

People's Participation in Local Sustainable Development: Comparative Insights from India and Global Case Studies

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Abstract

This study examines the opportunities arising from people's participation in local sustainable development, comparing Indian urban neighborhoods and global examples. It questions how the behaviors of participants bear on the success of Sustainable Development Indicators (SDIs) criteria in two Indian green rating systems, namely the, IGBC-Green Rating System (IGBC-GRS) and GRIHA-LD, using mixed-method analysis. This study employed primary data from virtual survey through website analysis and secondary data from 8 IGBC certified residential societies in the study area, studying participatory engagement within waste management, water use, energy use conservation, transportation and social sustainability. The results showed that people have a higher degree of public engagement within the dimensions that were mostly visible and executable (waste segregation and water conservation), as opposed to the dimension that required a degree of technical or institutional amendments (energy systems and transport planning). The research provides an international comparison, which found that engagement impacted outcomes in all cases, and that ownership and feedback of behaviors improved sustainability outcomes. The study proposes a Participatory Assessment Framework for Urban Neighborhoods in India (PA-SAFUNI), a scalable assessment tool to evaluate and potentially improve participatory integration into urban sustainability frameworks. The study concludes that participatory community-led activities are pivotal to sustainable urban development frameworks and are thus paramount to create sustainable, effective and inclusive frameworks that influence sustainable urban development.

Keywords: Sustainable Development Indicators (SDIs), urban neighborhoods, GRIHA-LD, IGBC Green Societies, participatory planning, citizen engagement, Sustainable Assessment Tools (SATs).

INTRODUCTION

With rapid population increase, migration, and infrastructure expansion, India is experiencing a substantial urban transformation phase that has resulted in issues like socio-spatial inequity and environmental degradation [1]. Sustainable urban development has thereby emerged as a crucial area of concentration for tackling these problems. Sustainability assessment tools for developments have emerged as standards for environmental performance, encompassing a range of indicators that cover nearly all aspects of urban planning, design, and operation [2]. Neighborhoods, the building blocks of urban environments [3], present themselves as crucial units for integrating sustainability principles into everyday life. But while local involvement is acknowledged as a key factor in sustainable development, there is still a significant lack of integration of participatory procedures in sustainability assessment tools [4]. Globally, tools such as LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method), and GRIHA (Green Rating for Integrated Habitat Assessment) have gained ground since the 1990s, and today there are nearly over 100 rating systems for urban development, with countries adapting indicators with slight variations as per local context [5]. In India, frameworks such as the Indian Green Building Council (IGBC), established in 2001 (Indian Green Building Council, n.d.), and the Green Rating for Integrated Habitat Assessment – Large Developments (GRIHA-LD), launched in 2007 [5], were created to promote sustainable building practices and assess the environmental performance of buildings and developments. However, despite these well-meaning initiatives and their positive impacts on small to medium developments, they still overlook the critical importance of citizen participation [6]. This research argues that for sustainable urban development to

become mainstream and effectively integrated into standard practices, it is essential for the guiding tools and their indicators to incorporate participatory aspects in a more comprehensive manner.

To begin with this initial study aims to evaluate sustainable development programs in India and assess the caliber of engagement among residents of India's green-rated residential communities through a combination of secondary studies and one primary pilot study. It looks at how participatory elements are incorporated into current neighborhood rating systems and determines which Sustainable Development Indicators (SDIs) are most affected by local engagement. It also aims to identify areas of participation that are already being achieved, and those that can be easily incorporated, as well as those where some work may be red. By tackling these goals, the study seeks to advance the conversation on sustainable urban governance by filling in knowledge gaps about people participation, improving sustainability frameworks, and educating urban planners and politicians on successful community engagement tactics.

LITERATURE REVIEW

The necessity to address social and environmental deterioration as well as economic challenges in increasingly urbanizing situations has propelled the idea of sustainable urban development in recent decades. Research suggests that the failure to engage local people fully has been a major barrier to implementing the UN Sustainable Development Goals. According to scholars, sustainable development requires active people participation and is not merely a technological problem [7]. This principle is particularly evident in the context of SDG 11 (Sustainable Cities and Communities), which emphasizes the importance of inclusive and resilient urban environments. Achieving this goal necessitates the active involvement of communities in urban planning and decision-making processes, ensuring that development reflects local needs and priorities [8]. Additionally, SDG 12 (Responsible Consumption and Production) aims to ensure sustainable consumption and production patterns, recognizing that efficient resource use and sustainable practices are vital for reducing environmental impact and promoting economic growth [9]. This goal emphasizes the need to minimize waste generation and improve resource efficiency across various sectors, including food, energy, and materials. By promoting responsible consumption, SDG 12 encourages individuals, businesses, and governments to adopt practices that reduce ecological footprints, enhance sustainability, and foster innovation in resource management [10]. Furthermore, SDG 17 (Partnerships for the Goals) highlights the critical role of collaboration among various stakeholders—governments, civil society, and the private sector—in mobilizing resources and fostering innovation [11]. By building strong partnerships and encouraging community engagement, these three goals underscore that meaningful participation is essential for creating sustainable urban solutions and responsible resource use. Together, they illustrate that effective sustainability initiatives are rooted in local ownership, collaborative efforts, and responsible practices, ultimately leading to more equitable and sustainable development outcomes for future generations.

The role of participatory mechanisms in sustainability assessment frameworks has been extensively explored in the literature. According to [12,18], effective involvement of local residents can lead to improved environmental outcomes and more resilient communities. Pretty [13] emphasizes the positive correlation between effective sustainability practices and community engagement, noting that participatory approaches enhance local knowledge and empower residents to take ownership of sustainability initiatives.

Despite these findings, there remains significant scope for understanding how to effectively operationalize participatory features within existing sustainability assessment tools. However, critiques highlight their insufficient focus on citizen participation [14]. Existing research indicates that while these frameworks provide valuable environmental standards, they often neglect the social dimensions of sustainability, particularly the active engagement of local communities in decision-making processes.

Moreover, the study integrates and evaluates participation through behavioral indicators, such as active involvement, awareness campaigns, and feedback mechanisms. To compare levels of involvement across different instances and domains, descriptive statistics—including mean scores and rankings—were utilized. Thematic coding has been used to create new insights drawn from an array of sources leading to an organized amalgamation of multi-source data. The participatory governance structure is Local Agenda 21 [12]. Moreover, the literature has been critical in recognizing that sustainability frameworks are limited

in regards to describing the socio-behavioral aspects of urban sustainability. Scholars and researchers advocate more research on contributors to assist piloting participatory orientation metrics for future urban sustainability assessment frameworks to promote inclusivity and stakeholder participation in the evaluation of policies.

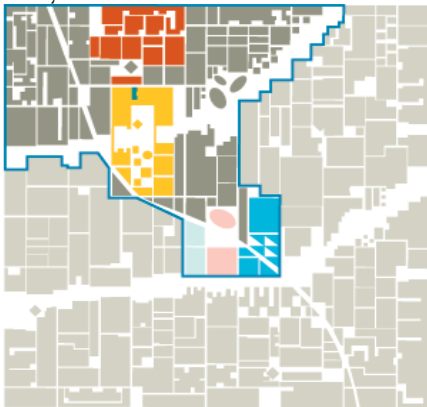
In order to encourage more inclusive governance and improve the overall efficacy of urban sustainability efforts, this literature review emphasizes the importance of including participatory methods into sustainability assessments. The study intends to add to the growing conversation on sustainable urban development and the importance of people's participation.

