing Rooms	1 point	(0.01%)	
4.c	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicle	3 points	(0.03%)	(0.11%)
4.d	Alternative Transportation - Parking Capacity	2 points	(0.02%)	
5.a	Site Development - Protect or Restore Habitat	1 point	(0.01%)	
5.b	Site Development - Maximize Open Space	1 point	(0.01%)	(0.02%)
6.a	Storm water Design - Quantity Control	1 point	(0.01%)	
6.b	Storm water Design - Quality Control	1 point	(0.01%)	(0.02%)
7.a	Heat Island Effect - Non-roof	1 point	(0.01%)	
7.b	Heat Island Effect - Roof	1 point	(0.01%)	(0.02%)
8	Light Pollution Reduction	1 point	(0.01%)	(0.01%)
	Total	26 points	(23.6%)	(23.6%)

[(2)] Green Building Education Services, *LEED Green Associate study guide & LEED Checklist*, 2010

Table (3) shows that the most important of the Sustainable Sites credits (17 points of total 26) consider two main strategies:

- Alternative transportation to reduce CO2 emissions.
- Community connectivity.

The following part of the research will describe briefly Sustainable Sites credits in LEED and their impact on the Middle East region:

5.1.1.1. Protect undeveloped land "Greenfield"

- Avoid building on Prime farm land.
- Avoid building on wetlands.
- Avoid building on public park land.
- Avoid building in the areas of the flood plain.
- Avoid building on areas close to lakes, streams, or any body of water.
- Avoid building on areas that is habitat for threatened or endangered species.
- Avoid building on areas that are used by organisms "Animals or birds" for their lives' cycle like immigration, living ...etc.
- Make the building dense by minimizing the project footprint.

Nobody can deny that the previous strategies are environmental and logic for any region of the world include the Middle East except last one which guide the architect to minimize the footprint. This strategy needs more study before applied in hot countries. Refer to Fig. 1. We can see that old Arabian city left small open spaces between buildings and avoid minimizing the footprint to maximize the shadow areas. This is the same phenomena of wall opening "Mashrabia." This strategy is obvious for countries, which have open green spaces with forests. In this case, the building should be dense and the footprint should be the minimum. The Middle East does not have this nature unless in Syria, Lebanon and part of Morocco. That means even the Middle East region can't have one rating system with the same credits.

Fig. 1. (a) Picture on the left side illustrates Naseem in Doha; (b) Picture in the middle of old Cairo; (c) Picture on the right illustrates Yemen planning [3]

[3] http://ad009cdnb.archdaily.net/wp-content/uploads/2009/07/06_al-nasseem-528x396.jpg
http://3.bp.blogspot.com/_RNrl2Gr0VwI/TSqNiBsG3CI/AAAAAAAADn4/jvLkzZZ7Gxg/s1600/old%2Bcairo.jpg
http://spacingtoronto.ca/wp-content/uploads/2012/03/2271829554_4675283ec5_z-600x400.jpg

5.1.1.2. Reuse / Restore previously developed sites "Brownfield"

- Develop brown field sites.
- Develop in Dense area, using existing transportation, Share resources "if the next door building has an unde ruse GYM, it could be shared," Zoning requirements for mixed-use development.
- Restore damaged areas.
- Provide community connectivity. "People must be able to walk between the project without being blocked by walls, highways, or any other barrier. LEED encourages building besides basic services* to encourage community connectivity.

5.1.1.3. Site planning and land-use

- Maximize open space. With reference of comment mentioned on page 6 that hot weather countries in desert climates have certain considerations to follow this strategy.
- Reduce Construction waste.
- Protect existing site: This could be done through: Protect topsoil, Protect storm water from running off, Protect wildlife, Protect an ecosystem, Protect plants & trees that absorb CO2.
- Restore damaged areas.
- Develop a previously developed area.
- Zoning requirements: Zoning typically has three categories of Land-use (Residential, Commercial, and Industrial). Mixed-use development has come into favor than a zoned area to minimize parking requirements.

5.1.1.4. Reduce automobile uses or promote alternatives

There are many strategies to reduce automobile use, which are:

- Car share Program: To rent a car is better than owning one.
- Locate near mass transit / Provide Access.
- Enhance transportation: to create a shuttle bus program
- Pedestrian access.
- Bicycle accessibility: to include bicycle storage and changing room.
- Telecommunicating home office for whom have no assigned office space.
- Alternative fuel Vehicle.
- Minimize parking lots: LEED pushes to consider underground parking with the minimum number required by code. This will reduce car use.

