



**3rd INTERNATIONAL
CONFERENCE ON SUSTAINABLE
BUILT ENVIRONMENT 2025**
LEADING TO **VIKSIT BHARAT**

BOOK OF ABSTRACTS

SUB-THEMES

- Technology Driving Sustainability
- Green Building and Energy Efficiency
- Sustainable and Climate-Resilient Infrastructure
- Circular Economy, Climate Finance and Waste Management
- Public Policy for Sustainable Development
- Smart Cities and Urban Planning
- Social Sustainability and Inclusivity

Amity University, Noida, Uttar Pradesh, India
RICS School of Built Environment

20th & 21st March 2025

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Foreword

3rd International Conference on Sustainable Built Environment 2025, with the theme **Leading to Viksit Bharat** was a conference that deliberated diverse aspects of planning, development and operations of Sustainable Built Environment that would contribute to Sustainable Development of the nation. Deliberations including **paper presentations under comprehensive sub-themes of the Conference, Panel discussions, Fireside Chat and Keynote addresses** covered discussions for the topic with respect to designing, construction, operations, redevelopment and disposal of built environment. Discussion regarding Financing of Sustainable Built Environment, digital interface, policy guidelines are overarching aspects in these stages.

It's a unique academic conference that included representation of experts from industry, academia and government departments including policy making bodies. The Competitions that were conducted included understanding of the **Vision of the young generation for Sustainable Built Environment** with respect to designing of related products and services and posters for dissemination of their Vision. The entries have been an education for us that how young generation considers these aspects at different stages of their life from School to HEIs and then in professional journey and jury panel members had a difficult task of announcing the winners. Diversity of academic Institutions and geographical regions from where Competition entries were received shows the desire in our young generation to contribute in developing Sustainable Built Environment that would lead to achieving the Vision of Viksit Bharat. We are honoured to have provided a platform for them to showcase their Vision.

Research paper Abstracts have representation of researchers at global level and discussions were enriched by the participation of international experts. Discussion by experts on topics '**Transition to adaptive, resilient and net zero buildings for Viksit Bharat**', '**Sustainable Practices in Construction**', '**Net Zero Commercial Buildings Achieving Energy Independence**', '**Industry Academic Interface – Intrinsic to Sustainable Built Environment Development**' and '**Sustainability intrinsic to academic curriculum and pedagogy – National and Global perspective**' brought a comprehensive learning on the Industry, Academic and Policy makers perspective for present and future and value of interface of tasks of these three groups of professionals.

RICS SBE team had innovatively planned the Conference to include participation of diverse stakeholders for the topic and with the encouragement and support of the University Leadership, this one-and-a-half-day Conference was conducted. We are thankful to the support of Scientific Committee members, Knowledge Partners, Publication Partner and Platinum Sponsor for supporting and enriching the Conference.

We hope that readers of this Book of Abstracts would have as much learning and knowledge gain as much RICS SBE team has had in planning and conducting the Conference. We look forward to further associations and deliberations with you all and your feedback regarding the Conference that would contribute in planning the 4th edition of the Conference with even wider scope and impact.

Dr. Vanita Ahuja

Director RICS – SBE Noida and
Group Academic Head (Design and Built Environment),
Amity Education Group

1. Introduction to RICS SBE, Noida and the Conference ICSBE 2025

1.1. Conference Theme: Sustainable Built Environment Leading to Viksit Bharat

RICS School of Built Environment (RICS SBE), Amity University is an industry-led academic institution that delivers specialized undergraduate and postgraduate programs to students aspiring to work in the real estate, construction and infrastructure sector. It also serves as a hub for research and development of technical expertise in built environment.

Established in 2013, RICS SBE is supported by leading real estate, construction & infrastructure firms as well as the Ministry of Urban Development, Government of India. It is a Department of Amity University's Noida and Mumbai campuses and has enrolled 3000+ students till date. Set up in response to a strong call from the industry to address the challenge of the shortage of skilled professionals, the school aims to bridge the skills gap by delivering industry-ready professionals. Thus, RICS SBE aims to bring excellence in both teaching and research by continually improving the teaching expertise and by organising an annual international conference on Sustainable Built Environment.

The International Conference "Sustainable Built Environment Leading to Viksit Bharat" was planned with aim of fostering cross-sectoral collaboration to drive sustainable development in India's built environment, by bringing together national and international experts from various fields such as management, economics, engineering, architecture, urban planning, policymaking, and technology. The conference served as a dynamic platform to address sustainability challenges and opportunities across urban and rural landscapes at both national and global levels.

The conference highlighted the collaboration of academic institutions, policymakers, industry, and social organizations—the pillars facilitating societal growth (Vikas). It explored innovative strategies, policies, and technologies that drive India's transformation into a Viksit Bharat (Developed India). This aligns with the Global Sustainable Development Goals (SDGs) and supports India's Nationally Determined Contributions (NDCs), contributing to the country's ambition of achieving Net Zero Carbon emissions by 2070.

Emphasizing the interconnectedness of the built environment, technology, and policymaking, the conference aligned the efforts of academia, industry, the social sector, and government toward these goals. In addition to expert presentations and panel discussions, the event featured competitions encouraging students to design sustainable products, systems, branding collaterals, and posters. The best presentations in each category were recognized and felicitated. These competitions aim to inspire creative solutions to India's sustainability challenges.

1.1.1. Target Audience

The conference aimed to attract participants from various sectors to ensure rich, interdisciplinary discussions:

- **Academics and Researchers:** From fields including such as urban planning, engineering, economics, architecture, environmental science, and public policy.
- **Government Organisations and Policymakers:** Diverse departments including those focused on urban development, sustainability, and environmental policy making.
- **Industry Professionals:** Including professionals from real estate, construction, technology, energy sectors and domains other supporting sustainable development.

- **Research Scholars and Young Professionals:** Encouraged youth participation from higher education academic institutions to foster fresh ideas and innovation.
- **Start-Up Ecosystem in Sustainability:** The start-up ecosystem in sustainability is rapidly expanding, with organizations driving innovative solutions to tackle climate change and environmental challenges. Additionally, organizations are facilitating this growth through funding, certification, and other necessary support. All concerned were the target audience.
- **International Delegates and NGOs:** For sharing global insights and collaboration on sustainability solutions.

1.2. Conference Objectives and Key Themes

1.2.1 Key Objectives

The objectives of this conference were multifaceted, focusing on thought leadership, innovation, and practical outcomes:

- **To Promote Sustainable Urban Development:** Explore sustainable models for urban planning, infrastructure development, green building, and resource efficiency.
- **To Foster Cross-Sector Collaboration:** Facilitate dialogue between academia, industry, leading organisations, policymakers, and urban planners to create actionable sustainable solutions.
- **To Address Technological Innovation:** Highlight the role of emerging technologies—such as AI, IoT, and smart grids—in promoting sustainability across the built environment.
- **To Shape Policy Discourse:** Provide recommendations that influence government policies to create more sustainable, equitable, and resilient cities and communities.
- **To Support India's Vision for 2047:** Align with India's long-term vision of becoming a developed nation by promoting sustainable growth across various sectors.
- **Engage the Next Generation:** Encourage active participation from students, young professionals, and emerging innovators through competitions, workshops, and presentations.

1.2.2 Key Themes

The broader theme, *Sustainable Built Environment Leading to Viksit Bharat*, encompassed a range of key sub-themes, encouraging participation from multiple disciplines and fostering comprehensive discussions on the future of sustainability in India.

- **Technology Driving Sustainability:** Exploring the integration of Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IOT), smart grids, other emerging technologies and renewable energy in the development of sustainable cities and infrastructure.
- **Green Building and Energy Efficiency:** Examining sustainable construction methods, energy-efficient systems, and carbon-neutral infrastructure projects.
- **Sustainable and Climate-Resilient Infrastructure:** Strategies for building infrastructure that is adaptive to climate change, resilient to natural disasters and responds to goals of SDGs.
- **Circular Economy, Climate Finance and Waste Management:** Discussions on sustainable waste management practices and the circular economy in the built environment, Sustainable Real Estate Development and Financing, Green Financing for Built Environment
- **Public Policy for Sustainable Development:** The role of governance, regulation, and policy making in promoting sustainable cities and communities.
- **Smart Cities and Urban Planning:** Advancing the concept of smart cities that integrate technology for better resource management, transportation, and quality of life.
- **Social Sustainability and Inclusivity:** Addressing the social dimensions of sustainability, including affordable housing, inclusive growth, and equitable urbanization.

1.3. Conference Schedule

1.3.1 Schedule Day 1- 20/03/2025

Time	Programme Schedule
8:30 - 9:30	Registration & Tea
9:30 - 11:00	<p>Inaugural Session</p> <p>Welcome speech by Dr. Vanita Ahuja, Director RICS SBE - Noida</p> <p>Address by Mr. U. Ramachandran, Senior Vice President, Amity Education Group</p> <p>Inaugural Address by the Chief Guest, Mr. V. Suresh, Vice Chairman, National Building Code of India</p> <p>Keynote Address by Guest of Honor (Virtual) Dr. Namrita Kalsi, Chief Architect, Haryana Mass Rapid Transport Corporation Limited.</p> <p>Release of ICSBE 2025 Book of Abstracts</p>
11:00-11:15	<p>High Tea</p> <p>Start of Branding Competition</p>
11:15-12:10	<p>Panel Discussion 1: Transition to adaptive, resilient and net zero buildings for Viksit Bharat</p>
12:10-12:25	<p>Presentation: “Responsible Real Estate” by Mr. Ritesh Sachdev, Senior Vice President, Head of Leasing and Asset Management, Sustainability & CSR, <i>Tata Realty and Infrastructure Ltd</i></p>
12:25-13:20	Panel Discussion 2- Sustainable Practices in Construction
13:20- 13:30	Signing of MOU with AEEE (Alliance for Energy Efficient Economy)
13:30-14:15	Lunch & Group Photo
14:15-16:00	<p>Breakout Sessions (Presentations in 5 Breakout Sessions)</p> <p>Roundtable Discussion - Net Zero Commercial Buildings Achieving Energy Independence</p>
16:00-16:15	High Tea
16:15-18:15	Breakout Sessions (Presentations in 5 Breakout Sessions)
18:30 onwards	Networking Dinner

1.3.2 Schedule Day 2- 21/03/2025

Time	Programme Schedule
8:30 - 9:30	Networking Tea
9:30-10:30	Competitions Awardees Presentations
10:30-11:00	Virtual Fireside Chat: Industry Academic interface – Intrinsic to Sustainable Built Environment Development
11:00-11:15	High Tea
11:15-12:15	Panel Discussion 3: Sustainability intrinsic to academic curriculum and pedagogy – National and Global perspective
12:15-13:00	Valedictory session Award ceremony Summarisation by Dr. Vanita Ahuja , Director RICS SBE - Noida Vote of Thanks by Dr. Ashish Gupta , Member Secretary organising Committee
13:00-14:00	Lunch & Group Photo
14:00 - 17:50	“AI-Drone Inspection Technology Workshop with MOU Partners RaSpect Intelligence Inspection Limited, Hongkong.” (Paid Workshop)

