

Policy Intervention and Legislative Framework Relating to the Sustainability of Built Structures in India

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Abstract:

If not coupled with effective urbanization and utmost planning for crucial and optimum resource utilization, sustainable development becomes a fiction. Rapid urbanization and industrialization have been a key source of concern for the environment's consistent deterioration. With the presence of evident impediments, there is already a conscious limit on industrial growth in place. However, urbanization cannot be fully stifled in order to foster green movement, and vice versa. Among the many efforts made by the Indian government to improve energy efficiency and the sustainability of the built environment, the desire to incorporate important market players, along with legislative incentives, has begun to make a difference. The primary actors have been divided over the choice of ratings since the introduction of GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council), and BEE (Bureau of Energy Efficiency), offering a bewildered outlook with the many regulatory indexes and perimeters. The policies/ratings/mechanisms in place in many states to maintain the energy efficiency of the built environment are incompatible, resulting in a significant margin of error. For efficient implementation of these policies, the involvement of adequately empowered local entities becomes critical. This cannot be done without first examining the influence of current regulations and frameworks on the energy usage and functioning of the built environment, which includes both residential and commercial structures.

Keywords: Green Buildings, Energy Efficiency, Sustainable Development, Urbanization, Rating Mechanism

Introduction

In the year 2018, a special report on the feasibility of keeping the annual heating of the globe below 1.5 degree Celsius, as was decided in the Paris Agreement,³ was reviewed by Intergovernmental Panel on Climate Change.⁴ According to the report, the goal to go beyond the said temperature merely by reduction of emission is improbable. With the current set of emissions, the world is set to breach the limit from 2030 to 2052.⁵ The suggestions include for development of Carbon Dioxide Removal Technology, which currently is undeveloped and untested. One of the prominent suggestions applicable on both developed and developing economies, is the requirement of rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings) to curb carbon-emissions.⁶ Key players in the International Climate Change movement, national governments, policy makers and even judicial members have largely looked at the quantum of carbon emission through industrial

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³ The Paris Agreement, Adopted Dec. 12, 2015; entered into force Nov. 4, 2016

⁴ Intergovernmental Panel on Climate Change, AR6 Synthesis Report: Climate Change 2022

⁵ United Nations Development Programme, 'Sustainable Development Goals', <<https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>> Accessed at 7 October 2020.

⁶ World Green Building Council, 'Green Buildings and Sustainable Development Goals', <<https://www.worldgbc.org/green-building-sustainable-development-goals>>, Accessed at 7 October 2020

lens. However, it becomes highly prominent to note that the sustainability of urban infrastructure and climate change mitigation has to go hand in hand. Urban development will be required at a balancing pace with green development goals, which calls for regular audit of energy emissions by a building structure. Energy efficiency in buildings worldwide has been given considerable attention, however, the policy makers in India have resorted to suggestive mechanisms and voluntary ratings instead of mandatory audit and regular checkpoints in the construction and maintenance of a building.

The World Green Buildings Council, which is an amalgamation of independent, non-profit organizations made up of businesses and organizations working in the building and construction industry, and aim to promote the creation of 'green buildings' per se in their respective nation; stated that these energy efficient buildings promote 09 out of 17 Sustainable Development Goals⁴ of United Nations Development Programme.⁵ According to the report, Green Buildings firstly improve people's health and well-being promoting SDG number 03, i.e. 'Ensure healthy lives and Promote well-being for all at all ages'; it runs on renewable energy, which is cheaper to run promoting SDG 07, i.e. 'Ensure access to affordable, reliable, sustainable and modern energy for all'; the creation of such structures creates jobs and boosts economy promoting SDG 08, i.e. 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'; it also spurs innovation & contribute to climate resilient infrastructure boosting SDG 09 of 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation'; further creating a fabric for sustainable communities and cities meanwhile pushing the completion of SDG 11, i.e. 'Make cities and human settlements inclusive, safe, resilient and sustainable'; it further uses circular principle causing no wastage of resources aiming at SDG 12, i.e. 'Ensure sustainable consumption and production patterns'; it also reduces carbon emissions by built structures fulfilling SDG 13, i.e. 'Take urgent action to combat climate change and its impact'; with further methods to improve biodiversity, save water resources & measures to protect green cover, these built structures also help in fulfilling SDG 15 i.e. 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss; lastly, the partnership among key players of market, industry and governance, these fulfill SDG 17 i.e. 'Strengthen the means of implementation and revitalize the global partnership for sustainable development.'⁷

In the absence of a mandatory legal document relating to energy efficiency with available sanctioning power to appropriate authorities on the building construction and regulations, the judicial discourse has been limited to translocation of hazardous industries away from residential buildings,⁸ and petitions for denied possession where the builders have exceeded the permitted story limit by appropriate municipal authority.^{9,10} However, there has been an awakened responsibility on the part of National Green Tribunal lately with order for green audit of the buildings in Delhi to keep a check over air quality.¹¹ Furthermore, NGT has started to

⁷ World Green Building Council, 'Green Building: Improving the lives of billions by helping to achieve the UN Sustainable Development Goals', <<https://www.worldgbc.org/news-media/green-building-improving-lives-billions-helping-achieve-un-sustainable-development-goals>>, Accessed at 8 October 2020

