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The Applicability of LEED of New Construction (LEED-NC) in the Middle East

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Abstract

During the last 20 years, the need to specific measurable systems to assess the sustainability level of green building had been discussed. Many countries have adopted the LEED rating system as an assessment tool of sustainability. The research aim is to examine LEED-NC to determine whether it is applicable in the Middle East Countries. An analytical study of 25 projects in the Middle East is carried with different attributes using an international benchmark, to find out how it works. This indicates the main factors that should be taken in consideration in the assessment process for LEED NC in the MEC.

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Keywords: Sustainability, Green Building, Rating Systems, Leed-NC, Middle East

1. Introduction

1.1 Natural Resource Problems and world awareness

In the last century, Cities had suffered lots of problems due to the lack in natural resources especially energy that is derived from fossil fuels, in addition to the risk that is caused from the climate changes and the CO₂ emissions. Concerned authorities started to expand their efforts to reduce the environmental impacts and building industry converted to be recognized as a major contributor to the world's energy usage, landfill waste and diminishing green space¹. Though building construction has played an important role in achieving sustainability, but construction industry is a major contributor to global warming and it harms nature, consumes energy and resources². It also

disturbs Earth's natural ecology, microclimate, and creates unmanageable amounts of construction waste diverting to landfills. All of these had shown significant stress on the environment.

The manufacture process of the raw materials and chemicals emits high percentage of CO₂ (50% of the world's CO₂ emission), and the extraction of the building materials (steel, concrete and glass) required large quantity of energy³. Additionally the transportation and installation of these materials need intensive energy. All of these issues have forced the authorities and research institutes to seek for effective solutions to mitigate the impact of the climate changes and energy consumption and to achieve a balance between the environment and the construction requirements and the influence of its rapid technology.

2. Literature Review

2.1 *The need of sustainability assessments*

During the last 20 years, climate changes had been discussed and actioned on across the world in order to achieve sustainable cities and the green growth in construction market had been involved resulting that so many buildings aim to be green and claiming sustainability. And according to that it was required to set a specific measurable system for resources to use them ideally and in an efficient way such as energy, water conservation, rain and storm treatment, material and resource management, construction waste management, and to be under the responsibility of specific members who develop it eventually in order to achieve green and sustainable buildings⁴.

Nowadays green buildings are gaining more attention globally and sustainability assessments increasingly being seen as indispensable for informed decision making⁵. Their objective is designing powerful buildings by decreasing their negative effects on the environment and saving the needs of today without neglecting the right of the coming generation from environmental resources by keeping more natural materials and sharing in the development of the interior environmental performance⁶.

Rating systems have been developed to measure the sustainability level of Green Buildings and provide best-practice experience in their highest certification level. The design, construction and operation of sustainable buildings are measured using several criteria collected in checklist with certain benchmarks and through that building owners and operators can get precise data about the performance of the buildings and their impact on the environment. The positive change the green building rating systems are trying to instigate by regulating construction industry and directing it towards a sustainable future by assessing sustainability for the building components such as energy, water savings, waste and materials selection, sustainable site development, beside the environmental quality, social aspects and economical quality. Furthermore, the purpose of rating systems is to certify the different aspects of sustainable development during the planning and construction stages.

The important criteria for successful assessments are convenience, usability and adequate effort during the different stages of the design process. The result of the assessment should be easy to communicate and should be showing transparent derivation and reliability⁷, we can see in Fig.1 how green building rating systems are spreading among the world and that some countries had a special categories like LEED Brazil, LEED Canada, BREEAM Gulf,.....etc.

We can note that though there are lots of the assessments but most of them were set on the same fundamental principles which are reflected in their main categories and credit distribution and weighting, and these categories present the major elements that affect the quality of the environment such as Sustainable Sites, Energy efficiency, Indoor Environmental Quality and Material & Resources, and their credits were distributed according to a weighting factor that corresponds to their actual impact on climate change and the priority of the adapted development and the future requirements¹.

