

# LEED CS in Brazil: Discussing the Validity of the Method for the Improvement of Environmental Quality on Buildings

Monica Santos SALGADO<sup>a</sup>

<sup>a</sup> Federal University of Rio de Janeiro, Brazil, [monicassalgado@ufrj.br](mailto:monicassalgado@ufrj.br)

## ABSTRACT

The construction industry has a negative impact on the environment, due the exploitation of raw materials, transportation of materials and the construction process itself. In Brazil, discussions around the alternatives towards a more sustainable construction have led to the adoption of some foreign systems for the environmental evaluation of buildings – particularly the North American LEED certification. On August 2016, registers indicated 354 certified buildings in the country. Despite the dissemination, LEED's validity to orient the production of sustainable buildings should be discussed. This research has the intent to analyse the contribution of LEED rating system for the improvement of environmental performance in Brazilians' buildings. The research method includes, at first, the assessment of certification map, in order to identify LEED type most widely adopted – which revealed the preference for LEED CS (for Core and Shell). Second, the analyses of the scoreboard for each LEED CS certified building. Results indicate that some relevant environmental targets had been often ignored by certain LEED CS certified buildings. So, it is necessary to review the exaggerated importance given to environmental rating systems, and to enlighten some new possibilities that will lead civil construction industry to the next level towards sustainable development.

**Keywords:** *design process, green rating tool, high-performance building*

## 1. INTRODUCTION

During United Nations Conference in Stockholm on 1972 the main goal has been the establishment of strategies for sustainable development. In what refers to civil construction industry, only in 1999 the CIB (International Council for Research and Innovation in Building Industry) prepared a specific document, entitled “Agenda 21 for sustainable construction”, and, three years later, “Agenda 21 for sustainable construction in developing countries”. Those documents reveal three aspects to be considered due the accomplishment of environmental targets: the definition of environmental performance levels for buildings; the necessity of changes in design and construction management, and the importance of the investment in actions for the implementation of a new culture on civil construction sector.

The environmental certification has arisen as a consequence of this effort towards the improvement of environmental performance of buildings. In this sense, since 1990's architects and engineers have the opportunity to evaluate the environmental performance of buildings through different rating systems. Among the methods, the English BREEAM (UK), the French HQE®, and North American LEED™ should be highlighted. Further analysis confirms that the evolution of rating systems in different countries is largely based on those initial rating systems.

The first Brazilian Building to obtain an environmental certification was a bank, which received a LEED certification on 2007. However, after almost twenty years, it is necessary to continue questioning at what level those methods are truly contributing for sustainable construction. In the words of Cole:

“The prevailing mechanistic, anthropocentric worldview has been some 500 years in the mankind and is now ingrained all aspects of western society and culture. It has (...) dictated the reductive approaches used to understand and evaluate building environmental performance. Almost all current building environmental assessment system, for example, are based on the simple addition of points attained by meeting a series of discrete performance requirements.”

This research has the purpose to discuss LEED rating system contribution to the improvement of environmental performance of buildings in Brazil. The research method includes, at first, the assessment of certification map, in order to identify LEED type most widely adopted and, second, the analyses of the scoreboard for each LEED CS certified building. Although the results cannot be considered conclusive, this contribution can give a glimpse of what should be done in search of a more sustainable construction.

## 2. LEED CERTIFICATION IN BRAZIL: CASE STUDY

Although since 2003 there is a specific Brazilian method to certify buildings with high energy efficiency – PROCEL Edifica – only on 2014 Brazilian Central Government has established that PROCEL labeling should be compulsory for public buildings (Normative Instruction n ° 2 – Ministry of Planning, Development and Management). For the private market, there is no regulatory requirement in what concerns environmental performance of buildings.

At the same time, LEED™ and HQE methods have made their way to Brazil. The French methodology has been adapted, resulting in the AQUA Brazilian certification. On August 2016, BREEAM has not certified any building, AQUA process has certified 253 buildings, against 354 LEED certifications. Thus, it is correct to say that LEED certification is the most popular in Brazil Real Estate market.