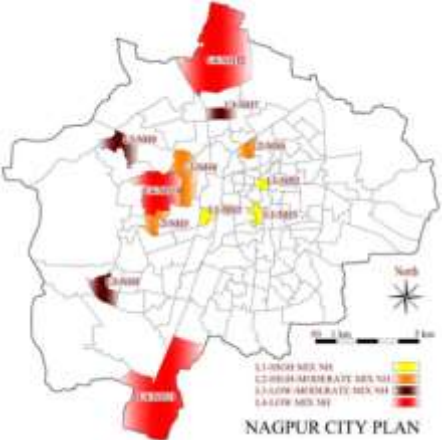
The following Table 1 compiles case-based evidence from global and Indian contexts, highlighting how community behavior, perception, and participation influence sustainability outcomes across various urban development frameworks.

TABLE-1: Literature Review of National and International Case Studies on People-Centered Sustainability Practices [25]-[34]

Sr. No.	Synthesis of Global Best Practices	Findings
1	BIOSZENTENDRÁS (HUNGARY) SUSTAINABLE LIFESTYLES POLICY AND PRACTICE. [25] Report Author(s): Lewis Akenji, Simon Gilby, Caixia Mao, Ryu Koide and Atsushi Watabe, Institute for Global Environmental Strategies (2019)	Sustainable lifestyles approaches (ENERGY CONSUMPTION) like: Constraints of the lifestyle consumption domains-oriented methodology. Aimed at boosting self-sufficiency. Participants collaboratively cultivate plants, manufacture vegetable-based food and artisanal items, while acquiring knowledge in organic gardening and healthy meal preparation.
2	“HUMAN BEHAVIOR AND SUSTAINABILITY [26] Joern Fischer, Robert Dyball, Ioan Fazey, Catherine Gross, Stephen Dovers, Paul R Ehrlich, Robert J Brulle, Carleton Christensen, and Richard J Borden, Front Ecol Environ 2012; doi:10.1890/110079”	Normative feedback and social comparison approaches (ENERGY CONSERVATION): 0-power discloses the customer's energy use, provides descriptive insights into energy usage in their vicinity, and offers pragmatic recommendations for further reducing energy expenditure. This straightforward method, using social comparison and acceptance, has resulted in 80% of customers decreasing their power use, with sustained average reductions in energy use ranging from 1.5% to 3.5.
3	“THE DEBATE OVER NEIGHBORHOOD DENSITY IN DUBAI: BETWEEN THEORY AND PRACTICALITY [27] (by Khaled Alawadi and Ouafa Benkraouda)”	In context with LEED-ND & UN-Habitat strategies: (SITE-PLANNING AND BEHAVIOUR) This study examines and contrasts the perspectives of experts, people, and government officials about the viability of adopting compact designs in the development of Dubai neighborhoods. Findings indicate that while professionals and policymakers recognise the benefits of density, the inhabitants of Dubai see it as a hazard to their economic and social standing. Participation is hindered by cultural factors.
4	SAVING ENERGY BY BEHAVIORAL CHANGES by Colton Kester, William	Sustainable lifestyles approaches (ENERGY CONSERVATION):

	James, Steven Gerber (Kansas State University). [28]	Research indicates that behavioural modifications may be more effective for energy conservation than expensive infrastructural alterations. The findings indicate that around 50% savings may be achieved via heightened customer awareness. Encouraging inhabitants to either reduce their consumption of these items or transition to Energy Star equipment would facilitate cost savings for individuals. The potential for savings via appliance switching underscores the need of fostering individual understanding.
5	BedZED - the UK's first major zero-carbon community [29] https://www.bioregional.com/projects-and-services/case-studies/bedzed-the-uks-first-large-scale-eco-village https://youtu.be/FWhQVGZPFZI 	The landmark BedZED hamlet in South London serves as a global exemplar for zero-carbon dwellings, characterised by significant energy savings, reduced utility expenses, enough green space, a welcoming community, and sustained above-market property values. BedZED (Beddington Zero Energy Development) is the biggest sustainability-focused, mixed-use community in the UK. Constructed in Sutton, London, in 2002. The BedZED community in Surrey, UK, demonstrated that implementing a carbon-neutral toolkit and modifying members' behaviour resulted in "sustainable lifestyle strategies [being] a very cost-effective way to reduce impacts compared to expensive infrastructure" (Hodge & Haltrecht, 2009, p. 6). It is essential to motivate the community living in these sustainable areas to adopt sustainable actions and behaviours to enhance overall sustainability.
6	SUSTAINABLE COMMUNITY DEVELOPMENT - IMPACT OF RESIDENTS' BEHAVIOUR ON TOTAL SUSTAINABILITY OF A SUSTAINABLE COMMUNITY (A thesis submitted by Volker Patrick Seidel, School of Environment and Sustainability). April 2013 © Volker Patrick Seidel, 2013. [30] This research explores the question: "How does decision making behaviour by the residents of a planned sustainable community influence environmental performance?" The main objectives of the research are: 1. To determine the extent to which inhabitants are affected by the incentives	The University is the sustainable community located on Burnaby Mountain next to Simon Fraser University. This study examined the impact of individual resident activity on the overall ecological footprint of the sustainable community and the ways in which planners might affect this behaviour. Five Level Framework: A general framework for planning and decision-making in complex systems using five independent, non-overlapping levels:

	established by planners to promote more sustainable conduct. 2. To determine the degree to which people's activity contributes to or undermines community sustainability. 3. To determine the indicators used to evaluate the community's overall sustainability, if any exist.	 Framework for Strategic Sustainable Development. (Robèrt et al 2002; Robèrt 2000; Holmberg and Robèrt 2000)
7	MASDAR CITY: The World's First Zero-carbon City [31] https://masdarcity.ae/ Located to the southeast of Abu Dhabi Island around 17km from downtown Abu Dhabi Total site area = 590 hectares Total populations = 40,000 residents Land use = Mixed land use (residential, commercial, institutional and lightweight industry) The Foster and Partners architectural company of Britain is responsible for the city's design. Starting in 2006, the project aimed to finish the first phase by 2009, however the global financial crisis caused a delay until 2015.  Master-plan	Solar power and other renewable energy sources provide all of Masdar City's electricity. A total of 87,777 solar panels spread over a 54-acre field and rooftop installations across the city contribute to this goal. Amazingly, the city will supposedly save 50% in electricity and resources since there will be no electric switches or water taps; instead, motion sensors will take care of these things. The lead architect, Gerard Evenden said, "When we started this project, nobody had really looked at doing projects of this scale. Masdar City is a planned Zero-Carbon city project in Abu Dhabi, UAE. It is being constructed by Masdar (by Mubadala Development Company). In order to ensure that the proposed development is compatible with the society's lifestyle and to support the local residents' acceptance of living in the city, it is proposed to hold meetings with them to give them a chance to voice their needs and discuss profitable activities that appeal to them. Many obstacles, such as getting people to want to and be able to take part in conversations about sustainability, are likely to stand in the way of local community involvement. The local population may be educated and made more aware of the advantages that come from implementing sustainability principles, as well as the underlying principles of these ideas, and this will help them overcome these challenges. That way, they may contribute meaningfully to group conversations.