5.1.1.5. Provide stewardship of nature and the site's surrounding

Sustainable site includes responsible for stewardship of (Water Runoff, Vegetation, Wildlife, and Climate).

5.1.1.6. Develop efficient storm water management

Sustainable Sites consider the storm water to increase the efficiency of water consuming. It is based on following strategies; Reduce impervious surfaces, Collect Storm water and Reuse it. If the storm water must leave the site, the water should not run so quickly as to cause erosion of surrounding areas. Rain

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* Basic services: are those services that are open to the public, and are common services that people might use regularly. People must be able to walk between the project and the services without being blocked by walls, highways, or other barriers (this is called pedestrian access). LEED encourages building near a variety of basic services, not just one type of service. The basic-services such as: Bank, Masjid, Supermarket / convenience store, Day care, Dry cleaner, Fire station, Salon, Hardware store, Library, Medical / Dental, Park , Pharmacy, Post office, Restaurant, School, Theatre, Museum, Community centre, Gym, Church

gardens, planted areas, enable sites to downsize the storm sewer connection because the site captured the water on site. In addition, Retention ponds can be used to store excess storm water.

5.1.1.7. Reduce heat islands [*] effect

Heat Islands are negatively affecting the ecology system Fig. 2. LEED considers some rules to avoid heat islands' impact, which are:

- Minimize the development footprint.
- Underground parking
- Under Cover parking
- Hardscape materials with high reflectance
- Covering roofs with high SRI materials
- Green Roof
- Provide shade from trees, solar panels, architectural devices with high SRI "Solar Reflectance Index" [**]
- Open grid paving, which allows green shrubs to grow through it.

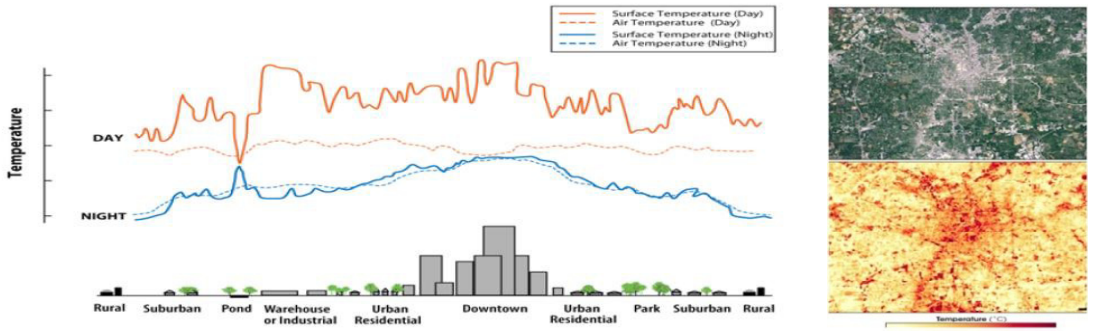

Fig. 2. (a) Diagram on left side illustrates the temperature difference between urban and rural natural areas; (b) Picture right above illustrates a normal aerial view for a village ; (c) Picture right below illustrates thermal masses for picture (b)
(Source: LEED Green Associate study guide 2010)

5.1.1.8. Reduce light pollution or minimize light trespass from the building and the site

The proper lighting design will result in levels that both ensure safety and reduce light pollution.

5.1.2. Conclusion of sustainable sites strategies in the Middle East region

Most of the Sustainable Sites strategies can protect the planet through minimizing the CO2 emissions, increasing the water efficiency of the building, and protecting Green fields from human attack by construction. In addition, they encourage community connectivity. On the other hand, the weight of each

[*] Heat Islands: are the temperature differences between developed and undeveloped areas. It negatively affects those who live in this area, plants, and wildlife. It needs more energy to cool those buildings. Also, it Changes rain patterns

[**] SRI is the surface material ability to reflect sunlight on scale 1 to 0. Black is Zero and white is one. That is why white material is better than black one.

item should be revised against local challenges, which mean each part of the world has its environmental problems and needs to push designers to solve these problems.