Until LEED version 3, the types of assessments were: LEED-NC – for new construction and major renovations; LEED-OM – for existing buildings; LEED-CI – for commercial interiors; LEED-CS – for Core and Shell; LEED for schools; LEED for retail; LEED for healthcare; LEED for homes; and LEED-ND – for neighborhood development. Version 4 has changed that classification. The environmental analyses consider seven dimensions: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation in Design or Innovation in Operations and Regional Priority Credits.

Some difficulties pointed by Udall and Schendler about LEED method, are: the high cost of certification, the “Point mongering” (what happens when the design team becomes obsessively focused on getting credits, regardless of whether they add environmental value); the complexity of Energy Modeling; and the fact that the certification process takes a long time.

Table 1 presents certification numbers of all LEED Buildings in Brazil until August 2016.

	PLATINUM	GOLD	SILVER	CERTIFIED	TOTAL
LEED CI	6	21	8	8	43
<b>LEED CS</b>	<b>5</b>	<b>71</b>	<b>45</b>	<b>28</b>	<b>149</b>
LEED OM	0	9	10	5	24
LEED Home	0	0	1	0	1
LEED School	0	1	1	0	2
LEED NC	3	41	45	30	119
LEED Retail	1	2	3	10	16
<b>TOTAL</b>	<b>15</b>	<b>145</b>	<b>113</b>	<b>81</b>	<b>354</b>

Table 1: LEED certifications granted in Brazil until August 2016  
Source: Green Building Council Brazil, 2016

LEED CS (for Core and Schell) is the most widely adopted certification. One possible reason is the similarity with PROCEL label requirements, particularly in what concerns to energy consumption.

The interest in LEED certification is concentrated on the southeast region (82% of certified buildings), as highlighted in Table 2.

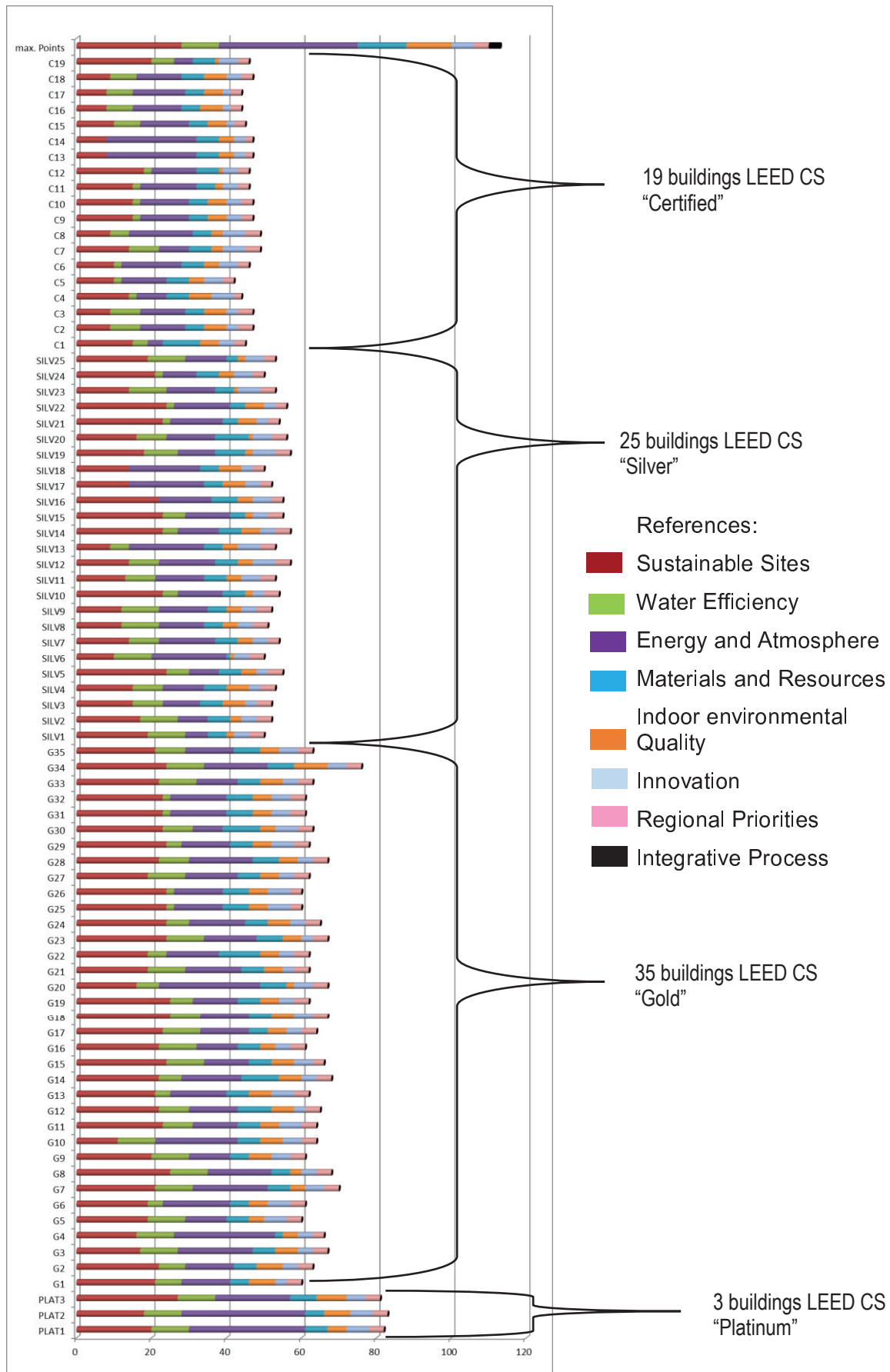
	NORTH	NORTHEAST	MIDWEST	<b>SOUTHEAST</b>	SOUTH	TOTAL
PLATINUM	0	0	0	<b>3</b>	2	5
GOLD	0	1	5	<b>55</b>	10	71
SILVER	0	1	1	<b>37</b>	6	45
CERTIFIED	0	1	0	<b>27</b>	0	28
<b>TOTAL</b>	<b>0</b>	<b>3</b>	<b>6</b>	<b>122</b>	<b>18</b>	<b>149</b>