8	Nordic Youth As Sustainable Changemakers: In the transition to sustainable consumption and production [32] Published in 2019 by Nordic Council of Ministers This study examines the relationship between Sustainable Consumption and Production (SDG12) and the 13–30 age group in the Nordic nations. In this study, we looked at how young people feel about sustainable consumption and lifestyles, as well as what drives them, what inspires them, what they do, what they advocate, and what they want. .	The Sustainable Lifestyles Accelerator (SLA) (suslife.info): The project “The Sustainable Lifestyles Accelerator – Catalyzing Change (ACCELERATOR)” mobilizes more than 70000 private households in seven countries to analyse their material and carbon footprints, and to plan and implement footprint reductions by behavioural change. Based on experiences from Finland, we assume a footprint reduction potential of at least 25 % per participating household and a very high potential for scaling up these environmental effects. To guide and support such a transition, the ACCELERATOR will provide online and offline tools (and their combination) for footprint calculation, individual road mapping and experimenting, and sharing experiences for upscaling.
9	ASSESSING SUSTAINABILITY OF MIXED USE NEIGHBOURHOODS THROUGH RESIDENTS’ TRAVEL BEHAVIOUR AND PERCEPTION: THE CASE OF NAGPUR, INDIA. (ISSN 2071-1050, [33] www.mdpi.com/journal/sustainability)  NAGPUR CITY PLAN	In context with LEED-ND & UN-Habitat sustainable strategies: (SITE-PLANNING AND BEHAVIOUR) The sustainability indicators are used to illustrate the travel habit and perception of residents in mixed-use communities. The perception indicator looks at how inhabitants feel, how secure it is, how satisfied they are, and how much money they spend on travel, while the travel behaviour indicator looks at things like commute distance, transportation mode, car ownership, and travel expenditures. Neighborhoods with a moderate to high land-use mix are more likely to have sustainable travel habits, according to the research. According to the residents' perception sustainability index, communities with a moderate mix of land uses are better for the environment than neighborhoods with a high or low mix of land uses.
10	“Online Discussion on behaviour change: The Policy Learning Platform arranged an online discussion with thirteen partners from the CLEAN, EMPOWER, ENERSELVES, FINERPOL, LOCARBO, MOLOC, REBUS, and ZERO CO₂ projects on 5 December 2018 to discuss the challenges of behaviour change”. [34] The European Academy of Bolzano, which is involved in the SINFONIA smart cities project under Horizon 2020, also joined the conversation.	Community projects are seen as particularly successful instruments for behaviour modification, since they engage groups of individuals who are already acquainted, fostering commitments and cultivating trust. - Community projects provide oversight and feedback among members, including a competitive element. - Collaborative endeavours may inspire people to fulfil their group commitments and not disappoint the team. - A Public commitments to reduce energy use, made as part of community projects rather than informally, tend to be more

	The discussion went onto the topic of community initiatives, and highlighted a number of successful community initiatives from around Europe.	durable than private ones owing to the influence of peer pressure. Recommendations: • Supporting behaviour change requires measuring energy consumption and providing regular feedback. Users should maintain a positive tone and be specific about the kind and frequency of feedback they provide. • Interventions should use a combination of strategies from the various alternatives, including training, awareness enhancement, optimal choice architecture, and community engagement.
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Table 1 highlights the urgent need for more people's involvement in sustainable practices and identifies important gaps in existing frameworks, especially in the Indian context. Although international case studies show how local engagement can be successfully integrated, India's lack of formalized participatory procedures hinders effective implementation. To create more inclusive sustainability plans that take advantage of people's perspectives and promote increased environmental accountability, these gaps must be filled.

MATERIALS AND METHODOLOGY

This study employs a mixed-method approach to examine how citizen participation contributes to sustainable neighborhood development, specifically within the frameworks of the Indian Green Building Council for Green Residential Societies (IGBC-GRS) and GRIHA-LD (Green Rating for Integrated Habitat Assessment – Large Developments). The methodology integrates qualitative case study reviews, survey-based perception analysis, and a formal evaluation model to assess participatory engagement across key sustainability domains.

A comparative case study analysis was conducted on eight IGBC-certified green residential societies located in various regions of India. These societies were selected based on data accessibility, representativeness of modern green practices, and their certification tier (Gold/Platinum). Secondary data sources included IGBC documentation and developer reports gathered from the official website.

The assessment focused on six Sustainable Development Indicators (SDIs): Solid Waste Management, Water Management, Energy Conservation, Green Facility Operations, Resident Health and Well-being, and Exceptional Green Practices. These indicators were evaluated to understand their role in enhancing sustainability within the selected case studies.

Green building ratings encompass a variety of sustainable practices and solutions aimed at reducing environmental impacts. The holistic methodology of green building design takes into account the life cycle effects of the used materials. The techniques used in IGBC for Green Residential Societies closely correspond with the chosen SDIs. By prioritising site design, energy efficiency, water management, waste management, transportation solutions, socio-economic participation, and creative viability, these communities foster sustainability while improving the quality of life for its inhabitants. Engaging the community in these efforts further strengthens the impact, fostering a culture of sustainability and resilience.

Standardized Measurement: The Likert scale, ranging from 1 to 5, evaluates participation levels:

- 1 = Poor: Very Low Participation-No engagement.
- 2 = Fair: Low Participation- Minimal involvement.
- 3 = Good: Moderate Participation-Some involvement.
- 4 = Very Good: High Participation-Active involvement.
- 5 = Excellent: Very High Participation- Full control.

Linking to Arnstein's Ladder: By assigning Likert scores to case study initiatives, we can correlate these scores with the levels of participation outlined in Arnstein's Ladder:

TABLE 2: Adapted Arnstein's Ladder of Citizen Participation [16], proposed Weighted Scoring Model (WSM) participatory dimensions based scores as per Likert scale.

Sr. No.	SDI's Implementation Score	Participation Score	Rung	Degree of Citizen Power	Proposed Participatory Levels
1.	Excellent	5	Citizen Control	Degree of Citizen Power	High Participation
2.	Very Good	4	Delegated Power		
3.	Very Good	4	Partnership		
4.	Good	3	Placation	Degree of Tokenism	Medium Participation
5.	Good	3	Consulting		
6.	Fair	2	Informing		
7.	Poor	1	Therapy	Non-participation	Low Participation
8.	Poor	1	Manipulation		

3.1 CASE STUDIES: IGBC Certified Green Residential Societies Projects (2021) Brief Description of Selection Criteria: In order to comprehend the participatory aspects of sustainable development within India's urban residential sector, a total of eight IGBC-certified Green Residential Societies were chosen for an in-depth case study. The selection of these projects was based on the following criteria: • IGBC Certification: Only those societies that achieved Gold or Platinum ratings under the IGBC Green Residential Societies (GRS) framework were considered. • Geographic Diversity: Societies from both metropolitan areas (such as Mumbai and Surat) and smaller cities (like Patna and Guwahati) were included to ensure a broad geographic representation. • Availability of Data: Projects were selected based on the presence of comprehensive project documentation accessible through official IGBC channels or reports provided by developers. • Diversity in Project Characteristics: Preference was given to projects that exhibited unique green features, resident-led initiatives, and sustainability performance across six essential Sustainable Development Indicators (SDIs).