⁸ MC Mehta v Union of India, AIR 1996 SC 2231

⁹ Padamchand J. Kothari v State of Maharashtra Bombay High Court O.S. Writ Petition No. 920 of 1985; Pratibha Cooperative Housing Society Ltd. v State of Maharashtra AIR 1991 SC 1453; West Coast Builders (P) Ltd. v The Collector Bombay High Court Appeal No. 92/1994 in Writ Petition No. 391/94

¹⁰ Roy, B. (2021). Colonial Images, Neo-colonial Realities: Unpacking the Construct of the Tribal Woman in Mahasweta Devi's Outcast. GLS KALP – Journal of Multidisciplinary Studies, 1(4), 13–23. Retrieved from <https://glskalp.in/index.php/glskalp/article/view/17>

¹¹ Radhika Khosla & Ankit Bharadwaj, 'Green court's order for an audit of buildings in Delhi is a new frontier in the fight for clean air', Scroll.in, Jan 05, 2017 <<https://scroll.in/article/825734/green-courts-order-for-an-audit-of-buildings-in-delhi-is-a-new-frontier-in-the-fight-for-clean-air>> Accessed at 23 July 2020.

impose heavy fines on the private builders who failed to take necessary environment clearances under Environment Impact Assessment Notification, 2006.¹² NGT, through its act of National Green Tribunal Act 2010 is empowered to mandate any form of environmental sanction on a built structure which falls directly under Water (Prevention and Control of Pollution) Act, 1974, Water (Prevention and Control of Pollution) Cess Act, 1977, Forest (Conservation) Act, 1980, Air (Prevention and Control of Pollution) Act, 1981, Environment (Protection) Act, 1986, Public Liability Insurance Act, 1991 and Biological Diversity Act, 2002. Though a comprehensive judicial activism on the subject firstly requires technical awareness of the need for low carbon technology in Indian building stock, secondly firm and mandatory legislative documents with sanctions through which stakeholders receive a *locus standi* in the courts.

The power of NGT for environmental sanction under the above-mentioned environmental legislations also clashes with the newly induced Real Estate (Regulation and Development) Act, 2016. The legislation aims at setting up of Real Estate Regulatory Authority for regulation and promotion of real estate sector. The authority under the legislation, in order to promote growth and promotion of a healthy, transparent, efficient and competitive real estate sector make recommendations to the appropriate Government of the competent authority for “*measures to encourage construction of environmentally sustainable and affordable housing, promoting standardization and use of appropriate construction materials, fixtures, fittings and construction techniques*”¹³. The ‘Appropriate Government’ which can be given recommendations by the Regulatory Authority under the Act is Central Government, in case of Union Territory without legislature, Delhi or Puducherry and the State Governments in case of State territory.¹⁴ The authoritative sanctions of National Green Tribunal and the Real Estate Regulatory Authority may clash upon the subject matter where the environmental impacts of built structures are involved. The former is empowered to decide taking into account the principles of natural justice while bringing the ecological balances with the urbanization. However, the latter is empowered to decide for the highest benefit of the key players of the real estate market. With the two bodies functioning in the same grey area, it becomes pertinent to study the role of both NGT and Real Estate Regulatory Authority in the environmental sanctions of built structures.

The policy making for the energy efficiency in the Indian building stock comes into the interplay between Ministry of Power, Ministry of Environment, Forest and Climate Change and Ministry of Renewable Energy. Historically, to develop this concept, there have been three primary rating systems namely, GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council) and BEE (Bureau of Energy Efficiency).

Growing needs for sustainable built structures

According to a report published by Architecture 2030, Building materials and construction sector contributes to 11 percent of the total Global Carbon Emissions.¹⁵ Additionally, building operations sector contributes to 28 percent of the same.¹⁶ The quantum of natural resources used by this sector at such an alarming rate is a matter of concern for the advocates of

¹² TK Rohit, ‘NGT says Environmental Clearance a must before starting construction projects, The Hindu, January 22, 2020 <<https://www.thehindu.com/news/national/tamil-nadu/ngt-says-environmental-clearance-a-must-before-starting-construction-projects/article30613176.ece> >

¹³ Real Estate (Regulation and Development) Act, 2016, Section 32 (e)

¹⁴ *Id*, Section 2 (g)

¹⁵ Architecture 2030, ‘Buildings generate nearly 40% of annual global GHG emissions’, <https://architecture2030.org/buildings_problem_why/> Accessed at 1 September 2022

¹⁶ *Id*

sustainable development. However, this also presents an opportunity for promotion of methods and techniques necessary for equating the need for a fast-paced urban development while maintaining the ecological balance. It has been noted even by judiciary everyday municipal challenges which the mega cities are facing because of rapid urbanization. In the case of *Almitra H. Patel v. Union of India*¹⁷, the court had observed stating: “*Historic city of Delhi – the Capital of India – is one of the most polluted cities in the world. The authorities responsible for pollution control and environment protection have not been able to provide a clean and healthy environment to the residents of Delhi. The ambient air is so polluted that it is difficult to breathe. River Yamuna – the main source of drinking water supply is free dumping place for untreated sewage and industrial waste. Apart from air and water pollution, the city is virtually an open dustbin. Garbage strewn all over Delhi is a common sight. It is no doubt correct that rapid industrial development, urbanization, and regular flow of persons from rural to urban areas have made major contribution towards environment degradation*”¹⁸

The principle of Sustainable Development focusses upon meeting the needs of the present generation without compromising upon the ability of the future generations to meet their own needs.¹⁹ Principle I of the 1987 Brundtland Report stated “*all human beings have the fundamental right to an environment adequate for their health and well-being*”,²⁰ while the principle II commonly known as Principle of Inter-Generational Equity spoke “*every generation holds the Earth in common with members of the present generation and with other generations, past and future*”. Indian Supreme Court has mentioned the principle of Sustainable Development and principle of Inter-Generational Equity within numerous judicial pronouncements. In order to take up urban development and sustainability hand in hand, the concept of sustainable built environment is the need of the hour. The concept of energy efficiency; if brought into building construction, materials and operations sectors comprehensively by inculcating sustainable architectural designs to lower down the energy usage, providing rainwater harvesting techniques attached to the building complexes, creating solar based technology of energy output, formulating effective drains and sanitation facilities and many such other aspects; will lead to a sustainable output towards the built structures in the world.

