

Attitudes and Barriers of Interior Designers to Practice Sustainable Interior Architecture and Design in Bengaluru

Mayukha C. Katari, Vidhya M. S.*, N. S. Nalini, Rama R. Subrahmanian
Dayananda Sagar College of Architecture, DSI Campus, Shavige Malleswara Hills,
Kumaraswamy Layout, Bengaluru 560078

*Corresponding Author: ar.vidhyamaney@gmail.com

HIGHLIGHTS

- Empirical Assessment in Bengaluru: Evaluated the attitudes and practical application of Sustainable Interior Architecture and Design (SIAD) among 60 practicing architects and interior designers.
- Hierarchical Ranking of Barriers: Identified and systematically ranked the severity of adoption obstacles using a 5-point Likert scale, establishing a clear order of critical challenges.
- Key Obstacles Identified: Highlighted inadequate professional training (mean 4.03) and low client interest (mean 3.93) as the primary bottlenecks hindering practical implementation.
- Actionable Insights for Stakeholders: Provided targeted findings to help educators, governing bodies, material suppliers, and practitioners focus interventions where they are needed most.

Abstract

The principle of sustainable interior design is still not prevalent in practice. The objective of this study is to find and analyze the issues architects and interior designers face in implementing Sustainable Interior Architecture and Design (SIAD) in Bengaluru. This study used a literature review and a questionnaire survey to assess the challenges faced. The findings were based on the opinions of 60 architects and interior designers. Thus, the obstacles that impede the practice of sustainability have been identified, and their importance has been assessed by means of a 5-

point Likert scale. The results indicate that the architects and interior designers are aware of the environmental significance of the SIAD. Nevertheless, the overall assessment of its usage was only 3.45 out of 5. The most important obstacles mentioned in this study are designers' training (4.03), insufficient interest of clients (3.93), high costs (3.55), unfavorable regulations (3.43), the problem of obtaining the necessary materials (3.28), and inadequate knowledge of clients (2.92). The results obtained allow researchers to create a framework for discussing SIAD issues.

Keywords: Bengaluru, Implementation Barriers, Sustainability Awareness, Sustainable Interior Design (SIAD)

1. Introduction

The growing demand for interior environments that are not only functional but also environmentally responsible has led to the emergence of sustainable interior architecture and design (SIAD) [1]. Sustainable design has been globally accepted as an important aspect that should be incorporated in product development; however, it is not utilized in the area of interior design as much as in other domains such as architecture or city planning [2]. The city of Bengaluru is a case in point since it reveals opportunities for both sustainable urban design and contemporary urban needs at the same time. Nowadays, building interiors are increasingly sophisticated in design and technology but still limited in sustainable application [3]. In addition, interiors generally have a much shorter lifespan than buildings, so it generates waste and require many different materials [4]. Therefore, it is extremely important to implement sustainable solutions into the interior design process for the purpose of pretreatment and utilization of raw materials, saving energy, and increasing the living standards. However, the implementation of sustainable interior design principles requires systemic modification and cooperation between designers, clients, and public policy makers with the ultimate goal of creating a sustainable design practice that focuses on the principles of sustainability rather than simply creating awareness. This paper places itself in this context, analyzing the professional realities of how sustainability is understood, negotiated, and frequently compromised in interior design practice in the vibrant development context of Bengaluru.

There has been growing criticism of the built environment for its disproportionate use of various resources and emissions. In 2022, 34% of the global energy demand was contributed by buildings, along with approximately 21% of total greenhouse gas (GHG) emissions [5]. Similarly, interior environments use a significant amount of embodied energy and waste as a result of continuous refurbishments, types of finishing, and

intensive fit-outs, but these impacts are often unknown. In cities like Bengaluru in India, where there are always construction and renovation, the environmental effects of the interiors have been recognized. For example, the development of industrialization has led to worsened conditions regarding energy stress, air pollution, and a lack of water in fast-urbanizing Bengaluru [6-8]. The pressure on the ecology of the planet brought about by modern commercial or residential interior designs represents only one part of the problem of sustainability.

Adoption of sustainable design is on the rise among design practitioners today; however, evidence of sustainable design as a concept in action remains limited due to the various contextual constraints existing in India, which are at variance with international practices and benchmarks [9]. Due to the difference between sustainability knowledge and actual actions taken for the planet's benefit, it becomes apparent that sustainable interior design should be addressed in practice. In Bengaluru, there are numerous industry practitioners aware of the importance of sustainable design solutions, such as energy-efficient lighting, utilization of recycled materials, and improvement of indoor air quality, but this does not lead to the successful application of these solutions within their projects. It is also important to note that the existence of innovations for nature-related purposes or sustainable practices is market-driven and pushed by client demands rather than being formed by existing innovation standards or regulations [10]. Hence, this results in forming a gap related to sustainable design practice that restricts the designers' ability to turn their intention of applying sustainable design techniques into actuality. The purpose of this paper is to overcome this gap by investigating the barriers faced by practitioners not as theoretical notions but as real-life problems. Bengaluru, as one of the fastest-growing metropolises in India, provides a revealing microcosm to study these tensions. The findings are not just descriptive but diagnostic in an effort to find leverage points where intervention with meaningful change can be

made. Given that the city is simultaneously both a place of environmental vulnerability and an innovation hub, a closer examination of the ways in which sustainability principles are taken up in interior design practice is both timely and necessary.

Theoretically, this research adds to a body of growing discourse on the topic of sustainable design by paying attention to the interior scale, where human experience and responsibility to the environment intersect most directly. While sustainability frameworks often put their focus on architecture and urban settings, interiors, being temporally dynamic and user-driven, require their own design thinking and empirical insights [11]. Through practitioner attitude surveys and ranking of perceived barriers, the study provides evidence-based perspectives about how sustainability is implemented, modified, or resisted in practice. The implications are not just an academic reflection. For educators, the findings highlight gaps in current design curricula in the skills and confidence to advocate for sustainable solutions among young professionals. When it comes to policymakers, they point to the lack of enabling regulations and incentives to promote sustainable use of materials and life-cycle thinking. Specifically, the results suggest the need for better communication of the long-term value of the environmental and economic benefits of SIAD to practitioners and clients. Finally, the findings of this study are that it was initiated from perception and translated into practical knowledge, resulting in practical ways to obtain localized context about sustainability and use that information to develop design pedagogy, policies, and guide the evolving ethical practice of interior design in a city facing struggles with its environment.

