# COMPARATIVE STUDY ON GREEN BUILDING RATING SYSTEMS IN SOUTH ASIA

***T.D. Denagama****

*Department of Construction Technology, University of Vocational Technology, Sri Lanka*

## INTRODUCTION

Human beings have been in existence in the world for about 200,000 years, passing several stages of civilization through the developments of Mesopotamia, Egypt's Nile Valley and the Indus Valleys which can be considered as starting point of the origins of human civilization, up to the present modern civilization in 21st century. At the beginning human beings have lived in harmony with the nature by understanding the role of the humans within Nature. Later on, with the dawn of the industrial revolution and introduction of many more advancement in diverse fields, the human way of life became more complex and full of needs thanks to the so called development. The Rapid increase of the human population also contributed to this fact.

Under this context, mankind forgot their role with regard to the environment, and attempted to control the environment for their own benefits. Due to the immoderate consumption of resources ultimately resulted in environmental issues such as global warming, climate changes, rise of sea levels and different types of environmental disasters.

Rachel Carson's book *Silent Spring* (1962), in which she point outs the powerful and often negative effects humans activities have on nature, gave birth to the modern environmental movement on critiquing environmental devastation (Bernardi, 2017). In the recent past, impacts faced by humans due to irresponsible behavior and in 1983 the United Nations appointed the Brundtland Commission on Environment and Development to address concerns about the accelerating deterioration of the human environment and natural resources and the consequences of that for economic and social development of mankind (Ranaweera, 2010).

The concept of sustainable development came into being with the Brundtland report (Chethana, 2016) (Doan et al., 2017) It was defined as a "development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs". The concept of sustainability is said to be threefold: environmental, economic, and social. This is defined as the triple bottom line of sustainability and is represented by three intertwined circles (Chethana et al., 2016) (Sev, 2008). A new forth pillar was introduced and named as the institutional dimension. It is defined as "the results of interpersonal processes, such as communication and co-operation, resulting in information and systems of rules governing the interaction of members of a society" (Spangenberg, 2002)

Compared to the other industries, the construction industry creates structures which are long lasting. Structures in developed countries have an average life of 80–100 years. In many countries, there are buildings, bridges and other structures with a life span of hundreds years.. This clearly implies that the design of a building will have long-term repercussions on a structure's environmental performance and it is a very important matter to consider in terms of environment sustainability. The construction industry plays a major role in satisfying the needs of society, enhancing the quality of life (Tam, 2004) (Abdul Rahman, 2013), and contributing to the economic growth of a country (Osei, 2013). One-tenth of the global economy is devoted to constructing, operating and equipping homes and offices (Shi, 2008). On the other hand, it has been heavily criticized for being a main contributor to carbon emissions, environmental degradation, and global warming etc. (Wong, 2013)

Awareness of the destruction of nature by humans has gradually prompted scientists and policy and decision makers to struggle to find an optimum solution on this. In this regard, the concepts of sustainable development and sustainability, which are closely related to each other, were introduced into public discussion (Bernardi, 2017). With the introduction of the concept of sustainable development, many related new concepts came into action. Sustainable architecture or green building concept is one of those which describes an energy and ecologically conscious approach to the design of the built environment, and seeks to reduce the negative environmental impacts of buildings by improving efficiency and moderation in the use of materials, energy, and development space (Ranaweera, 2010). Sustainable building rating tools play an important role in applying the sustainable principles into the construction field (Xiaoping, 2009). Hence, Green building concept has now become a flagship of sustainable development that owns the responsibility for balancing long-term economic, environmental and social health in recent decades.

A green building is defined as one which uses less water, optimizes energy efficiency, conserves natural resources, produces less waste and provides healthier spaces for occupants, as compared to a conventional building (Sande & Phadtare, 2015). There are many different definitions for a green building due to its popularity. Numerous benefits of green buildings were recognized by many researchers. For example green buildings are energy efficient, water conserving and non-toxic and recycled materials highly satisfied the occupant productivity, improve indoor and outdoor air quality, improves marketability decrease operating cost longer life span minimized replacement and operation cost. Moreover, green building enhances efficiencies in resource management and operational performance and minimizes risks, which threaten the human health and environment (Howe, 2009).