Table (1) Sustainability Assessment tools in America and European Countries

Categories	LEED	BREEM	CASBEE	SBTool ^{PT}
Launch Date	1998	1990	2001	2005
Country/ Region	United State of America	United Kingdom	Japan	Portugal
Governance	United State Green Building Council (USGBC)	Building Research Establishment (BRE)	The Japanese Sustainable Building Consortium (JSPC)	The International Initiative for a Sustainable Built Environment (iiSBE)
Scope	Global	National	Global	National
Rating Systems / Schemes	Building Design & Construction (BD+C) Interior Design & Construction (ID+C) Neighbourhood Development (ND) Building Operations & Maintenance (O+M) Homes Design (Homes)	Communities Infrastructure New Construction In-Use Refurbishment & Fit-out	Detached Houses Temporary Construction Brief versions Local government versions Heat Island effect Urban Development Cities Market Promotion	SBTool ^{PT} -H for housing SBTool ^{PT} -SPTU for Tourism♦ SBTool ^{PT} -UP for Urban Planning♦ SBTool ^{PT} -C for Commercial♦ ♦= (under development)
Certification Levels and Score	Certified (40–49) Silver (50–59) Gold (60–79) Platinum (≥80)	Unclassified (<30%) Pass (≥30%) Good (≥45%) Very good (≥55%) Excellent (≥70%) Outstanding (≥85%)	Poor (<0.5), * Fairly poor (0.5–1), ** Good (1–1.5), *** Very good (1.5–3), **** Excellent (≥3), *****	A+ Best practice = (P> 1) A = (0.9 ≤ P ≤ 1) B = (0.7 < P ≤ 0.9) C = (0.5 < P ≤ 0.7) D = (0.3 < P ≤ 0.5) E = (0.1 < P ≤ 0.3)

Table (2) Sustainability Assessment tools in Middle East Countries

Categories	GPRS	QSAS/GSAS	Pearl	Standard SI 5281
Launch Date	2009	2009	2010	2005 (updated 2011)
Country/ Region	Egypt	Qatar	United Arab Emirates	Israel
Governance	The Green Building Council (GBC) and the Housing and Building National Research Center (HBRC)	The Gulf Organization for Research & Development (GORD) and T.C. Chen Centre for Energy Studies and Building Simulation at Pennsylvania University	The Abu Dhabi Urban Planning Council (ADUPC)	Israel Green Building Council (ILGBC)
Scope	National	National	National	National
Rating Systems / Schemes	None	GSAS Districts, GSAS Parks GSAS Design assessment GSAS Railways GSAS Health Care GSAS Operation Assessment GSAS Commercial & Residential	Pearl Community Pearl Building Pearl Villa	Residential Office Building Educational buildings Health care buildings Retail buildings Public buildings Hospitality buildings
Rating Levels	Certified (40–49) Silver (50–59) Gold (60–79) Green (≥80)	$X < 0.0^h$, $0.0 \leq x \leq 0.5$, * $0.5 \leq x \leq 1$, ** $1 \leq x \leq 1.5$, *** $1.5 \leq x \leq 2$, **** $2 \leq x \leq 2.5$, ***** $2.5 \leq x \leq 3$, *****	AMCg = 1 Pearl AMC+60 cp = 2 Pearl AMC+85 cp = 3 Pearl AMC+115 cp = 4 Pearl AMC+140 cp = 5 Pearl	1 Star (55-64) 2 Stars (65-74) 3 Stars (75-82) 4 Stars (83-89) 5 Stars (90-100)

LEED assesses the environmental performance of the building throughout its life cycle and provides third party certification of green buildings. Among all the sustainability assessments, LEED has been the most popular and preferable assessment and the most common in use globally in certifying high performance buildings due to its effectiveness in decreasing energy consumption as some studies have proved that LEED certificated building save about 25-30 % energy and may reach more than 45% especially in building with platinum and gold certification ¹¹. Also it covers a wide range of project sectors and scopes like¹²:

- a) **Building Design & Construction (BD+C)** which is applied to newly constructed buildings or going through a major renovation; includes New Construction, Core & Shell, Schools, Retail, Hospitality, Data Centers, Warehouses & Distribution Centers, and Healthcare
- b) **Interior Design & Construction (ID+C)** which is applied to a complete interior fit-out project; includes Commercial Interiors, Retail and Hospitality
- c) **Building Operations & Maintenance (O+M)** which is applied to existing buildings that are undergoing improvement work; includes Existing Buildings, Schools, Retail, Hospitality, Data Centers, and Warehouses & Distribution Centers
- d) **Neighborhood Development (ND)** which is applied to new land development projects or redevelopment projects containing residential uses, nonresidential uses, or a mix.
- e) **Homes Design & Construction (Homes)** which is applied to single family homes, low- rise or mid-rise multi-family; includes Homes and units

Under LEED 2009, there are 110 possible credit points distributed across six main credit categories: Sustainable Sites (26 pt.), Water Efficiency (10 pt.), Energy and Atmosphere (35 pt.), Materials and Resources (14 pt.), Indoor Environmental Quality (15 pt.), Innovation in Design (6 pt.) and the last 4 points can be received as an extra points (Bonus) for Regional Priority Credits if the project meets prescribed environmental benchmarks for its geographical locale. These regional credits are not new credits within LEED, but they are awarded for fulfillment of pre-established credits that regional USGBC chapters and councils have tagged as particularly important to their areas of the country (Chart 1).