1.4. Knowledge Partners and Sponsors



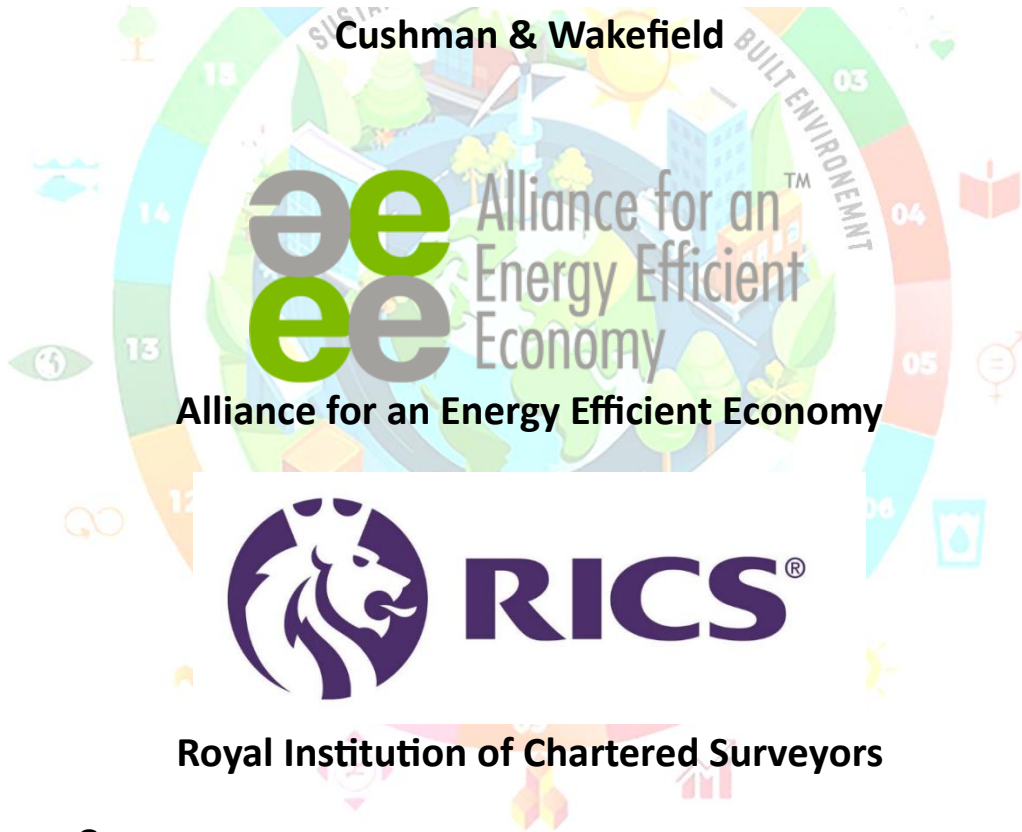
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Adoption of BIM in Indian Road Infrastructure Projects: Trends, Barriers, and Sustainability Outcomes

Shankar Bimal Banerjee¹; Sanjay Govind Patil²



Shankar Bimal Banerjee



Sanjay Govind Patil

Purpose

The adoption of Building Information Modeling (BIM) in Indian road infrastructure projects represents a transformative shift in the construction industry, offering enhanced efficiency, collaboration, and sustainability. This research investigates the key trends driving BIM adoption, the barriers limiting its widespread implementation, and its contributions to sustainability outcomes in infrastructure development. By addressing critical gaps in current practices, the study underscores BIM's potential to reshape the construction landscape in India.

Approach and Method

A mixed-method approach was employed, combining a review of academic literature, policy documents, and case studies of prominent infrastructure projects. This methodology synthesizes qualitative insights and quantitative analyses to evaluate BIM's impact on project performance, lifecycle management, and sustainability goals. The integration of BIM with advanced technologies such as Digital Twin and the Internet of Things (IoT) is a notable trend, facilitating real-time data management and improved decision-making across project phases.

Despite these advancements, several barriers impede BIM's broader adoption. These include a lack of skilled professionals, resistance to change within traditional construction workflows, unclear business value, and high initial costs. Furthermore, the absence of standardized guidelines and insufficient government mandates exacerbates these challenges. Addressing these issues is critical to unlocking BIM's full potential.

Findings

The findings highlight BIM's capability to reduce project timelines, enhance cost efficiency, and support environmentally sustainable practices. By enabling optimized material usage, energy-efficient designs, and low-carbon construction techniques, BIM contributes significantly to India's sustainability commitments. Government initiatives such as policy mandates and capacity-building programs are essential for fostering widespread adoption.

Implications

This study offers actionable recommendations for stakeholders, including policymakers, project managers, and industry professionals. It emphasizes the need for targeted training programs, public-private partnerships, and the establishment of standardized guidelines. Aligning BIM adoption with the National Infrastructure Pipeline ensures its role in achieving India's infrastructure and sustainability goals. By addressing existing barriers, this research provides a strategic framework for leveraging BIM to modernize India's road infrastructure sector effectively.

Keywords: Building Information Modeling, Construction 4.0, Digital Twin, Road Infrastructure, Sustainability

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Assessing the Impact of AI and ML on Property Valuation Accuracy and Efficiency

Neelam Surya Vamshi¹; Ashish Gupta²



Neelam Surya Vamshi



Ashish Gupta

Purpose

The study examines the impact of Artificial Intelligence (AI) and Machine Learning (ML) on property valuation, focusing on how these technologies improve accuracy, efficiency, and scalability. It explores the role of predictive AI, predictive analytics, and hybrid models in addressing traditional valuation inefficiencies and market fluctuations.

Approach and Method

The research evaluates AI-driven valuation techniques using case studies of Zillow's Zestimate and Redfin Estimate to evaluate the practical application of AI in property valuation. Additionally, gather insights from industry professionals on the future role of AI and ML in reshaping real estate valuation practices. Also, the study critically examines challenges such as data quality issues, algorithmic transparency, and systemic biases in AI-based valuation models.

Findings

The results will show how AI and ML are transforming the accuracy and efficiency, improving valuation accuracy, analysing the benefits and challenges, and gathering insights from industry professionals on the future role of AI and ML in reshaping real estate valuation practices.

Implications

The study provides insights for industry professionals, policymakers, and researchers on leveraging AI for better valuation practices while addressing ethical and technical challenges. Furthermore, it offers strategies to balance AI insights with human expertise, ensuring responsible adoption in both developed and emerging markets.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Predictive AI, Predictive analytics, Hybrid approaches, Property valuation.

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Challenges and Opportunities of Adopting Construction Technologies—BIM, Green Building, and VR/AR—In the Indian Construction Industry

Ashiq Sharif¹; Taqdees Anjum²



Ashiq Sharif



Taqdees Anjum

Purpose: The Indian construction industry is rapidly expanding, necessitating the adoption of advanced technologies to improve efficiency, cost management, and sustainability. While countries like the UK and Singapore have mandated the use of Building Information Modelling (BIM), India still faces significant challenges in integrating emerging technologies. This study aims to explore the challenges and opportunities of adopting construction technologies like BIM, Green Building, and Virtual/Augmented Reality (VR/AR) in the Indian construction industry. The research investigates key barriers such as financial constraints, skill gaps, and regulatory limitations while highlighting the potential benefits of these technologies in enhancing project performance and sustainability.

Approach and Method: This study adopts a mixed-method approach by analysing data from literature reviews, case studies, expert interviews, and structured questionnaires distributed to industry professionals. The research examines existing adoption frameworks in other countries and evaluates their applicability to the Indian context. Expert interviews provide qualitative insights into industry perceptions, while the questionnaire responses help quantify adoption levels, challenges, and potential growth areas. Case studies of projects that have successfully implemented these technologies offer practical lessons for broader adoption.

Findings: Preliminary findings indicate that while awareness of BIM, Green Building, and VR/AR is growing in India, adoption remains limited due to high implementation costs, lack of skilled professionals, resistance to change, and inadequate policy support. However, the study also identifies significant opportunities, including increased efficiency in project execution, reduced material waste, enhanced design accuracy, and improved stakeholder collaboration. The research highlights the need for government incentives, industry training programs, and standardized implementation guidelines to drive wider adoption.

Implications: The findings of this study can help policymakers, construction firms, and industry stakeholders develop strategies to overcome barriers and accelerate the adoption of these technologies in India. By addressing key challenges and leveraging emerging opportunities, India's construction sector can enhance productivity, achieve sustainability goals, and align with global best practices. This research also contributes to the academic discourse on construction technology adoption, providing a foundation for future studies on digital transformation in the Indian construction industry.

Keywords: BIM, Green Building, VR/AR, Construction Technology Adoption, Indian Construction Industry.

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Clash Detection and Its Resolution in BIM

Deepak P¹; Jyoti Singh²



Deepak P



Jyoti Singh

Purpose

This study explores how proactive clash avoidance strategies using Building Information Modelling (BIM) contribute to sustainable construction practices. By identifying and preventing design conflicts early in the project lifecycle, BIM improves project efficiency, reduces material waste, and minimizes rework. The study also evaluates key BIM tools and addresses challenges such as data integration and training needs. Ultimately, it demonstrates how BIM enhances project delivery and supports sustainable construction.

Approach and Method

A qualitative approach is used to understand how BIM prevents design clashes and supports sustainability. The study involves reviewing existing research, analysing BIM tools such as Autodesk Revit, Navisworks Manage, and BIM 360, and studying real-life examples. The focus is on how proactive clash detection improves coordination, minimizes waste, and enhances project efficiency. Additionally, challenges such as data integration and training are identified, along with practical solutions.

Findings

Improved Design Coordination, proactive Clash Detection, Project Efficiency, Effective use of BIM Tool, Support for sustainable construction.

Implications

The findings indicate significant benefits for project delivery, cost savings, and sustainability. By integrating BIM effectively, construction firms can improve collaboration, enhance project coordination, and achieve long-term efficiency. However, the study also emphasizes the need for proper training and standardized processes to maximize BIM's potential. Addressing these challenges will ensure that BIM continues to drive sustainable construction practices.

Keywords: BIM, Waste Reduction, Clash Detection, Clash Avoidance, Proactive Strategies, Efficiency Improvement, Sustainable Construction.

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Comparative Analysis of Planning and Scheduling Efficiency in Traditional vs. IPD-BIM Based Construction of Commercial Projects in India: A Sustainable Approach

Ujjal Saurabh Bordoloi¹; Jyoti Singh²



Ujjal Saurabh Bordoloi



Jyoti Singh

Purpose

Proper planning and scheduling are essential for commercial construction projects in India to be completed on time and within budget. Issues with traditional planning and scheduling methods, such as lack of real-time project visibility, miscommunications among stakeholders and ineffective resource allocation frequently cause delays and cost overruns. To highlight their importance in attaining sustainable building outcomes, this study compares the traditional planning and scheduling effectiveness with approaches based on Building Information Modelling (BIM) and Integrated Project Delivery (IPD).

Approach and Method

To assess challenges associated with the current planning and scheduling techniques in comparison to the impact of IPD-BIM integration on the efficiency of commercial projects, a comparative study methodology is used, which includes literature studies and a questionnaire-based approach. Additionally, this study compares the problems with traditional methods and examines how IPD and BIM might improve scheduling and planning in a sustainable way. Examining how IPD's collaborative framework and BIM-driven digital modelling enhance material efficiency, promote energy-efficient design, minimizing construction waste, and allocating resources optimally, this integration eventually reduces the environmental impact of building projects and support sustainable building programs in commercial construction sector.

Findings

Findings show that projects based on Integrated Project Delivery (IPD) and Building Information Modelling (BIM) significantly enhances planning and schedule accuracy, stakeholder participation, and resource allocations as compared to traditional approaches. Together, IPD and BIM improve real-time decision-making, minimize rework, and speed up energy-efficient design options, all of which help to lower carbon footprints. The study provides a framework for applying IPD-BIM approaches that is appropriate for sustainable commercial building sector.

Implications

The study highlights the importance of BIM and IPD to ensure that commercial construction is as efficient and sustainable as possible. Thus, the framework presents practical, actionable, and valuable strategies to policymakers, project managers, and developers to move towards IPD-BIM adoption, which helps the Indian commercial construction industry be more efficient, cost-effective, and sustainable.

Keywords: Project Planning, Scheduling, BIM, IPD, Sustainability, Construction, Commercial Projects

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Developing a framework for Integration of Building automation system in commercial building.

Shashank Mishra¹; Ashmita Rupal²



Shashank Mishra



Ashmita Rupal

Purpose: The purpose of this project is to integrate a Building Automation System (BAS) into a commercial building to enhance energy efficiency, improve occupant comfort, optimize operational performance, and ensure safety. The goal is to reduce energy consumption, lower operational costs, meet sustainability targets, and comply with relevant regulations. The project aims to demonstrate how IoT, artificial intelligence, and big data can be used to automate and optimize building functions, contributing to long-term system efficiency and sustainability.

Approach and Method: The project will begin with a literature review on government policies and energy regulations, examining sustainability standards, carbon reduction policies, and smart city integration. Key case studies, including The Edge in Amsterdam and One Bryant Park in New York City, will be analyzed to understand successful BAS implementation in real-world commercial buildings. Following this, the project will focus on the design and implementation of a BAS, integrating systems like HVAC, lighting, security, and energy management. The BAS will use IoT sensors and AI algorithms for real-time data collection and optimization. The project will evaluate the system's performance based on energy savings, occupant comfort, and overall operational efficiency. The project will begin with a literature review on government policies and energy regulations, examining sustainability standards, carbon reduction policies, and smart city integration. Key case studies, including The Edge in Amsterdam and One Bryant Park in New York City, will be analyzed to understand successful BAS implementation in real-world commercial buildings. Following this, the project will focus on the design and implementation of a BAS, integrating systems like HVAC, lighting, security, and energy management. The BAS will use IoT sensors and AI algorithms for real-time data collection and optimization. The project will evaluate the system's performance based on energy savings, occupant comfort, and overall operational efficiency.