With the growth of green buildings, a yardstick was required to evaluate green buildings' performance (Crawley & Aho, 1999). Therefore, many green building rating systems and tools were introduced into practice around the world (Gowri, 2004). It is estimated that there are around 600 green rating systems globally (Vierra, 2011). Most assessment systems now cover comprehensively different types of aspects relevant to sustainable development of buildings and embrace a wide range of building premises, such as homes, hotels, offices, industrial factory premises, retail outlets, schools, etc. (Lee, 2013). The first green building guideline named Building Research Establishment Environmental Assessment Method (BREEAM) was introduced in the United Kingdom (UK) in 1990. Since then there has been a rapid growth in the number of green building guidelines around the globe, in last few decades more than 23 countries have established their own green building rating systems that are used as a benchmark in assessing the level of sustainability of buildings.

Many researchers have pointed out that green building assessment system should be formulated according to the background of a certain country and region. Moving with the trend south Asian countries pay their attention towards the green building concept and some of the countries set their own green building assessment tools mean while some of them are adapted green rating systems which are initiated by other countries.

Asian region belongs to one of the emerging economies of the world. As per the World Atlas South Asia is defined as the south region of the Asia which consists of countries Afghanistan, Pakistan, India, Nepal, Bhutan, Bangladesh, the Maldives and Sri Lanka. South Asia covers about 5.2 million $km^2$ (2.0 million sq mi), which is 11.71% of the total Asian continent or 3.5% of the world's land area. The population of South Asia is about 1.891 billion or about one-fourth of the world's population, making it both the most populous and the most densely populated geographical region in the world. Moreover, it accounts for about 39.49% of Asia's population, over 24% of the world's population, and is home to a vast array of people.

## METHODOLOGY

The main purpose or objective of this research study is to study the background of the initiation and operation of green building ratings in South Asia and to identify the Sri Lankan status or level in going green in South Asia. Qualitative approach is used for the analysis of the collected data. Secondary data were collected from the literature and the official websites of the green rating systems of South Asian countries and from rating manuals. All eight south Asian countries were selected for the research analysis as research population. Judgmental/purposive sampling techniques was used to identify the sample due to limitations such as unavailability of local green rating systems, some of the countries were not included in comparative analysis. The constant comparative analysis method is used to study the selected green building systems and their available latest version on new building construction category was selected for the analysis. The compared main variables were as following, Authoritative institution, Year origin, Latest Version, Flexibility, Validity, Cost, Rating levels, Rating approach, Number of Certified buildings and Categorical comparison.

## DATA COLLECTION

The following data was collected for the analysis. Nepal, Bhutan, Bangladesh, Afghanistan and Maldives are not having their own local green building rating system. All eight South Asian countries are having at least one rated green building. Bangladesh used LEED USA rating in most of the rating buildings. Maldives used to practice Sri Lankan GREEN SL rating system for rated green buildings. Bhutan is considered as one of the greenest countries in the world with high forest cover and greener environment. Hence green construction is common there and there is no necessity of adapting a new green building rating tool. Summary of the data collected were presented in Table 1.

| Country | Name of the Rating | Abbreviation Used for rating |
|---|---|---|
| Afghanistan | No local rating initiated so far | - |
| Bangladesh | No local rating initiated so far | - |
| Bhutan | No local rating initiated so far | - |
| India | Indian Green Building Council Rating System | IGBC |
| | Green Rating for Integrated Habitat Assessment | GRIHA |
| | Bureau of Energy Efficiency | BEE |
| Maldives | No local rating initiated so far | - |
| Nepal | No local rating initiated so far | - |
| Pakistan | Sustainability in Energy and Environmental Development | SEED |
| Sri Lanka | Blue Green Sri Lanka Green Guide | Blue Green Sri Lanka |
| | Green SL Rating System | GREEN SL |

Table 1: Ratings of the South Asian countries

BEE rating system initiated by the Bureau of energy efficiency, India, was not taken for further analysis because of the lack of details on rating system and from the details found it only focuses on energy saving of buildings. LEED INDIA rating system is almost the same as the LEED USA rating system hence it was not used for the research analysis because of its foreign origin. There was no data about local green ratings in Afghanistan.

