Estidama Pearl Building Rating System of Abu Dhabi and Al Sa'fat of Dubai: Comparison and Analysis

Omair Awadh(✉)

British University in Dubai, Dubai, United Arab Emirates
omairawadh@gmail.com

Abstract. In the built environment industry, sustainable building assessment systems provide a framework and tool to follow in order to embed sustainable development measures. While green building assessment systems are mostly focused on the environmental design and systems performance. To help developers, designers and construction stakeholders in defining the projects' sustainability objectives and design indicators, two UAE-based sustainability regulations have been objectively assessed and major differences have been identified. A comparative analysis of (1) Estidama Pearl Building Rating System (PBRS) of Abu Dhabi and (2) Al Sa'fat of Dubai has been conducted. The analysis has been structured in accordance to an international standard; ISO/AWI 21929 Sustainability Indicators, and to another similar system; SBAT of South Africa. As construction is constantly increasing in the UAE and other developing countries, climate change impacts of buildings and adaptability measures need to be considered more frequently through such systems. In addition, the social aspect of sustainable development could be further supported by new building techniques suitable to the region. The local green building assessment systems should look at the life cycle analysis and operational phase assessment as they directly support the economic aspect of the stainability along with their environmental-social positive impact. It is expected that the results presented in this research can contribute to a better understanding in the field of sustainability regulations and environmental designs.

Keywords: Sustainability · Green building · Estidama · Al Sa'fat

1 Introduction

The first generation of green building assessment systems, such as LEED and BREEAM, were created in developed countries. Subsequently, developing countries saw the need and expressed interest in creating their own systems. The development of these systems has been mainly driven by the three pillars of sustainability, being environmental; social; and economics, and customized in line with the region's needs. This has resulted in a difference in quality between systems emanating from developed and developing countries [1]. On the other hand, some developing countries saw no need to follow such systems as they are in transition phase with no requirement of maintaining the present [2]. According to Castro et al. [3], due to the social and economic glitches in developing countries, the sustainability of developments and

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buildings is extremely important. The sustainable buildings' aim in developing countries is to maximise beneficial social and economic impact while minimising negative environmental impacts [4].

In the Middle East, the United Arab Emirates (UAE) recognized the need to adopt sustainability practices in the construction industry early on and on that basis further actions have been taken. Acknowledging the sustainable development needs in the UAE, green building codes and regulations have been mandated for new constructions in Abu Dhabi and Dubai. The Estidama Pearl Rating Systems (PRSs) have been developed for villas, buildings and communities as the regulatory sustainability code in Abu Dhabi. The first version of PRSs was released in April 2010 in line with Abu Dhabi's 2030 vision [5]. Pearl 1 is the minimum rating for privately-funded projects and Pearl 2 for government-funded projects. Pearl 3–5 rating is targeted voluntarily. Another local system; the Dubai Green Building Regulations and Specifications (DGBR), has been developed as part of the Dubai 2015 Strategic Plan. This code was mandated in 2011 for all government projects at the piloting stage, then for private projects in March, 2014. DGBR is a set of mandatory requirements for buildings with no different ratings [6].

In September 2016, the new Dubai Green Buildings Evaluation System; Al Sa'fat, was introduced to the construction industry stakeholders and professionals. An updated Al Sa'fat version v1.1 has since been released at the end of 2016, in line with Dubai Plan 2021 [7]. This system has four different ratings for building, with Bronze Sa'fa being the minimum rating requirement. Silver, Gold and Platinum ratings are optional ratings that are expected to be encouraged to target through governmental incentives.

As sustainable developments are mainly driven by codes and regulations in the UAE and the Middle East [8], this study compares the Al Sa'fat of Dubai and Estidama Pearl Building Rating System (PBRS) of Abu Dhabi regulations. The objective of this comparison is to assess and analyze sustainability practices in the UAE's built environment. The differences and strengths of each system are the main focus of the study, while further possible improvements have also been highlighted.

