

CONFERENCE PAPER

NZAAR-SGER-18-58 SGER 2018

Obstacles of Application of Green Pyramid Rating System (GPRS) on Local Projects in Egypt

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PUBLISHED IN

The Fourth NZAAR International Event Series on Natural and Built Environment, Cities, Sustainability and Advanced Engineering
International Conference on Sustainability, Green Buildings, Environmental Engineering and Renewable Energy (SGER 2018)

Pages	120–128 of the volume
Held	27 January 2018, GTower Hotel, Kuala Lumpur, Malaysia
ISSN	2463-5979 (online) 2463-5960 (print)
Publisher	New Zealand Academy of Applied Research Ltd, Auckland

ABSTRACT

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Keywords: Green Pyramid Rating System; Green Architecture; LEED; Obstacles; Potentials; Egyptian Context

HOW TO CITE

Sara Samy Khalifa, Morad Abdelkader, Abeer Mostafa Eissa and Ahmad M. Hamdy (2018). Obstacles of Application of Green Pyramid Rating System (GPRS) on Local Projects in Egypt. In *The Fourth NZAAR International Event Series on Natural and Built Environment, Cities, Sustainability and Advanced Engineering*, Kuala Lumpur, Malaysia, 27 January 2018 (pp. 120–128). Auckland: New Zealand Academy of Applied Research. ISSN 2463-5979 (online), 2463-5960 (print).

OBSTACLES OF APPLICATION OF GREEN PYRAMID RATING SYSTEM (GPRS) ON LOCAL PROJECTS IN EGYPT

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Abstract

Green architecture practices in Egypt are very limited and their progress does not go with constant steps as required for mitigating local environmental problems. This paper is a step towards determining the overall image of the Egyptian green architecture practices with a special focus on obstacle of its applications. This is met via evaluating some local environmentally oriented projects in terms of applying green architecture principles through reviewing fulfilling of Green Pyramid Rating System's (GPRS) credits for each case study. As the credits describe measures of applying green architecture principles, achieving these credits could be utilized as relative indicator of implementing these measures, and accordingly determining potentials and obstacles of applying these principles in the Egyptian context. It should be noted that the evaluation results exclusively describe the selected five case studies, yet they indicate and assert what can be described as obstacles and potentials for applying green architecture principles in the local context.

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1. Introduction

After the industrial revolution most of the world countries turned to use non-renewable energy resources until the start of energy crisis in 1970's. In 1980's world turned to take a responsible approach towards nature which helped in the emergence of a new green approach that represents a model shift in the way we understand, design and construction today. Green buildings aim to fundamentally change the built environment by creating energy efficient, healthy and productive buildings that mitigate the significant impacts of the built environment.

Several green building rating systems have been developed to promote green building practices such as Leadership in Energy and Environmental Design (LEED) in US, Building Research Establishment Environmental Assessment Method (BREEAM) in UK, and many others around the world.

On the local level, current green architecture practices in Egypt are still at an experimental phase and they need to be promoted to go with constant steps to mitigate environmental impacts.

In 2011, Egyptian Green Building Council (EGBC) has developed GPRS to evaluate local green building practices and encourage the building industry to adopt green architecture principles.

This research aims to determine obstacles of application of GPRS in Egypt, hence suggesting recommendations that can pave a better way to increase the potentials on account of obstacles towards applying green architecture principles in Egypt in the near future.

The research exclusively studies the obstacles of applying green architecture principle locally in Egypt, via examining the practices context.

2. Research Methods

This paper addresses the possibility of applying the principles of green architecture in Egypt through a review of selected of Egyptian environmental-oriented projects and applying GPRS on them to determine the obtained credits and the non-obtained credits and the reasons for not being achieved which could help in concluding obstacles which face the design teams seeking to develop green projects.

Additional data about the selected environmentally oriented projects is obtained through an open-ended interview with the designers of these projects. This interview mainly consists of two parts:

Part one is a set of questions about orienting the project towards green architecture, while part two is an application of GPRS checklist on the project and determining the reasons of failure to obtain some credits.