2. Literature Review

The majority of architects and interior designers recognize that creating sustainable buildings helps protect the environment as well as provides a better quality of life for the individuals occupying those buildings. However, this fact does not mean

that there is a consistent practice of sustainability. Sustainable interior design has all but disappeared from mainstream design in both India and many other parts of the world. The manner in which the profession has advanced worldwide indicates this pattern is common: (1) Enthusiasm is usually overrun by costs, (2) Limited levels of technical training are available, and (3) There is usually not enough available institutional support [12]. The perception that sustainable design requires higher initial investments with longer pay-back periods still prevents many practitioners and clients from pursuing sustainable options. In developing economies, where local technologies and material innovations are often rare, these issues are more concrete [13-15].

Further, the classification can be based on a lack of education; designers are often only exposed to the concept of sustainability in a limited capacity during their training, which subsequently translates to uncertainty and lack of consistency in practice [16]. The geographical variations in the global research framework regarding India are further emphasized by the research methodology used by researchers from around the world. There is a difference between the sustainability studies being conducted in India (primarily through the lenses of architecture, urban planning, and sustainable building materials) and other study areas being explored globally. As an example, the topic of sustainability is being studied through green building rating systems (such as LEED India and IGBC) and passive design principles integrated into architectural education; however, research conducted in India does not focus on the interior or the interiors of the built environment, which is where the greatest factors affecting energy consumption, material selection, and human experience can be controlled. At both the professional and academic community levels, many have stated that there is a great need for greater integration of sustainability into the curriculum. Inadequate structured training often leaves professionals with only two options: either they train themselves or attend bits of professional

development [17][18]. The disparity in the coherence of the training across different institutions makes it possible for designers to pay significantly different levels of attention to their jobs and indicates that design from one designer to another may differ from client to client. It is important to mention Bengaluru as it has become an innovation and design hub and embodies all the contradictions of India's transformation as well as its progress.

Various scholars have studied the issues within the field of urban development in relation to spatial urban development, which involves civil engineering and urban sustainability [6]. The application of the Sustainable Urban Street (SUS) Model in Bengaluru shows that, although the results of the social and environmental indicators prove moderate success of the SUS Model [19], it still illustrates a positive-at-heart attitude toward sustainability but not enough to practice it due to the official legislation. Concurrently, it is yet unclear how Bengaluru designers perceive sustainability in their work. Most of the contemporary studies on sustainability in India view sustainability problems as an architectural or policy issue while neglecting the aspects of the complexity of the physical, technical, and human aspects of micro-land use. Less discussion takes place concerning the selection of interior finishes, illumination, or furnishing that directly affect a user's experience and the environment. In terms of sustainability studies, the city of Bengaluru has been omitted as a subject of study in different types of sustainability studies. The objective of this research is to analyze sustainability from the informal viewpoint of the practitioners who apply theoretical knowledge gained from their past experience. Unlike previous studies that concentrate on different credentials and established systems and situations, this research on sustainability tackles the issue from the perspective of interior designers. The research was conducted by way of employing a formal questionnaire and analyzing its results through the means of the Likert scale [20]. This research provided an opportunity to collect quantitative

data in respect to sustainability issues, which is not as easy as it might seem to be. The research study presents not only an offer of a new approach to the study of sustainability but also utilizes Bengaluru as a live example of the urban environment that possesses vivid creative approaches to solving urban problems. A local practitioner-centred approach has been established using the city of Bengaluru as the base of the research to provide an alternative to a generalized view of sustainability; it positions sustainability within the social and material environments from which modern India's interior design industry has evolved.

Indian literature has been studied less than International Literature according to research completed worldwide to date. The research produced by different researchers for the International Community has produced numerous specifications for Sustainability. The specifications are location-specific; however, they all address issues regarding the life cycles of Building Materials and their influence on both Human Health and Environmental impact through their Fit-out construction [21]. The majority of research conducted in the Indian context is focused on green building rating, passive architectural design, and awareness creation [17][22][23]. There is little independent research on interior design in India, with practitioners stating that there is insufficient empirical research on Indian interior designers who are attempting to adapt to sustainable practices in their economic and regulatory contexts. Since there is an imbalance between the research and practical aspects of sustainability, discussions on sustainability are likely to be purely theoretical. This is not only an academic gap but also has a severe impact on policymaking and practitioners in the field. While examining the perspectives of practitioners in Bengaluru, the study generates evidence of the need for dialogue on sustainability issues with regard to what practitioners think about sustainability in design.

In this study, the following research

questions (RQ) are addressed: RQ(1) To what extent do the interior designers of Bengaluru understand and articulate the meaning and significance of sustainable interior architecture and design (SIAD)? Awareness is considered to be the first step toward behavioral change, but it remains unclear whether the practitioners possess such awareness and to what depth. Understanding whether sustainability is perceived as a technical requirement, an ethical responsibility, or merely an aesthetic trend can reveal how designers conceptualize their professional agency. RQ(2) To what extent do interior designers in Bengaluru incorporate sustainability principles into their design processes and decision-making? Translating awareness into action is seldom straightforward. Designers must navigate client expectations, cost considerations, and material availability. By assessing how often sustainability principles are applied in actual projects, this study evaluates whether sustainability exists as an aspiration or a consistent design practice. RQ(3) To what extent do interior designers consider the economic implications of sustainability, such as cost effectiveness, lifecycle value, and long-term savings, when making design decisions? Economic perception frequently shapes environmental decision-making. The majority of design professionals and customers view sustainable design as "costly" without necessarily understanding the operational and lifecycle advantages of sustainable materials [12]. This inquiry asks whether financial rationale provides a rational constraint or a perceptual barrier to implementing designs utilizing sustainable resources. These questions will not simply provide information; instead, they investigate the cognitive, operational, and economic dimensions of sustainable interior design as practiced within a rapidly developing city in India. In creating both attitudinal and practical assessments, the study will establish an understanding of how sustainability does or does not occur during professional design processes in Bengaluru. The objective of this study is to: (1) Investigate the attitudes of professional interior designers in