Table 2: Certified LEED CS buildings in Brazil (until August 2016)  
Source: Green Building Council Brazil, 2016

According to Green Building Council, 55% of LEED CS certified buildings in Brazil has adopted the version 3, 16% adopted version 2 , 28% has confidential data (impossible to know which version has been adopted) and version

4 has certified only three buildings until August 2016. So, this research analyzed the 82 scoreboard of buildings that has been certified on LEED CS version 3 (the most popular).

In order to deepen the research on those 82 buildings Graphic 1 presents how each environmental dimension has been accomplished. It is possible to notice that even in different classifications (platinum, gold, etc), some environmental dimensions were frequently being neglected.



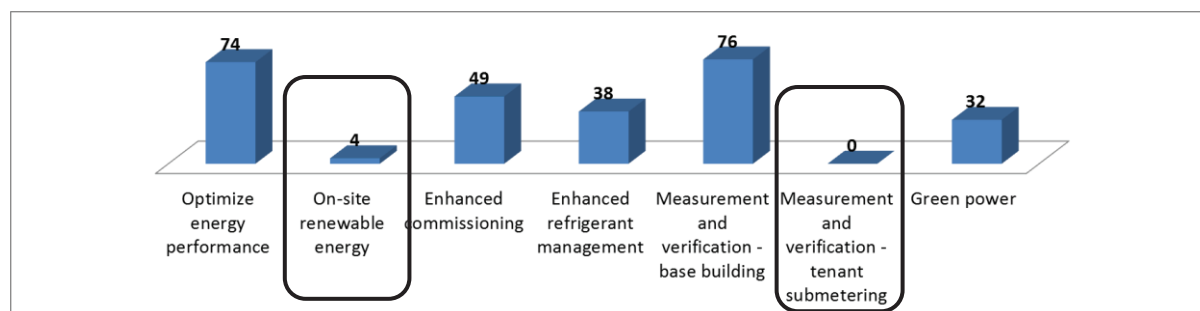
Graphic 1: 82 LEED CS certified buildings in Brazil (until August, 2016) - percentage achieved in each Dimension

### 3. DATA ANALYSIS – LEED CS IN BRAZIL

Data analyses allow identify the environmental requirements that seem to be more difficult to be achieved (requirements that rarely has been achieved by LEED CS certified buildings). Four dimensions call our attention: "Materials and Resource", "Energy and Atmosphere", and "Indoor Environmental Quality".