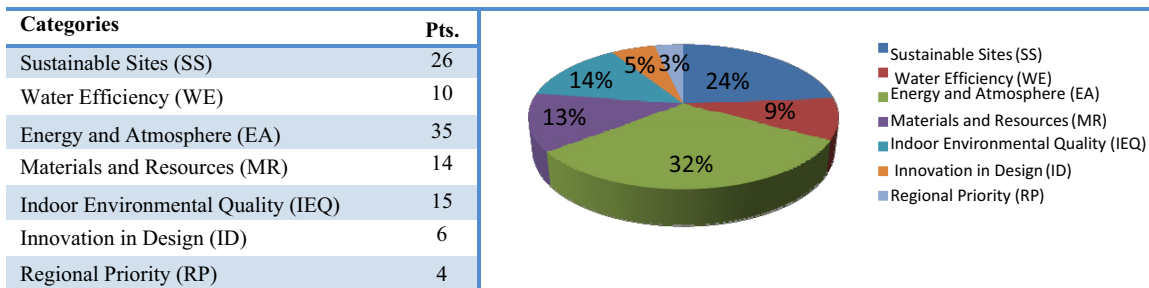


Chart (1) LEED categories credits and their percentage

2.3 LEED rating system in the Middle East Countries

LEED has gained its popularity and becomes familiar to developers in the Middle East even more than the BREEAM Gulf which was launched in 2009 specially for Gulf projects and was disused after two years, and the reason for that was the well marketed of LEED in the Middle East as it offers training programs as well as most of the decision makers especially in Gulf countries had continued their studies in US so they are attracted to the US System more than the UK one (BREEAM)¹³.

From Chart (2), it's clearly shown that at the beginning, United Arab of Emirates (UAE) was the only country that registered on LEED and had three certified projects, after the release of LEED V2.2, Other countries begin on registering on the LEED like Qatar, KSA, Egypt, Jordon, etc. till they become 82 projects that achieved Platinum, Gold, Silver and Certified rating under the LEED-NC at the Middle East Countries. In V.2009, some of the countries raised their participation like Israel, Egypt and KSA, and others appear to register for the first time like Oman, Morocco, Tunisia and Kuwait.

It is worth mentioning the percentage of sharing in UAE is staying on the top of the list of countries among the Middle East Countries achieving LEED certifications in its projects and the highest in registered projects.