Bengaluru regarding sustainable interior architecture and interior design. (2) Evaluate their level of understanding and awareness about the environmental impacts associated with their choices related to interior design (i.e., the use of finishes, furniture, fixtures, etc.). (3) Identify and rank the barriers that prevent the implementation of sustainable interior practices. (4) Provide recommendations for furthering professional training, aligning with policy, and fostering collaboration among industry practitioners to advance SIAD in Bengaluru. In achieving these objectives, this study will yield findings that are grounded in evidence and thus will serve as a basis for both pedagogy and policy to increase the degree to which sustainability is integrated into the practice of interior design in India.

3. Problem Statement

In Bengaluru, professional designers possess reasonably strong theoretical knowledge of Sustainable Interior Architecture and Design (SIAD), the gap between theory and practice remains wide. Practicing designers encounter systemic and economic obstacles, such as lack of training, lack of interest from clients, and high initial costs, which stand in the way of introducing sustainability in their projects on a regular basis.

4. Objectives of the Study

This study aims to investigate the views that architects and interior designers of Bengaluru have towards Sustainable Interior Architecture and Design. The study will analyse their understanding of the term, level of awareness, and opinions about sustainability issues. It shall also identify the key barriers to sustainable interior design through the Lauris scale. Finally, solutions will be provided for enhancing training programmes available for professionals and developing policies to stimulate collaboration within the industry.

5. Materials and Methods / Methodology

5.1. Study Area and Data Context

The research was performed in the evolving urban center of Bengaluru, which is experiencing significant numbers of design-centered projects being constructed alongside a developing discourse about sustainability; Bengaluru is one of the leading design-focused and technology-oriented Indian cities, making it an intriguing environment to study the many ways sustainability as an idea can be understood and implemented by individuals who practice interior design. Data collection included information about designers who work for interior design companies, architects, and designers who provide a range of interior design services. As Bengaluru has a large design professional population, studying these design professionals will capture some of the diversity of ways design professionals operate in a large firm or independently. Survey data have been acquired through digital means via professional networks, associations of designers, and digital channels. Digital survey methodology was particularly valuable for the digitally connected design professional community, essentially enhancing access for potential respondents while being non-intrusive. Figure 1 provides a general research flow detailing all the steps involved in the research, including literature review and instrument design, data analysis, and interpretation.

5.2. Research Design

The study assumed a mixed-method design as it combined quantitative and qualitative strategies to develop a detailed interpretation of SIAD practices. The quantitative data showed to have higher significance, as it provided enough data to compare the trends, whereas qualitative data helped to gain an understanding of the motives and ways of occurrence of the events, being limited only by the area of data collection indicated by the quantitative research. The technique used was triangulation because it was possible to access both forms of data, thus increasing the knowledge of the issue. The

manner of creating a survey was proper, as the already existing literature and the subject of the study were utilized. Therefore, the aim of this survey was to investigate not only the opinions of the respondents but also their experience after providing the answers to the questionnaire about sustainable design practices. The research included both quantitative measurement of the subject and qualitative assessment, as it contained a large number of open-ended questions, allowing respondents to express their opinions freely. A stratified random sample was used to achieve balanced representation within the different types of firms and professional levels of the participating professionals. 60 participants were included in the final study, which is a reasonably small sample for a professionally focused study of this nature. Such a size, though limited, allowed for interpretive richness and manageable data reliability. Ethical protocols were strictly followed: informed consent was obtained, anonymity preserved, and participation was voluntary.

5.3. Data Collection Methods

The primary data collection process employed the use of an online survey instrument administered via Google Forms. The use of Google Forms was deemed beneficial by the researchers in terms of its convenience and suitability for use in a digital environment. The questionnaire consisted of four different parts, each one targeting specific parameters of the SIAD as shown in Table 1. In the first section, the focus is placed on demographic and professional information of respondents, such as education, experience, and job roles. The second part focused on analyzing the knowledge and understanding of sustainability concepts. The third segment concerned the assessment of the extent to which sustainability has been adopted by respondents in their designs in terms of the use of the three pillars of sustainability. Finally, the fourth part concerned the investigation of barriers to sustainable interior design and difficulties in implementing sustainable methods by the respondents. The last segments of the questionnaire employed a five-point Likert scale (1 = Strongly

Disagree and 5 = Strongly Agree). Moreover, a mark of 3 (3 = Neutral) will reflect respondents' neutrality or uncertainty about the issue. The Likert format, while sometimes criticized for its tendency to flatten nuance, remains a pragmatic tool for identifying patterns of agreement and resistance across professional cohorts. The survey link was circulated through professional associations, LinkedIn networks, and design forums, ensuring that the outreach remained both ethical and relevant. Respondents could complete the questionnaire at their convenience, a flexibility that increased participation rates among working professionals. Although online surveys lack the richness of face-to-face interaction, they proved particularly effective for geographically dispersed respondents and time-constrained professionals.

6. Experimental Work / Implementation

Data analysis was conducted using both descriptive and inferential statistical methods, supported by SPSS (Statistical Package for the Social Sciences, Version 26) for quantitative analysis and Microsoft Excel for data management and visualization. Responses from the Likert-scale questions were coded numerically and analyzed to identify trends, mean scores, and standard deviations. Cross-tabulations were used to compare perceptions across demographic variables such as years of experience, firm type, and educational background. To interpret the qualitative responses, particularly the open-ended sections, content analysis was performed manually. This approach allowed patterns and themes to emerge organically, capturing subtle variations in tone, phrasing, and emphasis that automated text-mining tools might miss. The integration of qualitative insights provided contextual grounding for quantitative results, enabling a more textured understanding of the barriers and enablers shaping SIAD in Bengaluru. The analysis followed an iterative approach: preliminary coding led to the identification of recurrent themes, which were then revisited in light of statistical findings. This cyclical interpretation helped to validate findings across both datasets. Limitations, however, were acknowledged,

particularly the modest sample size and potential self-selection bias inherent in voluntary online surveys. Despite these, the methodological framework, illustrated in Figure 1, provided a robust foundation for exploring the interplay among awareness, implementation, and barriers in sustainable interior design practices.