Findings: The expected findings of this project include significant energy savings through optimized system control, which will result in reduced operational costs. The BAS is expected to enhance occupant comfort by automatically adjusting indoor conditions based on real-time data, improving satisfaction. Operational efficiency will also improve as manual interventions are minimized and systems are integrated for streamlined management. The BAS will support the building in achieving sustainability goals and green certifications such as LEED, contributing to carbon reduction and energy optimization. Predictive maintenance will be enabled by real-time data, extending the lifespan of building systems. The project will also show how BAS helps buildings comply with energy efficiency standards and government regulations.

Implications: The integration of a BAS in commercial buildings offers significant cost savings, enhances environmental sustainability, and improves building safety. This approach can lead to reduced energy consumption, lower maintenance costs, and contribute to the achievement of green building certifications. The system's scalability ensures that the building remains adaptable to future technological advancements. This project can serve as a model for other buildings seeking to implement smart building solutions and could influence policy by demonstrating the value of BAS in achieving energy efficiency and sustainability goals.

Keywords: *Sustainable elements in building, Energy consumption in a commercial building, ECBC code, Energy Efficiency in commercial Building, Case Studies, Achieving of Renewable Energy Source.*

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Enhancing LEED Certification through Building Information Modeling (BIM): Streamlining Processes and Optimizing Workflow Integration

Shashank Vats¹; Jyoti Singh²



Shashank Vats



Jyoti Singh

Purpose

Sustainable buildings are important for protecting the environment and saving resources. The Leadership in Energy and Environmental Design (LEED) certification is a well-known system that helps ensure buildings are environmentally friendly. However, the traditional process of getting LEED certification is very complicated. It requires a lot of paperwork, calculations, and checks, which take a lot of time and effort. These challenges make it difficult for many projects to achieve sustainability goals efficiently.

Approach and Method

The study first looks at the current problems in the LEED certification process and finds areas that need improvement. In another step, it explores how BIM can solve these problems. BIM can store important data, analyze energy use, and track building materials in real-time. This research will develop BIM based conceptual framework to automate the LEED certification process.

Findings

This research aims to make the LEED certification process easier by using Building Information Modeling (BIM). BIM is a digital tool that helps in designing and managing buildings. It can improve real time data sharing, reduces mistakes, and automate tasks. This research focuses on creating and automating a BIM-based system to help simplify the steps needed for LEED certification. The system will cover both required prerequisites and optional credits in areas like materials use, indoor air quality, and energy efficiency.

Implications

The results show that using BIM can save time, reduce costs, and improve accuracy when applying for LEED certification process. This novel framework is especially useful for large buildings like offices, schools, and hospitals, where paperwork and coordination are more difficult. By following this method, builders and designers can get LEED certification more easily, and it will help in monitoring the process of construction also help make buildings more energy-efficient and environmentally friendly. This research proves that BIM can change the way we design and construct sustainable buildings. The proposed system can be adapted and used in different construction projects to make LEED certification simpler and faster.

Keywords: LEED , BIM , Sustainable Buildings , Credit Points , Integrated Process

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Exploration of use of AI in Drafting and Interpretation of contract in Indian construction Industry

Vikash Kumar Choubey¹; Triveni Prasad Nanda²



Vikash Kumar Choubey



Triveni Prasad Nanda

Purpose

The construction industry is one of the fastest-growing sectors in developing countries like India. In this era of technological supremacy, integrating AI into construction contracts has become essential. This paper examines the transformative potential of AI in drafting and interpreting contracts within the Indian construction industry. As one of the largest sectors, the Indian construction industry generates a vast number of contracts and disputes, leading to significant challenges in contract regulation and related legal frameworks. AI can help address these challenges by streamlining contract management processes, enhancing contract accuracy, automating compliance checks, reducing legal ambiguities, and ultimately minimizing litigation issues.

Approach and Method

The paper adopts a questionnaire survey involving construction firms, industry experts, legal professionals, and government employees to conclude its findings. The approach utilizes qualitative analysis through the Delphi technique, a structured method used to gather expert opinions and achieve consensus on a particular topic through multiple rounds of surveys or questionnaires.

Findings

The findings demonstrate that the use of AI remains challenging for small-scale contractors, government staff, and the majority of construction professionals from a techno-legal background (civil engineering) due to technological resistance. However, where AI is utilized for contract drafting and interpretation, it efficiently reduces ambiguities in clause interpretation, drafting errors, and disputes arising from misinterpretation of clauses. Additionally, AI facilitates the fast and easy understanding of previous court judgments as case studies in a significant manner. It is also useful for predictive analysis, helping to mitigate contractual disputes before they escalate into time-consuming legal conflicts.

Implications

A wide range of stakeholders, including legal professionals, construction professionals, legislators, and the general public, would be affected by the impact of AI-driven contracts in the Indian construction sector. Integrating AI into construction contracts will significantly reduce contract interpretation ambiguities, lower costs, save time, enhance legal provisions, improve contractual clarity, increase judicial efficiency when needed, and ultimately lead to fewer legal conflicts. Despite its numerous benefits, AI adoption remains slow and lacks widespread consideration due to regulatory ambiguities, high implementation costs, and scepticism among stakeholders. It is now imperative for policymakers to establish AI specific legal frameworks, while other stakeholders must embrace AI integration. This research contributes to the discourse on AI's legal applications, paving the way for future advancements in AI-assisted contract governance.

Keywords: AI-powered contracts, legal compliance, construction industry, contract interpretation, risk assessment.

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Human-Centric Office Design: A BIM-Based Framework for Optimizing Workspaces

Faiz Ali¹; Jyoti Singh²



Faiz Ali



Jyoti Singh

Purpose

The evolving nature of workplace environments, driven by technological advancements and changing workforce expectations, calls for human-centric office designs that enhance occupant well-being, productivity, and sustainability. Traditional office layouts often fail to adapt to dynamic employee needs, resulting in inefficient space utilization, excessive energy consumption, and suboptimal working conditions. This study presents a Building Information Modelling (BIM)-based framework that integrates smart technologies, real-time analytics, and sustainable design principles to create adaptable and high performance workspaces.

Approach and Method

At the core of this framework is BIM as a collaborative platform that synthesizes multi-dimensional data, including ergonomic considerations, spatial functionality, biophilic elements, and energy efficiency metrics. By combining qualitative insights—such as user feedback, behavioural analytics, and well-being benchmarks—with quantitative data from IoT sensors (e.g., air quality, lighting, and thermal comfort), designers can simulate, evaluate, and optimize office layouts dynamically. This approach ensures a balance between individual preferences and organizational goals while enhancing environmental sustainability.

Findings

The proposed framework emphasizes adaptability and resilience, enabling offices to evolve with workforce demands and technological innovations. Modular design strategies, supported by BIM's clash detection and lifecycle analysis, facilitate future-ready spaces that remain functional amid organizational shifts. Additionally, the incorporation of post-occupancy evaluation (POE) tools within the BIM environment promotes continuous monitoring and data driven improvements, ensuring long-term efficiency and sustainability.

Implications

Aligned with Sustainable Development Goal (SDG) 11, this research highlights the role of BIM in fostering sustainable, inclusive, and resilient work environments. By prioritizing occupant well-being alongside energy efficiency and space optimization, organizations can transform office design into a key driver of workplace excellence, environmental responsibility, and long-term sustainability. This framework serves as a blueprint for architects, facility managers, and corporate leaders seeking to bridge the gap between human-centered design and practical implementation in the modern workplace.

Keywords: Human-centric design, BIM, sustainability, workspace optimization, productivity, well being, SDG 11.

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Implementation of Digital Technology in Construction Project.

Animesh Kumar Singh¹; Suhail Khan²



Animesh Kumar Singh



Suhail Khan

Purpose

This research examines how digital tools and systems are used in construction project management to improve project efficiency and sustainability. It focuses on areas like planning, execution, monitoring, and control, and aims to identify strategies for successful adoption of digital technologies.

Approach and Method

The study explores the impact of digital technologies on construction project management through a holistic approach to adoption, implementation, and sustainability. It involves identifying and analyzing various digital tools and systems applicable to key project management components and evaluating their effectiveness.

Findings

The research highlights the potential of digital technologies to enhance project outcomes by improving cost management, scheduling, communication, and overall performance. It also addresses the challenges associated with the implementation of digital solutions, including financial constraints, workforce adaptability, and technological integration complexities.

Implications

The findings of this study aim to provide valuable insights for industry stakeholders to leverage digital advancements for achieving operational excellence and sustainable growth in construction projects. Strategic recommendations are proposed for the sustainable adoption and long-term integration of digital technologies in construction project management.

Keywords: Digital Technologies, Project Efficiency, Construction Management, Sustainability, Innovation.

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Integration of AI Technologies in HVAC Systems for Enhanced Performance, Energy Efficiency, and Predictive Maintenance

Fozail Misbah¹; Mazharul Haque²; Taqdees Anjum³



Fozail Misbah



Mazharul Haque



Taqdees Anjum

Abstract

Artificial Intelligence (AI) is increasingly being integrated into Heating, Ventilation, and Air Conditioning (HVAC) systems to optimize energy consumption, improve system performance, and enhance predictive maintenance capabilities. This study systematically reviews the role of AI in HVAC operations, focusing on the application of advanced technologies such as machine learning (ML), natural language processing (NLP), and computer vision. AI-driven HVAC systems enable smarter control mechanisms, real-time fault detection, and data-driven decision-making, leading to significant energy savings and operational efficiency. This review examines research in the integration of AI into HVAC systems, focusing on advancements, applications, case studies, and challenges identified in the field. Citations were generated using Harzing's Publish or Perish tool, covering publications from 2019 to 2024. Findings are supported by academic research and industry reports, illustrating how AI can significantly enhance energy efficiency, reduce operational costs, minimize downtime, and contribute to sustainable building practices. Machine learning algorithms are particularly effective in predictive maintenance, reducing unexpected system failures and downtime by analyzing sensor data to detect anomalies. AI-based optimization techniques adjust HVAC operations in real-time, resulting in energy savings of up to 30%. Case studies such as Google's Nest Thermostat and Johnson Controls' OpenBlue platform demonstrate the practical benefits of AI in energy management and system optimization, with reported improvements in energy efficiency of 10-25%. Additionally, AI technologies contribute to improved indoor air quality (IAQ) by dynamically adjusting ventilation systems based on real-time environmental data. Despite these advancements, challenges remain, including the high initial costs of AI implementation, integration with legacy HVAC infrastructure, and concerns regarding data privacy and security. Furthermore, specialized training is required for HVAC professionals to effectively manage AI-driven systems. The findings suggest that AI has the potential to significantly advance HVAC performance, reduce operational costs, and support sustainable building practices in the evolving landscape of smart building technologies.

Keywords: Artificial Intelligence (AI), Energy Optimization, Predictive Maintenance, Machine Learning (ML), Smart HVAC Systems, Sustainable Building Practices.

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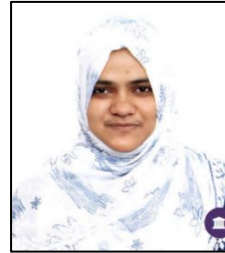
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Integration of AI, BIM, and ML for Delay Analysis in Construction Projects

Praveen Karole¹; Taqdees Anjum²



Praveen Karole



Taqdees Anjum

Purpose

Construction projects worldwide frequently experience delays, leading to increased costs, resource waste, and schedule disruptions. The study explores the application of artificial intelligence (AI) in delay analysis as a viable strategy to address these challenges effectively. Additionally, it examines how AI, when integrated with BIM and Machine Learning, can contribute to sustainable development in construction projects, aligning with the goal of achieving sustainability by 2030.

Approach and Method

The research investigates AI-driven delay analysis techniques, including ML models and Artificial Neural Networks, which provide accurate predictions of potential delays. The study also explores the integration of AI with BIM to enhance project planning and coordination. Furthermore, real-time data collection via IoT devices, such as sensors on construction sites, is examined for its ability to continuously monitor project status and provide actionable insights.