Table 3: IGBC for Green Residential Societies: Checklist of Sustainable Development Indicators (SDIs) and highlighted participatory aspects based Indicators [2]

Category	Credits/ Indicators
Green Facilities, Operation & Maintenance	- FOM Credit 1.1 Basic Amenities - FOM Credit 1.2 Green Parking Facilities - FOM Credit 1.3 Covered External Lighting Fixtures - FOM Credit 1.4 Minimize Heat gain through Roof - FOM Credit 1.5 Vegetation on site - FOM Credit 2.1 Annual Maintenance Contract - FOM Credit 2.2 Measurement & Monitoring - FOM Credit 2.3 Use of Green Products - FOM Credit 3 Green Education for occupants
Water Management	- WM Mandatory Requirement Rainwater Harvesting - WM Credit 1 Water Metering - WM Credit 2 Per capita water consumption (LPD) - WM Credit 3 Water Efficient Fixtures - WM Credit 4 On-site STP - WM Credit 5 Reuse of Treated Wastewater - WM Credit 6 Enhanced Rainwater Harvesting
Energy Conservation	- EC Mandatory Requirement HCFC Free Appliances - EC Credit 1 Efficient Lighting Fixtures - EC Credit 2 Energy efficient equipment in common areas - EC Credit 3 Renewable power for Common Area Lighting - EC Credit 4 Alternate Water Heating Systems - EC Credit 5 Energy Monitoring Systems

Waste Management	- WM Mandatory Requirement Waste Segregation - WM Credit 1 Wet Waste Management: Treatment and Reuse - WM Credit 2 Dry waste Management
Resident Health & Wellbeing	- RHW Mandatory Requirement No smoking policy in common areas - RHW Credit 1 Daylighting in common areas - RHW Credit 2 Design for Differently Abled - RHW Credit 3 Facilities for Health & Wellbeing
Exceptional Green Practices	- EGP Credit 1.1 - 1.2 Exemplary Performance - EGP Credit 2.1 - 2.2 Innovative Practices - EGP Credit 3 IGBC Accredited Professional

Table 3 outlines the IGBC-GRS rating system's SDIs and their respective indicators or credits. These categories highlight not only technological measures (e.g., energy meters, solar lighting) but also participatory opportunities (e.g., community-led green education, health facilities, and waste segregation initiatives).

Key SDI Categories:

Green Facilities Operation & Maintenance

Water Management

Energy Conservation

Waste Management

Resident Health & Well-being

Exceptional Green Practices

Each category consists of several credits (e.g., "FOM Credit 1.3: Covered External Lighting Fixtures" or "WM Credit 5: Reuse of Treated Wastewater") that assess a project's commitment to sustainability and its scope for community engagement.

Table 4: Case Studies of IGBC for 'Green Residential Societies (GRS)' [14], [35].

S.No.	Case Studies (IGBC-Green Residential Societies)	Key Green Features:	Weighted Scores (1/6 = 0.167) as per 6 Sustainable Development Indicators (SDIs)
1.	IGBC Green Residential Societies Platinum Name: Divya Jyoti Trust Location: Surat	80% of the roof and non-roof runoff harvested through on-site rainwater harvesting tank Treatment of total wastewater generated through the DEWATS system 15kWp solar panels to meet the total power requirement Organic waste management through biogas plant	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $5 \times 0.167 = 0.835$ Energy Conservation: $3 \times 0.167 = 0.501$ Resident Health & Wellbeing: $1 \times 0.167 = 0.167$ Green Facility Management: $3 \times 0.167 = 0.501$ Exceptional Green Practices: $1 \times 0.167 = 0.167$ Total Weighted Score = 3.006
2.	IGBC Green Residential Societies Gold Name: Godrej Sahakar Nagar 2 Location: Mumbai	30% of vegetation is designed in combination on the ground and roof to mitigate the heat island effect Harvested 100% of roof and non-roof	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $5 \times 0.167 = 0.835$ Energy Conservation: $4 \times 0.167 = 0.668$ Resident Health & Wellbeing: $3 \times 0.167 = 0.501$

		runoff through on-site rainwater harvesting tank Low flow fixtures installed in all flats and common area washrooms 100% LED lighting fixtures in all interior common areas and landscaped areas.	Green Facility Management: $4 \times 0.167 = 0.668$ Exceptional Green Practices: $1 \times 0.167 = 0.167$ Total Weighted Score = 3.502
3.	IGBC Green Residential Societies Platinum Name: Gold Finch Location: Mumbai	Green walls, green roofs, terrace gardening, & Rainwater harvesting Ring well. Health and fitness facility for members. Organic waste treatment on-site - OWC machine. LED lighting, lighting controls, 3-star energy efficient electro-mechanical equipment and Electric vehicle charging, and bicycle provision in the common parking area.	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $5 \times 0.167 = 0.835$ Energy Conservation: $5 \times 0.167 = 0.835$ Resident Health & Wellbeing: $5 \times 0.167 = 0.835$ Green Facility Management: $5 \times 0.167 = 0.835$ Exceptional Green Practices: $3 \times 0.167 = 0.501$ Total Weighted Score = 4.002
4.	IGBC Green Residential Societies Platinum Name: Jade Imperial Location: Mumbai	Landscaping on the ground, built structures & terrace gardening. A Natural day-lighting & solar system for common area lighting. Organic waste treatment on-site- OWC machine. Electric vehicle charging station & bicycle parking facility. LED lighting & 3-star energy-efficient electro-mechanical equipment. Rainwater harvesting - Ring well to enhance groundwater table.	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $5 \times 0.167 = 0.835$ Energy Conservation: $4 \times 0.167 = 0.668$ Resident Health & Wellbeing: $4 \times 0.167 = 0.668$ Green Facility Management: $4 \times 0.167 = 0.668$ Exceptional Green Practices: $3 \times 0.167 = 0.501$ Total Weighted Score = 3.835

5.	IGBC Green Residential Societies Gold Name: RBI BRSOQ Location: Bank Road Patna	100% Heat Island Mitigation, Roof 35% Water Demand Reduction No Night Skylight Pollution 100% Waste Segregation & Management More Than 20% EV Charging Facility	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $4 \times 0.167 = 0.668$ Energy Conservation: $3 \times 0.167 = 0.501$ Resident Health & Wellbeing: $3 \times 0.167 = 0.501$ Green Facility Management: $4 \times 0.167 = 0.668$ Exceptional Green Practices: $1 \times 0.167 = 0.167$ Total Weighted Score = 3.002
6.	IGBC Green Residential Societies Gold Name: RBI KSQ Location: KURJI ROAD, PATNA	RE generation to cater 100% Common Area Lighting 35% Water Demand Reduction Greater than 30% Landscape Area 100% Heat Island Mitigation, Roof No Night Skylight Pollution	Waste Management: $4 \times 0.167 = 0.668$ Water Management: $4 \times 0.167 = 0.668$ Energy Conservation: $5 \times 0.167 = 0.835$ Resident Health & Wellbeing: $3 \times 0.167 = 0.501$ Green Facility Management: $4 \times 0.167 = 0.668$ Exceptional Green Practices: $3 \times 0.167 = 0.501$ Total Weighted Score = 3.841
7.	IGBC Green Residential Societies Platinum Name: RBI Officers Quarter Location: Dhanastra (Mumbai)	Installation of 10 kW capacity of Solar PV modules. Daylight sensor in the common area. Organic Waste conservator (OWC) is 50kg/Day. LED light is used with 100% efficiently Rainwater collection & reuse is 17% of total storm water.	Waste Management: $4 \times 0.167 = 0.668$ Water Management: $3 \times 0.167 = 0.501$ Energy Conservation: $4 \times 0.167 = 0.668$ Resident Health & Wellbeing: $3 \times 0.167 = 0.501$ Green Facility Management: $4 \times 0.167 = 0.668$ Exceptional Green Practices: $3 \times 0.167 = 0.501$ Total Weighted Score = 3.507