7. Result and Discussion

7.1. Respondent Background

Part 1: Profile of Survey Respondents: The demographic profile of the respondents was analyzed, which illustrates the educational background of the respondents, with the majority, 63.3%, holding a Bachelor's degree. Additionally, 35% of the respondents had obtained a Master's, and less than 1% had a Diploma or Ph.D. Regarding professional affiliations, 100% of respondents were CoA-registered professionals. While 4 of them are also part of IIA, and 3 of them are members of the Indian Institute of Interior Designers (IIID). In terms of professional experience, 33% of the respondents have between 1 to 3 years of experience, 30% have 4-6 years of experience, 10% have 11-15 years of experience, an equal percentage of 8.3% have 7 to 10 years of experience, and less than one year of experience; furthermore, an overall 10% of the respondents have 16-plus years of experience

7.2. Level of Professionals' awareness about the concept of Sustainable Interior Design

As can be seen from Figure 2, results of the analysis of Likert data indicate knowledge and perception among interior designers towards sustainability. Results indicate a medium to high level of awareness of the principles and goals of sustainable interior design, with a mean of 3.72. Understanding the issues involved: A significant proportion of respondents scored themselves a 4, meaning they were largely aware of terminology associated with the concept of sustainability. Only a small part of people surveyed rated their understanding of the matter as low, hinting at the possibility of the presence of knowledge gaps. The role of sustainable

interior design in decreasing the burden on the planet is appreciated the most: the average score for this statement equals 4.35, which implies that the respondents agree upon the necessity of sustainable design the most. 33 out of 60 respondents strongly agree with the statement, indicating the high sensitivity towards the necessity of sustainable interior design principles. In terms of the age of materials or technologies used by the group, it is seen that people tend to be somewhat moderate in their application of sustainable materials/technologies, receiving 3.35 on average. Furthermore, some respondents scored themselves 4 out of 5, showing that there exists a possibility to raise awareness concerning various sustainable solutions.

A low level of knowledge associated with client sustainability in Bengaluru is one of the most serious issues that the survey illustrates, as shown by an overall average score of 2.92. In the survey, most participants rated their clients a 3 for being aware of sustainable interiors, and only a few gave them a 5, indicating there is a lack of client appreciation for the importance and value of sustainable interior design. The lowest-rated parameter in the survey was education on sustainable design within the current architecture and design curriculum in India to properly prepare professionals to have the required skill set for sustainable design, which had an average rating of 2.75. Most professionals were dissatisfied with the educational outcomes, as 23 of the 60 rated the ratings of the current curriculum a 1 or 2, indicating that there are currently insufficient programs within the current educational structure to increase students' skill sets and capabilities related to sustainability. Overall, the data shows that while professionals highly value sustainability, there is a significant disconnect between professional understanding of sustainability and readiness of both clients and designers to engage in sustainable practices. Therefore, this data shows that there is a critical need for additional education on sustainability within architectural curricula, as well as additional efforts made to engage with clients and industry partners.

7.3. Level of Implementation of Sustainable Principles in Interior Design Practices

As indicated in Figure 3, the use of integrating sustainable design principles in projects had a moderate mean score of 3.45, which shows that although most professionals incorporate sustainability, there is still inconsistency in its use. The majority of participants rated their practices at an average of 3 or 4, which indicates that sustainable practices are indeed implemented, but they are not yet fully prioritized, since the same was the case with the application of sustainable materials. Here, a relatively high average score of 4 is due to those respondents who rated their application the highest, but still, some participants rated it as low as 2 or 3, which can imply that sustainable materials are used, but not to the full extent, mostly due to the lack of availability and price. A very low average score (3.28) was reported regarding the availability of sustainable materials, when most participants reported being able to rate, on average, at least a couple of items, i.e., one or two with 2-3 ratings, which implies that there are some barriers to adopting sustainable practices. This implies that it is likely difficult to find the required sustainable materials, or it is simply not available in the region, which can obstruct the mass adoption of sustainable practices. A positive note to the environmentally conscious aspects such as energy efficiency & Indoor Air Quality, which were assigned much higher average ratings than many of the other areas, with an average of 3.92. The majority of the survey's participants rated their concern for environmentally friendly, sustainable design to be "4" or "5," indicating a good level of awareness regarding sustainability in terms of performance related to the design. Thus, while the material choices to be selected may pose a challenge, there are increasing numbers of considerations for including sustainability in projects related to environmental design. There was a consensus among participants that sustainable design can easily be incorporated as a part of modern style, with a mean score of 4.05 and an overall rating of either a "4" or "5" by most participants; therefore, indicating great confidence that sustainability and modern

design can be combined. Such a positive attitude shows that aesthetic issues are not a major hindrance to the acceptance of sustainability, which is important for increased acceptance in the industry. In general, despite the intention and consciousness that exists for sustainable design, areas like material supply and uniformity in implementation are still challenging. The results serve to emphasize calls for better provision of sustainable materials and more stimulation towards sustainability as the default manner in interior design.

7.4. Barriers to Implementation of Sustainable Principles in Interior Design Practices

Figure 4 indicates that interior designers experience significant challenges in training and implementation, with the lack of formal education evident in a low mean score of 2.75, and only moderate attempts to remain current on sustainable materials and technologies (3.35). Constraints have a direct effect on implementing sustainability principles into projects (3.45). Client attitudes restrict progress, as there is little client knowledge of SIAD to allow their aesthetic preferences (4.07) to allow for sustainable design; however, SIAD can coexist with modern aesthetic preferences (4.05). Additionally, there is an overall lack of client interest in SIAD (3.93) due to fear of high up-front costs (3.55); these costs, however, are offset through long-term financial returns (3.98). Interior designers place a high value on environmental considerations (3.92), as designers are eager to integrate sustainability whenever possible to do so. Material availability appears to be an area of challenge due to a lack of available local materials (3.62), limited usage (3.37), and limited ease of availability (3.28). These constraints accentuate the need to implement mandatory sustainability criteria (4.38) as an effective means of facilitating the implementation of SIAD into the design process and removing present barriers. Overcoming these challenges through greater education, monetary incentives, compliance with policies, and market promotion could raise the use of sustainable interior design practices considerably.