## DATA ANALYSIS

Comparative analysis was conducted in three steps. First general details of the selected rating tools were compared. Then as the second step other important features were compared. Finally the rating categories were compared in selected rating systems. For this, ratings manuals on new construction were selected. It is important to encourage the new constructions in South Asia to adapt green building concept with the target of minimizing the environment hazards that can be experienced due to several phenomenon such as sea level rising, adverse weather conditions, climate change, global warming.

| Rating | SEED | GRIHA | IGBC | GREEN SL | Blue Green |
|---|---|---|---|---|---|
| Authoritative Body | Green Building Council of Pakistan | Ministry of New and Renewable Energy, India | Green Building Council of India | Green Building Council of Sri Lanka | Urban Development Authority of Sri Lanka |
| First Version | 2016 | 2007 | 2016 | 2010 | 2017 |
| Number of Versions | 1 | 3 | 1(Many amendments) | 2 | 1 |
| Types of Buildings | New construction, Major renovations, core and shell, schools, retails, data centers, ware houses, health care, hospitality, homes and multi family | New Buildings and Existing buildings, Special ratings for day schools, large development like cities | New Buildings, Residencies, Health care, schools, resorts, factories, data centers, service buildings, cities, townships, villages | New Buildings and Existing buildings | Only government and semi-government buildings |
| Symbol |   |  |   |   |  |
| Rating Levels | Silver (40-49) Gold (50-59) Platinum (60-69), Titanium (70 or above) | 1 star (25-40) 2 star (41-55) 3 star (56-70) 4 star (71-85) 5 star (86-105) | Certified (40-49), Silver (50-59), Gold (60- 74), Platinum (75-100) | Certified 40-49 points Silver 50-59 points Gold 60-69 points Platinum 70 point and above | Certified 40-49 points Silver 50-59 points Gold 60-69 points Platinum 70 point and above |
| Rating Approach to scoring criteria | Pre weighted Credits | Pre weighted Credits | Pre weighted Credits | Pre weighted Credits | Pre weighted Credits |
| Mandatory requirement | No | No | No | No | No |

Table 2: General detail comparison

Table 2 contains the general data comparison of the selected green building rating tools. India, Pakistan and Sri Lanka have their own green building councils and local ratings developed by the councils. Other two ratings from India (GRIHA) and Sri Lanka (Blue Green) were initiated by the respective government authorities. As per the data collected Sri Lanka is the first South Asian country which started own local rating system. Thereafter India and Pakistan initiated their local ratings as well. Different versions and amendments were released time to time in all ratings except Blue Green. There are different rating systems depending upon the building type in SEED, GRIHA and IGBC. Two Sri Lankan ratings are limited for new and existing constructions only. All the ratings belong to a logo which represents their national identity. GRIHA, GREEN SL and Blue green have the same rating levels and SEED contains titanium rating level. GRIHA follows star rating levels. Pre weighted credit approach was used in all ratings.

| Rating | | SEED | GRIHA | IGBC | GREEN SL | Blue Green |
|---|---|---|---|---|---|---|
| Maturity | | Not Found | 2073 (registered) | 6287 (registered) | 61 | 0 |
| Cost (20,000 $m^2$) | | Registration - $ 1500 Flat Fee - $ 5000 Review – 1360 $ ($ 7860) | Total – 450,000 INR ($ 6300) | Registration – 30,000 INR Precertificatio n – 250,000 INR Certification – 240,000 INR ($ 7280) | Registration – 50,000 LKR Certification - 1,080,000 LKR ($ 5650) | Registration – 5000 LKR Certification - 1,000,000 LKR ($ 5025) |
| Assessment Process | | Online Registration Preliminary Design, Document Submission, Initial Review, Final Review | Online Registration , Site Visits, Document Submission, Preliminary evaluation, Final Site visit, Final Evaluation | Online Registration, Preliminary Document Submission, Reviews, Site Visits Final Reviews | Registration Document Submission, Site Visits, Final Assessment, Reviews | Registration Document Submission, Design Assessment, Site Visits, Final Assessment |
| Validity | | Three years | Three years | Three years | Three years | Not Specified |
| Accessibility for information | | Average | Easy | Easy | Average | Difficult |
| Adaptability | Local | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Inter. | Not Specified | Not Specified | ✓ | ✓ | No |

Table 3: Other important factors comparison
*Currency exchange rates are as per the 14th May 2021 12.00

