



# Local Rating Systems for Sustainability are Mandatory to Protect the Planet – 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 by applying the most effective sustainable criteria. The methodology will be focused on evaluating LEED in the Middle East compared with a local rating system. 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, Protect the Planet; LEED in the Middle East.

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## 1.0 Introduction

Each rating system developing meets the following underlying principles: <sup>(1)</sup>

- 1) Ensure environmental quality through an accessible, holistic, and balanced measure of environmental impacts.
- 2) Measuring environmental quality.
- 3) Quantifying and calibrating a cost-effective performance standard for defining environmental quality.
- 4) Reflect the social and economic benefits of meeting the environmental objectives covered.
- 5) 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. 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.

### 1.1 Research Problem

The procedures of getting a LEED certificate are 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 in the US. The problem focuses on collecting points regardless the importance of this point to the environment.

## 2.0 Methodology

The methodology focuses on comparing the LEED principals as rating system with 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.

### 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 through <sup>(2)</sup>.

- 1) Efficiently using energy, water, land, and materials.
- 2) Protecting occupant health and improving employee productivity
- 3) Reducing waste and pollution from each green building.

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<sup>(1)</sup> BRE. BREEAM New Construction, Non-Domestic Buildings, Technical Manual.2011. (SD5073 – V.2.00), p.13

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide, 2010

## Sustainable Design Categories in LEED & Local Rating System

Hereby, it will be presented LEED and Green Pyramid categories tables (1) and (2). The word phrasing is the same in both with different weight and both have 110 points.

Table 1: LEED categories & their Weighting<sup>(2)</sup>

| 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%)     |
| <i>SUM</i>                   | 110 points         | (100%)     |

Table 2: Green Pyramid Categories & their Weighting<sup>(3)</sup>

| 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%)     |
| <i>SUM</i>                               | 110 points         | (100%)     |

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 it. For example, Water Efficiency has only (9%) in LEED, however it has (27%) in Green Pyramid. It means that Egypt is worried about the suffering of draught. Each part of the world should define its problems based on itself environmental and ecological studies to set the attributes of its rating system.

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide & LEED Checklist, 2010

<sup>(3)</sup> 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)

### Category One: Sustainable Sites

Sustainable Sites as a statement in LEED includes its goal to protect the virgin lands from human attacks.

#### Sustainable sites Prerequisite, Credits & their points:

The only prerequisite is "Construction Activity Pollution Prevention" and the following are its credits Table. 3

Table 3: Sustainable Sites Credits & their Weighting <sup>(2)</sup>

| 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                       |                  |                                     | (0.01%)                               |
| 4.a | Alternative Transportation - Public            |                  |                                     |                                       |
| 4.b | Transportation Access                          |                  |                                     |                                       |
| 4.c | Alternative Transportation - Bicycle Storage   | 1 point          | (0.01%)                             |                                       |
| 4.d | and Changing Rooms                             | 6 points         | (0.05%)                             | (0.11%)                               |
| 5.a | Alternative Transportation - Low-Emitting      | 1 point          | (0.01%)                             |                                       |
| 5.b | and Fuel-Efficient Vehicle                     | 3 points         | (0.03%)                             |                                       |
|     | Alternative Transportation - Parking Capacity  | 2 points         | (0.02%)                             | (0.02%)                               |
|     | Site Development - Protect or Restore Habitat  | 1 point          | (0.01%)                             |                                       |
|     | Site Development - Maximize Open Space         | 1 point          | (0.01%)                             |                                       |
| 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%)                               |
|     | <b>Total</b>                                   | <b>26 points</b> | <b>(23.6%)</b>                      | <b>(23.6%)</b>                        |

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

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide & LEED Checklist, 2010

### Protect undeveloped land “Greenfield”

- 1) Avoid building on prime farmland, wetlands, public parks, areas of the flood plain, areas close to lakes, streams, or habitat for threatened, areas that are used by organisms for their life cycle.
- 2) Make the building dense by minimizing the project footprint.

Nobody can deny that the previous strategies can protect the ecological system in any part of the world include the Middle East except the last one which requires to minimize the footprint. Refer to Fig. 1. We can see that historical places in the Middle East were against this concept. This is the same phenomena of window type “Mashrabia.” This strategy is obvious for countries, which have open green spaces with forests. That means even in the Middle East region we can't have only one rating system.