In relation to "Materials and Resources" two goals had not been achieved by most LEED CS certified buildings: Building reuse (related to the recycle or reuse of existing walls, floors and roof); and Materials reuse (related to the recycle or reuse of preexisting materials). However, those requisites can normally be achieved in refurbishment projects.

In relation to "Energy and Atmosphere", two goals had not been achieved by most LEED CS certified buildings, as presented on Graphic 2:



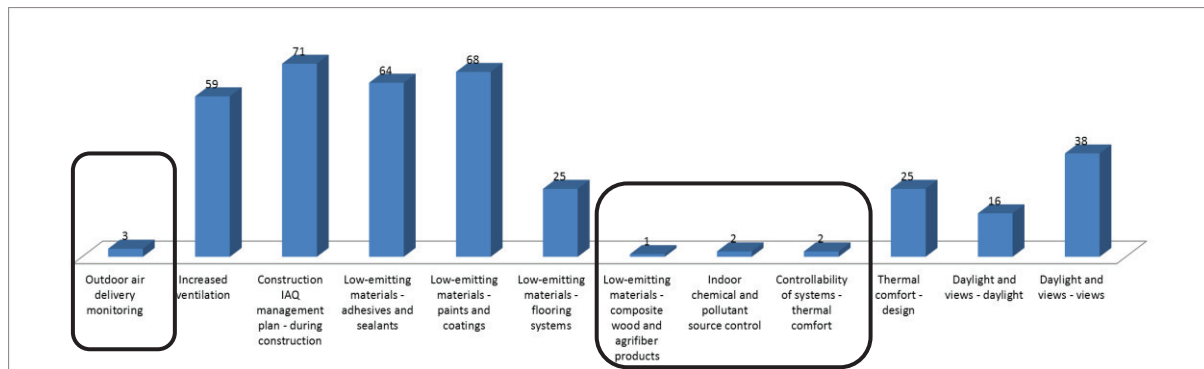
Graphic 2: Energy and atmosphere dimension – number of certified enterprises among 82 LEED CS certified buildings in Brazil (2016) that meet the requirement (total or partially)

Among the 82 Brazilians' buildings certified as LEED CS (2009 vrs3), only 4 meets the requirement related to "On site renewable energy", and none has punctuated on "Measurement and Verification – tenant submetering". The intent of those requisites are described below:

- On-site renewable energy: To encourage and recognize increasing levels of on-site renewable energy self-supply to reduce environmental and economic impacts associated with fossil fuel energy use;
- Measurement and Verification - Tenant Sub metering: To provide for ongoing accountability of building electricity consumption performance over time.

In relation to "Indoor Environmental Quality Dimension", four goals had not been achieved by most LEED CS certified buildings, as presented on Graphic 3:

- Outdoor Air Delivery Monitoring: To provide capacity for ventilation system monitoring to help promote occupant comfort and well-being;
- Low-Emitting Materials - Composite Wood and Agrifiber Products: To reduce the quantity of indoor air contaminants that are odorous, irritating and/ or harmful to the comfort and well-being of installers and occupants;
- Indoor Chemical and Pollutant Source Control: To minimize building occupant exposure to potentially hazardous particulates and chemical pollutants;
- Controllability of Systems - Thermal Comfort: To provide a high level of thermal comfort system control by individual occupants or groups in multi-occupant spaces (e.g., classrooms or conference areas) and promote their productivity, comfort and well-being



Graphic 3: Indoor environmental quality dimension – number of certified enterprises among 82 LEED CS certified buildings in Brazil (2016) that meet the requirement (total or partially)