The interview is answered for every project case by case, and then a summary of interview answers and GPRS application results is presented.

The main criteria of selecting case studies projects is to choose projects that consider many of green architecture principles, or in other words projects that seek certification from any green building rating systems.

3. Selected Case Studies

As LEED certified and GPRS registered projects in Egypt fulfill these criteria, the selected projects for case studies are as follows:

3.1 Info Fort Warehouse Project



Figure 1: Info Fort Warehouse

- Project Type: Warehouse (Multiple building project)
- Location: 6th of October city, Giza, Egypt
- Date of Completion: 2013
- LEED Certification: LEED Silver
- Owner: Info Fort Company
- Designer: MA Consultants
- Total Area: 23,000 m².^[1]

3.2 L'oreal Pyramids Cosmetics Factory

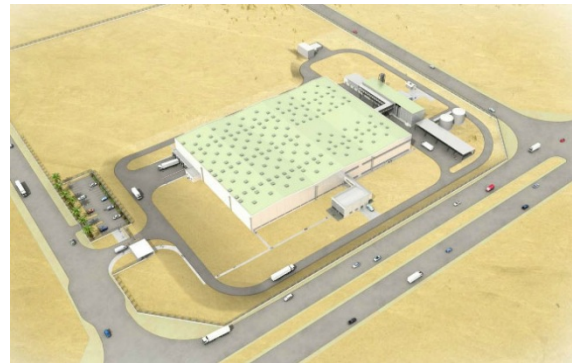


Figure 2: L'Oreal Pyramids Cosmetics Factory

- Project Type: Factory
- Location: Pyramids Industrial Parks, 10th of Ramadan City, Cairo
- LEED Certification: LEED Silver
- Date of Completion: 2013
- Owner: L'Oreal Cosmetics
- Designer: SNC Lavalin
- Total Area: 103,814 m², Footprint Area: 15,366 m².^[2]

3.3 Credit Agricole Egypt New Head Office Office



Figure 3: Credit Agricole Egypt New Head Office

- Project Type: Head Office Complex
- Location: New Cairo
- LEED Certification: LEED Platinum
- Date of Completion: Unknown
- Owner: Credit Agricole Egypt
- Designer: Engineering Consultants Group (ECG)
- Total Area: 51,334 m², Footprint Area: 26,667 m², Total Built Up Area: 42,000m².^[3]

3.4 Maadi Call Center MB4 Building



Figure 4: Maadi Call Center MB4 Building

- Project Type: Call Center Activities
- Location: Maadi, Autostrad Road
- LEED Certification: LEED Silver
- Date of Completion: Unknown
- Owner: Ministry of Communications
- Designer: Engineering Consultant Group (ECG)
- Total Area: Footprint: 4,200 m², Total Built Up Area: 25,200m²^[4]

3.5 Florenta Residential Compound



Figure 5: Florenta Residential Compound

- Project Type: Residential compound
- Location: El Maadi Ring Road, New Cairo, Cairo
- LEED Certification: N/A (GPRS Registered Project)
- Date of Completion: 2015
- Owner: Abraj Misr Company
- Designer: K&A Designs
- Total Area: 21,000 m²^[5]

4. Analysis & Results

GPRS was applied on the five case studies in the two parts:

In part one, designer 'opinion about LEED and GPRS application was defined through the following questions:

- Q1.What are the reasons of adopting green architecture principles in the project?
- Q2.What are the main obstacles that prevented from achieving some LEED credits?
- Q3.What are the main challenges in coordinating between different disciplines in the LEED registered/certified project?
- Q4.Did the designer know about developing an Egyptian green building rating system (GPRS) to be compatible with the Egyptian context?
- Q5.What are the reason for applying to obtain LEED certificate rather than GPRS certificate?
- Q6.Is the designer intending to apply for obtaining GPRS certificate in the future projects?