Figure 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\\_alnasseem-528x396.jpg](http://ad009cdnb.archdaily.net/wp-content/uploads/2009/07/06_alnasseem-528x396.jpg) [http://3.bp.blogspot.com/\\_RNrl2Gr0VwI/TSqNiBsG3CI/AAAAAAAAADn4/jvLkzZZ7Gxg/s1600/old%2Bcairo.jpg](http://3.bp.blogspot.com/_RNrl2Gr0VwI/TSqNiBsG3CI/AAAAAAAAADn4/jvLkzZZ7Gxg/s1600/old%2Bcairo.jpg) [http://spacingtoronto.ca/wp-content/uploads/2012/03/2271829554\\_4675283ec5\\_z-600x400.jpg](http://spacingtoronto.ca/wp-content/uploads/2012/03/2271829554_4675283ec5_z-600x400.jpg)

### Reuse | Restore Previously Developed Sites “Brownfield”

- 1) Develop brown field sites and using existing transportation.
- 2) Restore damaged areas.
- 3) Provide community connectivity by locating near basic services\* .

### Reduce Automobile uses or Promote Alternatives

Such as car share Program, enhance transportation, bicycle accessibility, alternative fuel vehicle, and minimize parking lots.

### Develop Efficient Storm Water Management

Such as reducing impervious surfaces, collect storm water and reuse it, and reduce erosion because water running off.

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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. Gvm. Church

## Reduce Heat Islands\* Effect

Heat Islands are negatively affecting the ecology system Fig. 2. LEED considers the following:

- 1) Minimize the development footprint.
- 2) Hardscape materials with high reflectance and Covering roofs with high SRI\*\* materials or Green roofs.
- 3) Open grid paving.

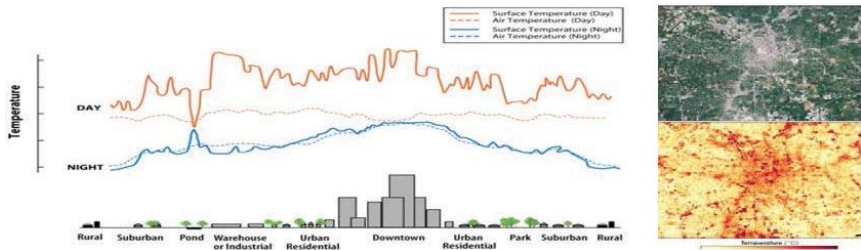


Fig. 2. (a) Diagram on left illustrates the temperature difference between urban and natural areas; (b) picture on right above illustrates a normal aerial view for a village; (c) picture on right below illustrates thermal masses for picture (b). "Reference: (2)"

## Reduce Light Pollution

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

## Conclusion of Sustainable Sites Strategies in the Middle East Region:

Most of the Sustainable Sites strategies can protect the planet through protecting Green fields from human attack by construction. On the other hand, the weight of each item should be revised against local environmental and ecological challenges.

## Category Two: Water Efficiency

It aims to protect potable water resources and to reduce the need for treatment of wastewater.

## Water Efficiency Prerequisite, Credits & their Points:

The prerequisite is (water use reduction by 20%). Table 4 describe its credits:

\* Heat Islands: are the temperature differences between developed and undeveloped areas. Also, it Changes rain patterns

\*\* SRI "Solar Reflectance Index" 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

Table 4: Water Efficiency Credits & their Weighting <sup>(2)</sup>

| 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%)                              |

### Outdoor Water Reduction Practice

- 1) Landscape Design: to select plants native adaptive <sup>\*\*</sup> plants <sup>\*</sup> and avoid invasive plants <sup>\*\*\*</sup>.
- 2) Xeriscaping: is the type of landscaping that reduces or eliminates the need for supplemental irrigation.

### Use Storm Water, Gray Water, & Processed Water

Storm Water or (Reclaimed rainwater) can be controlled with a roof top collection system. See Fig. 3.

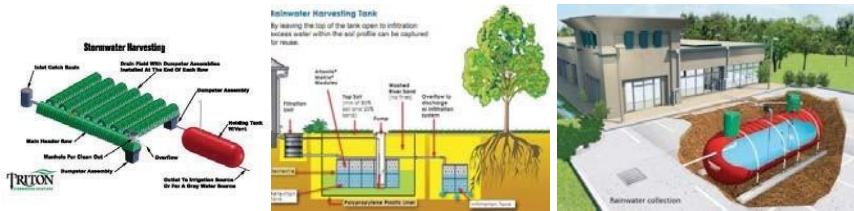


Figure 3: (a) Picture on Left Illustrates the Idea of Rooftop Storm Water Harvesting; (b) Picture in the Middle Illustrate the Reclaiming Process of Storm Water; (c) Picture on Right for Storm Water Tank. <sup>(4)</sup>

1. Gray Water is untreated household wastewater. It could be used for irrigation and landscape. See Fig. 4.

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

<sup>\*</sup> Native plants grow naturally and require less water, fertilizer

<sup>\*\*\*</sup> Invasive plants grow quickly and aggressively, spreading and displacing other plants

<sup>(4)</sup> <http://www.tritonsws.com/images/downloads/33-complete-stormwater-harvesting-front.jpg>

<http://capitolgreenroofs.groupsite.com/uploads/files>



Figure 4: (a) Picture on left & (b) picture in the middle illustrate the source and using of graywater; (c) picture on the right for graywater treatment<sup>(5)</sup>

### Indoor Strategies to Save Water

LEED strategies for saving indoor water consuming such are; dual flush toilets, high efficiency toilets, waterless Urinals, composite toilet system, low-flow showerhead and faucets, faucets with low-flow aerator and/or motion sensor, and install water meter

### 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. The weight of water efficiency in LEED does not reflect the real need of water in the Middle East region. In addition, new credits should be added. There are techniques for absorbing water from air moisture. Other techniques like using the solar energy for desalination of seawater without using any fossil energy.

