

## LEED – A Caribbean Architect's Perspective

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### Introduction

Buildings consume a significant amount of energy to construct and operate. Statistics indicate that buildings consume 40% of raw materials to construct and use 70% of electricity generated to operate. In the context of an ever-increasing energy crisis, the imperative to create more environmentally sustainable buildings is paramount. Having recognised this in the developed world, there is a growing trend in green building design and construction. This has given rise to several voluntary industry rating systems such as BREEAM, Green Star, Minergie, Green Globes and LEED.

LEED has become the most widely recognised benchmarking system for green design within the Commonwealth Caribbean region mainly by default. This is due to the fact that LEED was developed in the USA, to which the English-speaking Caribbean is geopolitically connected.

This paper looks at the context of LEED and its application to our region. It will also explore at a superficial level the premises of other rating systems for comparative analysis purposes. The paper proposes the localisation and adaptation of green building rating as a system towards the eventual implementation of a region-sensitive approach to green building, design and operation.

### LEED

*“LEED is an internationally recognised green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO<sub>2</sub> emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.”<sup>1</sup>*

LEED, Leadership in Energy and Environmental Design was developed by the U.S. Green Building Council formed in 1993, and the first pilot programme, LEED v1.0 launched in 1998. LEED v2.0 was subsequently released in 2000 and targeted at new construction only. Due to the success of LEED v2.0, other rating systems were developed – such as – LEED for Existing Buildings, LEED for Commercial Interiors, LEED for Core & Shell, and LEED for Neighbourhood Development. There is also LEED for Homes, which falls outside of, and is rated differently to the abovementioned. The current version of LEED is now LEED v3 which was launched in 2009 and comprises of a revamped rating system (referred to as LEED 2009), LEED Online (the online resource centre) and the new LEED Certification Model (the

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<sup>1</sup> Adapted from the U.S. Green Building Council website – [www.usgbc.org](http://www.usgbc.org), May 2010

way in which buildings are certified and people credentialed). For the purposes of this paper, when referring to LEED, the author implies LEED 2009 i.e. the newest of the LEED rating systems.

LEED, as a rating system, has been developed as a benchmark of a building's performance against the veritable impacts of human existence on the environment. LEED is based on the premise that there are thirteen aftereffects of human habitation – namely, (1) climate change (2) indoor air quality (3) resource depletion (4) human health criteria (5) water intake (6) human health: cancerous (7) ecotoxicity (8) eutrophication (9) habitat alteration (10) human health: non-cancerous (11) smog formation (12) ozone depletion; and, (13) acidification. LEED adopts a strategy of mitigation against these aftereffects through the use of LEED *credit categories*. The credit categories measure building performance against certain criteria, and allocate varying *points* to each category. There are five main credit categories that apply to all the rating systems within LEED, namely – **Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources**, and, **Indoor Environmental Quality**. Outside of these five categories, there are two main additional ones – Innovation in Design and Regional Priority. There are also other credit categories specific to LEED for Neighbourhood Development and LEED for Homes which fall outside the scope of this paper.

In essence, LEED sums up the credit categories into a point allocation system which totals 100 base points for the main categories and 10 *bonus points* for the Innovation in Design and Regional Priority categories. The terminology Certified, Silver, Gold and Platinum has been reserved by the USGBC for its varying award categories, based on the amount of points one can certifiably accomplish:

**Certified** – 40-49 points; **Silver** – 50-59 points; **Gold** – 60-79 points; and, **Platinum** – 80 points and over

Upon obtaining any given award under LEED 2009, it is to be noted that the award must be maintained through continual submission and evaluation of whole-building energy and water usage data. USGBC maintains the right to revoke any award given under the LEED 2009 rating system.

## **BREEAM**

The Building Research Establishment (BRE) Environmental Assessment Method, is a UK based green rating system developed by the BRE. It is described as *“the leading and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance.”*<sup>2</sup>

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<sup>2</sup> [www.breeam.org](http://www.breeam.org), May 2010

BREEAM is mainly used throughout the UK and Europe and has been adapted for various parts of the world. It was first developed in 1990 and uses the categories Management, Health & Wellbeing, Energy, Transport, Water, Material & Waste, Land-use & Ecology and Pollution to assess the environmental efficiency of a building as Good, Very Good, Excellent or Outstanding.