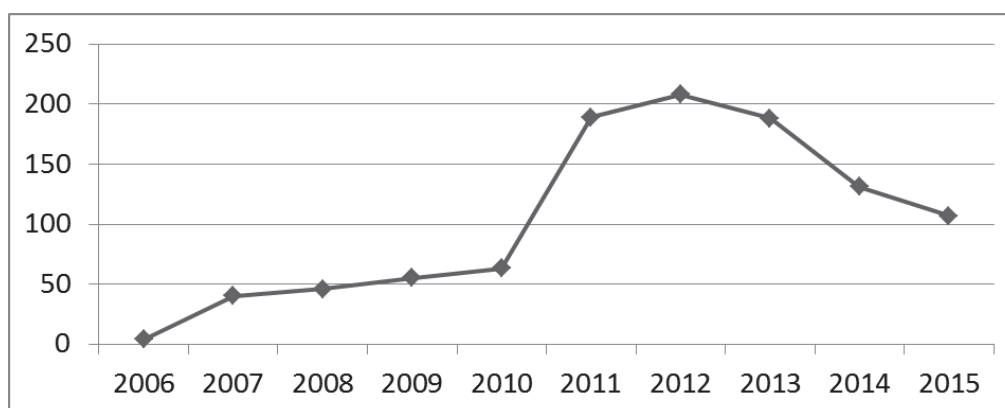
It has also been noticed that some certified buildings presents minimum punctuation on “Water Management Dimension”. None of certified buildings (not even the Platinum certified) had punctuated on “Innovation Dimension”, which considers the design solutions with exceptional performance (above the requirements set by the LEED Green Building Rating System).

#### 4. FINAL CONSIDERATIONS

Offer the entrepreneur the easiest way to obtain a green certification (as presented by some environmental rating systems) is revealed as pernicious, because it leads to the search of the fastest way to obtain the green seal, in opposite to the search for high environmental quality solutions for buildings.

In what refers to LEED CS method, it was observed that some environmental requirements are rarely achieved. To understand why it has happened, it would be necessary to know the details of each design and construction process of certified building. Maybe the building had already obtained the required score to be certified and, in this case, the entrepreneur felt little motivated to continue investing in the improvement of environmental performance. This seems to be the most vicious problem on environmental rating systems: professionals do not pursue design solutions for sustainability, but only the solutions that can bring the necessary punctuation to obtain a green certificate.

The analysis also indicates that, in Brazil, there are few certified buildings. Initiatives are grouped on one region (Southeast) – mostly commercial or corporative facilities – which can signalize the intention of entrepreneurs to add green value to their firms through the green label of their headquarters. It is worth mentioning that the number of new LEED registers in Brazil is dropping significantly, as presented on graphic 4, which indicates a reduction of interest in LEED certification that should be analysed in future research.



Graphic 4: LEED registers in Brazil: from 2006 to 2015  
Source: Green Building Council Brasil, 2016

However, the discussion around sustainable construction is changing, and there are some new concepts emerging, particularly: integrative design and regenerative development. According to Boecker et al the concept of integrative design is different from integrated design because the latter term implies something that is past and completed, while the word “integrative” suggests an evolving process and implies that we’re never really done. Integrative



design intends to guarantee the participation of a multidisciplinary team of architects and engineers discussing environmental targets since the beginning of architecture design (conceptual phase) and over all the design process. This modus operandi offers new possibilities, through continuous exchange of ideas about the ideal solution for the project.

The second concept, related to regenerative design, will gain momentum over the next decade as a necessary approach to green building strategies, as mentioned by Cole. The author emphasizes that the transition from green buildings practices to those more firmly framed by regenerative development, will parallel the shift from a mechanistic to an ecological worldview.

Finally it is worth mentioning the importance of environmental rating systems as the first step towards sustainable construction. The new version of LEED system (Version 4) seems to presents advances in comparison to the last one. However, the age of environmental rating systems is reaching its end, and it's time to look forward.

## 5. ACKNOWLEDGMENT

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