Answers of these questions in the five case studies are summarized in table 1.

Table 1: Answers of Interview Questions in the Five Case Studies

Qs	Case Studies				
	1	2	3	4	5
Q1	Owner	Owner	Owner	Owner	Owner
Q2	Lack of awareness	Lack of awareness & Initial cost	Initial cost	Initial cost	Initial cost
Q3	Lack of specialists	Lack of specialists & knowhow and qualified contractors	Lack of knowhow and qualified contractors	Lack of knowhow and qualified contractors	Lack of knowhow and qualified contractors
Q4	Yes	No	Only if involved in the academic career	Only if involved in the academic career	Yes
Q5	Marketability and owner requirements	Marketability and owner requirements	Marketability	Marketability	N/A
Q6	Only if owner requires	Only if owner requires	Only if owner requires	Only if owner requires	Only if owner requires

The table shows that:

- Designers orient their projects towards environmental architecture according to the owner requirements in all case studies.
- The main obstacle that prevented from achieving some credits is the initial cost in most of the cases.

The main challenges in coordinating between different disciplines in the LEED registered/certified project are lack of specialists, knowhow and qualified contractors.

- Knowledge about developing an Egyptian green building rating system

(GPRS) is not wide, especially when the designer is not involved in the academic career.

- Designers seek LEED certificate instead of GPRS certificate to increase the project marketability in most of the cases.
- Applying for GPRS certificate in the future projects depends on the owner requirements in all case studies.

While part two addresses the application of GPRS categories and credits on each case study with the help of data collected from the interviewees. Each project is then evaluated according to achieved and non-achieved credits.

A summary of case studies evaluation is presented in the following table.

Table 2: Summary of Case Studies Evaluation Using GPRS (based on data from^{[6],[7]})

GPRS Category	Case Studies				
	1	2	3	4	5
S.S	7.5	6	9	6	10.5
EA	8	11.5	10.5	6.5	9
WE	10.8	13.8	8.7	8.1	16.8
MR	4	4.5	2	2	3.5
IAQ	2.5	6	2.5	2.5	3.5
Man.	6.5	6.5	5.5	5.5	9
ID	2	3	0	0	0
Total	41	51.3	38.2	30.6	52.3
Rating	Certified	Silver	Uncertified	Uncertified	Silver

Credits applicability are then evaluated and divided into six applicability levels explained in table 3:

Table 3: Applicability Levels of GPRS Credits

Applicability Levels	No. of projects applied	Score
Fully obtained credits	5 of 5	4/4
Frequently obtained credits	4 of 5	3.2/4
Possibly obtained credits	3 of 5	2.4/4
Hardly obtained credits	2 of 5	1.6/4
Slightly obtained credits	1 of 5	0.8/4
Rarely obtained credits	0 of 4	0/4

The application of GPRS on the selected case studies indicates the credits that can be described as easy to be obtained and other the credits that designers may face some obstacles of fulfilling them.

Fully, frequently and possibly obtained credits indicate the easiness of their application and the availability of their application requirements.

On the other hand, obstacles of fulfilling other credits can be concluded from the credits that are hardly, slightly and rarely obtained in the examined case studies.

Table 4 represents evaluation of GPRS credits' fulfillment in the 5 case studies.

Hardly, slightly and rarely obtained credits are also highlighted in the schedule to conclude the obstacles that prevented from their application as follows:

Table 4: Fulfillment of GPRS credits in the five case studies

Categories/Credits	Credit Points	Case Study					Score/4	Evaluation					
		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh.	Rare.
Project Design and Implementation Plan	M	M	M	M	M	M	4	√					
Desert area development	1	1	1	1	0	1	3.2		√				
Informal area redevelopment	1	0	0	0	0	0	0						√
Brownfield site redevelopment	1	0	0	0	0	0	0						√
Compatibility with National Development Plan	1	0	0	1	0	1	1.6				√		