### **Green Globes**

This is essentially BREEAM migrated first to Canada in 1996 and now to the USA. It is described as “a revolutionary building environmental design and management tool. It delivers an online assessment protocol, rating system and guidance for green building design, operation and management. It is interactive, flexible and affordable, and provides market recognition of a building’s environmental attributes through third-party verification.”<sup>3</sup>

Green Globes awards 1-4 globes as a measure of a building’s greenness and is viewed as a more flexible, less onerous green building rating system than LEED.

### **Green Star**

First developed by the Green Building Council of Australia, Green Star is “a comprehensive, national, voluntary environmental rating system that evaluates the environmental design and construction of buildings...”<sup>4</sup> Green Star was launched in 2003 and is rooted in both BREEAM and LEED. Green Star has now also been adapted to other markets such as New Zealand and South Africa.

Green Star uses the categories *Management, Indoor Environment Quality, Energy, Transport, Water, Materials, Land Use & Ecology, Emissions* and *Innovation* to achieve a 4, 5 or 6 Star rating.

### **Minergie**

Minergie is a Swiss sustainable building standard wherein “Specific energy consumption is used as the main indicator to quantify the required building quality. In this way, a reliable assessment can be assured. Only the final energy consumed is relevant.”<sup>5</sup>

Minergie was first developed in 1998 and uses a simple baseline performance measure to certify buildings. The minimum baseline performance for Minergie buildings is an energy consumption of 60% less than an equivalent conventional building.

The Minergie standard proposes, but is not limited to, ways of achieving optimum energy performance through the use of – a compact building form; air-tight construction; high performance windows and

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<sup>3</sup> [www.greenglobes.com](http://www.greenglobes.com), May 2010

<sup>4</sup> [www.gbca.org.au](http://www.gbca.org.au), May 2010

<sup>5</sup> [www.minergie.com](http://www.minergie.com), May 2010

thermal insulation; separation of heated and unheated spaces within a building; controlled, balanced ventilation; renewable energy and efficient appliances and lighting.

## Synopsis

The above gives an indication of the multitude of green building rating systems, of which there are many more. When considering green building initiatives for the Caribbean, one should not be limited to LEED.

## Green Building Rating and the Caribbean

There are three fundamental principles of the rating systems discussed herein that are key to our contextual understanding of benchmarking green building within the Caribbean:

1. The rating systems are heavily rooted in country industry building standards (such as ASHRAE in the case of LEED); and a lot of emphasis is placed on fundamental commissioning of building energy systems, forming a prerequisite in both LEED and BREEAM. Commissioning is a quality assurance-based process requiring technical expertise to inspect and record functional performance testing of building systems. The capital cost of commissioning is significant but there is a high return on investment. The ratios indicate that for every US\$1 spent on commissioning, a savings of US\$4 in operations is achieved over the first five years of occupancy<sup>6</sup>. However, on a whole, commissioning has not been integrated into the Caribbean building context due to socio-economic constraints.
2. The rating systems are developed in a specific economic context i.e. developed nation economy. The Caribbean is made up of Small Island Developing States (SIDS). The relevance of this lies in the capital cost of green building, i.e. green buildings can attract a higher *first cost*, the principle of which is justified over life cycle return on investment. Within the Caribbean context, the value of capital cost against life cycle cost is not yet qualitatively accepted; and buildings are inevitably subjected to the cheapest taker.
3. The rating systems are developed for north and south temperate climatic zones where there are extremities between summer and winter. Within the Caribbean, climatic conditions are tropical and there are no seasonal extremities except wet and dry. Whereas northern and southern temperate zones have specific requirements for mechanical heating and rigorously airtight buildings, the Caribbean does not. Statistically, commercial buildings in northern climates consume approximately 25% energy in cooling and 25% in heating. Suffice it to say that within a tropical climate, the figure is likely 50% in cooling, as we are required to cool year-round. Also, it is to be noted that it takes more energy to cool than to heat.