5.2. Category two: Water efficiency

Water efficiency category aims to protect potable water resources and the supply of renewable fresh water. Its goals' briefings are:

- Reduce the quantity of water needed for buildings and landscaping.
- Reduce municipal water use.
- Reduce the need for treatment of waste water.

5.2.1. Water efficiency prerequisite, credits& their points

The prerequisite is (water use reduction by 20%). Table. 4 describe the credits of this category.

Table 4. Water Efficiency credits & their weighting [(2)]

No.	Water Efficiency credits	Credit points	Percentage for credit per 110 points
1	Water Efficient Landscaping	4 points	(0.04%)
2	Innovative Waste Water Technologies	2 points	(0.02%)
3	Water Use Reduction	4 points	(0.04%)
	Total	10 points	(0.09%)

Back to table 2 for the same category, we can find that the weight of water efficiency is different between Egypt and USA. LEED gives only 10% of it; however, the Egyptian rating system gives it 27.3%. It is around three times more for the same category. It is a proof that local environmental criteria are important to use a certain rating system.

Outdoor water reduction practice

- Landscape Design: To select plants with low water irrigation. This could be done by selecting native plants [*] and adaptive plants [**] and to avoid selecting invasive plants [***]. Furthermore, to limit or eliminate potable water usage in irrigation by using other types of water.
- Xeriscaping: Is the type of landscaping and gardening that reduces or eliminates the need for supplemental irrigation. It can be done through; proper planning and design, soil analysis and improvement, appropriate plant selection, practical turf areas, efficient irrigation, use of mulches, and maintenance.
- Reduce turf grasses: A beautiful landscape can be achieved without the need of vast amounts of turf grasses that deplete water supplies. Golf course like landscaping looks great, but it is a water hog.

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(2) Green Building Education Services, *LEED Green Associate study guide & LEED Checklist*, 2010

* Native plants grow naturally and require less water, fertilizer

** Adaptive plants are non-native plants but they perform well in the local climate. They require less water and more disease resistance

*** Invasive plants grow quickly and aggressively, spreading and displacing other plants.

5.2.1.1. Use storm water, gray water, & processed water

- Storm Water or (Reclaimed rainwater) can be controlled with a roof top collection system. It helps to save municipal water consuming. See Fig. 3.

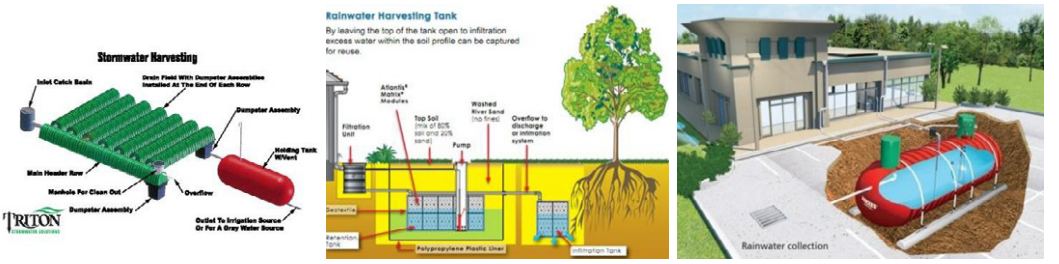

Fig. 3. (a) Picture on left side illustrates the idea of rooftop storm water harvesting; (b) Picture in the middle illustrate the reclaiming process of storm water; (c) Picture on right for storm water tank. [4]

- Gray Water is water that can be used twice. It is untreated household waste water. It can be piped to storage tanks for later use. It comes from Bathtubs, showers, bathroom sinks, washing machines, and Laundry tubs. It could be used for irrigation and landscape. See Fig. 4.