Comparing this study's findings on the barriers to implementing SIAD with Jordan (Mohsen). Jordan faces an acute water shortage. The availability of materials such as wood and timber is limited. Sustainability is a necessity. This is reflected in their market demand and trends (3.65) and higher client participation (3.63). This might be a major reason for the disparity in the level of implementation. Designers in Jordan display a higher level of SIAD implementation at 3.98 compared to Bengaluru, which scored 3.45. Interior designers in Jordan show high awareness at 84%, and 89% acknowledge the benefits. This is greater than Bengaluru, where 74% show high awareness and 84% acknowledge the benefits. The paper [24] surveyed the barriers to implementing SIAD and compared the barriers with the US, Afghanistan, and India. According to the survey conducted, about 91% of respondents in Afghanistan, about 71% in India, and 32% of respondents in the USA have moderate to low knowledge of sustainable construction. Compared to the study, it was found that 74% of the participants showed high awareness of SIAD. This might suggest that awareness is higher in Bengaluru.

7.5. Qualitative survey

The questionnaire survey interviewed participants, asking six questions such as the following: (1.) How long have you been practicing interior design, and what typology of projects do you usually work on? (2.) Why do you choose to include (or not include) sustainable principles in your interior design projects? (3.) Can you describe a project where you attempted to incorporate sustainable design? What worked well and what didn't? (4.) What percentage of your projects would you estimate follow sustainability principles (e.g., energy, water, materials, air quality)? (5.) How do clients typically respond when you propose sustainable design options? (6.) What are the biggest barriers you face in applying sustainable interior design in Bengaluru?

7.6. Survey Analysis

A qualitative survey was further used to understand

how the designers in Sustainable Architecture firms are implementing sustainability and what are the challenges they face. Design decisions are primarily based on the goals of the client. The designers will work with the client based on how receptive (Open) and what type of material resources they have. Brand-conscious clients typically will respond better to this than other types of clients, who see this as a unique service provided to their property. While designers will try to adhere to sustainability principles in their design, practical issues get in the way of being able to do so. A large problem is the material source, where it is difficult to find what is needed, or the labour force is not skilled enough. Clients also have issues with maintenance of the materials and/or finances due to cost constraints. Therefore, designers tend to use at least a few types of Sustainable Principles (energized lighting, eco-materials) versus having a fully Sustainable Project.

7.7. Limitations

Some of the limitations of the study using survey-based research include: (1) Selection bias, because the study focused only on respondents who hold licenses issued by the Council of Architecture (CoA). Informal practitioners were excluded from this sample. (2) Response bias; respondents who have a greater interest in sustainable building practices may be more likely to respond to the survey than individuals who have less interest in sustainable building practices. (3) To attempt to minimize the extent of these limitations, the researchers used careful sampling practices, validated the data collected from the surveys, and acknowledged any biases encountered during the processing of the survey data.

8. Recommendations

The education system's focus on sustainability in the curriculum should provide future interior designers with the knowledge they need to implement sustainable design practices into their work. Furthermore, clients also need to be educated about sustainability because they directly benefit from the improved health from sustainable

design and can also realize long-term economic paybacks as well as other benefits that can arise from sustainable design implementation. The growth of LEED and GRIHA certifications will also help to increase the demand for sustainable interior designs. Finally, it is ultimately up to the government to initiate this sustainability movement by creating appropriate legislation and policies, as well as making sustainable materials and resources available and accessible on a local level.

9. Future Scope

Future studies can build on this foundation by looking into direct ways to create awareness with clients about improving the awareness of their projects through implementing sustainable design principles. It may also be helpful to investigate education campaigns that target clients, highlight successful sustainable projects, and quantify how much tangible benefit the client will receive from their project. Additionally, future research may investigate how policies and incentives are successfully developed and used in cities around the world; however, each will need to be adapted to suit the unique situation of Bengaluru, India. Lastly, by establishing a framework for collaboration between designers, suppliers of materials, policymakers, and clients, opportunities will be created that will aid those who encounter the aforementioned barriers to sustainable interior design and will ultimately result in developing a fully sustainable interior design infrastructure in Bengaluru. Finally, in order to see the current momentum regarding sustainable interior design (SIAD) converted into measurable, effective results in the built environments of Bengaluru, all stakeholders must work together.

10. Conclusion

This research has given an inclusive assessment of numerous factors preventing the application of Sustainable Interior Architecture and Design (SIAD) in Bengaluru. The results show a striking irony: although awareness of SIAD values among

interior designers in Bengaluru seems fairly good (mean 4.35), this awareness is not being translated effectively into practice (integration of SIAD - mean 3.45, use of sustainable materials - mean 3.37). Several interrelated factors contribute to this gap in implementation, which include perceived lack of awareness by the clients (mean: 3.93) and demand for aesthetics rather than sustainable practices (mean: 4.07), limited accessibility (mean: 3.62), and potentially higher cost for sourcing available sustainable materials (mean: 3.55). For a rapidly developing city like Bengaluru, pursuing sustainability is not merely a choice, but rather an obligation we have today and into the future. The long-term impacts (both environmental and social) of unsustainable actions create an urgency for changing our methods of approaching ecologically sensitive design, and using focused interventions is a critical component in closing the action-awareness gap. The decision-makers in Bengaluru can play a tremendous role as they can leverage SISD by ensuring the implementation of building codes and regulations that integrate sustainable design. Moreover, they could streamline the process of providing low-priced, sustainable, and locally available materials in ways such as developing policies supporting domestic manufacturers; providing incentives for producing environmental materials; and establishing relevant standards and certifications. Additionally, clients play an important role in creating demand for SIAD. Their choice of siding with sustainable design solutions directly affects the overall success of SIAD. Therefore, it is vital for clients to recognize the economic and environmental advantages of sustainable interior

design and understand the importance of SIAD interventions.