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<sup>6</sup> National Institute of Building Sciences, Whole Building Design Guide, [www.wbdg.org](http://www.wbdg.org), May 2010

In addition to the above points, it is important to highlight that in developed nations green building is championed by non-governmental organisations. Widespread governmental buy-in has only occurred subsequently, wherein all new federal buildings are required to achieve a certain green rating. Green building is also heavily incentivised and in some cases, subsidised by the state. On the private sector side of things, there is a significantly greater sense of corporate social responsibility, of *doing well by doing good*.

### **The Good, the Bad and the LEED**

The opportunities with LEED for the Caribbean exist in an adaptation of relevant principles. LEED contains a fountainhead of principles for measurable green building techniques. The following summarises the relevance of the sub-sections of the LEED credit categories for new construction.

#### ***Sustainable Sites***

This section requires *construction activity pollution prevention*. This is a highly recommended element of LEED for the Caribbean. The optional 'credits' are as follows:

Site Selection – deals with land use and zoning, discouraging inappropriate development. In the absence of local planning policy, this may be difficult to implement, however, basic site selection principles can be easily adopted, e.g. protecting watershed areas. However, this will only function within the framework of national policy and enforcement.

Development Density & Community Connectivity – channels development to urban areas with existing infrastructure, in an effort to protect green field. Within the Caribbean, governments tend to look to decentralisation as city centres are under stress with poor infrastructure.

Brownfield Redevelopment – the opportunities for this may be limited within the Caribbean having never become significantly industrialised.

Alternative Transportation: Public Transportation Access – the credit implies that proximity to public transportation deserves award. The justification of this item may be difficult in nations that struggle with proper public transportation infrastructure, the cultural implications of which are sensitive.

Alternative Transportation: Bicycle Storage & Changing Rooms – encouraging cycling, a noble concept, but as per the above, the cultural implications are far-reaching.

Alternative Transportation: Low-Emitting & Fuel-Efficient Vehicles – the objective is to give preference to the use of such by providing preferential parking spots, charging stations, etc. The use of fuel-efficient vehicles has yet not become integrated into Caribbean culture.

Alternative Transportation: Parking Capacity – encouraging the minimum parking capacity required by law; the objective of this credit is to reduce expansive asphalted parking and discourage automobile use. Inadequate parking is typically the case in Caribbean city centres.

Site Development: Protect or Restore Habitat – a welcomed principle for the Caribbean, to be integrated into planning policy and managed against megalomania.

Site Development: Maximise Open Space – particularly relevant for Caribbean developers who believe in maximum densities, this could be adopted to incentivise sustainability.

Stormwater Design: Quantity & Quality Control – this principle encourages percolation rather than rapid discharge, the latter being most commonly practiced. This is particularly relevant in the Caribbean which experiences perennial flooding due to heavy rainfall.

Heat Island Effect: Non-roof & Roof – encouraging the use of covered parking and green roofs to minimise the heat footprint of urban development, this principle is of relevance to the Caribbean.

Light Pollution Reduction – effectively reducing the impact of development on nocturnal environments, this principle is particularly relevant for coastal and tourism driven Caribbean economies.

### ***Water Efficiency***

Focusing on the reduction of water consumption, this is a particularly relevant category to the Caribbean where water resources are incrementally diminishing. The entire credit category is relevant to the region and should be adopted as a holistic principle as it goes beyond sustainability and into survival. Sustainability focuses on the mitigation of crises and in the case of Trinidad in particular, water has already become a crisis.

### ***Energy & Atmosphere***

This section requires fundamental commissioning of building energy systems. As discussed earlier, this aspect forms a significant barrier for LEED in the Caribbean. Commissioning requires third-party verification, of which there are no known bodies within the region; and which attracts a significant *soft cost*, requiring early commitment on the part of the project team.

Other credit categories deal with optimising energy performance over a baseline performance. The ramifications of this include the collection and auditing of accurate energy data for building types in the various islands so that baseline performance can be measured.

The use of on-site renewable energy attracts credits. In the case of Trinidad, where electricity from the grid is inexpensive, the motivation to use renewable energy is low because there is little or no payback. Barbados however uses solar water heating extensively. This is an exemplary instance of the contextualisation of sustainability.

The remaining categories of *energy & atmosphere* deal with enhanced commissioning, enhanced refrigerant management (no use of CFC's, halons), measurement and verification (using International Performance Measurement & Verification Protocol, IPMVP) and green power. Due to current common practice, most of these are not meaningfully applicable or accessible (in the case of green power) within

the Caribbean, but can form the basis of developing other best practice region-sensitive approaches to energy use.