2 Research Methodology

The selected sustainable development regulations within the UAE, Estidama PBRS and Al Sa'fat, will be assessed and analyzed against the frame of the following;

- ISO 21929-1: 2011 Sustainable construction works core indicators and the sustainable building assessment tool as an international standardization body [9].
- The Sustainable Building Assessment Tool (SBAT) of South Africa as a developing country system that sensibly addresses the three pillars of sustainability; environmental, social and economic. The SBAT describes 15 sets of objectives that should be aimed for in buildings' development. It suggests that the extent to which these objectives are achieved in buildings provide a simple, yet reasonably effective, measure of the level of support for sustainable development [4].

A quantitative and qualitative analysis of the selected systems has been conducted and objectively presented. The selection of the frame works to which the two systems are compared against is based on state-of-the-art review, how they best fit the study objectives, and the area of the author's own experience. SBAT represents another developing country case of similar environment to the UAE while the International Organization for Standardization (ISO) indicators represent an international frame.

According to Berardi [10] the sustainability assessment systems differ in structure and they do not preferably overlap. The assessment is structured according to the two frame works for better understanding and parallel analysis. This should simplify the process and highlight the main differences. Critical analysis has been adopted throughout the discussion as a way to identify potential for improvements in buildings' sustainability standards and to propose a roadmap for the overall green building systems' approach, with the mention of future areas of research.

3 Discussion and Results

Castro et al. [3] differentiate between Green buildings and Sustainable buildings based on the aspects they consider and address. The list in "Fig. 1" demonstrates how sustainable building design considers several additional aspects as compared to green

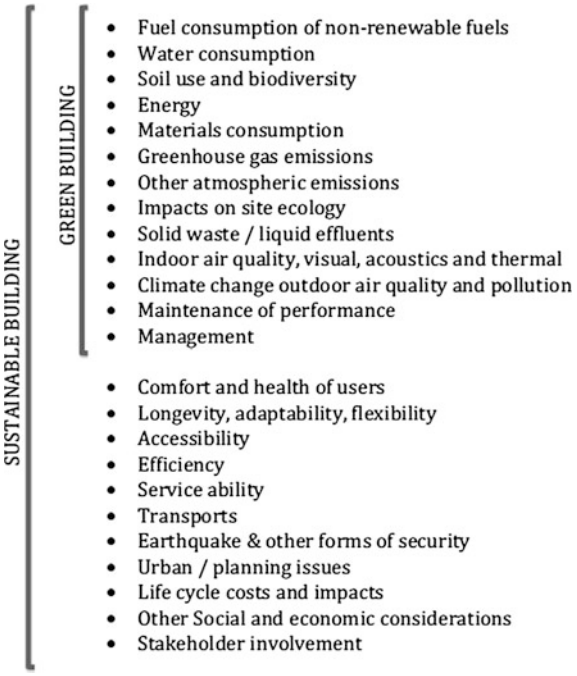

Fig. 1. Aspects considered in green building and sustainable building design (*Source* Castro et al. [3])

building. Green buildings tend to focus on the environmental aspects of sustainability, while Sustainable buildings also cover social and economic and additional environmental related aspects [3].

Fenner and Ryce [11] define the Total Quality Assessment (TQA) sustainability system as a system that evaluates ecological, economic and social aspects. Estidama Pearl Rating System can be considered a TQA point-based system, whereby projects are awarded points for different credits that are grouped under a number of categories. Prerequisite credits need to be achieved, with no associated points, in order to accommodate the minimum system requirements. In addition, project specific matrices should be followed for additional credit points to achieve different certification levels. According to Elgendy [12] Estidama is mostly developed using LEED and BREEAM elements whilst adapting the system to the unique local needs and environment.

Estidama Pearl Rating System (PRS) was established by the Abu Dhabi Urban Planning Council (UPC) on a five ratings basis that can be obtained based on achieving prerequisites and optional credit points. The building ratings under the PRS are; 1 Pearl (20 prerequisites), 2 Pearl (20 prerequisites + 60 points), 3 Pearl (20 prerequisites + 85 points), 4 Pearl (20 prerequisites + 115 points), and 5 Pearl (20 prerequisites + 140 points). Eight credit categories are available in the Pearl Building Rating System (PBRS v1.0) with a maximum of 180 points [5]. Figure 2 illustrates the credit categories and their points' weighting.