Green Buildings – Meaning and Importance

A green building necessarily means a built structure based heavily upon nature friendly processes right from its design, functions, and operations. The aim is not just emitting less carbon components into the environment but also to promote healthy and sustainable lifestyle for its inhabitants. Energy efficiency in built structures is not a concept which has been developed in modern architecture. Ancient architecture has given considerable attention to nature and its elements for sustenance.²¹ Indian Vedic philosophy emphasized upon usage of the five fundamental elements of nature namely – Water, Fire, Earth, Wind and Space.²² Historical architectural structures were constructed while efficient using a combination of these elements. Not only this, but the historical residential structures were also developed based on ancient Vedic science for architecture, commonly known as *Vastushastras*.²³

Open spaces were left in the Centre of the buildings for better lighting and cross-ventilation in adjoining rooms. Prayer rooms and water storage areas were intentionally kept in the northeast

¹⁷ (2000) 2 SCC 679

¹⁸ *Id*

¹⁹ Our Common Future, Brundtland Report (1987) 43

²⁰ *Id*

²¹ Narendra D. Patel and Nikesh P. Shah, ‘Green Housing- Review, Rating and Implementation’, The Indian Concrete Journal, September 2007 <<https://www.yumpu.com/en/document/read/18879191/green-housing-the-indian-concrete-journal>> Accessed at 1 September 2022

²² *Id*.

²³ *Supra* note 20.

direction so that the sun rays in the morning help in disinfecting the resources to be utilized for rest of the day. Due to monsoon and retreat monsoon, the southwest part of the houses used to face heavy rain and winds. Keeping it in view, the part facing southwest direction used to have heavy walls. Simply stating, the aforementioned could be called as prevailing byelaws for civil construction in India historically.

Even though the historical imprints state the use of appropriate science, technology and preserved knowledge governing the planning, construction and maintenance of built structures; the need for exploring such technology and architectural ways at that time were the exploratory urge to create. There wasn't a necessary man-nature conflict arising out of scarcity of resources at that time. Even though the explored resources were comparatively lesser than what is available now, the needs for today have rapidly changed to far paced burden over urban areas. The growing burden is not only created by the needs of residence in an urban setup. Even though, the need for residential complexes is far more urgent than any other necessary creation of economic development because the living standards of a population not only defines the growth of an economy but also is directly affiliated with other health concerns of the population. This imbalance is found little in the rural areas. However, urban areas in any economy are flooded with influx of people from rural to urban setups in the search of livelihood. People working in such areas are contributing efficiently to the economy, thus it becomes a need of governing bodies to fulfill such demands and respond back well. With increasing urbanization, natural resources are being utilized at a fast pace for economic and social development. This has been taken up already at numerous instances at international forums to pull such usage down to a sustainable one. The energy efficient buildings as mentioned above are most suitable in modern day world.

The notion of "green building" is gaining traction around the world, with the United States leading the way, followed by India in second place. Green buildings use supplemental cement ingredients instead of cement, resulting in lower carbon dioxide emissions. Green buildings are designed to take advantage of as much natural light and air as possible, resulting in energy savings. Another significant characteristic of such structures is the use of the rainwater system in and around the structures to raise the ground-water table. In India, there are three key rating systems: GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council), which offers LEED (Leadership in Energy and Environmental Design) certification, and BEE (Building Energy Efficiency) (The Bureau of Energy Efficiency). Green building may sound sophisticated, but it has a slew of issues that must be addressed quickly if it is to succeed. The building industry poses a significant environmental threat. Buildings account for at least 40% of global energy use. Buildings absorb around 42 percent of world water consumption and 50 percent of global raw material consumption when the manufacturing, construction, and operational periods of buildings are included. Furthermore, construction operations generate a significant amount of damage to the environment, including greenhouse gases, water pollution, solid waste, and CFCs (Chlorofluorocarbons).²⁴

India, too, is confronted with construction-related environmental issues. Building energy consumption has increased due to a near-consistent growth in yearly energy consumption in the residential and commercial sectors. During construction and operation, buildings need a lot of water. Another big difficulty is managing construction and demolition debris, as well as solid waste created by building tenants. The result of widespread urbanization is an uncontrollable "heat island" effect. Urban environments with wide expanses of asphalt, buildings, and other constructions replace vegetation and tree cover, obliterating the cooling given by vegetation via both shade and evapotranspiration. Ground-level ozone, which is

²⁴ Charles J Kibert, 'Green Buildings: An overview of Progress', 19 J. LAND USE & ENVTL. L. 491 2003-2004, Available at: http://heinonline.org/HOL/Page?handle=hein.journals/jluenvl19&div=24&g_sent=1&collection=journals (last accessed at 5 January 2022.)