Findings

AI models help predict delays by identifying issues like plan changes, resource shortages, and inefficiencies, allowing timely corrective actions. Integrating AI with BIM enhances visualization, resource management, and decision-making. IoT-enabled real-time data collection improves project monitoring and response to disruptions. A gap exists between AI and conventional tools like BIM and ML, limiting AI's full potential in construction management.

Implications

AI-driven delay analysis improves project efficiency, reduces costs, and minimizes financial risks. AI-BIM-IoT integration supports sustainable construction by optimizing resource use and reducing waste. Bridging the AI-BIM-ML gap can enhance project outcomes, drive innovation, and promote sustainability in construction management.

Keywords: Sustainability, Sustainable development, Delay Analysis, AI in Construction, ML, BIM, IoT in Construction.

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Integration of BIM and Lean Construction for Environmental (LCA) and Social (S-LCA) Life Cycle Assessment in Construction

Gayathri Suresh¹; Jyoti Singh²



Gayathri Suresh



Jyoti Singh

Purpose

The construction sector contributes to problems, including labor disputes, resource depletion, and carbon emissions, which have a significant effect on society and the environment. Social Life Cycle Assessment (S-LCA) is concerned with the welfare of communities and employees, whereas Life Cycle Assessment (LCA) aids in quantifying environmental impacts. These sustainability evaluations, however, are tedious and manual and do not incorporate digital tools such as Building Information Modelling (BIM). Because of this, many construction organizations find it difficult to apply them successfully in practical decision-making. The study aims to analyze regional variations in LCA and S-LCA procedures, investigate methods to include these evaluations with BIM, and create a more flexible LCA model that considers project limitations and economic fluctuations. To ensure financial viability and enable construction professionals to make informed decisions that support social and environmental sustainability, a flexible and structured framework must be established.

Approach and Method

This study uses a comparative and practical approach to address these issues. It first examines previous LCA and S-LCA studies conducted in various geographical areas to find best practices and discrepancies. It then investigates how BIM can be used to improve data visualization and accuracy, which could speed up and improve sustainability assessments.

Findings

To keep sustainability assessments up to date, the study suggests a dynamic LCA model that adapts to real project conditions and changes with the economy. Significant findings focus on the notable differences in LCA and S-LCA implementation around the world, which makes comparing sustainability performance across projects more challenging. The study also highlights the benefits of incorporating sustainability evaluations into BIM processes, which improves their use and accessibility in building design. Additionally, it highlights the shortcomings of current LCA models, which frequently neglect to take project-specific difficulties and changes in the economy into consideration. The suggested approach fills in these gaps by adjusting to financial and environmental realities, which improves the effectiveness of sustainability assessments for professionals in the field.

Implications

This study offers a straightforward, scalable, and approachable method for evaluating sustainability for construction professionals. Decision-makers can assess social and environmental effects in addition to project costs and schedules by combining BIM with LCA and S-LCA, which results in more informed and balanced decisions. By encouraging industry-wide adoption of sustainability assessments, the suggested methodology moves away from irregular environmental reports and toward a more integrated life-cycle approach. In the end, this approach helps the construction industry create more intelligent, environmentally friendly, and socially responsible projects.

Keywords: SLCA, LCA, BIM, Impact Assessment, Sustainability.

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Integration of Industry 5.0 in the Real Estate Sector

Shiv Pratap Singh¹; Saurabh Verma²



Shiv Pratap Singh



Saurabh Verma

Purpose

This paper investigates the integration of Industry 5.0 principles into the real estate sector, with a focus on fostering sustainability, human-centric design, and resilience. While Industry 4.0 emphasized automation and digitization, its limitations include concerns about job displacement, environmental sustainability, and ethical challenges. In contrast, Industry 5.0 emphasizes collaboration between humans and technology, aiming for sustainable and inclusive advancements. By combining technological innovations with a human-first approach, Industry 5.0 seeks to create a more balanced and future-proof built environment.

Approach and Method

The study aligns with three key objectives: exploring the significance of Industry 5.0 for the real estate sector, benchmarking exemplary real estate developers and REITs that demonstrate Industry 4.0 and 5.0 practices, and identifying transition opportunities for the commercial real estate (CRE) sector in India. The methodology of this study is based on secondary data analysis, leveraging existing literature, industry reports, case studies, and publicly available information from prominent publicly listed BSE real estate companies and REITs. This approach enables a comprehensive understanding of how various stakeholders in the real estate sector are evolving and adapting to Industry 5.0 trends.

Findings

The research explores the application of Industry 5.0 core principles, focusing on Human Centric Real Estate Development, Sustainability & ESG Integration, and Resilience & Future-Proofing, within the real estate sector. These principles emphasize the need for intelligent spaces designed with occupant well-being in mind, the adoption of sustainable construction practices, and the ability of real estate developments to withstand socio economic and environmental disruptions. By integrating advanced technologies like artificial intelligence (AI), the Internet of Things (IoT), and digital twins while ensuring a human oriented design approach, Industry 5.0 can reshape real estate practices to be more adaptive and sustainable.

Implications

The research identifies the gap between current real estate industry practices and the adoption of Industry 5.0 principles, highlighting areas where human-centric design, sustainability, and resilience are yet to be fully integrated. While advancements in AI, IoT, and circular economy practices are emerging, their widespread implementation remains limited due to challenges such as technological investment, regulatory frameworks, and workforce adaptation. By assessing key performance indicators, this study underscores the need for a structured approach to align real estate development with Industry 5.0, ensuring future-proof, efficient, and sustainable built environments.

Keywords: Industry 5.0, Human-Centric Design, Sustainability & ESG Integration, Resilient Built Environment.

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Leveraging Digital Technologies to Enhance Cost Efficiency, Sustainability, and Innovation in the Development of Affordable Housing Solutions.

Koppula Teja Satya Sai Gowtham¹; Jyoti Singh²



Koppula Teja Satya Sai Gowtham



Jyoti Singh

Purpose

The rapid advancement of digital technologies is reshaping the landscape of affordable housing by optimizing cost efficiency, enhancing sustainability, and driving innovation. This study explores the integration of Industrialized Building System (IBS) technology, artificial intelligence (AI), and machine learning (ML) in the affordable housing sector. The aim is to leverage AI-driven design optimization, predictive maintenance, and smart construction management to reduce costs and enhance the environmental and structural performance of housing solutions.

Approach and Method

The methodology combines case studies, quantitative data analysis, and AI-based simulations to assess cost reductions and efficiency improvements in affordable housing development. This approach helps to understand the role of digital technologies in optimizing cost efficiency and sustainability.

Findings

The findings indicate that the adoption of digital technologies can significantly lower construction costs, improve resource utilization, and streamline project timelines. These improvements are essential for enhancing the affordability and sustainability of housing solutions.

Implications

The study highlights the potential of digital transformation to make affordable housing more viable and sustainable. By addressing key economic and environmental challenges, this transformation supports the creation of cost-effective, sustainable housing solutions in the sector.

Keywords: Digital technologies, AI, machine learning, affordable housing, sustainability.

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Optimizing Contract Management with Building Information Modelling (BIM): A Data-Driven Approach to the Construction Lifecycle

Aishwarya Rawat¹; Jyoti Singh²



Aishwarya Rawat



Jyoti Singh

Purpose

Building Information Modelling (BIM) can enhance contract management in construction by improving efficiency and collaboration. However, its adoption faces challenges such as legal uncertainties and technological barriers. This study aims to explore the factors influencing BIM adoption in contract management by identifying key drivers and barriers. It investigates the reasons behind the slow adoption of BIM and examines both enablers that facilitate its use and obstacles that hinder widespread implementation.

Approach and Method

The research will conduct a systematic review of existing literature to identify critical factors affecting BIM adoption in contract management. Additionally, a comparative case study will be carried out, analysing two construction projects—one utilizing BIM for contract management and the other following traditional methods. The study will assess BIM's impact on cost control, dispute resolution, risk allocation, stakeholder collaboration, and sustainability. Expert interviews and qualitative data analysis will further provide insights into practical challenges and benefits.

Findings

The study will provide insights into the advantages and limitations of BIM-based contract management. It will bridge the gap between traditional and BIM-based contract management by offering a theoretical framework that integrates BIM within existing contract management practices. This framework will outline best practices, technological enablers, sustainability considerations, and policy recommendations necessary for seamless BIM adoption.

Implications

The findings will contribute to both academia and industry by bridging the gap between traditional and BIM-based contract management practices. This framework will guide industry professionals, policymakers, researchers in adopting BIM-driven contract management solutions and driving digital transformation in construction projects.

Keywords: Building Information Modelling (BIM), contract management, digital transformation, Sustainability.

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Purview of Technology Adoption in Delay Analysis and Claims Management

Saira Suman¹; Taqdees Anjum²



Saira Suman



Taqdees Anjum

Purpose

Construction projects are inherently complicated, which can result in disputes, schedule delays, and cost overruns of up to 30% in megaprojects, all of which reduce productivity. Conventional delay analysis techniques frequently lack accuracy and speed. The quality of contract documents and inadequate coordination and communication (60%) are the main reasons for the decline in labour productivity, according to a 2023 study by FMI. Another insightful study by Autodesk and FMI discovered that miscommunication and insufficient project data account for 52% of rework. By improving tracking and communication and promoting advanced project management, technology provides an answer. Project efficiency and risk reduction are being revolutionized by cutting-edge technologies such as the Internet of Things (IoT), data analytics, Building Information Modelling (BIM), and Project Management Information Systems (PMIS).

Approach and Method

This study emphasizes how important it is for construction companies to use technology as a fundamental part of contemporary project management procedures, not only as a choice. The primary objective is to investigate efficient ways to incorporate technology into claims management and delay analysis in the construction sector. Surveys targeting industry professionals will form the primary method of data collection. This approach will provide insights into current practices and pinpoint challenges within claims management and delay analysis. The information gathered will then be carefully analyzed to develop a robust framework outlining how technology can be effectively integrated to improve these processes.

Findings

With the use of state-of-the-art technology solutions, the study aims to significantly reduce disputes, rework, time delays, and construction project cost overruns. Implementing cutting-edge technical solutions is expected to significantly enhance construction projects' capacity for claims management and delay analysis.

Implications

Technology integration in construction improves project outcomes and lowers financial risks, increasing enterprises' operational efficiency and competitiveness. Most importantly, it makes a big difference in energy efficiency. Building Information Modeling (BIM) enables digital representations that optimize resource use and minimize waste through conflict detection, accurate cost estimation, and enhanced coordination. Project management software facilitates real-time performance monitoring, pinpointing areas for improvement and enabling energy efficient adjustments. Additionally, real-time site monitoring via drones, cameras, and sensors provides up-to-date data, allowing project managers to make informed decisions for efficient energy use and sustainability.

Keywords: construction projects, delay, claims, PMIS, energy efficiency, sustainability, technical Solutions.

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Quantification of Construction Waste through BIM

Pranav Raj¹; Jyoti Singh²



Pranav Raj



Jyoti Singh

Purpose

An Overview of BIM Applications in Construction Waste Quantification and Reduction This study aims to assess the potential of BIM-based clash detection as a mean for C&D waste estimation and management considering the economic and environmental impacts of C&D waste generation. It aims to formulate a structured method for quantifying and reducing the wastage of materials in a systematic manner to facilitate sustainable construction practices.

Approach and Method

A comparative methodology has been used for the study by combining manual and BIM approaches for estimating the construction waste. A case study of a residential building model is created through Autodesk Revit, and different manual estimation techniques including area-based calculations of constructed area, material components, and individual measurement estimates are done. Also, clash detection to identify and quantify design clashes that lead to construction waste is done using Autodesk Navisworks Manage. The findings from both methods are analysed to determine the accuracy and efficiency of BIM in waste estimation. A questionnaire survey is also conducted among industry professionals to assess the adoption potential of BIM-based waste management in construction.

Findings

The research reveals that BIM-based clash detection can estimate and potentially prevent 40-45% of construction waste that would otherwise be generated due to design errors and coordination issues. Compared to manual estimation methods, BIM provides a more precise and efficient means of quantifying waste in the pre-construction phase. The analysis further shows that wall-related clashes contribute the most to waste generation (58.5%), followed by railings, columns, and beams. In addition to that, the survey results show a trend of growing industry inclination toward BIM adoption, with 85% of respondents supporting its implementation for waste management.