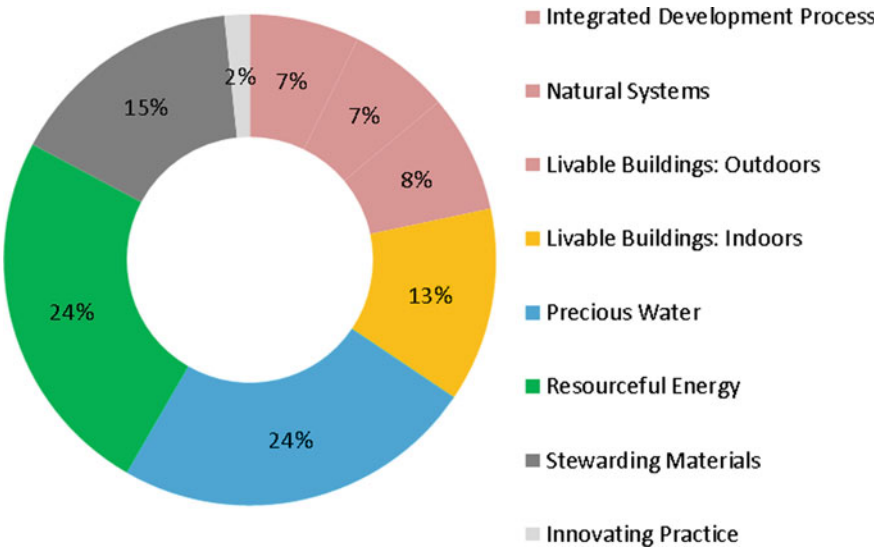

Fig. 2. Estidama PBRS V1.0 available credit points weighting per category

Al Sa'fat can also be categorized as a TQA system that has 4 different ratings with a set of requirements for each rating. This provides less flexibility than the point-based system, and makes it most stringent as per Shareef and Altan [8]. The latest v1.1 of Al Sa'fat, developed by the Dubai Municipality (DM), consists of 5 categories and has

four ratings for buildings only. Bronze Sa'fa requires for 42 prerequisites. Silver, Gold and Platinum Sa'fa rating require 81, 98, and 102 prerequisites, respectively. Figure 3 illustrates Al Sa'fat categories and their prerequisites' weighting.

To simplify the categories' weighting comparison, similar categories have been color-coded in Figs. 2 and 3. The intent of the three categories of PBRS; Integrated Development, Natural Systems and Livable Building Outdoors, is the same as that of Al Sa'fat's Ecology and Planning category intent, and thus have been given the same color code.