Transport infrastructure connection	1	1	1	1	1	1	4	√						
Catering for remote sites	1	0	0	0	0	1	0.8						√	
Alternative methods of transport	1	1	1	1	1	1	4	√						
Protection of habitat	1	1	0	1	1	1	3.2		√					
Respect sites of historic/cultural interest	1	0	0	0	0	0	0							√
Minimizing Pollution during construction	1	1	1	1	1	1	4	√						
Total	10	5	4	6	4	7	1.6	4	2	--	1	1	3	
Categories/Credits	Credit Points	Case Study					Score/4	Evaluation						
Energy Efficiency		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh.	Rare.	
Minimum Energy Performance	M	M	M	M	M	M	4	√						
Energy Monitoring & Reporting	M	M	M	M	M	M	4	√						
Ozone Depletion avoidance	M	M	M	M	M	M	4	√						
Energy Efficiency Improvement	10	6	1	9	2	0	1.4						√	
Passive external heat gain/loss reduction	7	0	5	0	0	2	0.8						√	
Energy Efficient Appliances	3	3	3	3	3	3	4	√						
Vertical Transportation Systems	3	0	0	0	0	0	0							√
Peak Load Reduction	6	3	3	3	3	0	1.6					√		
Renewable Energy Sources	10	0	4	1	0	10	1.2						√	
Environmental Impact	4	2	2	2	2	2	2					√		
Operation and Maintenance	1	1	1	1	1	1	4	√						
Optimized Energy and Performance	4	2	4	2	2	0	2					√		
Energy and Carbon Inventories	2	0	0	0	0	0	0							√
Total	50	17	23	22	14	18	2.2	5	--	--	3	3	2	
Categories/Credits	Credit Points	Case Study					Score/4	Evaluation						
Water Efficiency		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh.	Rare.	
Minimum Water Efficiency	M	M	M	M	M	M	4	√						
Water Use Monitoring	M	--	--	M	M	M	2.4			√				
Indoor Water Efficiency Improvement	8	6	8	3.5	3.5	5	2.6			√				

Outdoor Water Efficiency Improvement	9	5	2	5	4	6	2					√		
Efficiency of Water-based Cooling	4	0	0	0	0	0	0							√
Water Feature Efficiency	4	4	4	4	4	2	3.6		√					
Water Leakage Detection	6	0	0	0	0	0	0							√
Efficient Water Use During Construction	3	3	0	0	0	3	1.6					√		
Waste Water Management	12	0	8	2	2	8	1.33						√	
Sanitary Used Pipes	4	0	0	0	0	4	0.8						√	
Total	50	17	23	14.5	13.5	28	1.8	1	1	2	2	2	2	2
Categories/Credits	Credit Points	Case Study					Score/4	Evaluation						
Materials & Resources		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh.	Rare.	
Schedule of Principal Project Materials	M	M	M	M	M	M	4	√						
Elimination of exposure to toxic materials	M	M	M	M	M	M	4	√						
Regionally procured materials	3	3	3	1	1	2	2.7			√				
Materials fabricated on site	1	0	0	0	0	1	0.8						√	
Use of readily renewable materials	3	0	0	0	0	0	0							√
Use of salvaged materials	3	0	0	0	0	0	0							√
Use of recycled materials	4	0	1	2	2	2	1.4						√	
Use of lightweight materials	1	1	1	0	0	1	2.4			√				
Use of higher durability materials	1	1	1	1	1	1	4	√						
Use of prefabricated elements	3	3	3	0	0	0	1						√	
LCC analysis of materials in the project	1	0	0	0	0	0	0							√
Total	20	8	9	5	5	7	2.3	3	--	2	--	3	3	
Categories/Credits	Credit Points	Case Study					Score/4	Evaluation						
Indoor Environmental Quality		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh	Rare.	
Minimum Ventilation and Indoor Air Quality	M	M	M	M	M	M	4	√						
Control of Smoking in and around the Building	M	M	M	M	M	M	4	√						
Control of Legionella and	M	--	--	--	--	M	0.8						√	