### Category Three: Energy & Atmosphere

It aims to reduce energy consumption for low CO<sub>2</sub> emissions and to protect the planet and the ecological system by using natural refrigerants.

### Energy & Atmosphere Prerequisites, Credits & their Points:

There prerequisites are; fundamental commissioning of building energy systems; minimum energy performance; and fundamental refrigerant management Table 5.

### Energy & Atmosphere Goals in LEED:

- 1) Reduce energy consumption.
- 2) Energy Audit
- 3) Building Orientation
- 4) Building Envelops: 40% of energy used to heat and cool was lost to air for leaks in building envelopes or wrong glass type.

<sup>(5)</sup> <http://graywater.com/soilb.jpg> <http://udcinc.rog/graywaterlarge.jpg>

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide & LEED Checklist, 2010



- 5) Lighting Design: to select the proper lighting fixture with minimum energy consumption and using lighting controls.
- 6) HVAC system: it counts 30% of energy in commercial building and 50% of energy in residential.
- 7) Use renewable energy.
- 8) Protect the Ozone layer.

Table 5: Energy & Atmosphere Credits & their Weighting <sup>(2)</sup>

| 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%)                              |

### Conclusion of Energy & Atmosphere Strategies in the Middle East Region:

It leads to better energy efficiency, to protect the Ozone layer and minimize the GWP. <sup>\*</sup> In the Middle East, we should emphasize on using available renewable-energy resources. We still use electricity and natural gas for water heating. Local rating systems should guarantee to protect natural resources.

### Category Four: Material & Resources

Sustainable Materials are materials, which reduce the demands on ecosystems during their life cycle. It includes the material processing and the entire product life cycle through use and disposal. This category aims to reduce waste and to build with sustainable materials.

### Material & Resources Prerequisites, Credits & their Points:

The prerequisite is; storage and collection of recyclables.

### Conclusion of Material & Resources Strategies in the Middle East Region:

This category helps to reduce the demand for new materials by reusing buildings and materials when possible. Furthermore, it recommends using renewable and local materials besides

<sup>\*</sup> GWB means Global Warming Potential

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

enhancing recycling programs.

Table 6: Materials and Resources Credits & their Weighting <sup>(2)</sup>

| 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%)                               |
|     | <b>Total</b>   | <b>14 points</b> | <b>(12.7%)</b>                      | <b>(12.7%)</b>                        |

### Category Five: Indoor Environmental Quality

- 1) Improve Indoor Air Quality (IAQ) by avoiding using materials, which have high VOCs. \*
- 2) Improve ventilation.
- 3) Control air temperature; humidity; lighting; acoustics; and air quality.

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.

### Conclusion of Indoor Environmental Quality Strategies in the Middle East region:

The credits for ventilation, daylighting are important in any environment; however, in the Middle East credits should focus on indoor courts. It means that for hot weather countries the indoor environmental quality principals are different from cold-weather countries.

### 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 is used for:

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide & LEED Checklist, 2010

\* VOC means Volatile Organic Compounds

7: Indoor Environmental Quality Credits & their Weighting <sup>(2)</sup>

| 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 Agnifiber 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%)                               |

Exemplary performance that exceeds the credit requirements.

- 1) Innovative performance.
- 2) Having one LEED AP\*.

**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.

<sup>(2)</sup> Green Building Education Services, LEED Green Associate study guide & LEED Checklist, 2010

\*AP means Accredited Professional

### **Category Seven: Regional Priority**

Regional priority credits are only available for projects within the USA.

### **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 an international rating system.

## **3.0 Conclusion**

The research has explored that using LEED, as a rating system in any part of the world is not the best way to achieve the sustainability level for some parts of the world. LEED credits weight reflects the need of an entire environment, which is not in the Middle East. On the other hand, Green Pyramid as the local rating system has missed some important areas of Egyptian environment. It needs a lot of development to enhance its role.

### **3.1 Research Recommendations**

- 1) Architects have a big role to protect our planet through following sustainable principals during the design and construction processes.
- 2) Each part of the world has its environmental challenges that architects should consider by their designs.
- 3) LEED is an effective sustainable tool that architects can use, but not everywhere. It measures based on the USA environmental challenges which are not implemented in the Middle East.
- 4) 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.
- 5) 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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