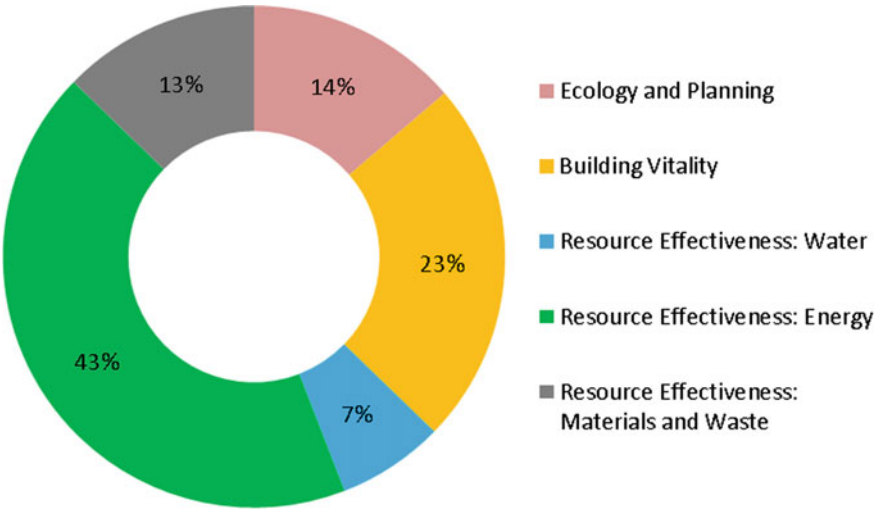

Fig. 3. Al Sa'fat V1.1 available credit points weighting per category

Based on the simplified Figs. 1 and 2, it is clear that Al Sa'fat is an energy-focused system with a 43% weighting for energy efficiency requirements, while PBRS equally prioritizes and balances between energy and water categories with a weighting of 24% each. Water category weighting is the least in Al Sa'fat, 7% only. On the other hand, the Building Vitality (which is equivalent to PBRS's category Livable Building: Indoors) category is given a higher weighting in Al Sa'fat than in PBRS. This category is mostly related to the indoor environmental quality and occupants comfort and wellbeing.

According to ISO/TR 21932: 2013, a projects' six phases of decision-making process are: strategic planning; project definition; design; construction and handover; operation and maintenance; and end-of-life strategy [9]. Both PBRS and Al Sa'fat consider only the first 4 phases of most developments. The Operation and Maintenance and End-of-life phases are currently not being considered. It should be noted that an Estidama system for the operation phase has been developed but has not yet been mandated to date. Similarly, Al Sa'fat includes a re-certification requirement post-construction completion for building operations. Therefore, more attention should be given to the operational phase practices. It is preferable for new constructions to

consider building life cycle analysis in the early stages of design to examine the building systems suitability throughout the development's life, including the operation and end-of-life phases.

As for existing buildings' sustainability in the UAE, no regulations have been enforced yet. It is worth noting that the 'Technical Guidelines for Retrofitting Existing Buildings' has been developed by the Emirates Breen Building Council in 2015 [13] however it has not been enforced. Existing buildings' monitoring, auditing and benchmarking are the first steps to identify ways of improvements.

Sustainability indicators of construction works according to ISO TS 2011 mandate are classified under 14 categories and 25 indicators. This part of ISO 21929 describes and gives guidelines for the development of sustainability indicators related to buildings and defines the aspects of buildings to consider when developing sustainability indicators system. The PBRS and Al Sa'fat comparison, in line with ISO sustainability indicators, is presented in Table 1 hereafter. A point-based comparison has been followed, where '1' reflects positive indicator consideration and '0' means non-considered indicator.

7 of the 14 categories are fully addressed in both systems. Out of 7, 5 of those are environmental related, one is environmental-social related and the seventh is economic related. Site selection and site accessibility indicators are considered in PBRS only while planning for maintainability and building accessibility indicators are considered in Al Sa'fat only. Access to services and Aesthetic quality categories are better covered in PBRS than in Al Sa'fat. Safety and Adaptability categories are poorly considered in both, where Resistance, Fire Safety and Adaptability for Climate Change are not covered. However, Stability and Adaptability for changed use purpose are considered in PBRS.

In summary, most of the environmental indicators are considered in both systems with no direct consideration given to climate change adaptability. On the other hand, both assessed systems consider the social indicators the least with clear shortfall in the safety category. As for the economical aspect, only one indicator is present within ISO indicators and it is considered in both Al Sa'fat and PBRS.

Taking another developing country's case, South Africa's Sustainable Building Assessment Tool (SBAT) considers the three pillars of sustainability equally. 5 objectives have been assigned under each one of these pillars. SBAT consists of 9 structured stages of development: Briefing; Site Analysis; Target Setting; Design; Design development; Construction; Handover; Operation; and Reuse/refurbish/recycle.

Gibberd [4] suggests that SBAT objectives provide a reasonably effective and simple measure of the development sustainability. Table 2 demonstrates that PBRS credits cover all of SBAT's 15 objectives. Two objectives have not been taken into consideration within Al Sa'fat. One of these is a social objective (Access to facilities) and the other one is an economic objective (Adaptability and flexibility).