8.	IGBC Green Residential Societies Platinum Name: RBI Officer's Quarters Location: Guwahati	100% Street and common area lighting catered by solar PV 100% organic waste treated by organic waste converter Energy-efficient LED lights for all interior and exterior areas Rooftop rainwater harvesting Low-flow water fixtures Installed energy and water meters.	Waste Management: $5 \times 0.167 = 0.835$ Water Management: $5 \times 0.167 = 0.835$ Energy Conservation: $5 \times 0.167 = 0.835$ Resident Health & Wellbeing: $4 \times 0.167 = 0.668$ Green Facility Management: $5 \times 0.167 = 0.835$ Exceptional Green Practices: $3 \times 0.167 = 0.501$ Total Weighted Score = 4.309
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Scoring System for IGBC-Green Residential Societies

The scoring system for the IGBC-Green Residential Societies is based on a scale of 1 to 5, where each score corresponds to the effectiveness and implementation of specific green features against the Sustainable Development Indicators (SDIs).

TABLE 5: People's Participation as per Proposed Scores in likert scale in table-2 (refer table 2,3 and 4) for the six 'Sustainable Development Indicators (SDIs)' in IGBC for Green Residential Societies.

S.No.	IGBC GRS Case Study	Total Weighted Score (Approx.)	SDI's Implementation Score	Proposed Participatory levels
1.	Divya Jyoti Trust, Surat	$3.006 \approx 3$	Good	Medium
2.	Godrej Sahakar Nagar 2, Mumbai	$3.502 \approx 3.5$	Good	Medium
3.	Gold Finch, Mumbai	$4.002 \approx 4$	Very Good	High
4.	Jade Imperial, Mumbai	$3.835 \approx 3.8$	Good	Medium
5.	RBI BRSOQ, Patna	$3.002 \approx 3$	Good	Medium
6.	RBI KSQ, Patna	$3.841 \approx 3.8$	Good	Medium
7.	RBI Officers' Quarter, Mumbai	$3.507 \approx 3.5$	Good	Medium
8.	RBI Officers' Quarter, Guwahati	$4.309 \approx 4$	Very Good	High

Table 5 shows the analysis of participation of people in 6 Sustainable Development Indicators (SDIs) through a scoring system based on a Likert scale, as detailed in Tables 2, 3, and 4, across eight IGBC Green Residential Societies. The total weighted score of the case studies ranged approximately from 3.0 to 4.3 including average community engagement in sustainability. Societies that scored between 3.0 and 3.9, such as Divya Jyoti Trust and RBI Patna, showed the societies were at a Good level of SDI implementation with a Medium level of participation from its residents. On the other hand, societies that scored 4.0 or better, such as Gold Finch and RBI Guwahati, showed the societies were at a Very Good level of SDI implementation with a High level of participation. The scores ultimately were calculated by averaging responses across SDIs and being weighted by importance using a Likert scale based on resident opinions and comments. The report also highlighted the relationship between participatory engagement and effective sustainability achievement.

Table 6: Participatory Sustainability Assessment Across IGBC Case Studies

Case Study	Waste Management	Water Management	Energy Conservation	Resident Health & Wellbeing	Green Facility Mgmt.	Exceptional Green Practices
Divya Jyoti Trust, Surat	High	High	Medium	Low	Medium	Low
Godrej Sahakar Nagar 2, Mumbai	Medium	High	High	Medium	Medium	Medium
Gold Finch, Mumbai	High	High	High	Medium	Medium	High
Jade Imperial, Mumbai	High	Medium	High	Medium	Medium	Medium
RBI BRSOQ, Patna	High	High	High	Low	Medium	Low
RBI KSQ, Patna	High	High	High	Low	Medium	Medium
RBI Officers Quarter, Mumbai	High	High	High	Medium	Medium	Medium
RBI Officers Quarter, Guwahati	High	High	High	Medium	Medium	Medium

The grading of each case study contained in this table was conducted using a qualitative evaluation framework based on six Sustainable Development Indicators (SDIs)—Waste Management, Resident Health & Wellbeing, Green Facility Management, and, Excellent Green Practices. Grading was based on qualitative terms— (High (H), Medium (M), and Low (L)) to identify the level of sustainability performance. Ratings were probably based on assessed evidence with respect to on-ground practices, document reviews, site inspections, and stakeholders, and aligned with IGBC (Indian Green Building Council) protocols. A High rating would suggest that there are written evidence and visible demonstrated practices, while Medium indicates some degree of compliance or practice that is completed partially, while Low would indicate little or no result as very little happens. The evaluative aspect of this approach is to compare the degree of sustainability that different societies are adopting and the level of practice across these dimensions of environment and wellbeing.

Insights from Case Studies, (Refer Table-4, 5 and 6)

Several case studies illustrate the application of the six SDIs in promoting sustainability within urban neighborhoods:

Green Facility Operation and Management: Implementing smart energy meters and solar-powered street lighting demonstrates effective management practices. Residents contribute to energy reduction efforts by using energy-efficient appliances.

Water Management: The installation of low-flow fixtures and rainwater harvesting systems is complemented by people participation in conservation and responsible water use, highlighting the collaborative approach to water sustainability.

Energy Conservation: The promotion of energy-efficient appliances, along with people involvement in maintaining solar energy systems, underscores the importance of people participation in energy conservation initiatives.

Waste Management: Active efforts in reducing plastic consumption, supporting recycling activities, and implementing thorough waste segregation and on-site composting reflect the community's commitment to effective waste management.

Resident Health and Wellbeing: Facilities such as exercise centers, secure lighting, and safety systems, along with people participation in wellness initiatives, contribute significantly to the health and wellbeing of residents.

Exceptional Green Practices: Homeowners engage in maintaining green areas, practicing terrace gardening, and participating in biodiversity conservation, which are essential for reducing the urban heat island effect and fostering ecological awareness.

The results from the grading analysis show, however, distinct variations in community involvement with respect to the different sustainability indicators to support the central importance of people's involvement in fostering equitable cases of ecologically sustainable urban living. Higher participation rates in waste management and, to some degree, water use, show that residents are willing, ready, and able to contribute to a sustainability initiative when the program is visible, manageable, or easy and interconnected with their daily activities. Campus sustainability programs cultivate collective responsibility and ownership that allow sustainability initiatives to be a richer and more meaningful experience. Lower rates of participation related to energy use, transport behaviour, and green facility management highlight issues surrounding people's awareness and accessibility, or institutional gaps, which cannot be filled without further educational and infrastructure considerations.