### ***Materials & Resources***

This section of LEED deals largely with recycling and the use of recycled materials in building content. The implications of this for the Caribbean are the establishment of efficient recycling mechanisms. At the moment, recycling is yet to become best practice. In some instances, goods collected for recycling are shipped away for proper processing. Herein, the energy in transportation has to be weighed against the benefits of recycling.

A potential heavyweight in *materials & resources* for the Caribbean is the promotion of the use of regional materials. This encourages local industry and is valuable not just environmentally, but socially. The use of local materials reduces the energy involved in transporting goods to the site and supports native industry.

### ***Indoor Environmental Quality***

The pre-requisites of this section address minimum indoor air quality performance and environmental tobacco smoke control. Minimum indoor air quality is particularly relevant to our commercial office space especially with regards to the filtering of air and the introduction of fresh air. A survey of commercial buildings in Port of Spain alone will probably indicate that these aspects of mechanical ventilation are overlooked. The remaining credit categories of LEED IEQ address the following:

Outdoor Air Delivery Monitoring, Increased Ventilation – beneficial to the Caribbean context, but limited by the high levels of humidity. Increased fresh air intake may be demanding on the ventilation system because of the moisture content in outdoor air.

Construction Activity Indoor Air Quality – relevant to the quality of air during construction and prior to occupancy this section deals with building flush-outs and air testing. Building flush-outs are not customarily conducted in the Caribbean due to the humidity in the atmosphere. The introduction of 100% fresh air into any air conditioned space in this climate is not recommended due to the moisture content of outside air and the negative effects that residual moisture has on enclosed environments (build-up of mold, etc.)

Low-Emitting Materials addresses the use of low VOC adhesives, sealants, paints, coatings and flooring – extremely relevant and achievable in the Caribbean context.

Indoor Chemical and Pollutant Source Control – a mechanism to address the containment of any noxious fumes that may be emitted in the processes undertaken within the building; and also to control the entry of pollutants by users of the facility (through foot-traffic). Grid mats to capture dirt and particulates are one of the strategies to addressing the latter, and is welcomed in dusty, humid climates such as the Caribbean.

Controllability of Systems, Lighting, Thermal Comfort, Design, Verification – For office space, this is essential. Offices tend to be too bright in the Caribbean as designers have not yet accepted the proliferation of video display terminals as a design factor. Also, office space tends to be too cold as designers often focus on capacity. The use of sweaters is typical in office space in the Caribbean. The contradiction of this is self-explanatory.

Daylight and Views – addresses the users' access to daylight and views, a necessity for mental health and well-being; extremely applicable to the Caribbean context.

## **Summary**

The above summarises the varying aspects of LEED and its potential application within the Caribbean. It is the opinion of the author that LEED forms a relevant basis for green building rating within the Caribbean. However, to date, there are no known LEED certified buildings within the region. The LEED project directory only indicates that there is one project registered in Port of Spain in October 2005 for LEED NC 2.1. Registration is the first stage of the LEED certification process and occurs when the project team decides to pursue LEED certification. This typically occurs at the pre-design stage of a project. The reasons for the limited adoption of LEED in the Caribbean can be deduced as that of (1) cost and (2) administration.

The cost aspects of LEED are tied to the cost of commissioning indicated earlier. The financial cost of commissioning is significant, and the social cost lies in the lack of a formal structure for the process of commissioning within the Caribbean.

The administrative aspects are linked to the documentation required when pursuing LEED. The documentation is extensive and requires precise quality management, coordinating multiple submissions of drawings, specifications, calculations and verifications on code compliance, etc. As project teams struggle to achieve projects on budget and on time, LEED may be perceived by local teams as a further barrier within the local building climate.

## **The Way Forward**

LEED is a system. It is a complex system that has been broken down into very simplistic terms for the purposes of this paper. The purposes of LEED and all the other rating systems mentioned herein are for the promulgation of good, healthy, green buildings. Going green is not a fanciful notion reserved for rhetoric. It is not separate to the social and infrastructural problems we face in the Caribbean – of flooding and hurricanes, poverty, urban congestion, deforestation, food production, inflation, etc. Going green is in fact a holistic principle based on the integration of society, environment and economy, i.e. the *triple*

*bottom line.* Green building is at the root of finding the solutions required to advance the Caribbean in this tripartite unison.