harmful to human health, is formed as a result of this. This also leads to higher temperatures, which increases the need for air cooling, which in turn raises the demand for energy generation, leading to greenhouse gas emissions.²⁵ As a result, it is reasonable to conclude that buildings are one of the key pollutants affecting urban air quality and contributing to climate change. As a result, the demand for green building design developed, with the goal of addressing all of these challenges in a holistic and scientific manner.²⁶ A green building is one that incorporates environmentally beneficial characteristics. The color “green” is used to depict nature in this case. Green buildings are becoming increasingly popular among building owners and operators. Climate change and a desire

The goal of green building design is to reduce non-renewable resource demand, increase the efficiency of these resources while they are in use, and maximize the reuse, recycling, and utilization of renewable resources. When compared to traditional structures, green buildings use 40 to 60 percent less power. This is due to the technical design of the building relying on high efficiency materials and technology.²⁷ Green buildings also make an effort to generate on-site energy through the use of renewable energy sources to meet their energy requirements. Solar thermal systems, for example, may be used to create hot water or solar PV panels can be used to generate electricity, decreasing reliance on grid power. Another advantage of green buildings is that they create less garbage due to on-site waste handling.

Green construction rules have opened up a plethora of possibilities for energy-efficient technological innovation. While technology provides opportunities, its improper selection and implementation can cause problems. Warm and humid climates, as well as hot and dry climates, influence material and design choices. However, the construction industry and would-be clients frequently push for haphazard application of Western materials and architecture without regard for the Indian climate. In hot and dry climates, for example, the need for glass leads to wasteful heating and greater usage of energy-intensive air conditioning.²⁸ Furthermore, mold development in the tunnels and towers used to carry cold air into buildings as a cooling strategy is said to cause harmful indoor air in green buildings. Another concern with green buildings is the expense of construction. The cost of creating green buildings is higher than that of conventional structures.²⁹

Regulatory policies related to Green Buildings

In 2016, the National Building Code 2016 was released, which incorporates modern and

²⁵ Erin Burg Hupp, “Recent Trend in Green Buildings Laws: Potential Pre-emption of Green Building and Whether Retrofitting Existing Buildings Will Reduce Greenhouse Gases and Save the Economy”, 41 URB LAW 489 2009, Available at: http://heinonline.org/HOL/Page?handle=hein.journals/urban41&div=30&g_sent=1&collection=journals(last accessed at 8 January 2022)

²⁶ Sarah B Schindler, “Following Industry’s LEED: Municipal Adoption of Private Green Building Standards”, 62 FLA L REV 285 2010, Available at: http://www.floridalawreview.com/wpcontent/uploads/2010/01/Schindler_BOOK.pdf.

²⁷ GRIHA Manual, ‘National Rating System- GRIHA: An evaluation tool to help design, build, operate, and maintain a resource-efficient built environment’, Vol. I, MNRE & TERI (2010), p. 7, Available at: <http://www.rsrc.com/uploads/files/111201071822PMGriha%20Manual.pdf>

²⁸ Anumita Roychowdhury, “Green Buildings: It’s common sense”, 30 September 2012, DOWN TO EARTH, Available at: <http://www.downtoearth.org.in/content/green-buildings-it-s-common-sense> (last accessed at 10 January 2022).

²⁹ Ishan Srivastava, “Green Buildings are a joke: Hafeez Contractor”, 14 September 2011, Times of India, Available at: http://articles.timesofindia.indiatimes.com/2011-09-14/chennai/30153762_1_green-buildings-rating-system-rating-agencies (last accessed at 11 January 2022).

international norms. The revised Code includes updated requirements for the collaboration of need-based experts and agencies to ensure the correct fulfilment of obligations for the completion of a construction project. A detailed provision for streamlining the approval process in respect of different agencies has been incorporated in the form of an integrated approval process through single window approach for enabling expeditious approval process, avoiding separate clearances from various authorities, with the goal of ensuring ease of doing business in the built environment sector. In addition, the option for computerizing the approval process has been increased to allow for online submission of plans, drawings, and other information, as well as sanctioning thereof, resulting in a faster approval procedure. The framework for assuring competent professional certification of building structural safety and peer assessment of building design has been reinforced. Accessibility requirements for people with impairments and the elderly in buildings and the built environment have been substantially overhauled and updated. The requirements on fire and life safety have been carefully amended to address the difficulties of current complex building types, particularly high rises. The most recent structural loading, design, and construction codes, such as those pertaining to wind loads, earthquake-resistant building design, steel design, and foundations, have been introduced with the goal of assuring structural safety of structures, particularly against disasters. The Sustainable Development Principle has also been implemented. There are also new guidelines for structural use of glass, escalators and moving pathways, information and communication enabled systems, solid waste management, and asset and facility management.