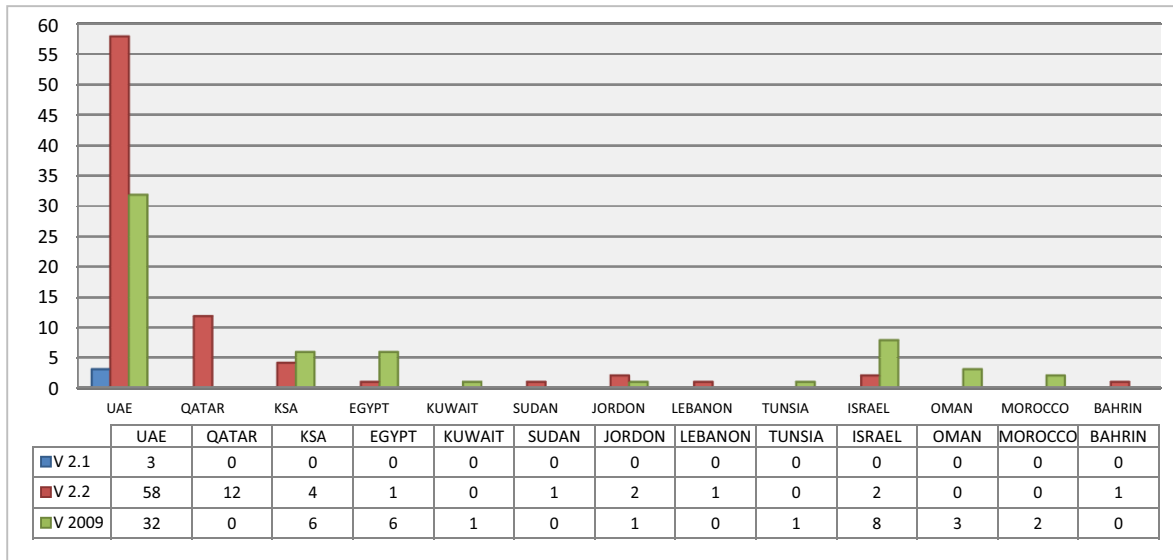


Chart (2) Number of project certified by LEED in different versions in MEC

3. Methodology :

In this study, an analysis and comparison between 25 projects in 8 countries in the Middle East that achieved Platinum, Gold, Silver and Certified rating under the LEED-NC has been conducted (Chart 3). In order to obtain an appropriate and convenient samples, we only picked projects rated under LEED-NC (V.2009) rating system which considers the latest version that are registered and also the overall credit requirements and credits distribution within categories remain the same. The analysis is basing on the score sheets that are published in the U.S Green Building Council Directory. One of the limitations that we faced was the lack of published data in some countries like KSA.

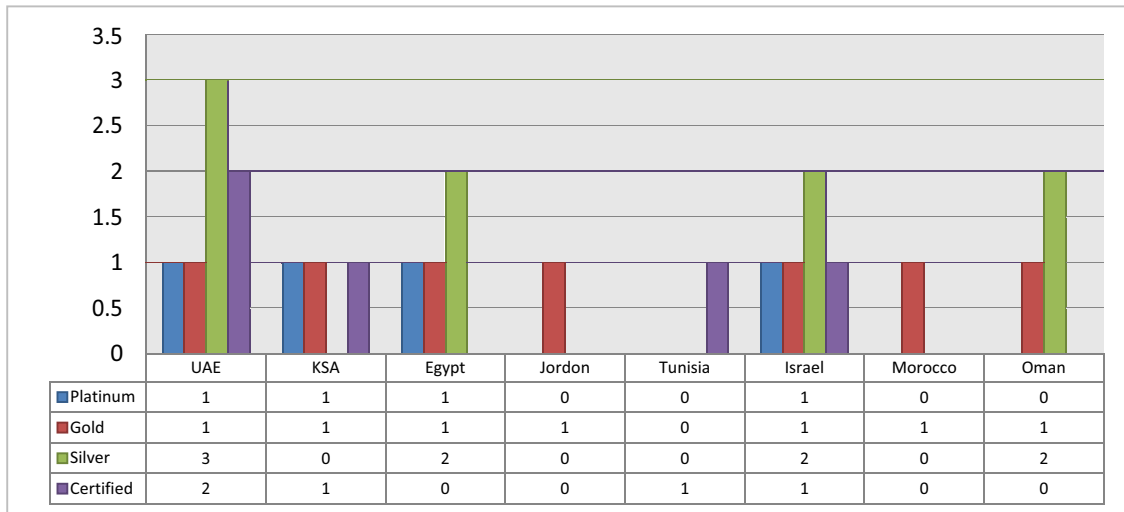


Chart (3) the selected sample consists of 25 projects.

This analysis has been conducted in two phases:

- **The first phase** was a comparison between the five countries that have higher number of LEED-NC V2009 certified projects. The comparison was conducted between the average score of selected projects in each country for each credit separately. It has been taken into account that the selected projects in each country are reflective of the total projects. Three countries have been discarded because they only have one certified project that does not reflect the general situation.
- **The second phase** was the analyzing of the average of total points of 25 projects in each credit separately. There are some credits have attracted the developers and entrepreneurs and reached a high average. It has been named “Applicable” credits (A= *Applicable credit and well achieved in projects: its average >75% of points*). And there are some other credits did not attract the developers and achieved a very low average, have been named “Not Applicable” credits” (NA= *Not Applicable credit and difficult to be achieved: its average <50% of points*). The researchers and decision makers should re-examine and discuss the difficulties facing entrepreneurs and the appropriateness and feasibility of these credits in the Middle East countries. Also, there were the “Need Developing” credits that have not achieved a high average (ND = *Need Developing : its average 50% <credit<75% of points*)

4. Results :

4.1 Regional Differentiations:

Reviewing and comparing the selected projects, which are LEED certified in the Middle East countries (MEC) specifies the differences between the regions. By comparing the average of achieved points in each country, it is found five countries that have higher number of LEED-NC V2009 certified projects: United Arab Emirates, Kingdom of Saudi Arabia, Israel, Egypt and Oman. The comparison in the table below between the averages of total points in the five countries shows slight differences between countries that may appear even among the projects in the same country. However, there are some differences which worth to be mentioned. The “SS” category are working well with countries but Oman. UAE and Israel faced difficulties to achieve a good performance in the “WE” category. KSA has shown a good performance in “EA” category compared to the other countries. The analysis has shown a feeble apply on the “MR” and a moderate performance in “EQ” category in all countries, but Egypt is slightly better in both. Finally, the “ID” and “RP” categories are a good opportunity for all countries to compensate the lost points in other categories.