The study highlights the potential for behavior-based strategies, beyond simple technical fixes, to focus on changing social norms and habits within residential communities. Providing feedback loops by developing community-ownership platforms and using participatory governance can develop an environment that encourages residents to be co-designers (owners) of their sustainability efforts, rather than followers of someone else's top-down interventions. Enabling dialogue, peer-learning, and resident-led innovations can help instill a culture of environmental stewardship at the local neighborhood level. Ultimately, sustainable urban living is best rooted in a well-informed, empowered, and participatory community that engages in the planning, implementation, and monitoring of green initiatives.

3.2 A VIRTUAL SURVEY: People's Participation in GRIHA-LD Framework

The virtual survey by approximately 120 architecture students assessed resident engagement with GRIHA-LD sustainability themes across urban neighborhoods.

"Sustainable development is increasingly understood as a multidimensional process that involves behavioral change, technological innovation, and institutional reform [18]."

The following Table 7 presents key findings from a virtual survey on six thematic parameters under GRIHA-LD, illustrating the role of people's participation across institutional, technological, and behavioral aspects of sustainable development in urban neighborhoods.

TABLE-7: Virtual Survey-Based Analysis of the GRIHA-LD Framework for Local-Level (Urban Neighbourhood) Sustainability

Sr. No.	THEME: 'GRIHA-LD' Parameters (Institutional Aspects)	SUB-THEME: Sustainable Development criteria (Technological Aspects)	Key Survey Questions (Extracted from Survey Forms)	Role of People's Participation : Findings based on responses/ observations (Behavioural Aspects)
1.	SITE-PLANNING	Storm water management Maintain existing site features	Q. Is there a problem with stormwater buildup? Q. Does water	Findings indicate that residents actively engage in maintaining natural drainage

		Manage construction activities in a manner to reduce environmental damage New plantation on site	logging occur seasonally? If so, how often? Q. Does the property have a sewage treatment plant (STP)? Q. What is the process for treating or reusing wastewater? Q. Does society have any initiatives in place to treat and utilize wastewater? Q. How is garbage handled- by dumping or by dry/ wet segregation and collection? Q. Does the community have CCTV and a boundary wall? Q. Are they kept up? Q. Are there enough parks or gathering places to encourage social interaction? Q. Is there access for bicycles or pedestrians?	channels and support initiatives for rainwater collection and recycled water use. Their responses reflect a commitment to responsible waste disposal practices. Suggestions: In order to prevent waterlogging and health risks, residents should be made aware that disposing of waste in open drains clogs natural drainage systems. In order to promote water conservation and sustainable site management, residents should also be encouraged to install rainwater harvesting systems and use recycled water for non-potable applications like cleaning and gardening.
2.	ENERGY	Outdoor street and security lighting Smart Mini-Grids Passive urban design Operation and Maintenance	Q. Do you own individual electricity meters? Q. Do you have a generator or an inverter for power backup? Do you know about renewable energy sources? Q. Is your society adopting sustainable energy practices? Q. Do you utilize energy-efficient	The results indicate that residents are talking about energy-efficient activities and expressing their preferences for lighting levels. They take part in energy-saving projects and exhibit knowledge of renewable energy sources.

			gadgets in your home, such as LEDs and rated fans? Q. Are you using or implementing energy-efficient equipment or practices? Q. If so, what kinds of renewable energy systems—such as water heaters, solar panels, and cookers—do you employ?	Suggestions: Through easily accessible platforms, such as written forms, smartphone apps, or digital dashboards, residents should be able to voice their opinions about the appropriateness of lighting levels and be given the authority to recommend changes. Additionally, people need to be made more aware of how automated switching and dimming controls for outdoor lighting work. In order to ensure rapid repairs, improve neighborhood safety, and save energy, residents should be encouraged to report issues to the maintenance crew as soon as they occur.
3.	WATER AND WASTE MANAGEMENT	Quality of water Toilets, urinals, showers, and all faucets in the kitchen and bathrooms should be low-flow models. Set up a reliable mechanism for tracking.	Q. Do you practice any methods to save water? What are they, if any? Q. Is rainwater harvesting something you use? Q. Is greywater being reused in your home? Q. Does the building have	The results demonstrate that locals are interested in rainwater gathering and use water-saving techniques. Their answers demonstrate a proactive approach to water challenges and a group approach

			above tanks or sub-tanks? Q. How frequently is water available? Are people happy? Q. Are there any societal water-saving practices in place, such as reuse and pressure management? Q. Do seasonal shortages occur, and if so, how is society handling them, for example, by using tankers?	to water management. Suggestions: In urban areas, effective water management requires the active participation of residents. To ensure long-term functionality, local focus groups can be established to jointly create plumbing and water treatment system operation and maintenance procedures. Additionally, residents should be informed about smart water metering systems that use less electricity and conserve water by having voice and alarm notifications. CCTV monitoring can also help with behavior tracking and guarantee that the neighborhood follows sensible water consumption guidelines.
4.	SOLID WASTE MANAGEMENT	Handling and treatment of special waste. Segregation and storage of waste on-site. Construction and demolition waste management.	Q. In your home, do you separate dry and wet waste? Q. Does your local area or neighborhood have a place to collect trash? Q. Does your home or	The results show that locals use local resources for trash management and actively engage in waste segregation methods. Their dedication to composting and recycling shows

			neighborhood have a biodegradable composting system installed? Q. Is there a Samiti or NGO that gathers kitchen scraps for biofertilizer or livestock feed? Q. Do you dispose of waste (such as paper, plastic, and e-waste) in recycling facilities?	that they are actively involved in solid waste management programs. Suggestions: Households must actively participate in solid waste management for it to be effective. In order to facilitate appropriate segregation at the source, residents should be instructed on how to properly use color-coded dustbins, which are blue for inorganic garbage, green for organic waste, and black for e-waste. This technique promotes an environmentally conscious culture in addition to increasing the effectiveness of recycling and reuse procedures. Cleaner and more sustainable urban areas can be greatly enhanced by communities equipping individuals with easy-to-implement trash segregation practices.
5.	TRANSPORT	Constructing bike lanes and pedestrian walkways to ensure the safe coexistence of motorised and non-	Q. Which method of transportation—private, shared, or people—do you	The results indicate that locals participate in conversations regarding