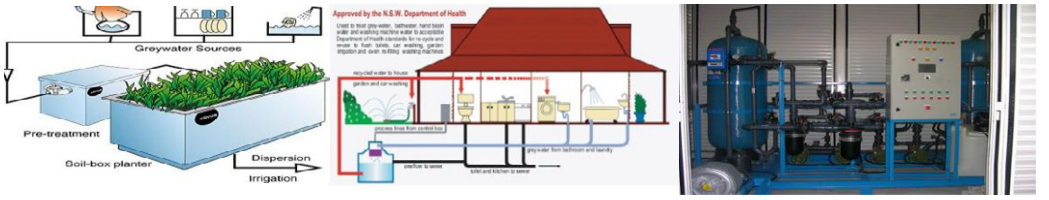

Fig. 4. (a) Picture on left side & (b) Picture in the middle illustrate the source and using of gray water; (c) Picture on the right illustrates the treatment of gray water. [5]

5.2.1.2. Indoor strategies to save water

There are many indicators that reflect the need of rethinking about indoor water consuming. For example, toilets account for 25% of daily water use in U.S. One leaky faucet waste around 7500 liter per annum.. Older toilets use 15-30 liter / flush, however, new one use maximum 6 liter / flush. (EPAct) in the US, the energy policy Act of 1992 established water conservation standards to save around 25 billion liter per day. [2]

The LEED strategies to save indoor water consuming such are:

- Dual flush toilets
- High efficiency toilets (HETs)

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[4] http://www.tritonsws.com/images/downloads/33-complete-stormwater-harvesting-front.jpg
http://capitolgreenroofs.groupsite.com/uploads/files

[5] http://graywater.com/soilb.jpg

http://udcinc.rog/graywaterlarge.jpg

[2] Green Building Education Services, *LEED Green Associate study guide*, 2010

- Waterless Urinals
- Composite toilet system
- Low-flow showerhead and faucets
- Faucets with low-flow Aerator and/or motion sensor
- Install water meter

5.2.2. Conclusion of water efficiency strategies in the Middle East region

All LEED water efficiency strategies help to save water consumption and generate new resources for water; however, these resources such as storm water rarely to be found in the Middle East countries. The weight of water efficiency in LEED doesn't reflect the real need of water in the Middle East region. Nine percent of points given to the water efficiency for sustainable building design in the Middle East is not enough at all. May Green Pyramid assigns the real weight for this category, which is 27.3%, which is logic for desert countries.

In addition, a new credit with high grades should be added, which is innovative techniques for resources of water based on real situation that could be found in this region. There are techniques for absorbing water from air moisture. Other techniques of using the solar energy for desalination of seawater without using any fossil energy. Sustainable rating system in the Middle East should have stepped forward based on potentials located in the Middle East region, which cannot be found in Europe or US.

5.3. Category three: Energy & atmosphere

Energy & Atmosphere category targets to reduce energy consumption for low CO2 emissions and use renewable-energy resources. Furthermore, it aims to protect the planet and the ecological system by using natural refrigerants to protect the ozone layer.

5.3.1. Energy & atmosphere prerequisites, credits& their points

There prerequisites are; fundamental commissioning of building energy systems; minimum energy performance; and fundamental refrigerant management. The credits of this category as described in Table. 5

Table 5. Energy & atmosphere credits & their weighting [(2)]

No.	Energy & Atmosphere credits	Credit points	Percentage for credit per 110 points
1	Optimize Energy Performance	19 points	(0.17%)
2	On-site Renewable Energy	7 points	(0.06%)
3	Enhanced Commissioning	2 points	(0.02%)
4	Enhanced Refrigerant Management	2 points	(0.02%)
5	Measurement and Verification	3 points	(0.03%)
6	Green Power	2 points	(0.02%)
	Total	35 points	(0.32%)

(2) Green Building Education Services, *LEED Green Associate study guide & LEED Checklist*, 2010

Back to table. 2 for the same category we can find that for a local Egyptian rating system, the weight of each category is different between both. LEED gives the heaviest weight for energy & atmosphere, which is 32%, meanwhile Egyptian local rating system, gives it 22.7%. It is a proof that local environmental criteria based on regional challenges are important to create a rating system.

5.3.2. Energy & atmosphere goals in LEED

LEED goals for energy and atmosphere are:

1. Reduce Energy: For LEED certification, the project needs to reduce energy use by a certain percentage over a comparable baseline building. For USA Buildings accounts:
- 36% of total energy use.
- 65% of electricity consumption
- 30% of greenhouse-gas emissions.
2. Energy Audit: An energy audit starts by determining how energy is used and then making suggestions for improvements.
3. Building Orientation
4. Landscape Design: a building placed in the shade of trees or other structures can block out the wind or reducing required cooling loads.
5. Building Envelops: 40% of energy used to heat and cool was lost to air for leaks in building envelopes or wrong glass type.
6. Thermal mass: It is an effective passive design technique. The thicker exterior, the less energy needed for cooling.
7. Lighting Design: To select the proper lighting fixture with minimum energy consumption and using lighting controls for energy saving.
8. Water Use: When we reduce water consumption , we reduce energy needed for heating and pumping water.
9. HVAC system: it counts 30% of energy in commercial building and 50% of energy in residential.
10. Using Renewable Energy which is generated from natural resources such as:
- Sunlight
- Wind
- Water
- Bio-Fuel
- Hydro Energy
- Wave & Tidal power system
- Geothermal heat
11. Protect the Ozone layer through Montreal Protocol [*] by using natural refrigerant.
12. Protect the planet through minimizing all sources of GWP "Global Warming Potentials"

5.3.3. Conclusion of energy & atmosphere strategies in the Middle East region

All LEED Energy & Atmosphere strategies push for better energy efficiency and can protect the Ozone layer and minimizing the GWP in the Middle East region. Moreover, a rating system for the Middle East region should emphasize the potential for widely available renewable-energy resources such as solar-energy resources. Many countries in the Middle East are using electricity and natural-gas power

[*] In 1987, the Montreal Protocol was signed and the signatory nations committed themselves to reducing the use of CFCs and other Ozone-Depletion substances. The treaty designed to protect the Ozone layer by phasing out the production of number of substances believed to be responsible for Ozone depletion. By 2030 it is planned to phase out the less active HCFCs.

for water heating. Many items should be added to local rating systems instead of using one, which can improve the situation, but not as it should be.

5.4. Category four: Material & resources

Sustainable Materials are materials, which reduce demands on ecosystems during their lives' cycle. That includes the material processing such as harvesting and production and the entire product life cycle through use and disposal. Sustainable building affects the triple bottom line through the use of materials in the following primary ways:

- Reducing waste.
- Building with sustainable materials.
- Creating a sustainable purchasing program.

5.4.1. Material & resources prerequisites, credits& their points

The prerequisite is; storage and collection of recyclables. There are seven main credits as described in Table. 6

Table 6. Materials and resources credits & their weighting [(2)]

No.	Materials & Resources credits	Credit points	Percentage of credit per 110 points	Percentage of strategy per 110 points
1	Building Reuse – Maintain Existing Walls, Floors, and Roofs	3 points	(0.03%)	
1.a	Building Reuse – Maintain 50% of Interior Nonstructural Elements	1 points	(0.01%)	(0.04%)
2	Construction Waste Management	2 points	(0.02%)	(0.02%)
3	Materials Reuse	2 points	(0.02%)	(0.02%)
4	Recycled Content	2 points	(0.02%)	(0.02%)
5	Regional Materials	2 points	(0.02%)	(0.02%)
6	Rapidly Renewable Materials	1 point	(0.01%)	(0.01%)
7	Certified Wood	1 point	(0.01%)	(0.01%)
	Total	14 points	(12.7%)	(12.7%)

(2) Green Building Education Services, *LEED Green Associate study guide & LEED Checklist*, 2010

5.4.2. Conclusion of material & resources strategies in the Middle East region

All LEED Material & Resources credits help to reduce the demand for new materials by reusing buildings and materials when possible. Furthermore, it recommends using renewable and local materials besides enhancing recycling programs. The impact of applying these credits will be positive for the Middle East. In addition, it needs some regulations and codes for building height. It is obvious not to make unless there is a need.

5.5. Category five: Indoor environmental quality

The target of getting points in this category based on:

- Improve Indoor Air Quality (IAQ) by avoiding using materials, which have high VOCs (Volatile Organic Compounds) and improve ventilation.
- Increase occupant comfort

The Indoor environmental quality concerns about;
Air temperature; humidity; lighting; acoustics; air quality; control systems.

5.5.1. Indoor environmental quality prerequisites, credits& their points

There are two prerequisites for Indoor Environmental Quality (IAQ) which are; minimum indoor air quality performance and environmental Tobacco smoke (ETS) control.