Table (3) Average of total points in the MEC projects

Categories	UAE	KSA	Israel	Egypt	Oman	
Sustainable Sites (SS)/26	16	14	20	18	8	
SSc1 / 1	Site Selection	0.78	1.00	1.00	1.00	0.67
SSc2 / 5	Development density and community connectivity	1.11	1.67	4.00	1.25	-
SSc3/1	Brownfield redevelopment	-	-	0.40	-	-
SSc4.1 /6	Alternative transportation - public transportation access	5.33	4.00	6.00	6.00	-
SSc4.2 /1	Alternative transportation - bicycle storage and changing rooms	0.56	0.33	1.00	0.75	1.00
SSc4.3 /3	Alternative transportation - low-emitting and fuel-efficient vehicles	2.67	3.00	2.40	3.00	3.00
SSc4.4 /2	Alternative transportation - parking capacity	2.00	2.00	2.00	1.50	1.33
SSc5.1 /1	Site development - protect or restore habitat	-	-	0.20	0.50	0.33
SSc5.2 /1	Site development - maximize open space	0.56	0.67	0.60	0.75	0.33
SSc6.1 /1	Stormwater design - quantity control	0.33	-	0.40	0.50	0.33
SSc6.2 /1	Stormwater design - quality control	0.44	-	0.40	0.50	0.33
SSc7.1 /1	Heat island effect - nonroof	0.67	0.67	1.00	1.00	0.67
SSc7.2 /1	Heat island effect - roof	0.89	1.00	0.60	1.00	0.33
SSc8 /1	Light pollution reduction	0.44	-	0.40	0.25	-

Water Efficiency (WE) /10		6	7	5	8	9
WEc1 /4	Water efficient landscaping	2.44	3.33	2.00	3.00	4.00
WEc2 /2	Innovative wastewater technologies	0.89	0.67	0.40	1.00	2.00
WEc3 /4	Water use reduction	2.56	3.33	3.00	3.50	2.67
Energy & Atmosphere (EA) /35		15	21	17	11	16
EAc1 /19	Optimize energy performance	7.89	11.33	12.00	6.25	7.67
EAc2 /7	On-site renewable energy	1.33	2.33	2.60	0.25	2.00
EAc3 /2	Enhanced commissioning	1.56	2.00	0.80	-	2.00
EAc4 /2	Enhanced refrigerant management	1.33	1.33	1.20	1.50	1.33
EAc5 /3	Measurement and verification	2.33	3.00	0.20	2.25	3.00
EAc6 /2	Green power	0.22	0.67	0.40	1.00	-
Material & Resources (MR) /14		5	5	5	6	5
MRC1.1 /3	Building reuse - maintain existing walls, floors and roof	-	-	-	-	-
MRC1.2 /1	Building reuse - maintain interior non-structural elements	-	-	-	-	-
MRC2 /2	Construction waste management	1.67	1.33	1.60	1.25	2.00
MRC3 /2	Materials reuse	-	-	-	-	-
MRC4 /2	Recycled content	1.11	1.00	1.00	1.75	1.33
MRC5 /2	Regional materials	1.89	1.67	1.80	2.00	1.67
MRC6 /1	Rapidly renewable materials	-	-	-	-	-
MRC7 /1	Certified wood	-	0.67	0.20	0.75	0.33
Indoor Environmental Quality (EQ) /15		8	8	7	11	8
EQc1 /1	Outdoor air delivery monitoring	0.44	0.67	0.40	1.00	-
EQc2 /1	Increased ventilation	0.44	0.67	0.80	1.00	0.33
EQc3.1 /1	Construction IAQ management plan - during construction	1.00	0.67	0.40	1.00	1.00
EQc3.2 /1	Construction IAQ management plan - before occupancy	0.56	0.33	0.20	-	0.67
EQc4.1 /1	Low-emitting materials - adhesives and sealants	1.00	0.33	0.40	0.75	1.00
EQc4.2 /1	Low-emitting materials - paints and coatings	1.00	0.67	0.60	1.00	1.00
EQc4.3 /1	Low-emitting materials - flooring systems	0.56	0.67	0.40	0.75	0.67
EQc4.4 /1	Low-emitting materials - composite wood and agrifiber products	0.22	-	-	0.75	0.33
EQc5 /1	Indoor chemical and pollutant source control	0.67	1.00	0.20	1.00	0.33
EQc6.1 /1	Controllability of systems - lighting	0.44	0.67	0.80	0.75	0.67
EQc6.2 /1	Controllability of systems - thermal comfort	0.33	0.33	0.80	0.25	0.33
EQc7.1 /1	Thermal comfort - design	0.67	1.00	0.80	1.00	1.00
EQc7.2 /1	Thermal comfort - verification	0.67	1.00	0.80	1.00	1.00
EQc8.1 /1	Daylight and views - daylight	0.11	-	0.40	0.25	-
EQc8.2 /1	Daylight and views - views	0.33	0.33	0.20	0.75	-
Innovation in Design (ID) /6		4	5	4	4	5
IDc1	Innovation in design	3.44	4.33	2.60	3.25	4.00
IDc2	LEED Accredited Professional	1.00	1.00	1.00	1.00	1.00
Regional Priority (RP) /4		4	4	3	4	4
EAc1	Optimize energy performance	0.33	0.67	0.80	0.75	0.67
EAc3	Enhanced Commissioning	0.78	1.00	0.40	-	1.00
EAc5	Measurement and verification	0.67	0.67	-	0.50	0.33
WEc1	Water efficient landscaping	0.56	0.67	0.80	1.00	0.33
WEc2	Innovative Waste Water Technologies	0.56	-	0.20	0.50	1.00
WEc3	Water use reduction	0.67	1.00	0.80	1.00	0.67
MRC2	Construction waste management	0.11	-	-	-	-