The Bureau of Indian Standards (BIS) did not include any green construction recommendations in the National Building Code of India, 2005. The Bureau of Energy Efficiency's Energy Conservation Building Code (ECBC) specifies prescriptive requirements for creating an energy-efficient structure envelope, which is the building's outer face. The façade will limit heat loss by using the insulating properties of the materials used for roof and wall construction. Allowing daylight in will also minimize energy use. As a result, selecting the appropriate exterior material for any green construction is critical. It then establishes a wall window proportion and determines how much of the built environment may be covered in glass.³⁰ This means that if a structure is coated in glass, it may be green and energy efficient. As a result, ECBC encourages the widespread use of glass and promotes high-performance, pricey glass produced by a few high-end enterprises. Interestingly (or not), Saint-Gobain Glass is also a founding member of the Indian Green Building Council, which is supported by industry group CII. The green code is designed to help their firm succeed. The ECBC does not give any water, waste management, or building material recommendations.³¹ ECBC is currently voluntary, but once enforced, it has the potential to accelerate the green construction movement. ECBC has received notifications from Rajasthan, Odisha, and Kerala. With ECBC, a building's annual energy consumption may be reduced to 140-110 kwh per sq m. There are buildings today that use half of the energy allowed by the code. Bayer Eco Commercial Building in Noida, for example, uses roughly 75 kwh/sq. m/year.

A green building rating system is a method for assessing a building's environmental performance throughout its life cycle. It generally consists of a set of standards encompassing many aspects of green building design, construction, and operation. Each criteria contains a set of pre-assigned points and establishes verifiable performance standards and targets. Once a project meets the grading requirements, it is given points. The points are totaled to determine a project's final rating. Rating systems need a project to be evaluated by an impartial third party, and several mechanisms are in place to assure a fair review. Green building grading systems

³⁰ Anuradha Shukla, "Only chaos reigns in green realty biz", 2008, MAIL TODAY, Available at: <http://the3c.in/pdf/PRESS285.pdf> (last accessed at 12 January 2022).

³¹ Sunita Narain, "A Green Façade", 15 April 2013, DOWN TO EARTH, Available at: <http://www.downtoearth.org.in/content/green-facade> (last accessed at 3 June 2022)

have been significant in spreading awareness and popularizing green building concepts across the world. They are mostly voluntary in nature. Building Research Establishment Assessment Method (BREEAM) developed in the United Kingdom,³² Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) in Japan,³³ and Hong Kong Building Environmental Assessment Method (HKBEAM)³⁴ are just a few of the green building rating systems in use around the world. The majority of these grading systems are suited to the construction sector of the nation in which they were created. As a result, there was a need to create grading systems that were tailored to Indian conditions and requirements. As a result, the rating systems listed below were created. GRIHA, IGBC, and BEE are the three key grading systems in India.

GRIHA: GRIHA is an acronym for Green Rating for Integrated Habitat Assessment. It aims to keep a building's resource consumption, waste creation, and overall environmental effect below set nationally allowed limits or standards. It assesses a building's environmental performance over the course of its full life cycle, establishing a clear definition of what constitutes a “green building”.³⁵ The Energy and Resource Institute (TERI) has been instrumental in bringing together numerous efforts that are critical for the efficient implementation and mainstreaming of sustainable habitats in India.³⁶ TERI created GRIHA (Green Rating for Integrated Habitat Assessment) with over two decades of expertise in green and energy efficient buildings, which was accepted as the national rating system for green buildings by the Government of India in 2007.³⁷ GRIHA is a “design evaluation methodology” for green buildings that is applicable to all types of structures in all climate zones across the country. A building's expected performance across its whole life cycle, from conception to operation, is evaluated in GRIHA. The following stages of the life cycle have been recognized as being worth assessing:

Pre-Construction Stage - Issues such as accessibility to public transportation, type of soil, kind of land, location of the property, flora and wildlife on the land before building begins, natural landscape and land characteristics are all intra- and inter-site issues.

Building planning and construction stages: Resource conservation and demand reduction, resource utilisation efficiency, resource recovery and reuse, and accommodations for occupant health and well-being are all problems to consider. Land, water, energy, air, and green cover are the primary resources discussed in this section.

Building operation and maintenance stage: Building system and process operation and maintenance, monitoring and recording of energy usage, occupant health and well-being, as well as global and local environmental concerns

The GRIHA rating is a 100-point system that includes 33 criteria organized into divisions such

³² Briefing Note, ‘*Building Research establishment Assessment Method (BREEAM)*’, Willmott Dixon, (December, 2010), Available at: <http://www.willmottdixongroup.co.uk/assets/b/r/briefing-note-16-breeam-2.pdf> (accessed at 8 January 2022).

³³ Comprehensive Assessment System for Building Environmental Efficiency, “CASBEE for Market Promotion (tentative version)”, Japan Sustainable Building Consortium, p 2, Available at: http://www.unepfi.org/fileadmin/publications/property/CASBEE-Market_Promotion_tentative.pdf (last accessed at 7 January 2022)

³⁴ Kevin Edmunds, HK-BEAM: “*Improving the Life Cycle Performance of New Residential Buildings*”, Centre of Environmental Technology, Ltd, Hong Kong, Available at: <http://www.housingauthority.gov.hk/mini-site/housingconference/1999/en/events/conf/conferen/pdf/ekevin.pdf> (last accessed at 7 January 2022)

³⁵ Green Rating for Integrated Habitat Assessment, Available at: http://www.grihaindia.org/index.php?option=com_content&view=article&id=73 (last accessed 5 February 2022)

³⁶ TERI, Available at: http://www.teriin.org/index.php?option=com_content&task=view&id=17 (last accessed 6 February 2022)