other health risks														
Optimized Ventilation	5	1	5	0	0	1	1.1							√
Controlling emissions from building materials	5	2	5	2	2	2	1.6						√	
Thermal Comfort	2	2	2	2	2	2	4	√						
Visual Comfort	2	0	0	1	1	2	1.6					√		
Acoustic Comfort	1	0	0	0	0	0	0							√
¹ Total	15	5	12	5	5	7	2.1	3	--	--	1	2	2	
Categories/Credits	Credit Points	Case Study					Score/4	Evaluation						
Management		1	2	3	4	5		Fully	Freq.	Poss.	Hard	Sligh.	Rare.	
Integrated Plan and Method Statement	M	M	M	M	M	M	4	√						
Health & Safety and Welfare regulations	M	M	M	M	M	M	4	√						
Demolition Method Statement	M	M	M	M	M	M	4	√						
Containers for site materials waste	2	2	2	2	2	2	4	√						
Employing waste recycling workers on site	1	1	1	1	1	1	4	√						
Access for lorries, plant and equipment	1	1	0	1	1	1	3.2		√					
Identified and separated storage areas	2	2	2	2	2	2	4	√						
Project Waste Management Plan	1	1	1	1	1	1	4	√						
Company specialized in recycling and disposal	2	2	2	2	2	2	4	√						
Protecting water sources from pollution	2	0	0	0	0	2	0.8						√	
Waste from mixing equipment	2	2	2	2	2	2	4	√						
Control of emissions and pollutants	2	2	2	0	0	0	1.6					√		
Providing a Building User Guide	3	0	3	0	0	3	1.6					√		
Providing a Periodic Maintenance Schedule	2	0	2	0	0	2	1.6					√		
Total	20	13	15	11	11	18	3.2	9	1	--	3	1	--	

5. Discussion & Conclusion

From the previous analysis, obstacles of fulfilling some credits of GPRS in the Egyptian context can be concluded as follows:

➤ Category 1: Sustainable Sites

- Absence of governmental incentives for redeveloping informal areas
- Absence of governmental incentives for following the national development plan
- High initial cost
- Sites of historic/cultural interest are exceptional cases

➤ Category 2: Energy & Atmosphere

- High initial cost required for some credits.
- Lack of design team specialist who are aware of environmental control strategies and building simulation programs to choose the optimum choices for the building environmental performance
- Unavailability of the required equipment for some credits
- Lack of design team and other disciplines specialists who are aware with energy efficiency strategies and the use of simulation programs required for that purpose.
- Lack of design team specialists
- Unavailability of the required equipment and technology
- Lack of design team specialist who are aware of environmental control strategies and building simulation programs to choose the optimum choices for the building environmental performance
- Unavailability of the required technology for some credits
- Category 3: Water Efficiency
- Lack of design team awareness of the importance of irrigation operation and maintenance plan
- Unavailability of the required equipment for some credits
- High initial cost required for some credits.
- Lack of contractors' awareness

- Lack of the required technology for some credits

- Lack of specialists

- Unavailability of certified sanitary pipes in the Egyptian market

➤ Category 4: Materials & Resources

- Lack of qualified contractors and builders

High initial cost required for some credits.

- Lack of contractors' awareness

- Unavailability of recycling companies for construction materials

to provide the required materials

- Unavailability of data about life cycle cost of the available materials.

➤ Category 5: Indoor Environmental Quality

- The mentioned code (ASHRAE) is not a local one, designers are not aware of its requirements and how to apply it

- Lack of the required technology for some credits

- Lack of specialists

- High initial cost required for some credits

- Unavailability of low emitting materials in the Egyptian market

- Lack of design team specialists who are aware about appropriate daylighting strategies and simulation programs required for this purpose

➤ Category 6: Management

- Lack of awareness of contractors and builders

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