4.2 Credits Applicability ¹⁴:

4.2.1 Sustainable Sites (SS):

The Sustainable Sites category focuses on the environment surrounding the building, the vital relationships among buildings and local and regional ecosystems, and preserving the biodiversity that natural systems rely on, and from Table (4), it's shown that the average of achieved points in the last six credits does not reach the 50 % of points in the selected projects. This means approximately 40% of the points available in the sustainable sites credits are considered Not Applicable for the project developers. Furthermore, "Brownfield redevelopment" credit gained only 9% of points a very low percentage while "Alternative transportation - parking capacity" gained 94% a high percentage.

Table (4) Sustainable Sites credits and percentage of achieved points by MEC.

	Sustainable Sites credits	Credits Points	Percentage of total Average %	Applicability
SSc4.4	Alternative transportation - parking capacity	2	Highest 94	A
SSc4.3	Alternative transportation - low-emitting and fuel-efficient vehicles	3	92	A
SSc1	Site Selection	1	84	A
SSc4.1	Alternative transportation - public transportation access	6	82	A
SSc7.2	Heat island effect - roof	1	81	A
SSc4.2	Alternative transportation - bicycle storage and changing rooms	1	73	ND
SSc7.1	Heat island effect – non roof	1	73	ND
SSc5.2	Site development - maximize open space	1	62	ND
SSc2	Development density and community connectivity	5	40	NA
SSc6.1	Storm water design - quantity control	1	36	NA
SSc6.2	Storm water design - quality control	1	35	NA
SSc8	Light pollution reduction	1	32	NA
SSc5.1	Site development - protect or restore habitat	1	23	NA
SSc3	Brownfield redevelopment	1	Lowest 9	NA

4.2.2 Water Efficiency (WE):

The Water Efficiency credits recognize the use of non-potable and alternative sources of water, and it has shown in Table (5) that 20% of the points are Not Applicable for developers. In addition, there are no Applicable credits and the highest average reaches only 73% of points, which is not very high.

Table (5) Water Efficiency credits and percentage of achieved points by MEC

	Water Efficiency credits	Credits Points	Percentage of total Average %	Applicability
WEc3	Water use reduction	4	Highest 73	ND
WEc1	Water efficient landscaping	4	69	ND
WEc2	Innovative wastewater technologies	2	Lowest 48	NA

4.2.3 Energy and Atmosphere (EA):

The Energy and Atmosphere (EA) category addressing energy use reduction, energy-efficient design strategies, and renewable energy sources, with a focus on design that reduces overall energy needs, such as building orientation and glazing selection, and the choice of climate-appropriate building materials. Table (6) shows there is only one credit which is applicable with only 76% of points. In addition, three credits have 70 % of available points need development to reach an acceptable level to attract developers.