Table 7. Indoor environmental quality credits & their weighting [(2)]

No.	Indoor Environmental Quality credits	Credit points	Percentage of credit per 110 points	Percentage of strategy per 110 points
1	Outdoor Air Delivery Monitoring	1 point	(0.01%)	(0.01%)
2	Increased Ventilation	1 point	(0.01%)	(0.01%)
3.a	Construction IAQ Management Plan – During Construction	1 point	(0.01%)	
3.b	Construction IAQ Management Plan – Before Occupancy	1 point	(0.01%)	(0.02%)
4.a	Low – Emitting Materials – Adhesives and Sealants	1 point	(0.01%)	
4.b	Low – Emitting Materials – Paints and Coatings	1 point	(0.01%)	
4.c	Low – Emitting Materials – Flooring Systems	1 point	(0.01%)	
4.d	Low – Emitting Materials – Composite Wood and Agrifiber Products	1 point	(0.01%)	(0.04%)
5	Indoor Chemical and Pollutant Source Control	1 point	(0.01%)	(0.01%)
6.a	Controllability of Systems - Lighting	1 point	(0.01%)	
6.b	Controllability of Systems – Thermal Comfort	1 point	(0.01%)	(0.03%)
7.a	Thermal Comfort - Design	1 point	(0.01%)	
7.b	Thermal Comfort - Verification	1 point	(0.01%)	(0.03%)
8.a	Daylight and Views - Daylight	1 point	(0.01%)	
8.b	Daylight and Views - Views	1 point	(0.01%)	(0.02%)
	Total	15 points	(13.6%)	(13.6%)

(2) Green Building Education Services, *LEED Green Associate study guide & LEED Checklist*, 2010

5.5.2. Conclusion of indoor environmental quality strategies in the Middle East region

Indoor environmental quality credits for low-emitting materials and indoor chemical and pollutant source have 5 points (33.3% of IEQ) and related more to the material & resources' category. The rest credits for ventilation, daylights are important in any environment; however, the viewer credit in the Middle East region could be towards indoor courts. It means for hot weather countries the indoor environmental quality principals could be different than cold-weather countries.

5.6. Category six: Innovation and design process

Innovation in design or operating existing building is a flexible category used to award points for performance and creativity. It can be used for:

- Exemplary performance that exceeds the credit requirements.
- Innovative performance, which is demonstrating a quantifiable building, not found in the LEED rating system.
- Having one LEED AP* participant in the project.

5.6.1. Innovation and design process credits& their points

There is no prerequisite for Innovation and Design and five open credits for innovation as explained. There is one credit for having one LEED AP in the project team.

5.6.2. Conclusion of innovation and design in the Middle East region

It is an important category for any rating system. However, it should have more points for innovation in building performance, especially for cooling in hot weather.

5.7. Category seven: Regional priority

Regional priority credits are only available for projects within the USA. The state zip code lists regional priority credits, which are four credits.

5.7.1. Conclusion of regional priority in the Middle East region

Regional priority credits have nothing to be mentioned in the Middle East countries because they are only available in the USA. However, this category can solve many troubles in LEED as a rating system used abroad of its originating location.

6. Conclusion

The research has explored that using LEED, as sustainable rating system for any part of the world is not the best way to reach to the sustainability level for some parts of the world. LEED credits weight reflect the need of a entire environment which is not in the Middel East region. It helps the energy efficientcy and reduce the water consumption without guiding the architect towards real solutions to achieve that. On the other hand Green Pyramid as local rating system has missed some importance areas for Egyptian environment which means that it needs a lot of development to enhance its role for sustianbility in Egypt.

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* AP means Accredit Professional

7. Research Recommendations

- Architects have a big role to protect our planet through following sustainable principals during the design process, producing construction documents and specification, construction phase, and building operation.
- Each part of the world has its environmental challenges that architects should consider by their designs. Hot weather and desert are different from cold weather in a forest environment.
- Rating systems are tools to can measure the level of sustainability that buildings can achieve.
- LEED is an effective sustainable tool that architects can use it for better building performance. However, it measures based on the USA environmental challenges which are not all implemented in the Middle East region.
- Architects should consider the Middle East countries environmental challenges. Some of those are not mentioned in LEED. Local environmental criteria should be applied to any rating system to can be fully effective and reflect the environment of the project.
- Local sustainable rating systems should be applied for building permits. Authorities in Middle East countries should require from architects to follow it as a mandatory requirement. Otherwise, owners will not be careful to ask architects to have sustainable buildings to protect our environment.

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