Implications

In conclusion, the study highlights the importance of BIM in promoting sustainable construction practices through reducing material waste, enhancing cost efficiency, and improving project planning. In turn, the introduction of BIM-based waste estimation at the pre-construction stage can bring project costs down, stop resource overuse, and improve environmental sustainability. The result also endorses the leveraging of BIM technology in the industry to enhance the waste management strategies within institutions where traditional waste estimation techniques are less effective.

Keywords: Building Information modelling (BIM), Construction waste, Waste estimation, Clash detection, Sustainable construction

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Study on Affordable Housing Technologies: Identifying Successful Technologies for India's Housing for All Mission

Satya Priya¹; Suhail Khan²



Satya Priya



Suhail Khan

Purpose

Providing affordable housing remains a major challenge in India, where rapid urbanization and rising construction costs impact accessibility for low-income groups. The Housing for All mission aims to bridge this gap by promoting cost-effective and sustainable housing technologies. This study seeks to assess existing affordable housing technologies, analyse their effectiveness, and recommend the most suitable solutions for large-scale implementation.

Approach and Method

This research evaluates various affordable housing technologies currently in use across India. The study employs a combination of literature review, case studies of implemented projects, and expert opinions to understand the performance, feasibility, and adaptability of these technologies. Key evaluation criteria include construction cost, speed, durability, environmental impact, and ease of implementation in diverse geographic conditions.

Findings

The study critically assesses multiple affordable housing technologies that have proven successful in India. It further identifies the most effective construction technology suitable for large-scale deployment under the Pradhan Mantri Awas Yojana (PMAY), ensuring efficiency and sustainability in mass housing development.

Implications

The research findings provide valuable guidance for policymakers, developers, and urban planners in selecting optimal housing technologies. By understanding the strengths and limitations of various construction methods, stakeholders can make informed decisions that align with the Housing for All mission, ultimately enhancing housing accessibility for economically weaker sections across India.

Keywords: *Affordable Housing, Construction Technologies, PMAY, Sustainable Housing, Low-Cost Construction.*

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Tech-driven Viksit Bharat: Drivers, Barriers and Effective interventions for the construction industry

Madhumira V¹; Taqdees Anjum²



Madhumira V



Taqdees Anjum

Purpose

The construction sector is a cornerstone of India's economic development, driving infrastructure growth, urbanization, and employment opportunities. With the nation's vision of "Viksit Bharat" (Developed India) by 2047, it becomes critical to address inefficiencies, enhance productivity, and meet global standards through technological advancements. This study aims to understand barriers, drivers and effective interventions by using cutting-edge technologies. It seeks to align the sector with the nation's developmental goals by promoting innovation, sustainability, and resilience.

Approach and Method

The research employs learnings based on stakeholder feedback and expert interviews, focusing on improvement / focus areas addressing issue in technology penetration. It evaluates current government initiatives and policies, using gap analysis to identify challenges. The study derives learnings from House of Quality research model in identifying major barriers in emerging technologies and policy intervention to address this issue.

Findings

The research highlights significant opportunities for improvement in India's construction sector through the adoption of advanced technologies and sustainable practices. A key finding is the need for coordinated efforts between policymakers, industry stakeholders, and technology providers to address existing challenges. The study underscores the transformative potential of digital tools in streamlining construction processes, reducing costs, and enhancing project efficiency. It also emphasizes the importance of skill development and policy alignment in overcoming barriers to technology adoption.

Implications

The findings provides actionable insights for policymakers, industry leaders, and technology providers to drive the construction sector's transformation, aligning it with the vision of Viksit Bharat by 2047. By fostering collaboration and innovation, the framework paves the way for a resilient, efficient, and future-ready construction ecosystem. It also highlights the importance of sustainability and digital transformation in achieving long-term growth and global competitiveness.

Keywords: Viksit Bharat, technology adoption, sustainable construction, digital transformation, policy intervention, roadmap 2047

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The Use of AI in Sustainable Construction Practices

Bansikha Baid¹; Deva Dutta Dubey²; Sushant Deodhar³



Bansikha Baid



Deva Dutta Dubey



Sushant Deodhar

Purpose: The construction industry is evolving rapidly, with Artificial Intelligence (AI) driving efficiency, automation, and sustainability. AI-powered tools are reshaping project planning, scheduling, resource management, and safety monitoring, making construction projects smarter, more cost-effective, and environmentally friendly. This study explores how ChatGPT, LLaMA, DALL-E, AutoML, Machine Learning (ML), and Deep Reinforcement Learning (DRL) are improving construction project management (CPM). We also highlight the challenges preventing the widespread adoption of these technologies, such as high costs, data security concerns, and resistance to change, while emphasizing how AI can support sustainable construction practices by optimizing material usage, reducing waste, and enhancing energy efficiency.

Approach and Method: This research summarizes recent studies about AI in CPM to answer the question: What is AI's role in sustainable construction? It reviews real-world case studies about AI applications in sustainable construction, focusing on design automation, real-time site monitoring, predictive analytics, and project collaboration. The study also highlights AI's impact on sustainability, including its ability to reduce construction waste, optimize energy consumption, and promote eco-friendly building materials. Additionally, it explores the challenges of AI adoption, such as data privacy issues, lack of expertise, and high implementation costs.

Findings:

1. Smarter Documentation & Communication – ChatGPT, LLaMA, and other AI-powered tools are revolutionizing contract review, report writing, and project documentation. They help teams collaborate more efficiently and get more done faster.
2. AI-Powered Design & Visualization – DALL-E and other generative AI models make creating 3D renderings, automated blueprints, and visual progress tracking easy, helping architects and engineers make better decisions.
3. Predict Risks & Optimize Resources – AutoML and predictive analytics help project managers predict delays, optimize resources, and prevent risks before they become big problems.
4. AI & IoT Increase Safety – AI real-time monitoring of worksite safety, predictive maintenance, and quality control through IoT sensors and computer vision prevents accidents before they happen.
5. Sustainable Construction with AI – AI optimizes energy consumption, reduces material waste, and enhances green building strategies, supporting the industry's shift toward sustainability and eco-friendly practices.
6. Barriers to AI Adoption – While AI offers benefits, adoption in construction is slow due to cost, lack of standardization, privacy risks, and workforce adaptation.

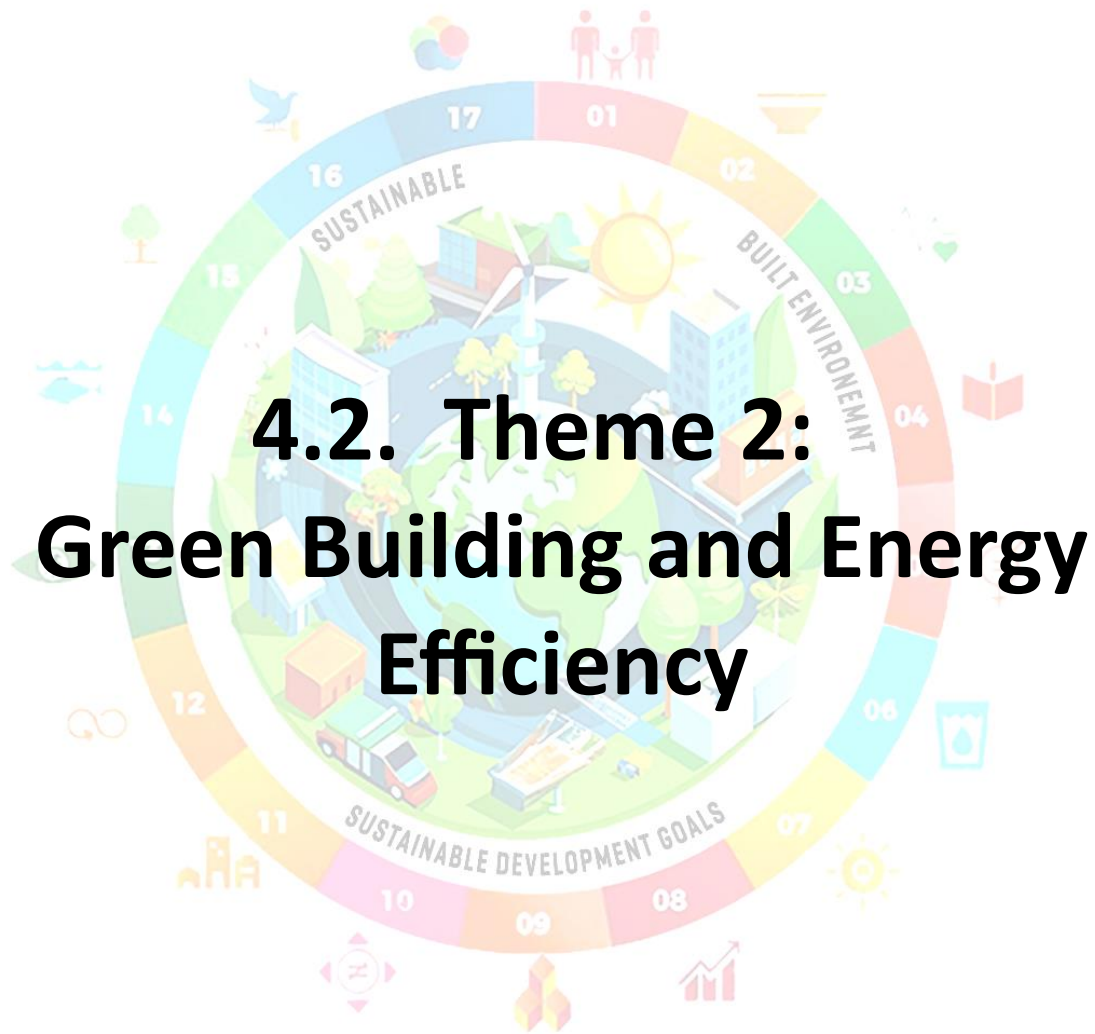
Implications: AI transforms construction project management for efficiency, cost savings, sustainability, and safety. Companies that adopt AI have increased productivity, smarter risk management, reduced environmental impact, and better decision-making. To reap the full benefits of AI, the industry must invest in training, establish clear guidelines, and develop AI tools that are easy for non-technical professionals to use. Construction is moving toward AI-powered automation and sustainability-focused AI applications, and those who adapt will have a competitive advantage and contribute to a greener future.

Keywords: Artificial Intelligence, Construction Project Management, Smart Construction, Sustainable Construction, Energy Efficiency.

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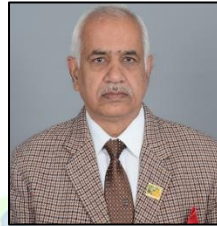


A study on the benefits of integrating biophilic design to create sustainably built interior spaces

Deepesh Jaisingh¹; S.P.Singh²; Sadiqa Abbas³



Deepesh Jaisingh



S.P.Singh



Sadiqa Abbas

Purpose: Biophilic design is defined as the application of greenery into built environments, which includes the practice of incorporating ornamental features, shrubs, plants and indoor trees into interior design to enhance indoor spaces. This is becoming increasingly prominent as a sustainable interior design approach that improves both indoor air quality (IAQ) and occupants' health. Historically, linked with beauty, indoor plants help purify the air, regulate humidity, and improve psychological health, making them a central component of sustainable interior design. This research explores the influence of Biophilic design on IAQ and its potential to create sustainable, health-promoting built environments. The research highlights the importance of strategic placement of plants, the use of air-purifying plant species, and their integration with passive design principles to enhance indoor environmental quality while contributing to international sustainability objectives.

Approach and Method: A research methodology of quantitative comparison is utilized, with a combination of empirical data analysis based on peer-reviewed research and survey-based user feedback. IAQ variations in various case studies with varying indoor plant species analyzed using SPSS statistical software to determine psychological and physiological reactions to interior green spaces. Comparative study is carried out between plant-rich and non-green indoor spaces to identify the physical advantages of biophilic interventions.

Findings: The research identifies considerable enhancements in IAQ and occupant health in indoor environments incorporating greenery. It shows a 30–50% decrease in VOC levels and CO₂ levels in rooms with proper interior landscaping. Enhanced thermal comfort and humidity control, minimizing the use of mechanical HVAC systems. Improved thinking performance, lower stress levels, and enhanced overall productivity, with users noting a 15–20% improvement in workplace satisfaction and concentration. Aesthetic and psychological gain underlies a positive spatial experience, driving restorative environments within healthcare, commercial, and domestic environments.