There is also a very clear business case for going green. The statistics, though North American (in the absence of local data), are overwhelming. Green buildings attract a higher rental value. They consume an average of 24% less energy than a typical building and can reduce water consumption by an average of 30%. Maintenance costs are 13% lower, CO2 emissions are 33% lower and occupant satisfaction is 27% higher<sup>7</sup>. Occupant satisfaction is relevant insofar as users represent the greatest overhead. The US national average indicates that business owners pay US\$2.25/ sq ft/ year on energy, US\$20/ sq ft/ year on rent and a whopping US\$318/ sq ft/ year on salaries. Hence a happy user is a more efficient one, with productivity gains recorded up to 16%<sup>8</sup>.

In addition, in the US, the value of green building construction is anticipated to increase to US\$60 billion in 2010; and, the Green Building Alliance forecasts that the market for green building products will be worth US\$30-40 billion annually<sup>9</sup>.

The economic case is clear. The social and environmental benefits are clear. It begs the question as to why green building has not become commonplace in Caribbean building culture, where the environment is our greatest economic asset. In looking at the progress of green building practices around the world it is apparent that the initiative is championed by charitable enterprise at first with governmental support occurring after. Herein lays the onus for the Caribbean, to accomplish cross-sector commitment towards the adoption of green building as a *way of life*.

## **The Big Picture**

Sustainable development is becoming increasingly urgent for the Caribbean. In the case of Trinidad and Tobago, carbon emissions in the energy sector have increased by 278% over the period 1990-2006<sup>10</sup>. In the same time period, carbon emissions from the transport sector have doubled<sup>11</sup>. However, the previous government limited its focus to absolute global carbon emissions – touting that Trinidad and Tobago emits

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<sup>7</sup> General Services Administration, Public Buildings Service. 2008, Assessing Green Building Performance: A Post Occupancy Evaluation of 12 GSA Buildings

<sup>8</sup> U.S. Green Building Council, LEED for Existing Buildings: O&M Reference Guide, pp. 12-13

<sup>9</sup> U.S. Green Building Council, Green Building and LEED Core Concepts Guide, First Edition

<sup>10</sup> Government of the Republic of Trinidad and Tobago, Draft Climate Change Policy, 2009

<sup>11</sup> Ibid.

less than 1% of the global inventory of green house gases. Unfortunately, this approach will not lead to a meaningful solution and it is hoped that the current administration will adopt a more proactive position.

Energy is cheap in Trinidad and Tobago. The average cost of residential electricity in Trinidad and Tobago is US\$0.06 per kWh; whereas, the USA is US\$0.12 per kWh; UK – US\$0.17 per kWh; Barbados – US\$0.12 per kWh; and, Jamaica – US\$0.23 per kWh. Cheap energy is often cited as a barrier to the adoption of green strategies. However, it is the contention of the author that cheap energy is actually the best incentive towards going green. Cheap energy can support the establishment of the industries required for developing green mechanisms. Cheap energy can be used to build the warehouses, factories, incubators, technology parks, schools, etc. that are required to educate our people or manufacture green building products. The economic opportunities are exponential – diminishing dependency on fossil fuels with a positive development in trade and industry and job creation.

### **Recommendations & Conclusion**

It is the recommendation of this paper that LEED be used as a reference only. Primary to this should be the development of a local green building rating system, established on the premises of both LEED *and* BREEAM. Reference should be made to the Hong Kong Building Environmental Assessment Method, HKBEAM, which was developed on the basis of BREEAM. Hong Kong lies on a sub-tropical latitude (22 degrees north) and hence shares similar climatic characteristics with the Caribbean. Though a significantly different socio-economic structure, Hong Kong's geographic location makes it the most relevant precedent for the development of a Caribbean green building rating system.

Of utmost importance is the aggressive development of awareness and education on green building principles. This is required to build the momentum on green building, increasing the incentive to participate and driving the process. LEED is one aspect only and green building, as a whole, within the Caribbean context requires wide scale adoption and implementation.