		motorized traffic • Organising transportation networks • Providing parking for vehicles and two-wheelers • Operating various forms of public transportation • A system for recharging electric automobiles	prefer for your daily commute? Q. Do you take people transportation, such as buses, rickshaws, or the metro? Q. How do you get to people transportation—by foot, rickshaw, or your own car? Q. Do you utilize shared taxis or carpool? Q. Where do you park your car—in a garage, on the street, or in a community? Q. Is there a push for environmentally friendly modes of transportation, such as riding a bike or using an e-rickshaw? Q. How frequently and how do you commute within the complex?	infrastructure upgrades and indicate a preference for environmentally friendly modes of transportation. Their decisions show an increasing understanding of how transportation affects the environment. Suggestions: Planning for sustainable transportation relies on local residents' informed and active participation. In addition to encouraging residents to use non-motorized modes like walking and bicycling, officials should also teach them to use shared infrastructure like ramp railings with caution. Digital signage that shows emotive feedback (such as happy or sad faces based on vehicle speed) is one example of a behavioral indicator that can successfully encourage safer driving habits. Furthermore, encouraging the use of electric
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				vehicles is a reflection of the community's commitment to clean mobility solutions and reducing emissions.
6.	SOCIAL	Facilities for construction workers On-site food production Development of social infrastructure Planning for populations with low incomes.	Q. Are there enough trash cans in the parks and colony? Is it permitted for vendors to operate within the colony? Q. Do you receive advance notice of proposed community policies? Q. How secure do you think your colony is? Q. Do you believe it is your moral duty to encourage sustainable practices in your society/ neighborhood. Q. Willingness to participate in activist activities, such as joining NGO/ organizations that focus on the environment?	The results show that locals are willing to participate in community events and understand the value of sustainable practices. Their answers point to a sense of accountability for communal areas and welfare. Suggestions: To maintain safety, inclusivity, and order at public meetings, people must abide by the laws and regulations. Understanding and adhering to site-specific signage, such as guidelines for disposing of rubbish in parks or public spaces, is equally crucial. An urban environment that is well-managed, courteous, and focused on the community is fostered by improving civic behavior and signage literacy.

The table presents an overview of how residents' participatory behavior interacts with the institutional and technological structures of the GRIHA-LD (Green Rating for Integrated Habitat Assessment for Large Development) parameters regarding six sustainability issues, which were site planning, energy, water and waste management, solid waste, transport, and social infrastructure. Residents' active participation was found to be a vital link between their planning framework and the planning parameters. For instance, in Site Planning residents were aware of the storm water and waste issues and took initiative to maintain drainage systems and practiced waste segregation. In Water and Waste Management there was evidence of water conservation, and communal approaches to water, such as rainwater harvesting practices that indicated community awareness toward sustainability.

In Energy and Transport categories, behavioral aspects reveal growing awareness and adoption of sustainable practices like using LEDs, solar panels, and shared or non-motorized transportation options. However, these areas also present an opportunity to enhance participation through better technological access and real-time feedback systems, such as smart lighting and behavioral cues in transport zones. In Solid Waste Management, the high level of composting and segregation reflects commendable public engagement, but the call for structured practices suggests a need for more formalized behavioral nudges. Similarly, in the Social theme, community members express responsibility for communal welfare, but recommendations emphasize civic discipline and awareness of site-specific regulations. Overall, the findings highlight that while the infrastructural and technological parameters of sustainable urban living are crucial; their success heavily depends on the depth and consistency of people's participation.

RESULT AND DISCUSSIONS

This study presents a comparative assessment of citizen participation levels across six Sustainable Development Indicators (SDIs) using the frameworks of IGBC-GRS and GRIHA-LD. Table 8 maps each indicator's participatory dimension based on Likert scores and Arnstein's Ladder of Citizen Participation. These scores are based on a Weighted Scoring Model (WSM), which aggregates and normalizes data collected from various case studies and surveys.

Normalization:

To ensure comparability across different categories, the scores may be normalized. This means adjusting the scores to a common scale, often between 1 and 5, based on the highest and lowest scores observed in the data set.

Calculation of Average Scores:

The average score for each SDI category is calculated by summing the individual scores from all case studies and dividing by the number of case studies that contributed data for that SDI.

Table 8: Comparative Participatory Assessment of IGBC-GRS and GRIHA-LD SDIs (refer Table 2)

Sustainable Development Indicator (SDI)	IGBC-GRS Likert Score	IGBC-GRS Citizen Power Level (Arnstein)	IGBC-GRS Participatory Level	GRIHA-LD Likert Score	GRIHA-LD Citizen Power Level (Arnstein)	GRIHA-LD Participatory Level
1. Solid Waste Management	4.0	Delegated Power / Partnership	High Participation	3.8	Consultation / Placation	Medium to High Participation
2. Water/wet waste Management	3.8	Partnership	High Participation	3.5	Consultation	Medium Participation
3. Social/ Resident Health & Well-being	3.7	Placation	Medium Participation	3.4	Consultation / Informing	Medium Participation
4. Energy Conservation	3.6	Consultation / Placation	Medium Participation	3.3	Informing	Low to Medium Participation

5. Site-planning/ Green Facility Operation & Management	3.5	Informing / Consultation	Low to Medium Participation	3.4	Informing / Placation	Medium Participation
6. Exceptional Green Practices (IGBC) /Transportation (GRIHA-LD)	3.3	Therapy / Informing	Low Participation	3.2	Informing / Therapy	Low Participation

The findings reveal that operational domains such as waste and water management demonstrate the highest levels of resident involvement—ranging from consultation to partnership—especially within IGBC-certified societies. In contrast, technically intensive domains like exceptional green practices and transportation reflect low to minimal engagement, often limited to informing or non-participation. Energy conservation and green facility operation also show limited participatory integration despite widespread awareness.

A pilot survey of approximately 120 residents from Indian neighborhoods reinforced these observations, revealing higher behavioral engagement in routine domains like waste segregation and water use, while more systemic areas like energy and transportation lack robust participatory tools.

These trends align with GRIHA's Five Rs of sustainability:

Refuse: Reject unsustainable or foreign models that ignore local context.

Reduce: Minimize reliance on high-energy materials and systems.

Reuse: Adopt traditional and time-tested local solutions.

Recycle: Maximize reuse of site-generated waste.

Reinvent: Customize technologies and participation methods for India's unique urban fabric.

Key Observations:

IGBC-GRS scores consistently higher in behavioral participation than GRIHA-LD.

The energy, transportation, and innovation domains lack effective mechanisms for citizen empowerment.

Behavioral interventions remain underutilized in Indian frameworks.

Community-based feedback loops and visibility platforms are essential yet often missing.

Further, international studies (in Table 1) [23, 25–34] confirm similar dynamics globally. Community-led behavioral interventions in BedZED (UK) [29], Opower (USA) [22], UniverCity (Canada) [30], and the Nordic SLA project [32] highlight the power of feedback, social comparison, and gamified engagement. In contrast, Masdar City (UAE) [31] demonstrates that overreliance on infrastructure and automation without social integration limits long-term sustainability. Likewise, projects in Hungary [25], Dubai [27], Nagpur [33], and EU community initiatives [34] emphasize the crucial role of culture, perception, and behavioral habits in determining sustainability outcomes. [23]

CONCLUSION

Sustainable urban development in India cannot succeed through technical compliance alone. Infrastructure must be complemented by participatory processes to ensure community alignment and ownership. This study concludes that citizen participation is a critical determinant of sustainability performance.

The research supports the adoption of PA-SAFUNI (Participatory Aspects–Sustainable Assessment Framework for Urban Neighbourhoods in India) [15] as a contextual yet scalable framework that integrates behavioral, institutional, and technological dimensions. It embodies the spirit of GRIHA's Five Rs while offering a methodologically robust assessment tool to evaluate community participation.

Furthermore, PA-SAFUNI is globally adaptable and aligns conceptually with UN-PASAT [15], reinforcing its relevance for international replication in the context of SDG localization.