In general, PBRS and Al Sa'fat follow the environmental objectives of similar local sustainable buildings' assessment systems of similar developing country, like SBAT of South Africa. However, not all environmental indicators of ISO have been considered by those. On the other hand, Al Sa'fat considers the economic indicators of ISO and follows 4 of SBAT's 5 economic objectives. SBAT social objectives are fully followed by PBRS while only 6 out of 9 social indicators of ISO are considered. In terms of Al Sa'fat social performance, 3 of 9 ISO indicators are considered and 4 of 5 SBAT

Table 1. PBRS and Al Sa'fat assessment based on ISO 21929 sustainability indicators

ISO 21929-1: 2011 core indicators		PBRS	Al Sa'fat
Category/indicator			
a	*Access to services*		
1	Public transportation	1	0
2	Personal modes of transportation	1	1
3	Green and open spaces	1	1
4	User relevant basic services	1	0
b	*Aesthetic quality*		
5	Integration with the surrounding	1	0
6	Impact of building in site	1	1
7	Local concerns	1	1
c	*Land*		
8	Site selection	1	0
d	*Accessibility*		
9	Building site	1	0
10	Building	0	1
e	*Harmful emissions*		
11	Potential impact on climate	1	1
12	Potential impact on the depletion of stratospheric ozone layer	1	1
f	*Non-renewable resources*		
13	Use of resources	1	1
g	*Fresh water*		
14	Use/consumption	1	1
h	*Waste*		
15	Production	1	1
i	*Indoor environmental*		
16	Indoor conditions	1	1
17	Indoor air quality	1	1
j	*Safety*		
18	Stability	1	0
19	Resistance	0	0
20	Fire safety	0	0
k	*Serviceability*		
21	Planning/measurement	1	1
l	*Adaptability*		
22	Adaptability for changed use purpose	1	0
23	Adaptability for climate change	0	0
m	*Costs*		
24	Planning/measurement	1	1
n	*Maintainability*		
25	Planning/assessment	0	1
	Total	20	15

Table 2. PBRS and Al Sa'fat assessment in line with SBAT objectives

SBAT objectives		PBRS	Al Sa'fat
a	*Social*		
1	Occupant comfort	1	1
2	Inclusive environments	1	1
3	Access to facilities	1	0
4	Participation and control	1	1
5	Education, health and safety	1	1
b	*Economic*		
6	Local economy	1	1
7	Efficiency of use	1	1
8	Adaptability and flexibility	1	0
9	Ongoing costs	1	1
10	Capital costs	1	1
c	*Environmental*		
11	Water	1	1
12	Energy	1	1
13	Waste	1	1
14	Site	1	1
15	Materials and components	1	1
	Total	15	13

objectives are followed. It can be concluded that PBRS and Al Sa'fat objectives are very similar to other developing countries' sustainable building assessment tools, while they do not necessarily consider all sustainability core indicators of ISO 21929, 2011.

According to Sinha et al. [14], green buildings are directly related development's sustainability and support the sustainable development practices, but they are not the same. Castro et al. [3] also identified the difference between Green buildings and Sustainable buildings design aspects, presented in Fig. 1. Sustainable buildings' assessment tools or systems should be considering the same parameters as these design aspects.

The discussion presented demonstrates that sustainable building assessment systems in developing countries are environmentally focused and need to sensibly consider the social aspects. It is worth mentioning that Estidama PRS has considered a fourth pillar for Abu Dhabi's sustainable development, the Cultural pillar, along with the three typical pillars of sustainability, which should contribute to the overarching social pillar. Future research in developing countries needs to assess the social performance of current sustainable developments, and consider improvements through sustainability regulations/systems. This is also reinforced by Castor et al. [3] suggestion to prioritize social and economic support in the developing countries. In order to encourage positive change in the economic and social system through buildings, new knowledge and techniques need to be developed specifically to the region.

The ongoing international standardization work related to sustainability in construction will enable more transparent assessments of the sustainability criteria of new and existing construction works and the results more comparable than what is possible with today's methods [15]. According to Brophy [16] it is crucial that these systems are simple to make them useful as design tools throughout the construction development. The assessment tools should contribute towards the balancing of sustainability dimensions (environmental, social, and economical), with the enhancement of practicality and resiliency. These systems should be able to consider constant technological development and multi-level application.