DECLARATIONS

Copyright Permission: The figures and tables used in the manuscript are the authors' own work and have not been reproduced or obtained from any previously published article or other copyrighted source.

Funding Source: This research received no external funding.

Acknowledgement: The authors would like to express their gratitude to the participants of the interview, the principal, and the institute for providing the necessary facilities and administrative support for conducting this research.

Data Availability: The data used in this study are available from the corresponding author upon reasonable request.

Authors' Contribution: **Mayukha C. Katari:** Conceptualization, Literature review, Data collection, Data analysis, Manuscript writing; **Vidhya M. S.:** Data analysis, Manuscript writing. Manuscript reviewing and editing, Formatting, Revisions, Journal selection, and Correspondence; **N. S. Nalini:** Manuscript reviewing and supervision; **Rama R. Subrahmanian:** Manuscript reviewing and supervision.

Use of AI and AI-Assisted Technologies: The authors used AI-assisted tools only for language improvement and grammar checking. All scientific content, interpretation, and conclusions remain the responsibility of the authors.

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this paper.

REFERENCES

- [1] O. Iwuanyanwu, I. Gil-Ozoudeh, C. Ike, and A. Okwandu, "Cultural and social dimensions of green architecture: Designing for sustainability and community well-being," *International Journal of Applied Research in Social Sciences*, vol. 6, no. 8, pp. 1951–1968, 2024.
- [2] N. R. Govind and H. Ramesh, "The impact of spatiotemporal patterns of land use land cover and land surface temperature on an urban cool island: A case study of Bengaluru," *Environmental Monitoring and Assessment*, vol. 191, no. 5, 2019.

- [3] T. V. Ramachandra, T. Mondal, B. Settur, and B. H. Aithal, "Environmental consequences in the neighbourhood of rapid unplanned urbanisation in Bangalore City," *Advances in Environmental and Engineering Research*, vol. 4, no. 4, pp. 1–17, 2023.
- [4] Y. Alassaf, "Comprehensive review of the advancements, benefits, challenges, and design integration of energy-efficient materials for sustainable buildings," *Buildings*, vol. 14, no. 9, Art. no. 2994, 2024.
- [5] United Nations Environment Programme, *2023 Global Status Report for Buildings and Construction*, 2024.
- [6] J. P. Horo and M. Punia, "Towards a unifying approach to city sustainability on the changing expression of urbanisation in Bengaluru," in *Smart Cities—Opportunities and Challenges*, S. Ahmed, S. M. Abbas, and H. Zia, Eds. Singapore: Springer, 2020, pp. 779–795.
- [7] N. Sushma R. N., "A review of using the green buildings strategy to reduce the effects of unplanned urbanization in Bengaluru," *International Journal of Science and Research (IJSR)*, vol. 12, no. 7, pp. 2041–2047, 2023.
- [8] K. V. Raju, A. Ravindra, S. Manasi, K. C. Smitha, and R. Srinivas, "Trends and status of environmental resource use in Bengaluru Metropolitan Area (BMA)," in *Environmental Resource Management in Bengaluru Metropolitan Area*, 2018, pp. 109–247.
- [9] C. Sekhar and R. Raina, "Towards more sustainable future: Assessment of sustainability literacy among the future managers in India," *Environment, Development and Sustainability*, vol. 23, no. 11, pp. 15830–15856, 2021.
- [10] M. Ferial and M. Amado, "Architectural design: Sustainability in the decision-making process," *Buildings*, vol. 9, no. 5, Art. no. 135, 2019.
- [11] M. Ashour, A. Mahdiyar, S. H. Haron, and M. H. Hanafi, "Barriers to the practice of sustainable interior architecture and design for interior renovations: A parsimonious-cybernetic fuzzy AHP approach," *Journal of Cleaner Production*, vol. 366, Art. no. 132958, 2022.
- [12] Y. Lee, "Communicating sustainable development: Effects of stakeholder-centric perceived sustainability," *Corporate Social Responsibility and Environmental Management*, vol. 27, no. 4, pp. 1540–1551, 2020.
- [13] C. Du Plessis, "A strategic framework for sustainable construction in developing countries," *Construction Management and Economics*, vol. 25, no. 1, pp. 67–76, 2007.
- [14] S. A. Kushwaha, J. R. Pitroda, and G. Ray, "Exploring barriers and opportunities for sustainable construction practices: A review," *International Journal of Scientific Research in Engineering and Management*, vol. 9, no. 11, pp. 1–9, 2025.
- [15] P. Pradhananga, M. Elzomor, and G. Santi Kasabdj, "Barriers and drivers to the adoption of sustainable construction practices in developing countries: A case study of Venezuela," *Journal of Architectural Engineering*, vol. 27, no. 3, 2021.
- [16] A. Khandelwal, "Breaking barriers: A paradigm shift towards environmental responsibility in the interior design industry," *The Times of India*, Jul. 17, 2023.
- [17] R. Chowdhury, "Holistic flexibility for deploying systems thinking as a cognitive skill," *Systemic Practice and Action Research*, vol. 36, no. 5, pp. 803–825, 2023.
- [18] T. Varkey, B. Tom, and B. Augustine, "Sustainability in architectural education in India," in *Proc. 2022 Second International Conference on Next Generation Intelligent Systems (ICNGIS)*, 2022, pp. 1–6.
- [19] A. Bhagat and A. Kumar, "An evaluation framework for sustainable urban streets (SUS) in India:

- The case study of Bengaluru City,” *Engineering, Technology & Applied Science Research*, vol. 15, no. 4, pp. 25014–25020, 2025.
- [20] R. Likert, “A technique for the measurement of attitudes,” *Archives of Psychology*, vol. 140, pp. 1–55, 1932.
- [21] W. Rashdan and A. F. Ashour, “Exploring sustainability in interior design: A comprehensive systematic review,” *Buildings*, vol. 14, no. 8, Art. no. 2303, 2024.
- [22] K. Gupta, “Toward sustainable design—The excluded issues: LEED rating system in India,” 2009.
- [23] U. Patel, S. Rakshit, S. A. Ram, and Z. B. Irfan, “Urban sustainability index: Measuring performance of 15 metropolitan cities of India,” *South Asian Journal of Social Studies and Economics*, pp. 1–11, 2019.
- [24] M. R. Shaker, B. S. Eustace, H. K. G. Erukala, R. G. Patel, M. B. Mohammed, M. A. Jabri, K. Desai, R. Goyal, and B. Chang, “Analysis of survey on barriers to the implementation of sustainable projects,” *Sustainability*, vol. 14, no. 24, Art. no. 16830, 2022.

Figures

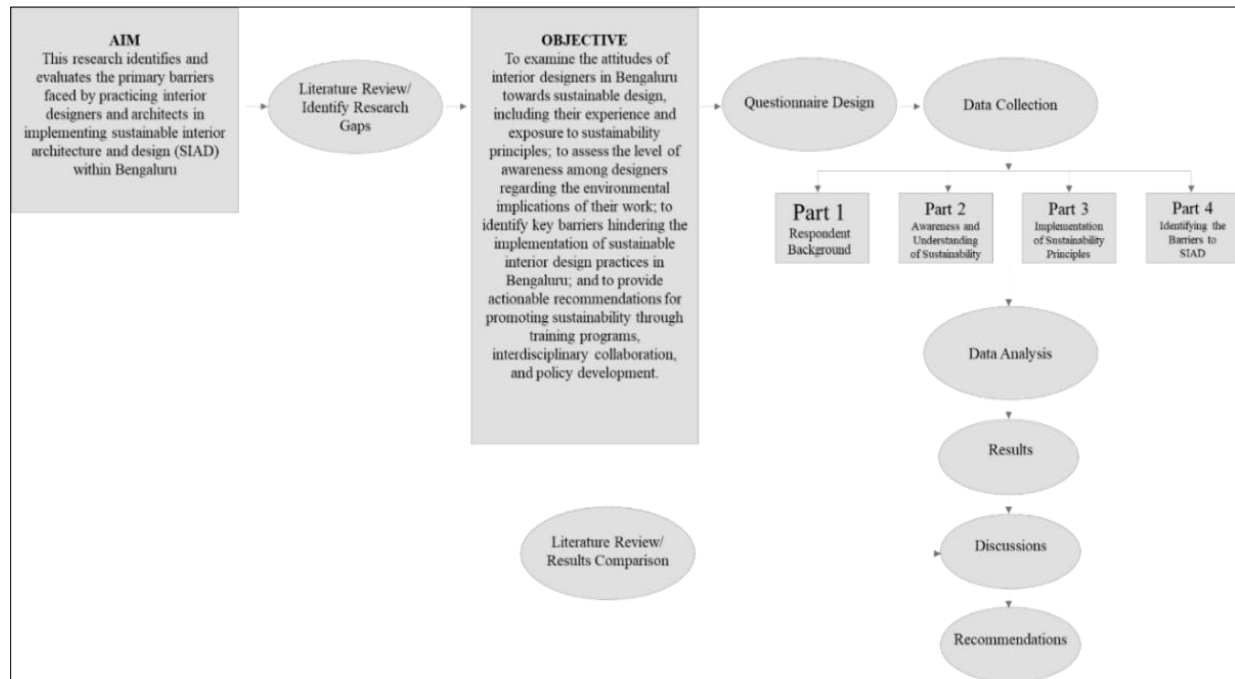


Figure 1: Research Process

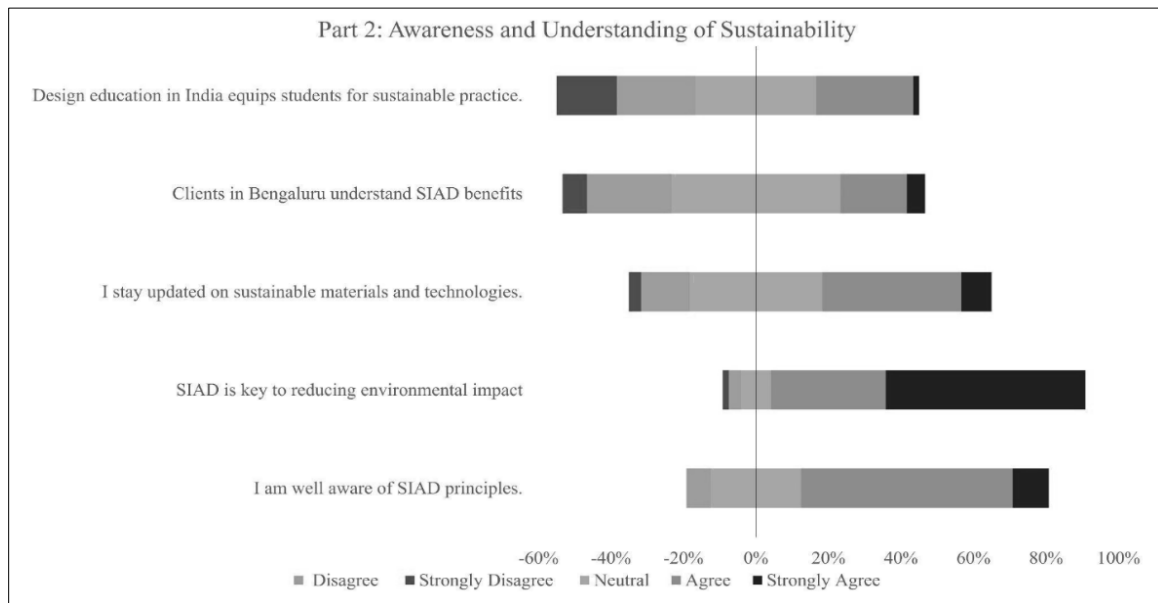