Implications: The findings highlights the necessity of integrating biophilic design as a standard in sustainable building design which includes recommendations like; developing guidelines for indoor plant selection based on IAQ improvement efficiency and maintenance feasibility, creating architectural frameworks incorporating interior greenery as a functional component rather than a decorative afterthought while promoting public awareness campaigns emphasizing the health benefits of interior landscaping. This study underscores the critical role of interior green-scapes in sustainable design in alignment with SDG's 3,7,11& 9, advocating for their integration into future building codes, policy-driven incentives for interior landscaping in commercial and residential sectors and environmental policies to enhance urban resilience and occupants' well-being.

Keywords: Sustainable design, biophilic design, indoor air quality, SDG.

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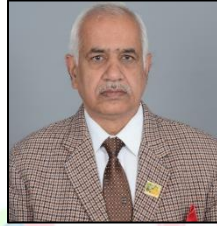
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Energy Efficiency in the Sustainable Built Environment: A Historical Review, Current Trends, and Future Prospects

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Shalini Sharma



S P Singh



Arvind Varshney

Abstract: The primary challenges today and in the future concerning overpopulation, climate change, urbanization, energy usage, resource consumption, and poverty are analysed and assessed. Recent technological advancements in building energy are investigated, accompanying current and anticipated potential in terms of energy, environmental issues and economic benefits.

Purpose: Addressing global energy issues, environmental sustainability, and climate change mitigation, energy efficiency is vital. This research paper offers an in-depth look at the history, present state, and future of energy efficiency, covering significant advancements, trends, and future potential improvements. Further-more seeks to critically examine the evolution of energy efficiency techniques, regulations, and technology, tracking them from previous uses to current ones and predicting future energy efficiency difficulties and directions.

Approach and Method: The study begins with exploration of historical elements, focusing on major forces steering energy efficiency programs, such as increasing energy expenses, environmental consciousness, etc. It highlights important milestones like enforcement of energy efficiency laws, emergence of energy saving technologies, establishment of energy management systems in industries, integration of energy efficiency in Planning and Construction. It discusses the need to reduce greenhouse gas emissions and fight climate change, increasing use of renewable energy, smart device innovations, home automation, and energy-efficient HVAC systems. It explores how advances in energy storage technologies can optimize energy use through the application of AI and machine learning in smart energy systems.

Findings: The study examines how policies impact the adoption of energy-efficient technologies, historical trends since the industrial era, and notable technological innovations like LED lighting. Also, the financial barriers to utilizing energy-saving solutions alongside the social factors that influence public awareness and behaviour regarding consumption. The role of AI and the IoT in enhancing energy efficiency outlines for future developments. Recommendations may include policy reforms that encourage innovation and collaboration among various stakeholders. Summarizes current challenges and opportunities for progress as it reviews how energy efficiency contributes to fighting climate change and enhancing energy security.

Conclusion: Highlighted are the significance of adopting sustainable methods, advancing technology, and making systemic changes to lessen environmental effects. The progress in energy efficiency has seen major improvements, embracing renewable energy, intelligent technologies, and AI-based solutions. Comparing historical and current energy methods, highlights how ongoing innovations and helpful policies are reaching for lasting sustainability. Envisioning, developments like incorporation of AI technologies, energy storage options, decentralized energy networks are expected to transform energy efficiency, accelerating for a cleaner more sustainable future for energy worldwide.

Keywords: Energy efficiency, Environmental quality, renewable energy, sustainability, Climate change, Energy, Sustainable Built Environment.

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Energy Optimization Using Sustainable Building Materials During the Construction Phase in India

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Anurag Vikram Singh



Saurabh Verma

Purpose

The primary objective of this study is to investigate using sustainable building materials can lower energy consumption in the building construction. Due to the high energy intensive process and vast use of traditional materials like steel, bricks and cement produce significant carbon emissions and global energy consumption. The building construction process can be made more ecofriendly by using reduced energy consumption building materials leading to reduced embodied carbon emissions.

Approach and Method

This research employs a mixed method approach to investigate green buildings in India, combining Literature review, industry reports, case studies and secondary data analysis. The study focuses on key aspects such as sustainability, material usage and energy efficiency with case studies like the CII Sohrabji Godrej Green Business Centre, Akshay Urja Bhawan and an analysis of embodied energy data using Indian Construction Material Database (ICMD) and Life Cycle Assessment (LCA) methodologies.

Findings

The findings show that using sustainable materials, like recycled steel, low-carbon cement, fly ash bricks, AAC blocks, and bio-based raw materials can reduce construction's embodied energy. Furthermore, focusing on production and transportation the total energy required to produce and transport materials by 20–40%. For example, the use of these materials during construction phase has resulted in energy savings of up to 30–40% for structures such as the CII Sohrabji Godrej Green Business Centre. Furthermore, by reducing carbon emissions, these materials contribute to a greener building process.

Implications

This study provides useful suggestions for building developers, project managers, and legislators and is also validated by various case studies and expert's opinions. The study completely supports the objective of decarbonizing India's building sector by optimizing material selection and construction methods, which is in line with Net Zero Energy Building (NZEB) initiatives. To balance cost, durability, and impact on environment.

Keywords: Sustainable materials, Embodied energy, green buildings, Construction phase, Life cycle assessment, Energy optimization

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Evaluating the Economic Viability of Net Zero Energy Buildings Through Life Cycle Cost Analysis

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Dikshith Raj D



Deva Dutta Dubey



Surya S

Purpose

Net Zero Energy Buildings (NZEBS) are redefining sustainable construction by ensuring that the energy they consume is balanced by on-site renewable energy generation. While NZEBs promise reduced energy costs and a lower environmental impact, their higher initial investment in energy efficient technology and renewable systems often raises concerns about financial feasibility over time. This study critically examines whether NZEBs can compete financially with conventional buildings over their full life cycle and their role in achieving global sustainability goals.

Approach and Method

A Life Cycle Cost Analysis (LCCA) is used to compare NZEBs with traditional buildings. The study integrates real-world case studies, energy performance simulations, and financial metrics such as Net Present Value (NPV), Return on Investment (ROI), and payback periods. It further explores how climate conditions, material selection, and government incentives influence NZEB economic viability.

Findings

The research findings highlight that, despite higher upfront costs, NZEBs:

- Significantly reduce long-term energy and maintenance expenses, leading to lower operating costs.
- Become financially feasible over time, particularly in regions where government incentives and renewable energy subsidies are available.
- Provide lasting economic and environmental advantages, reinforcing their role in the future of sustainable construction.

Implications

NZEBs play a crucial role in achieving the United Nations Sustainable Development Goal (SDG) 7: Affordable and Clean Energy, which focuses on improving energy efficiency and expanding the adoption of renewable energy solutions (United Nations, 2015). Although the initial costs of NZEBs may be a barrier, this study underscores their long-term economic and environmental benefits. The insights from this research provide valuable guidance for policymakers, architects, and investors seeking to implement sustainable construction practices. With appropriate financial strategies and policy support, NZEBs can be both an environmentally responsible and economically viable solution for the future.

Keywords: Net Zero Energy Buildings, Life Cycle Cost Analysis, Energy Efficiency, Sustainability, Renewable Energy, Economic Viability.

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Green Building Features in Developing vs. Developed Nations: A Bibliometric Analysis

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Kundan Bharambe



Deva Dutta Dubey

Purpose

Green buildings have become a crucial aspect of sustainable development, tackling the critical environmental issues and enhancing efficiency of resources. This research explores the characteristic features of green buildings across developing and developed nations via bibliometric analysis of academic work published in the last two decades. The purpose is to ascertain prevailing trends, thematic topic areas, and geographical differences in the implementation and application of green building features. The research largely conforms to United Nations Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities, which seeks to "make cities and human settlements inclusive, safe, resilient, and sustainable".

Approach and Method

The study adopts a bibliometric approach, gathering data from Scopus and other similar databases. Using bibliometric analysis tools, a comprehensive analysis of keyword co-occurrence, citation patterns, and thematic clustering is performed. The research maps the evolution of green building practices, highlighting the influence of policy frameworks, economic conditions, and technological advancements across developed and developing nations.

Findings

Results show contrasts in green building priorities viz. developed nations prioritize sophisticated energy systems, lifecycle analysis, and net-zero carbon goals, whereas developing nations prioritize cost-effective solutions, water efficiency, and utilizing local materials. In addition, developed nations benefit from well-established certification systems and government incentives, developing nations are hindered by limited financial resources, insufficient technical capacity, and weak regulatory systems. The analysis also identifies emerging research trends, such as circular economy principles and climate resilience, which are becoming increasingly pertinent in both contexts.

Implications

The study has two implications. Academically, it establishes areas of missing green building research, especially with regard to developing nations, and requires more localized and regional studies. Practically, it emphasizes the need for region-specific strategies that suit the specific socioeconomic and environmental contexts of each region. The results are intended to guide policymakers, architects, and sustainability professionals, promoting more inclusive and context-aware implementation of green building practices globally.

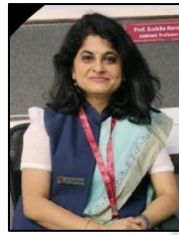
Keywords: *Green Building Features, Sustainability, Developed Nations, Developing Nations, Bibliometric Analysis, Sustainable Cities and Communities (SDG 11).*

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Integrated Simulation and Optimization for Day lighting and Energy Performance in Residential Buildings: A Case Study in Sanpada, Navi Mumbai

Suchita Karale¹; Saharsha A Nai²



Suchita Karale



Saharsha A Nai

Purpose

The rapid urbanization of tropical regions, particularly in Sanpada, Navi Mumbai, presents significant challenges in optimizing day lighting and energy performance in low income group (LIG) residential buildings. This study has an approach that combines advanced simulation techniques with innovative architectural design strategies to address critical issues in a warm and humid climate. Key performance metrics, including Window Floor Ratio (WFR), Window Wall Ratio (WWR), Equivalent SHGC and Residential Envelope Transmittance Value (RETV), are utilized to evaluate the thermal and day lighting performance of an existing residential building. Through this analysis, we identify critical inefficiencies in daylight distribution, leading to the proposal of novel interventions such as façade optimization with vertical fins, strategic window placements, and enhanced ventilation systems. Advanced simulation tools, including Rhino, are employed to assess these interventions, demonstrating significant reductions in cooling loads and improvements in indoor environmental quality.

Additionally, the research explores design innovations such as patterned walls, adjustable louvers/fins which can reduce surface temperatures by up to 3-5°C through passive cooling, and optimized light well configurations for deep-plan multi-storey buildings. The study meticulously analyzes the impact of both uniform and staggered lightwell designs on daylight availability and energy efficiency.

The findings underscore the necessity for sustainable and cost-effective design solutions for LIG housing in densely populated urban spaces. This research not only addresses the pressing challenges of achieving energy efficiency and effective day lighting in high-density urban settings but also provides actionable insights that can serve as a benchmark for future developments in urban landscapes. By focusing on the unique climatic and socio-economic context of Sanpada, Navi Mumbai, this study will contribute to the broader discourse on sustainable urban design and the importance of integrating environmental performance with architectural innovation.

Approach and Method

A novel approach incorporating advanced simulation techniques and innovative design strategies, utilizing performance metrics such as WFR, WWR, Equivalent SHGC and RETV.

Findings

To identify critical inefficiencies in daylight distribution and to propose a novel intervention, façade optimization and enhanced ventilation systems to improve indoor air quality.

Implications

The research will help to understand sustainable and cost-effective design solutions for LIG housing, emphasizing the importance of strategies in high-density urban environments.

Keywords: Daylight performance, energy efficiency, low-income group, design innovation, urbanization

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Mapping the Influence of Green Building Certifications on Property Values: A Bibliometric Analysis

Kundan Bharambe¹; Deva Dutta Dubey²



Kundan Bharambe



Deva Dutta Dubey

Purpose

The growing emphasis on sustainability in the real estate sector has spotlighted green building certifications as a pivotal factor influencing property values. Therefore, the influence of green building certifications such as LEED, BREEAM, and GRIHA on property value is an essential consideration. The paper highlights the academic debate, through a methodical examination of academic contributions spanning from 2010 to 2025, by way of a bibliometric analysis. This investigation delineates significant trends, prominent authors, and thematic clusters within the field. The objective of this analysis is to present a summary of the current literature while emphasizing the gaps that require additional inquiry. The primary alignment of the study is with United Nations Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities focusing on green buildings and their contribution to sustainable urban development.