³⁷ TERI- GRIHA, “TERI- GREEN Rating for Integrated Habitat Assessment”, TERI, 3rd March, 2006, p 3, Available at: <http://www.geothermalindia.com/data/Papers/TERI%20-%20Green%20Rating%20for%20Integrated%20Habitat%20Assessment.pdf> (accessed at 7 February 2022)

as site selection and planning, resource conservation and efficient use, building operation and maintenance, and innovation. Eight of these requirements are required, four are partially required, and the other criteria are optional. Each criterion is allocated a number of points. It indicates that a project that aims to achieve the criteria will be eligible for points. Based on the number of points achieved, several levels of certification (one to five stars) are granted. For example, one star is granted for 50-60 points, whereas five stars are provided for 91-100 points. Certification requires a minimum of 50 points.³⁸ Buildings must be in the design stage and larger than 2500 square meters to qualify for GRIHA certification. Offices, retail areas, institutional buildings, hotels, hospital buildings, healthcare facilities, homes, and multi-family high-rise buildings are among the types of structures.³⁹

There are three stages for GRIHA rating, namely, registration, documentation, and evaluation:

Registration: A project must be registered with ADaRSH through the GRIHA website by filling out the online registration form, which must be done before the start of the project since various concerns must be addressed during the pre-design stage. ADaRSH stands for Association for Development and Research of Sustainable Habitats, and it is an impartial venue for discussion of scientific and administrative concerns concerning sustainable habitats in India. It was established by TERI with the help of MNRE. Through GRIHA, it is obliged to encourage the development of buildings and habitats in India.

Documentation: All project materials must be submitted online in order to proceed to the next level, which is the evaluation.⁴⁰

Evaluation: The project documentation is graded in a three-tiered procedure and evaluated online. Following the online submission of papers, a team of professionals and specialists from the GRIHA Secretariat, ADaRSH, conducts a preliminary examination. For all proposed criteria, documentation should be thorough in every way. The ADaRSH team initially looks at whether the project meets the necessary requirements and, if it doesn't, rejects it. After that, the ADaRSH team will assess the optional criteria and estimate the total amount of points that can be earned. All documentation pertaining to compliance will be reviewed and validated.⁴¹

Members of the GRIHA assessment committee, which includes recognized industry specialists from landscape architecture, lighting and HVAC design, renewable energy, water and waste management, and building materials, receive the evaluation summary report. The points assessed by the technical team will be vetted by the members of the assessment committee. The papers will subsequently be reviewed independently by the assessment committee for the purpose of awarding points. The evaluation committee will give provisional scores and, if necessary, provide feedback on particular criteria. The project proponent will get the assessment report to examine and, if desired, take efforts to improve the score.⁴² The assessment committee's findings and comments will be detailed in the report. The report will include comments on each of the criteria as well as a general comment on the report. The

³⁸ GRIHA Manual, 'National Rating System- GRIHA: An evaluation tool to help design, build, operate, and maintain a resource-efficient built environment', Vol. I, MNRE & TERI (2010), pp. 10-12, Available at: <http://www.rsdc.com/uploads/files/111201071822PMGriha%20Manual.pdf> (accessed on 21st February, 2022)

³⁹ Green Rating, Available at: http://www.grihaindia.org/index.php?option=com_content&view=article&id=87 (last accessed in January 2022)

⁴⁰ Green Rating, Available at: http://www.grihaindia.org/index.php?option=com_content&view=article&id=87

⁴¹ Green Rating for Integrated Habitat Assessment (GRIHA), National Rating System for Green Buildings, Ministry of New & Renewable Energy Government of India, Available at: <http://2.imimg.com/data2/JQ/HK/MY-/national-rating-system-green-buildings-griha.pdf>

⁴² Green Buildings, 'GRIHA', Government of India, Ministry of New and Renewable Energy, Available at: <http://ncict.net/Rating/Griha.aspx> (accessed at 22 February 2022).

customer will have one month to resubmit the document with any required changes or additions. The screening procedure will be repeated for the resubmitted documents. The final score will be determined by the assessment committee. For approval and rating, the final score will be given to an Advisory Committee comprised of famous people and respected specialists in the area. The rating will be valid for five years from the date of the building's commissioning.

Indian Green Building Council: Green Homes, established by the Indian Green Building Council (IGBC), is the first grading system designed specifically for the residential sector in India. It is founded on well-established energy and environmental principles and finds a balance between well-established procedures and new ideas.⁴³ It assesses new residential structures in line with the IGBC Green Homes standards, including single-family homes, high-rise residential apartments, gated communities, row houses, and existing residential buildings that have been rehabilitated and remodeled.⁴⁴ The IGBC Green Homes Rating System is a consensus-based voluntary scheme. Its goal is to make it easier to build residences that are water efficient, waste-free, energy efficient, and healthful, pleasant, and ecologically friendly. It covers topics such as site selection and planning, water efficiency, energy efficiency, materials, indoor environmental quality, and the innovation and design process. Green building certification levels are determined by the total number of credits received. Green building certification levels are determined by the total number of credits received. For example, credits 45-51 receive a silver grade, and the building receives a "Outstanding Performance" designation. However, some non-negotiable conditions, such as soil erosion management, rainwater collecting, and CFC-free equipment, must be met by every Green Home.⁴⁵

IGBC Green Factory Building: In May 2008, the IGBC proposed a grading scheme for manufacturing buildings as part of its effort to expand green building ideas to all types of structures.⁴⁶ The IGBC Green Factory Building Rating System is a consensus-based voluntary initiative. The growth of green manufacturing would be aided by this ranking system. The IGBC Green Factory Building rating addresses green features in the same categories as the IGBC Green Home rating, but with the addition of a category called "Occupational Health," which has mandatory criteria such as tobacco smoke control, minimum fresh air requirements, and no asbestos use in the building.⁴⁷