Figure 2: Sustainability Awareness

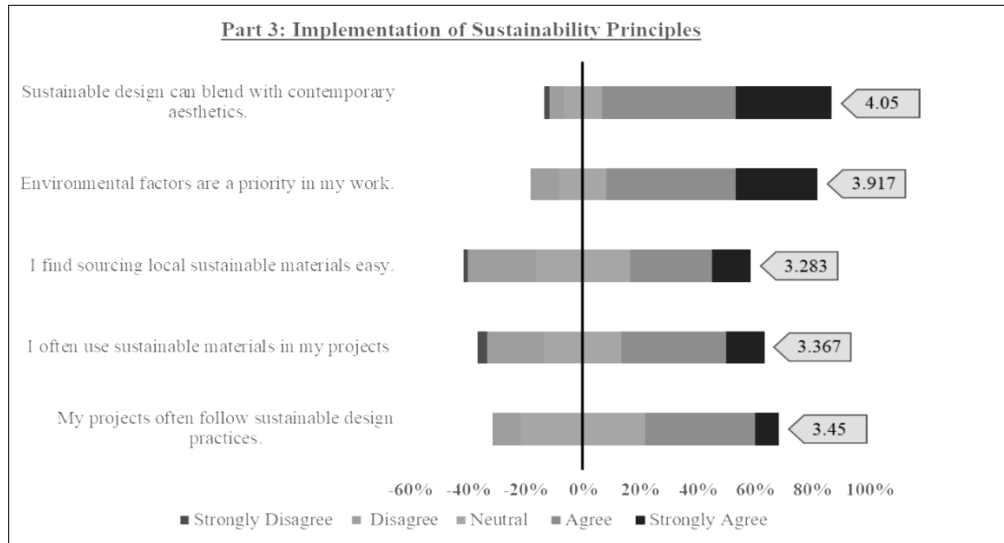


Figure 3: Sustainability Implementation

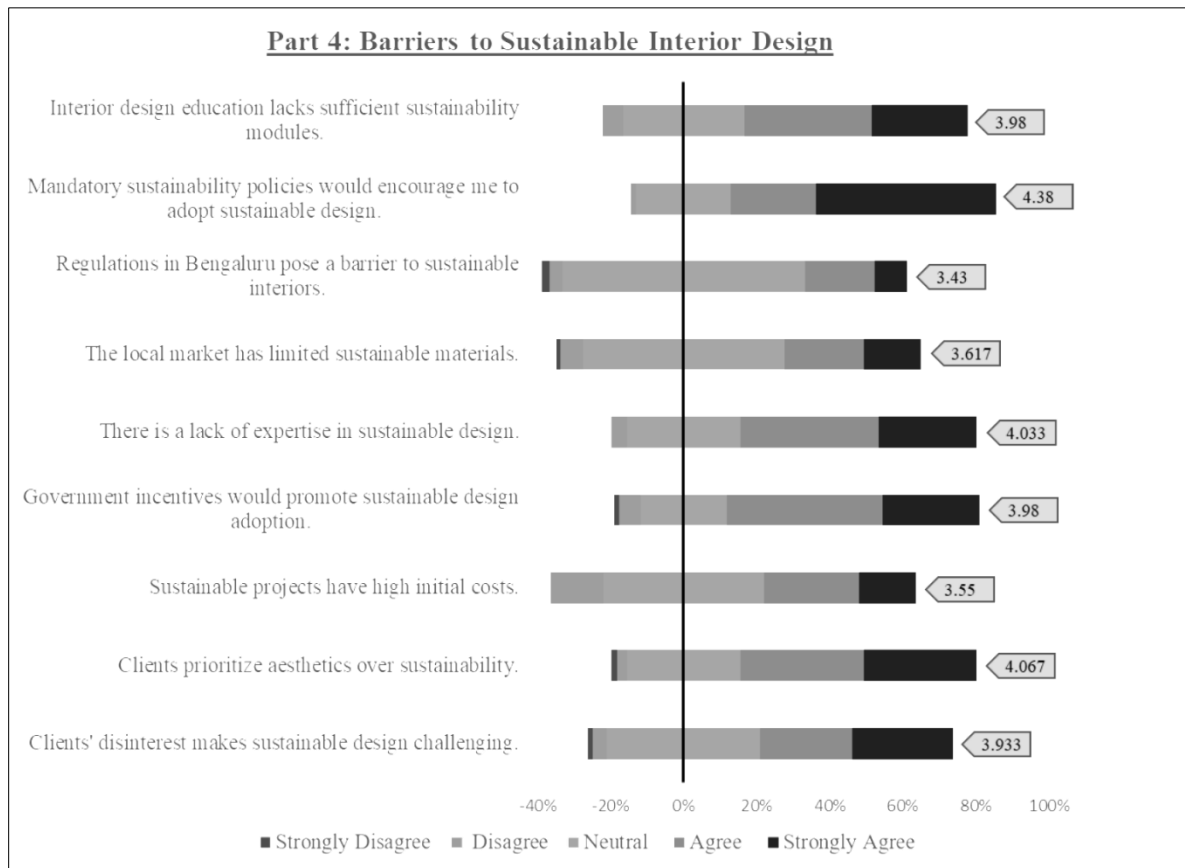


Figure 4: SIAD Practice Barriers

Tables

Part Number	Section Heading	Description
Part 1	Respondent Background	Collected data on respondents' education, professional affiliations/memberships, experiences, and roles in the interior design field. Aimed to establish a demographic profile.
Part 2	Awareness and Understanding of Sustainability	Explored the respondents' knowledge and understanding of sustainable interior design, including familiarity with sustainability principles and their implications.
Part 3	Implementation of Sustainability Principles	Divided into three dimensions: environmental, economic, and social. Assessed how well sustainability indicators are integrated into interior design practices using a 5 Point Likert scale.
Part 4	Identifying the Barriers to Sustainable Interior Design	Analyzed collected data to identify factors hindering the implementation of sustainable interior design practices.

Table 1: Survey Questions