Approach and Method

The methodology used is extracting bibliographic information from the Scopus and other databases, followed by using bibliometric tools for visualization and thematic mapping. The most important metrics include publication trends, citation networks, keyword co-occurrence, and collaborative authorship, which enable the identification of significant contributors and research centers.

Findings

Preliminary findings show that green buildings significantly enhance property values through the display of sustainability and efficiency in operations to investors and occupants alike. The analysis reveals a geographic disparity, with most studies concentrated in developed nations, highlighting the need for research in emerging markets and indicating thematic categorization, where there is an interaction of elements in the matrix containing information about different types of certifications, policy frameworks, and economic effects.

Implications

This study provides valuable insights for academics, policymakers, and industry professionals, underlining the economic rationale for adopting green certifications and their broader implications for sustainable development. By mapping the existing knowledge base, this research aims to stimulate cross-disciplinary dialogues and guide future empirical studies on the economic impact of sustainability initiatives in real estate.

Keywords: Green Building Certifications, Property Values, Sustainable Real Estate, Bibliometric Analysis, LEED, Sustainable Cities and Communities (SDG 11).

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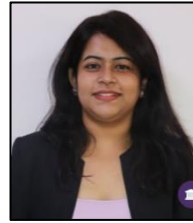
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Simulation and Optimization for high building performance in early design phase: A generative design approach.

Shailesh Sancheti¹; Ashmita Rupal²



Shailesh Sancheti



Ashmita Rupal

Purpose

Growing reliance on technology in high-rise design often compromises critical performance factors. This research examines how parametric computational workflows integrating optimization and simulation can enhance environmental and functional outcomes in early-stage high-rise design. It explores how such tools enable designers to balance technical complexity with human-centric priorities through data driven decisions.

Approach and Method

The study employs a qualitative as well as quantitative approach for integrating parametric modeling, simulations, and optimization. Scripting languages create algorithmic frameworks that define geometric relationships based on design parameters. These models link simulation tools for real-time analysis of energy efficiency, material usage, and structural performance. An optimization framework evaluates design variants, automating performance-based choices. Data is drawn from desk studies and digital resources on computational design practices.

Findings

Results show scripting languages generate adaptive geometric systems that dynamically connect design parameters to performance metrics. Early integration of simulations allows geometric adjustments (e.g., façade configurations) to automatically update structural or environmental variables, enabling rapid iteration. This workflow identifies conflicts between objectives like aesthetics and building performance during conceptual design, reducing late-stage revisions. The system balances spatial functionality, and sustainability without compromising design intent.

Implications

The study demonstrates how parametric workflows prioritize sustainability by embedding early-stage environmental analysis, aligning outcomes with ecological goals. Computational tools enhance agility, letting designers reconcile technical and human needs. It advocates adopting parametric methods in education and practice to address oversight of critical factors in technology-driven design. By bridging automation and human-centered priorities, this approach empowers architects to shape high-performance environments that harmonize innovation with responsibility.

Keywords: High Performance Buildings, Sustainability, Parametric Design, Simulation, Optimization

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Study About Adoption of Pre-Fabrication Technique for Green Building Construction

Mohd Fahim¹; Suhail Khan²



Mohd Fahim



Suhail Khan

Purpose

The construction industry is striving to adopt sustainable practices in response to growing environmental concerns, resource depletion, and the demand for faster construction. Prefabrication has emerged as a promising solution for green building construction due to its potential to enhance efficiency, reduce waste, and lower carbon emissions. This study explores the adoption of prefabrication techniques and their role in sustainable construction while addressing the challenges limiting their widespread implementation.

Approach and Method

An extensive literature review was conducted to identify key benefits and barriers to the adoption of prefabrication. To further analyze industry perspectives, an affinity diagram was developed to categorize the benefits of prefabrication in a green building environment. A questionnaire survey was then designed to collect responses, and the Relative Importance Index (RII) method was applied to perform factor analysis, identifying critical drivers and barriers influencing adoption.

Findings

The research highlights various advantages of prefabrication, including improved quality control, faster construction timelines, enhanced worker safety, and reduced environmental impact. However, significant challenges persist, such as high initial investment costs, logistical constraints, lack of policy support, and resistance from traditional construction stakeholders. Despite these obstacles, successful implementations in large-scale projects such as Singapore's Clement Canopy, B2 Modular Tower (Brooklyn, USA), and Mini Sky City (Changsha, China) demonstrate the feasibility of prefabrication as a sustainable construction method.

Implications

To accelerate the adoption of prefabrication, future research should focus on emerging technologies such as BIM, 3D printing, and modular construction to enhance scalability and adaptability. Additionally, strategic policy frameworks and industry-wide initiatives should be developed to overcome existing barriers. Comprehensive research and technological advancements are essential to making prefabrication a mainstream approach for sustainable construction.

Keywords: Prefabrication, Green Building, Sustainable Construction, BIM, Modular Construction, Construction Waste Reduction, Prefabrication Policy Frameworks

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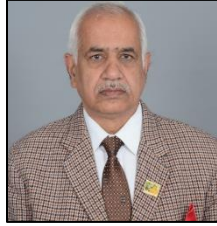
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Sustainable Building Interiors: A study on its adverse effects

Aprajita Singh¹; S.P.Singh²; Sadiqa Abbas³



Aprajita Singh



S.P.Singh



Sadiqa Abbas

Purpose: This study aims to highlight the adverse effects that new age, trends or materials that encompass sustainable design have on the health of end users. Sustainable design and material innovations are widely promoted as solutions to environmental challenges, yet their potential adverse effects on human health remain largely overlooked. This study aims to investigate the unintended health implications of modern sustainable building practices and materials, particularly concerning vulnerable demographic groups, especially on the health of diverse demographic building occupants inclusive of special needs. The review critically analyzes how new trends—like energy-efficient lighting, low-carbon materials, and air-tight passive design—can lead to health problems like sick building-syndrome, indoor-air-quality problems, and ophthalmological abnormalities. The research also points out international regulatory gaps, where products prohibited in one country for safety reasons are still being sold as sustainable options elsewhere. While a particular material has been deemed unsafe for use in toys, it is being used as safe building material. In the name of sustainability, materials and technologies are being sold without proper quality checks. While better quality products exist, there are cheaper versions which are using low grade chemical compositions and end up polluting the indoor air to an extent that it may lead to sick building syndrome.

Approach and Method: This study uses a quantitative methodology, aided by empirical data collection and statistical analysis through SPSS (Statistical Package for the Social Sciences) through systematic case studies and research paper reviews on regulatory policies, material toxicity reports, and occupant health surveys to evaluate potential health hazards. Regression analysis, ANOVA, and correlation studies are used to establish relationships between sustainable materials and design decisions with occupants' health symptoms reported.

Findings: Several risk factors linked to contemporary sustainable materials and design methods are recognized by the study. Cost-effective substitutes for eco-friendly materials usually have harmful chemical compositions that cause indoor air pollution and possible long-term respiratory problems. The application of LED and high-intensity lighting described as energy-efficient has been associated with ocular stress, circadian rhythm disruption, and enhanced vision disorder risks. Likewise, overly airtight passive designs, though increasing energy efficiency, have led to inadequate ventilation and moisture accumulation, fostering mold growth and enhancing respiratory disease. The results indicate that not all sustainable practices and materials are necessarily good, calling for enhanced quality control and regulatory management.

Implications: This research identifies the importance of a broader framework for assessment of sustainable building material and technologies. Policy actions have to concentrate on rigorous quality monitoring, health impacts on occupants, and consumer campaigns to avoid harm to health. Manufacturers have to ensure openness on material composition, and architects should follow a moderate approach to providing both environmental protection and well-being to the occupant. The research adds to the current literature on responsible sustainability in buildings, promoting evidence-based practice in sustainable building and design.

Keywords: Sustainable material, health hazards, indoor air quality, Sick building syndrome.

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Sustainable Construction Materials For Buildings

Saurav Singh¹; Saurabh Verma²



Saurav Singh



Saurabh Verma

Purpose

The construction industry is a major contributor to global carbon emissions and resource depletion. This study aims to analyze the current scenario of sustainable construction materials in India, evaluate best practices through global and national case studies, and recommend sustainable materials, policy enhancements, and market interventions to promote green material adoption.

Approach and Method

The research involves a literature review of sustainable building materials and policies in India, along with an evaluation of four case studies: Microsoft's Silicon Valley Campus (USA), the Bullitt Center (USA), the CII-Sohrabji Godrej Green Building Centre (India), and Net Zero Carbon Homes in Punjab (India). These case studies provide insights into material selection, energy efficiency strategies, and policy frameworks that support sustainability. The study also examines existing challenges in the Indian market and explores potential solutions through policy and industry initiatives.

Findings

The analysis reveals that while India has made progress in promoting sustainable building materials through regulatory frameworks like the Energy Conservation Building Code (ECBC) and green certification programs, adoption remains limited due to cost barriers, lack of awareness, and supply chain inefficiencies. Successful global and national projects have demonstrated the benefits of materials such as cross-laminated timber, recycled concrete, high-performance glazing, bamboo, and geopolymers. Policy support, financial incentives, and market-driven approaches have played a crucial role in their successful implementation.

Implications

The Environmental Product Declaration (EPD) and EC3 (Embodied Carbon in Construction Calculator) requirements drive transparency in building materials' carbon footprint. They influence material selection, procurement, and compliance with sustainability goals. EPDs provide standardized environmental impact data, while EC3 helps compare and reduce embodied carbon, promoting greener construction practices and aligning with carbon reduction regulations and certifications.

Keywords: Sustainable construction materials, green building, carbon footprint, policy interventions, India, case studies, circular economy, energy efficiency, EPD, EC3.

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The Impact of Renewable Energy Consumption on Economic Growth in BRICS Countries: A Comparative Analysis

Gunjan¹; Pooja Mehra²



Gunjan



Pooja Mehra

Purpose: To achieve sustainable development and mitigate climate change, the world must move toward net-zero carbon emissions and a shift to green energy. The adoption of renewable energy in the BRICS countries, which are important developing economies and energy consumers, is assessed in this study for its effects on the economy and environment. It measures the effect of renewable energy consumption and its proportion in the energy mix on GDP and GDP per capita, and it aligns the results with policies for carbon reduction and clean energy transitions. Through an analysis of the possibilities for widespread adoption of renewable energy, this study offers important insights into how the BRICS countries may solve environmental issues and promote sustainable economic growth.

Approach and Method: The relationship between economic performance and renewable energy is investigated using panel data econometric analysis. Stationarity is assessed using unit root tests, and the Fixed Effects approach is adopted after Pooled OLS and Hausman tests are used to choose the best model. GLS regression ensures robust estimates by correcting for autocorrelation and heteroscedasticity, while LSDV regression is used to examine country-specific effects. Model accuracy is further increased by log transformations of variables. By taking into consideration the structural variations among the BRICS countries, this methodological approach guarantees a thorough evaluation of the contribution of renewable energy to economic growth.

Findings: The study finds that, on a pooled basis, total renewable energy consumption positively affects GDP and GDP per capita in BRICS nations, with coefficients of 0.1072 and 0.1084, respectively. The share of renewable energy in the total energy mix has a stronger effect, with coefficients of 0.2389 for GDP and 0.2260 for GDP per capita. Country-specific analysis reveals that India, China, and South Africa exhibit a significant positive relationship between renewable energy consumption and economic growth. In India, the impact of renewable energy consumption on GDP and GDP per capita is 0.4228 and 0.3989, respectively. In China, the coefficients are 0.3776 for GDP and 0.2546 for GDP per capita, while in South Africa, they stand at 0.3616 and 0.3011. Conversely, Brazil and Russia show an insignificant relationship, highlighting the role of national energy policies, investment levels, and grid infrastructure in determining the economic benefits of renewable energy.