Table (6) Energy and Atmosphere credits and percentage of achieved points by MEC

	Energy and Atmosphere credits	Credits Points	Percentage of total Average %	Applicability
EAc4	Enhanced refrigerant management	2	Highest 76	A
EAc3	Enhanced commissioning	2	63	ND

EAc5	Measurement and verification	3	63	ND
EAc1	Optimize energy performance	19	51	ND
EAc2	On-site renewable energy	7	26	NA
EAc6	Green power	2	Lowest 17	NA

4.2.4 Material and Recourses (MR):

The Materials and Resources (MR) credit category focuses on minimizing the embodied energy and other impacts associated with the extraction, processing, transport, maintenance, and disposal of building materials. Table (7) shows clearly that four credits with 60% of available points in the Material and Recourses credits with zero percentage. In addition, only one credit out of eight is considered Applicable and two of them in need to developing.

Table(7) Material and Recourses credits and percentage of achieved points by MEC

	Material and Recourses credits	Credits Points	Percentage of total Average %	Applicability
MRc5	Regional materials	2	Highest 93	A
MRc2	Construction waste management	2	73	ND
MRc4	Recycled content	2	59	ND
MRc7	Certified wood	1	30	NA
MRc1.1	Building reuse - maintain existing walls, floors and roof	3	0	NA
MRc1.2	Building reuse - maintain interior nonstructural elements	1	0	NA
MRc3	Materials reuse	2	0	NA
MRc6	Rapidly renewable materials	1	0	NA

4.2.5 Indoor Environmental Quality (EQ):

The Indoor Environmental Quality (EQ) category rewards decisions made by project teams about indoor air quality and thermal, visual, and acoustic comfort. It has shown in Table (8) that the applicability of Indoor Environmental Quality credits. Forty Percent of credits are less than the acceptable percentage and considered Not Applicable credits. In addition to 25% of credits are need to be developed.

Table (8) Indoor Environmental Quality credits and percentage of achieved points by MEC

	Indoor Environmental Quality credits	Credits Points	Percentage of total Average %	Applicability
EQc4.2	Low-emitting materials - paints and coatings	1	Highest 88	A
EQc7.1	Thermal comfort - design	1	87	A
EQc7.2	Thermal comfort - verification	1	87	A
EQc3.1	Construction IAQ management plan - during construction	1	85	A
EQc4.1	Low-emitting materials - adhesives and sealants	1	76	A
EQc5	Indoor chemical and pollutant source control	1	65	ND
EQc4.3	Low-emitting materials - flooring systems	1	63	ND
EQc6.1	Controllability of systems - lighting	1	59	ND
EQc2	Increased ventilation	1	56	ND
EQc1	Outdoor air delivery monitoring	1	49	NA
EQc6.2	Controllability of systems - thermal comfort	1	41	NA
EQc3.2	Construction IAQ management plan - before occupancy	1	40	NA
EQc8.2	Daylight and views - views	1	29	NA
EQc4.4	Low-emitting materials - composite wood and agrifiber products	1	26	NA
EQc8.1	Daylight and views - daylight	1	Lowest 20	NA

4.2.6 Innovation in Design (ID):

The purpose of the Innovation in Design category is to recognize projects for innovative building features and sustainable building practices and strategies. Innovation in Design has been created to pursue project developers to exceed the limitation of existing credits and create new strategies to the green building. It is obviously clear that “LEED Accredited Professional” credit is the only credit that reaches the maximum 100%. This means all projects have a person who is a LEED AP and this credit is easily to be achieved. 65% of points that developers have succeeded to achieve in the Innovation in Design credit and should be developed.

Table (9) Innovation in Design credits and percentage of achieved points by MEC

	Innovation in Design credits	Credits Points	Percentage of total Average %	Applicability
IDc2	LEED Accredited Professional	1	100	A
IDc1	Innovation in design	5	65	ND

4.2.7 Regional Priority (RP):

The ultimate goal of RP credits is to enhance the ability of LEED project teams to address critical environmental issues across the country and around the world. Because each LEED project type may be associated with different environmental impacts, each rating system has its own RP credits, the participants prioritized any 6 credits to address the important issues of given locations. “Water use reduction” credit the highest rank in the water efficiency category is the most attractive credit in the Regional Priority vice versa the “Construction waste management” credit.