LEED India Green Building Rating System: The Leadership in Energy and Environmental Design (LEED-INDIA) Green Building Rating System is a nationally and globally recognized benchmark for high-performance green building design, construction, and operation. Building owners, architects, consultants, developers, facility managers, and project managers all benefit from LEED-tools INDIA's for designing, constructing, and operating green buildings. It encourages a whole-building approach to sustainability by recognizing success in the five core

⁴³ IGBC Green Homes Rating System, Available at: <http://www.igbc.in/site/igbc/testigbc.jsp?desc=115708&event=115679> (accessed at 22 February, 2022)

⁴⁴ Development Initiatives - IGBC green building rating programmes, Available at: <http://www.cii.in/ConsultingServicesDetails.aspx?enc=Y724SUiQraY7VcDZjgBoGO+FafhuVoTI1PIzPlzbMbY=> (accessed at 22 February, 2022)

⁴⁵ IGBC Green Homes Rating System, Version 2.0, April 2012, IGBC, Available at: [https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Homes%20-%20Abridged%20Reference%20Guide%20\(Versio%202.0\).pdf](https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Homes%20-%20Abridged%20Reference%20Guide%20(Versio%202.0).pdf) (accessed at 14 March 2022)

⁴⁶ Abridged Reference Guide, 'IGBC Green Factory Building Rating System', Pilot Version, Confederation of Indian Industry (2009), p 12, Available at: [https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Factory%20Buildings%20-%20Abridged%20Reference%20Guide%20\(Pilot%20Version\).pdf](https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Factory%20Buildings%20-%20Abridged%20Reference%20Guide%20(Pilot%20Version).pdf) (accessed at 14 March, 2022)

⁴⁷ *Supra* note 45.

categories listed below, which are the same as those recognized by IGBC Green Homes.

LEED India for New Construction: LEED India for New Construction and Major Renovations is a green building grading system that assists in the planning and design of high-performance commercial structures. This criterion applies to commercial buildings, such as offices, retail and service enterprises, institutional buildings (library, schools, museums, and so on), hotels, and structures with four or more livable floors. This programme is for buildings where the owner or developer has complete control over the design and operation.⁴⁸

LEED India for Core and Shell: LEED India for Core and Shell is a set of performance requirements for certifying Core and Shell building design and construction. Core and Shell buildings are ones in which the owners or developers do not have complete authority over the design and construction of the structure. These are spaces that have been leased or rented, such as an IT park, malls, retail centres, and warehouses. In other words, LEED Core and Shell can be used for projects where the owner/developer has limited control over building systems, such as retail development, or for projects that are designed and built to be partially occupied by the owner/developer, with more than 50% of the total space rented or leased out.⁴⁹

IGBC Green SEZ Rating System: The Green SEZ guidelines were developed by the IGBC and the Ministry of Commerce and Industry. As an extension of the Green SEZ principles, the IGBC has established the IGBC Green SEZ Rating System, which promotes projects to surpass the requirements of various regulations and standards. The IGBC Green SEZ Rating System is a consensus-based voluntary scheme. IGBC Green SEZ's goal is to make it easier to build energy-efficient, water-efficient, healthy, pleasant, and environmentally responsible SEZs. The criteria are the same as those used by other IGBC rating systems.⁵⁰

Bureau of Energy Efficiency: The Energy Conservation Building Code (ECBC) was created by the Bureau with the purpose of defining criteria for new, big, energy-efficient commercial buildings.⁵¹ The BEE programme assigns a star rating to office buildings on a scale of one to five, with five-star structures being the most energy efficient. This programme focuses on air-conditioned and non-air-conditioned office buildings in the warm and humid, composite, and hot and dry climatic zones.⁵² The building is rated using the Energy Performance Index (EPI) in kWh/sq m/year. Bandwidths for EPI have been defined for several climatic zones based on the percentage of air-conditioned space.⁵³ If the same site is located in a hot and humid climate zone like Chennai, the EPI bandwidths vary from 200 to 100 kWh/sq m/year, earning it a 5-Star rating if the EPI is less than 100 kWh/sq m/year and a 1-Star rating if the EPI is between 200 and 175 kWh/sq m/year. The star rating programme gives energy-efficient buildings broad attention and promotes demand for them. Buildings with a connected load of 500 kW or more are eligible for the BEE star rating system. In terms of purchased and generated electricity split by built-up area in sqm, the EPI is kWh/sq m/year. The total power does not, however, include energy generated on-site from renewable sources such as solar photovoltaic and other similar

⁴⁸ Abridged Reference Guide, 'LEED- India: Green Building Rating System', Version 1.0, IGBC (January 2007), Available at:

https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Interiors%20Ratings%20System%20Sep%202019.pdf (accessed at 2 April 2022)

⁴⁹ *Id.*

⁵⁰ *Supra* note 48.