RECOMMENDATIONS

Revise NSA Tools to Institutionalize Participation: IGBC-GRS and GRIHA-LD should embed structured, measurable criteria for community involvement, especially in domains where participation is weakest [2, 5, 15].

Adopt Behaviorally Informed Design Principles: Draw from proven international strategies (e.g., Opower, BedZED, SLA) to implement real-time feedback, normative comparisons, and gamification into rating systems [20, 22, 25, 29, 30].

Promote Localized Engagement Platforms: Use RWAs, community apps, kiosks, or bulletin boards to collect feedback, build awareness, and allow participatory inputs in sustainability decisions [13, 21, 24].

Implement GRIHA's Five Rs Locally: Use signage, education campaigns, and capacity-building programs to promote refuse, reduce, reuse, recycle, and reinvent strategies [5, 14, 24].

Adopt the PA-SAFUNI Framework and UN-PASAT as a Global Participatory Assessment tool outline: The PA-SAFUNI (Participatory Aspects-Sustainable Assessment Framework for Urban Neighbourhoods in India) provides a context-specific tool to measure and institutionalize citizen participation in sustainable urban development. When aligned with the globally adaptable UN-PASAT (outline for Participatory Aspects-based Sustainable Assessment Tool for Urban Neighbourhoods), together, these serve as a scalable blueprint for embedding behaviorally informed and community-driven sustainability metrics [14, 15].

Realign Policy and Governance: Advocate for integrating participation-based criteria into planning codes, municipal development plans, and performance contracts for developers [6, 16, 19, 20, 24].

By mainstreaming participation and behavior into green certification tools, India can position itself not just as an environmental leader but as a global benchmark in participatory urban sustainability. [19, 20, 21, 22, 24].

REFERENCES

- [1] United Nations. (1987). *Our Common Future*. Oxford University Press.
- [2] IGBC. (2020). IGBC Green Residential Societies Rating System, Version 1.0. <https://igbc.in>
- [3] Jacobs, J. (1961). *The Death and Life of Great American Cities*. Random House.
- [4] Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development*, 19(5), 289–300.
- [5] GRIHA Council. (2021). GRIHA for Large Developments (GRIHA-LD). <https://www.grihaindia.org>
- [6] Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of People Administration Research and Theory*, 18(4), 543–571.
- [7] Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable development goals: A global agenda for sustainable development. *Sustainable Development*, 24(6), 459–470.
- [8] Kumar, S., & Sinha, S. (2019). Sustainable urban development: A review of the literature. *Sustainable Cities and Society*, 48, 101-110.
- [9] Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2018). The circular economy – A new sustainability paradigm? *Journal of Cleaner Production*, 143, 757-768.
- [10] United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. <https://sdgs.un.org>
- [11] United Nations Development Programme (UNDP). (2020). *Sustainable Development Goals*. <https://www.undp.org>
- [12] United Nations. (1992). *Agenda 21: Programme of action for sustainable development*. <https://www.un.org/esa/sustdev/documents/agenda21/>
- [13] Pretty, J. (1995). Participatory learning for sustainable agriculture. *World Development*, 23(8), 1247–1263.
- [14] Nagpal, A., & Manchanda, S. (2025). Local-level people's participation intervention in rethinking architecture for sustainable societies. *The Spirit of Society Journal*, 8(2), 134–149.
- [15] Nagpal, A. (2025). People's participation in 'sustainable development indicators' for the local level: Towards development of an integrated framework. *Global Journal for Research Analysis*, 14(5); Nagpal, A., & Manchanda, S. (2025). People-participation as part of sustainable development tools for the local level: Towards development of an integrated tool. *Global Journal for Research Analysis*, 14(5). <https://doi.org/10.36106/gjra>
- [16] Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), 216–224.
- [17] Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, 1(1), 83–98. <https://doi.org/10.1504/IJSSCI.2008.017590>
- [18] Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: Mapping different approaches. *Sustainable Development*, 13(1), 38–52. <https://doi.org/10.1002/sd.244>;
- Redclift, M., & Springett, D. (Eds.). (2015). *Routledge international handbook of sustainable development*. Routledge;
- Sachs, J. D. (2015). *The age of sustainable development*. Columbia University Press. <https://doi.org/10.7312/sach17314>
- [19] Bennett, G., & Satterthwaite, D. (2019). *Cities and sustainable development: A guide for local governments*. Routledge.
- [20] Hodge, L., & Haltrecht, J. (2009). *BedZED seven years on: The impact of the UK's best known eco-village and its residents*. BioRegional.

- [21] UN-Habitat. (2020). World Cities Report 2020: The Value of Sustainable Urbanization. United Nations Human Settlements Programme.
- [22] Fischer, C., Vance, T., & Smith, B. (2012). A behaviorally informed approach to household energy use: A field experiment. *Behavioral Science & Policy*, 2(1), 11-22.
- [23] Nagpal, A., & Manchanda, S. (2021). Role of people-participation in sustainable development at local-level in Indian context. *Proceedings of the 16th SDEWES Conference, Dubrovnik, Croatia*, pp. 0881-1-0881-18.
- [24] Dempsey, N., Brown, C., & Bramley, G. (2012). The role of community engagement in sustainable urban development. *Sustainable Development*, 20(6), 455-467.
- [25] Akenji, L., Gilby, S., Mao, C., Koide, R., & Watabe, A. (2019). Sustainable lifestyles policy and practice. Institute for Global Environmental Strategies.
- [26] Fischer, J., Dyball, R., Fazey, I., Gross, C., Dovers, S. P., Ehrlich, P. R., Brulle, R. J., Christensen, C., & Borden, R. J. (2012). Human behavior and sustainability. *Frontiers in Ecology and the Environment*. <https://doi.org/10.1890/110079>
- [27] Alawadi, K., & Benkraouda, O. (2020). The debate over neighborhood density in Dubai: Between theory and practicality.
- [28] Kester, C., James, W., & Gerber, S. (2013). Saving energy by behavioral changes. Kansas State University.
- [29] BioRegional. (2002). BedZED - the UK's first major zero-carbon community. <https://www.bioregional.com/projects-and-services/case-studies/bedzed-the-uks-first-large-scale-eco-village>
- [30] Seidel, V. P. (2013). Sustainable community development - Impact of residents' behavior on total sustainability of a sustainable community. Thesis, School of Environment and Sustainability.
- [31] Masdar City. (n.d.). The world's first zero-carbon city. <https://masdarcity.ae/>
- [32] Nordic Council of Ministers. (2019). Nordic youth as sustainable changemakers: In the transition to sustainable consumption and production.
- [33] Jaiswal, A., & Kottakadu, A. (2020). Assessing sustainability of mixed-use neighbourhoods through residents' travel behaviour and perception: The case of Nagpur, India. *Sustainability*, 12(16), 6456. <https://doi.org/10.3390/su12166456>
- [34] Interreg Europe Policy Learning Platform. (2018, December 5). Online discussion on behaviour change: Summary report of the discussion with partners from CLEAN, EMPOWER, ENERSELVES, FINERPOL, LOCARBO, MOLOC, REBUS, and ZERO CO2. Interreg Europe. <https://www.interregeurope.eu/news-and-events/news/3252/online-discussion-on-behaviour-change>
- [35] Indian Green Building Council. (2021). Certified Green Residential Societies Project Reports. Retrieved from <https://igbc.in>