As per the table 3 two Indian ratings are ahead when compared to Sri Lankan ratings in terms of rated buildings. Cost for the cortication lies in between the $ 5000 to $ 7000. Sri Lankan ratings cost are at slightly lowest prices meanwhile Pakistan rating charges the highest. Assessment process is almost same in rating systems and GRIHA, SEED and also IGBC is having a well-established comprised online registration and certification process. Sri Lankan ratings are far behind on that process. Blue green guide has not specified a validity period for the certification. Accessibility for the relevant information is easy in IGBC and GRIHA. GREEN SL and SEED provide an average amount of data through their official websites. Through the Blue green guide it would be a difficult task to obtain basic data on rating. Table 4 refers to the categorical point's breakdown illustration of each rating system. Total marks achieved in all rating systems are 100 except

GRIHA rating it has allocated extra marks to the Innovation section. Separate sections are introduced on Life cycle cost performance metering and maintenance in GRIHA a rating system which is one of the important aspects during the operational process of a building. Majority of the ratings are not addressed in these facts. Cost for the greening is a debatable topic in current green building sector. Life cycle cost is a matter to be discussed under ratings.

| Category | SEED (%) | GRIHA (%) | IGBC (%) | GREEN SL (%) | Blue Green (%) |
|---|---|---|---|---|---|
| Considered Version | Version 1.0 (2016) | Version 3.0 (2019) | Version 3.0 (2016) | Version 2.0 (2018) | Version 1.0 (2017) |
| Management | 5 | 4 | 5 | 4 | 23 |
| Sustainable Sites | 12 | 12 | 14 | 25 | |
| Water Management | 12 | 16 | 18 | 14 | 10 |
| Energy | 28 | 18 | 28 | 22 | 27 |
| Indoor Air Quality | 14 | 12 | 12 | 13 | 13 |
| Natural Resources and Material | 8 | 12 | 16 | 14 | 20 |
| Waste Management | - | 16 | - | | |
| Sustainable Transportation | 15 | - | - | - | - |
| Innovation | 6 | 5 (extra) | 7 | 4 | 5 |
| Life Cycle Cost | - | 5 | - | - | - |
| Socio economic | - | 8 | - | 4 (include culture aspects) | 2 (include culture aspects) |
| Performance Metering and Monitoring | - | 7 | - | - | - |

Table 4: Categorical comparison

*Yellow color indicated the sections which contains mandatory prerequisites

Almost all the ratings total points that can be achieved are hundred meanwhile GRIHA rating awards extra five points for innovation. Except GREEN SL rating all the other rating systems allocate highest maximum points for energy section since it would be the most critical factor for South Asian region. GREEN SL rating allocates maximum points on Sustainable site section. Since Sri Lanka is an island land scarcity is also a one of the critical issues. GRIHA rating covers most of the section under the while it was different for other ratings. Life cycle cost and performance monitoring and metering sections were not included in any other rating. Most interesting fact is that two Sri Lankan ratings included a separated section on Socio cultural requirements but not in any o f the others. Most of the South Asian countries inherited their own sets of cultural values which can be easily incorporated in local ratings to highlight their national identity. SEED rating system was introduced as a separate section on Sustainable transportation. Especially Sri Lankan ratings should expand their tools for satisfying different types of buildings. Both SEED and Blue Green should be concerned on updating their first version which were initiated in 2016 and 2017 respectively.

## CONCLUSION

The comparative analysis indicates that India, Sri Lanka and Pakistan can be identified as the forefront South Asian countries in Green Building rating tools and its usage. Other countries are far behind them. India and Sri Lanka own more than one local rating. To have an own local rating which was initiated for local conditions and situations would highly benefit South Asian countries. It seems that most of the ratings are less matured while maintaining the same standards as other well- established ratings such as BREEAM or LEED US. Accessibility for information and advertising is not at satisfactory level in almost all the ratings. Sri Lankan ratings should initiate different ratings on the type of the buildings it will mostly enhance the public interest on converting the buildings as green buildings. Meanwhile South Asian regions are defined as highly populated region hence it would be important to focus on converting of residential buildings into green since large fraction of buildings belong to this the South Asian region. Finally, India, Pakistan and Sri Lanka are at an improving level in terms of the green building concept. As per the analysis Sri Lanka plays a major role in green building concept in South Asia which needs to be further improved and developed with consideration to local identity. All other nations also need to pay much attention on this regards because it is the current trend and also sustainable development is the best way of achieving higher living standards.

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