⁵¹ BEE Schemes, Available at: <https://beeindia.gov.in/content/about-bee>, (Last accessed at: 03rd April 2022)

⁵² Green buildings- BEE, Available at: <https://beeindia.gov.in/content/buildings-0> (Last accessed at: 03rd April 2022)

⁵³ *Id.*

technologies.⁵⁴

These abovementioned rating systems have numerous inconsistencies among each other. These three ranking systems are now considered to be voluntary, and consensus based. As a result, it is up to the developer to contact any of these grading systems to obtain a rating for his structure. It's worth noting that anytime a structure is rated, the name of the rating system is also included. This is to offer details on the criteria used to determine the rating.⁵⁵ As previously stated, each of these grading systems uses a set of criteria to assess the structures. GRIHA uses a 33-point approach, whereas IGBC uses a six-point system, which includes site selection and planning, water efficiency, energy efficiency, materials and resources, indoor environmental quality, and innovation and design process.⁵⁶

These rating systems use criteria that are very similar to one another, such as soil conservation or erosion control, tobacco and smoke control, use of low VOC paints/adhesives/sealants, minimize ozone layer depleting substances, rainwater harvesting, basic construction workforce facilities, use of low-energy materials in interiors, renewable energy utilization, and so on. As a result, it can be observed that the rating agencies use the same criteria, but the phrasing is different. It's worth noting that, while the criteria are the same, the points assigned to each of them by various rating agencies varied. For example, GRIHA offers 2 points for basic construction labour facilities, but IGBC only awards 1 point. GRIHA gives 5 points for rainwater harvesting, whilst IGBC gives 4 points. Also, the minimum points for a GRIHA rating are 50⁵⁷, compared to 38-40⁵⁸ for the IGBC Green Homes grading system and 23-27⁵⁹ for the LEED-India CS. As a result, the ratings are inconsistent. For example, Building A, which is graded by GRIHA, may be unable to obtain a green certificate, but Building B, although having less credit points than Building A, may be able to obtain a green certificate from IGBC.

Conclusion & Suggestions

The research gaps in the above-mentioned policy initiatives are not hard to find. These rating systems, though governed under appropriate legislations, still rests as voluntary and consensus based. It depends on the developer, be it of any residential complex or a commercial structure to reach out any of these ratings. Another challenge is that certain states have mandated BEE ratings for commercial and residential buildings; however, in the absence of any sanctioning authority, the quality of the building as the rating goes, is not checked frequently. Adding to this, Eco-Niwas Samhita, Part I is a step forward towards inclusion of urban local bodies by inclusion in the building bye-laws.

⁵⁴ *Id.*

⁵⁵ Narendra D Patel & Nikesh P Shah, "Green housing- Review, rating systems and implementation", The Indian Concrete Journal (September 2007), Available at: http://icjonline.com/views/POV_Narendra_Patel.pdf (accessed on 02nd April, 2022).

⁵⁶ GRIHA Manual, "National Rating System- GRIHA: An evaluation tool to help design, build, operate, and maintain a resource-efficient built environment", Vol I, MNRE & TERI (2010), Available at: <https://docplayer.net/215266778-Green-rating-for-integrated-habitat-assessment-griha-manual-volume-1.html>, (accessed on 2 April, 2022)

⁵⁷ *Id.*

⁵⁸ IGBC Green Homes Rating System, Available at https://igbc.in/igbc/html_pdfs/abridged/IGBC%20Green%20Homes%20Rating%20System%20Ver%203.0.pdf, (Last accessed 02nd April 2022)

⁵⁹ Abridged Reference Guide, "LEED- India: Green Building Rating System", Version 1.0, IGBC (January, 2007), Available at: <https://cii.in/PublicationDetail.aspx?enc=Fln6eOg/Xzo1QqBTAvXT6ERxog42FaZa21qvk3iF1KAHnM2sAwFa qVcCc4NkObrIV1cNKi8O70pv7zR3sRK/9nLU1j80Rswwa6JOAgoVDKDYDsSYMhCoBnTN/kDAw8eidaOTo9T54xCyUb8aqygE7YrpBJIR9mG5vKM1VT69ywKjpK0hVsZHIsqVJOpjDeJb>, (accessed at 2 April 2022)

Furthermore, rating systems like GRIHA have lately collaborated with numerous cities in the states like Gujarat, Himachal Pradesh, Punjab, West Bengal and Maharashtra; for incentivizing the inclusion of urban local bodies in the process. Another challenge which comes meanwhile is the inconsistency in these rating systems and their markings. There is no uniform code of marking for the ratings provided by different bodies. There arises a dire need to keep a check over policy implementation and mandating these rating systems in numerous states, check over the ground level implementation of the ratings in the states which have already adopted them, creation of uniform rating code for all the ratings and check the role of urban local bodies since the inclusion of their part in the building bye laws.

Apart from urban local bodies, it becomes necessary for the appropriate governments to coordinate with rating mechanisms and bring into picture the role of Panchayats right from the construction, regulation and functioning of built structures in the respective regions. United Nations Development Programme suggests for Panchayats to promote energy efficient building designs, energy conservation cooking devices and habits and adoption of energy conservation measures for its Sustainable Development Goal number 7, i.e. 'Ensure access to affordable, reliable, sustainable and modern energy for all'. Indian Green Buildings Council even provides for 'IGBC Green Village Rating System' which evaluates the performance of a village based on its lifestyle, drinking water, sanitation, education, healthcare, solid waste management, clean energy, local initiative and digital village initiative. However, the rating is not much relevant to the energy efficiency in built structures.

A set of homogenous parameters, backed by appropriate government authority mandating the performance and testing of such built structures keeping into consideration the urban growth, environmental clearance and the conditions of the Indian sub-continent holds primary importance. It is necessary that authorities at the Centre level, in nexus with the governments and authorities at lower levels create a homogenous yet specific set of rating mechanism, each for commercial and residential built structure.