Table (10) Regional Priority credits and percentage of achieved points by MEC

	Regional Priority credits	Credits Points	Percentage of total Average %	Applicability
WEc3	Water use reduction	1	78	Independent
WEc1	Water efficient landscaping	1	69	Independent
EAc1	Optimize energy performance	1	65	Independent
EAc3	Enhanced Commissioning	1	61	Independent
EAc5	Measurement and verification	1	48	Independent
WEc2	Innovative Waste Water Technologies	1	44	Independent
MRc2	Construction waste management	1	3	Independent

5. Conclusion :

Most of the Credit ratings in the LEED system are derived out of codes and regulations taken out of American standards and that was the main reason that the entrepreneurs have failed to achieve some of the credits. Among the most prominent categories that have shown the difficulty in gaining points in general are “Material and Recourses” and “Energy and Atmosphere”. Taking the value of the seven categories in mind and the number of points that should be achieved, we find that the coefficient of Applicability ($n = \text{Average of achieved points} / \text{available points in each category}$) is as follows in ascending order from low to high (Chart 4): Energy and Atmosphere ($n = 1.37$), Sustainable Sites ($n = 2.46$), Material and Recourses ($n = 2.5$), Indoor environmental quality ($n = 3.87$), Water Efficiency ($n = 6.6$), Innovation ($n = 11.83$), Regional Priority ($n = 23$).

From the above, there is difficulty facing entrepreneurs in achieving points in both the “Energy and Atmosphere”, followed by “Sustainable Sites” category. And vice versa, it is found that entrepreneurs and developers have resorted to the flexible categories to choose to compensate for the missing points which are the Regional Priority followed by Innovation in Design.

The most attractive credits of all categories are arranged in descending order as follows: SSc4.4: Alternative transportation - parking capacity, EAc4: Enhanced refrigerant management, MRc5: Regional materials, EQc4.2: Low-emitting materials - paints and coatings.

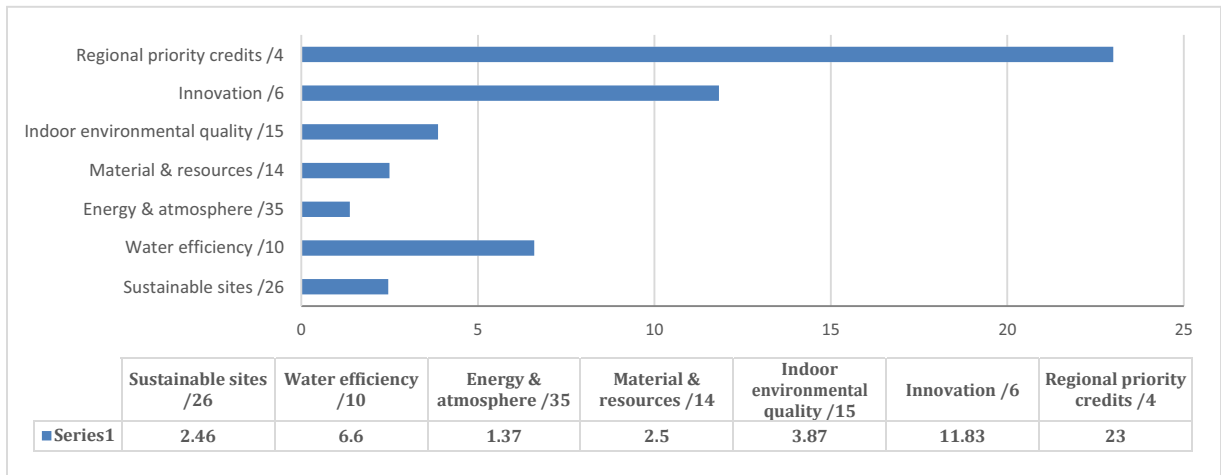


Chart (4) the applicability of the seven LEED-NC 2009 categories

However, some of credits did not achieve a high value in the result are arranged in ascending order as follows: SSc3/1: Brownfield redevelopment, WEc2 /2L: Innovative wastewater technologies, EAc6 /2: Green power, EQc8.1: Daylight and views – daylight.

Some of these credits did not achieve any points at all, and it was clear that all of them were from the category of Material and Resources. They are: MRc1.1 /3: Building reuse - maintain existing walls, floors and roof, MRc1.2 /1: Building reuse - maintain interior non-structural elements, MRc3 /2: Materials reuse, MRc6 /1: Rapidly renewable materials.

Also, there are some of credits, which have the greatest number of available points and greater value but Not Applicable such as SSc2: Development density and community connectivity (5 points) and EAc2: On-site renewable energy (7 points)

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