4 Conclusion

The two studied regulations of Abu Dhabi and Dubai; Estidama PBRS and Al Sa'fat, differ in structure and they do not perfectly overlap, making direct comparisons a challenge. When comparing the categories' weighting, PBRS is more balanced in terms of credits categorization. Energy and water categories of PBRS are given the same weighting, both contributing to 48% of the overall 180 points. The energy category weighting alone is 43% of 102 regulations of Al Sa'fat, while water category weighting is 7% only. On the other hand, indoor environmental quality and occupants' comfort & wellbeing are given higher weighting in Al Sa'fat than in PBRS.

Following two different frame works; (1) the international standardization body ISO 21929-1: 2011 sustainable construction core indicators and (2) the South African local sustainable building assessment tool (SBAT), the study suggests categorizing PBRS and Al Sa'fat as sustainability assessment systems as they target aspects beyond green buildings' criteria. Note that green buildings' design mostly focuses on the environmental aspects of sustainability, yet they are of direct support to sustainable development.

It was noted that no direct measure of the climate change impact and future adaptability is the main shortage found in both systems' environmental indicators. It is critical to account for the social design parameters and improve current characteristics of PBRS and Al Sa'fat. As for the economic criteria, it is recommended to focus on life cycle analysis for new projects and to enforce the implementation of the operational regulations for both new and existing projects.

References

1. Cole RJ (2005) Building environmental assessment methods: redefining intentions. In: The 2005 world sustainable building conference, Tokyo, pp 1934–1939
2. Voinov A, Farley J (2006) Reconciling sustainability, systems theory and discounting. Ecol Econ 63:104–113
3. Castro MF, Mateus R, Braganca L (2014) A critical analysis of building sustainability assessment methods for healthcare buildings. Environ Dev Sustain. doi:10.1007/s10668-014-9611-0

4. Gibberd J (2002) The sustainable building assessment tool assessing how buildings can support sustainability in developing countries. Built Environ Prof Convention, Johannesburg, South Africa
5. Abu Dhabi urban planning council (2010) Pearl building rating system. Des Constr. Version 1.0, April
6. Dubai municipality (2011) Green building regulations and specifications. www.dm.gov.ae. Accessed 10 Dec 2016
7. Dubai municipality (2016) Al Sa'fat—Dubai green buildings evaluation system. www.dm.gov.ae. Accessed 10 Dec 2016
8. Shareef SL, Altan H (2016) Building sustainability rating systems in the Middle East. Eng Sustain. doi:10.1680/jensu.16.00035
9. International Organization of Standardization (ISO) (2011) TS: ISO/TS 21929-1: 2011, sustainability in building construction—Sustainability indicators—part 1: framework for the development of indicators for buildings 2011 edition. ISO, Geneva, pp 1–24
10. Berardi U (2011) Sustainability assessment in the construction sector: rating systems and rated buildings. Sustain Dev. doi:10.1002/sd.532
11. Fenner RA, Ryce T (2007) A comparative analysis of two building rating systems. Part 1: evaluation. Eng Sustain 161:55–63. doi:10.1680/ensu.2008.161.1.55
12. Elgendy K (2010) Comparing Estidama's pearls rating system to LEED and BREEAM. www.carboun.com/sustainable-urbanism/. Accessed 15 Dec 2016
13. Emirates Green Building Council (2015) EmiratesGBC technical guidelines for retrofitting existing buildings. www.emiratesgbc.org/academy/emiratesgbc-technical-guidelines/. Accessed 22 Dec 2016
14. Sinha A, Gupta R, Kutnar A (2013) Sustainable development and green buildings. Drv Ind 64(1):45–53
15. Krigsvoll G, Fumo M, Morbiducci R (2010) National and international standardization (International Organization for Standardization and European Committee for Standardization) relevant for sustainability in construction. Sustainability. doi:10.3390/su2123777
16. Brophy V (2014) Building environmental assessment—a useful tool in the future delivery of holistic sustainability? In: The 2014 world sustainable building conference, Barcelona: Paper 119