Implications: The results highlight the necessity of strategic measures to increase renewable energy's positive effects on the economy and the environment. To realize the full potential of sustainable energy, investments must be strengthened, especially in Brazil and Russia. To hasten the shift away from fossil fuels, carbon pricing schemes and more stringent regulatory frameworks ought to be implemented. Energy security and integration of renewable energy can also be enhanced by updating energy grids and encouraging cross-border cooperation across BRICS. India, China, and South Africa should keep expanding their renewable energy projects, but Brazil and Russia need to fix structural obstacles and ineffective regulations to reap comparable economic rewards. The BRICS countries can greatly lower carbon emissions, improve energy security, and advance global sustainability goals by coordinating the spread of clean energy with economic growth.

Keywords: Environmental Sustainability, Sustainable Development, Renewable Energy Consumption, BRIC Countries, Cobb-Douglas Production Function, Least Squares Dummy Variable (LSDV) Model, Panel Data Analysis

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Wind Analysis of a Multi-Storey Building (G + 32) by using Etabs Or Staad Pro Software

Charu Chopra¹; Mithilesh Kumar²; Suraj Vishwakarma³; Divya Negi⁴



Charu Chopra



Mithilesh Kumar



Suraj Vishwakarma



Divya Negi

Purpose

Wind analysis is a crucial aspect of high-rise building design to ensure structural safety and stability. Now-a-days due to several environmental and financial constraints there are more and more projects coming up as sky scrapers. This study focuses on the wind analysis of a G+32 story building using ETABS software or STAAD Pro software, a widely used tool for structural analysis and design.

Approach and Method

The analysis considers various wind load parameters as per relevant building codes, including wind speed, pressure coefficients, and terrain categories. The software prototype is developed for the city of Varanasi, Uttar Pradesh, India for which the basic wind speed is taken 47 m/s averagely throughout the span of the year. The tallest building currently in Varanasi is the new Kashi Vishwanath Temple (76.2 meters). This paper focuses on a wind study for a G+32 story building with a height of 96 meters using ETABS or STAAD Pro software, which does not yet exist in Varanasi. The effect of wind is analyzed on the structure.

Findings

The study evaluates the building's response to wind forces, including lateral displacement, story drift, and base shear. By conducting a dynamic analysis, the structural behavior of the building under different wind conditions is assessed. The results will help in optimizing the design by ensuring adequate stiffness and strength while maintaining economic feasibility. The findings of this study contribute to improved structural performance and safer high-rise construction practices in wind-prone regions. After the assessment few recommendations to optimize the stiffness and stability of the building are suggested.

Implications

This study will contribute to the field of structural engineering by helping engineers and architects to design a sustainable wind-resistant building while ensuring compliance with national and international standards. The analysis also aids in achieving an optimal balance between strength, stability, and material efficiency, making high-rise construction more resilient to extreme wind conditions.

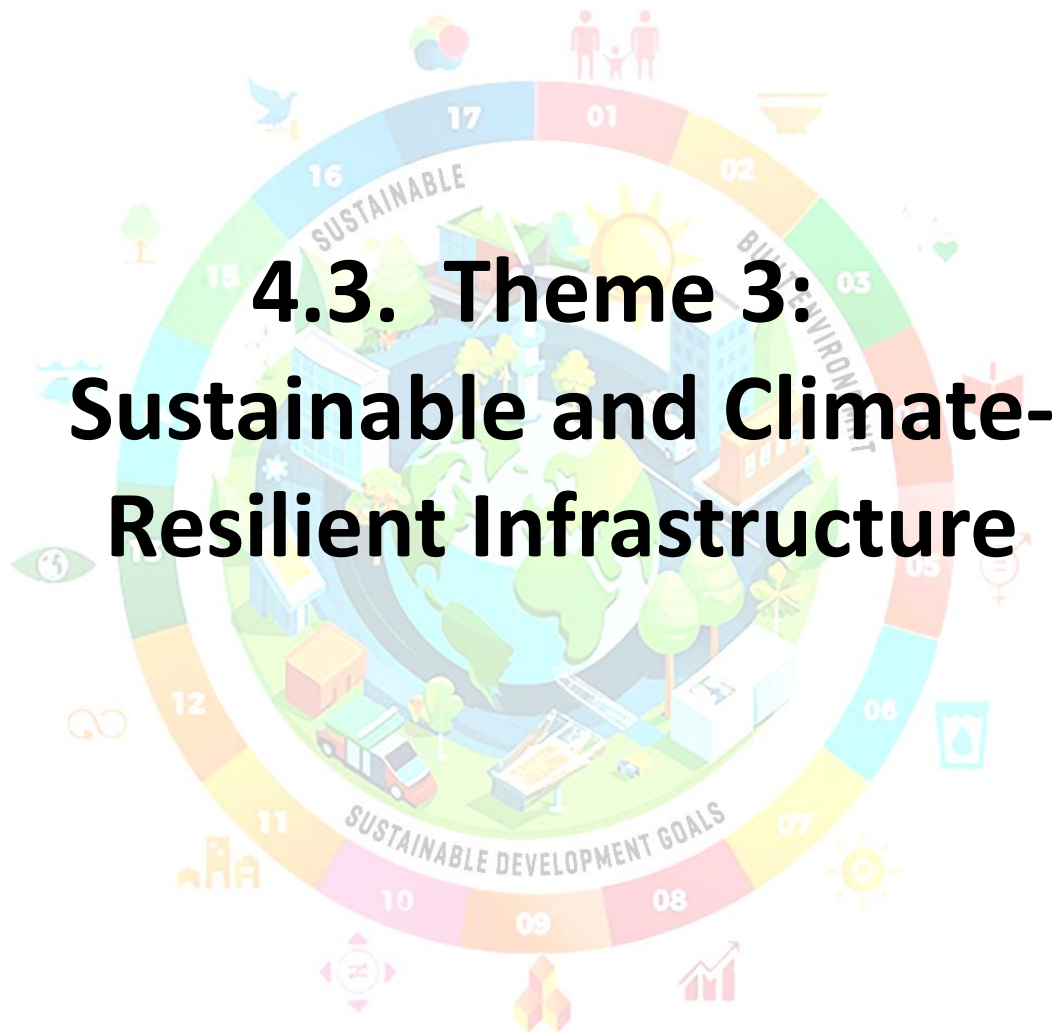
Keywords: Wind analysis, Dynamic analysis, ETABS software, Lateral displacement, Story drift.

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4.3. Theme 3: Sustainable and Climate- Resilient Infrastructure

Adoption of green procurement practices in Indian Infrastructure Projects

Parth Jain¹; Triveni Prasad Nanda²



Parth Jain



Triveni Prasad Nanda

Purpose The escalating environmental challenges and infrastructure development demands in India necessitate a transformative approach to procurement strategies. The adoption of Green Procurement Practices has been coming to pace worldwide, shifting from traditional ones in the last few decades; however, this shift varies in different sectors. This research critically examines the sustainable procurement ecosystem in Indian infrastructure projects, focusing on the multifaceted dimensions of green procurement adoption, barriers, and strategic implementation mechanisms. The key dimension of this research is comparative analysis of its Global adoption vs Indian adoption, furthermore the hinderances, the driving factors and critical parameters that influence its adoption.

Approach and Method The study employs a mixed-methods approach, integrating quantitative analysis and qualitative insights from multiple infrastructure sectors. The questionnaires that have been prepared are in accordance with the changing parameters and metrics used by companies to adopt or neglect of the green procurement policies. Utilizing systematic literature reviews majorly from the reports of world bank, leading IPCs and empirical investigation basically from the compliances introduced by BIS and BEE, the statistical tool that had been used is trend chart analysis to examine and correlate the past data in the industry, the comparative analysis to examine cost-benefit analysis and the research explores critical factors influencing green procurement practices, including:

- Regulatory frameworks
- Organizational capabilities
- Technological readiness
- Economic incentives
- Environmental performance indicators

Findings The findings of the research comprise of changing parameters while adopting the green procurement policies by various companies, the ongoing demand and incentives that drive adoption and some of the measures that can be implemented to see the positive outcomes. (Subjected to change at final report).

Implications The implications of this research would be fulfillment of environmental and economic sustainability, long-term cost savings and reduced carbon footprints in most stages of a project.

Keywords: Green Procurement, Carbon footprints, Sustainable Development Goals (SDGs), Sustainability metrics, Sustainable Procurement, Key Performance Indicators (KPIs), Environmental Impact, Economic benefits.

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Advanced Modeling Techniques for Compressive Strength of Recycled Aggregate Concrete

Gloria Angom¹; Priyanka Singh²; Md Zia Ul Haq³



Gloria Angom



Priyanka Singh



Md Zia Ul Haq

Purpose The purpose of this study is to predict the 28-day compressive strength of recycled aggregate concrete (RAC) using Non-Linear Regression (NLR). The research aims to address the challenges posed by the variability in recycled aggregate (RA) characteristics and to promote the use of environmentally friendly building materials by providing a reliable method for strength prediction. This study seeks to contribute to the wider adoption of recycled aggregate in sustainable construction practices.

Approach and Method The study employed Non-Linear Regression (NLR) to predict the compressive strength of recycled aggregate concrete. A comprehensive experimental program was conducted, incorporating varying percentages of recycled aggregate replacement (0%, 25%, 50%, 75%, 100%), different cement-to-water ratios, and curing ages as key factors. The input parameters included the ratios of cement, water, recycled aggregate, natural fine aggregate, coarse aggregate, and the percentage of recycled aggregate replacement. The experimental data were used to develop and validate the NLR model.

Findings The results demonstrated that Non-Linear Regression is an effective method for predicting the compressive strength of recycled aggregate concrete. The predicted compressive strength values after 28 days of curing showed minimal differences compared to the experimental values. This indicates that NLR can reliably estimate the strength of RAC, even with the inherent variability in recycled aggregate properties.

Implications This study provides valuable insights for engineers and researchers aiming to enhance the performance and reliability of recycled aggregate concrete. By offering a practical method for strength prediction, the research supports the broader use of recycled aggregates in sustainable construction. The findings underscore the environmental benefits of reusing construction waste, aligning with the growing emphasis on eco-friendly building practices. This work contributes to advancing the adoption of recycled materials in the construction industry, promoting both sustainability and resource efficiency.

Keywords: Recycled aggregate, Compressive strength, Prediction, Modelling, NonLinear Regression (NLR)

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Analysis of Transmission Line Towers Due to Wind Zone Re-classification in India

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Hirdesh Kumar



Ashok Kumar Sahoo



Shivam Shekhar

Abstract:

Enhancing existing transmission towers can be a more cost-effective and practical solution compared to constructing new ones, primarily due to challenges with land acquisition. This process involves reinforcing the towers to support heavier loads and withstand environmental stresses while adhering to updated building codes. The National Building Code (NBC) of 2016 introduced a revised wind map that is now incorporated into requests for proposals (RFPs) for transmission projects. This updated wind speed map replaces IS 802: 2015 guidelines and alters how wind loads are assessed for transmission lines. For projects built before 2016, the older wind speed standards may underestimate risks from stronger winds in specific areas. To address these concerns, it is crucial to reassess local wind conditions and recalculate wind loads based on the updated wind zones. This may necessitate reinforcements to ensure that existing towers can handle increased loads. Some upgrades can be performed while the line is live, but others—such as cross arms and peak structure may require temporary shutdowns. This approach aims to maintain the safety and reliability of transmission lines built to older standards as wind conditions change. Strengthening both the towers and their foundations is vital for adapting to new wind zones. This requires detailed design review, careful material selection, and thorough planning, potentially impacting project timelines and budgets. Our current focus is on upgrading the tower with respect to new wind zone standards. Utilizing finite element software (PLS TOWER), we have conducted proactive studies and recommended reinforcements to support the higher wind loads. Our analysis reveals that the existing tower is under significant strain, with several structural members at risk of failure due to the increased pressure. We propose using sub-bracing and cruciform leg connections to accommodate these added loads. Additionally, we are exploring options for performing upgrades while the line remains live, minimizing potential right-of-way issues and ensuring the ongoing reliability of the transmission line.

Purpose:

The objective of this project is to enhance the existing transmission towers by upgrading a specific tower located in a lower wind zone to comply with new higher wind zones. This necessary upgrade is required by the revised wind speed map introduced in the 2016 National Building Code (NBC), superseding the prior IS 802: 2015 guidelines. The goal is to ensure that the transmission towers can withstand higher wind loads and environmental stress, thereby enhancing safety and reliability.

Approach and Method

- Identification of Wind Zone Changes
- Loading Calculations for new wind load
- Development of PLS-Models
- Reinforcement Design

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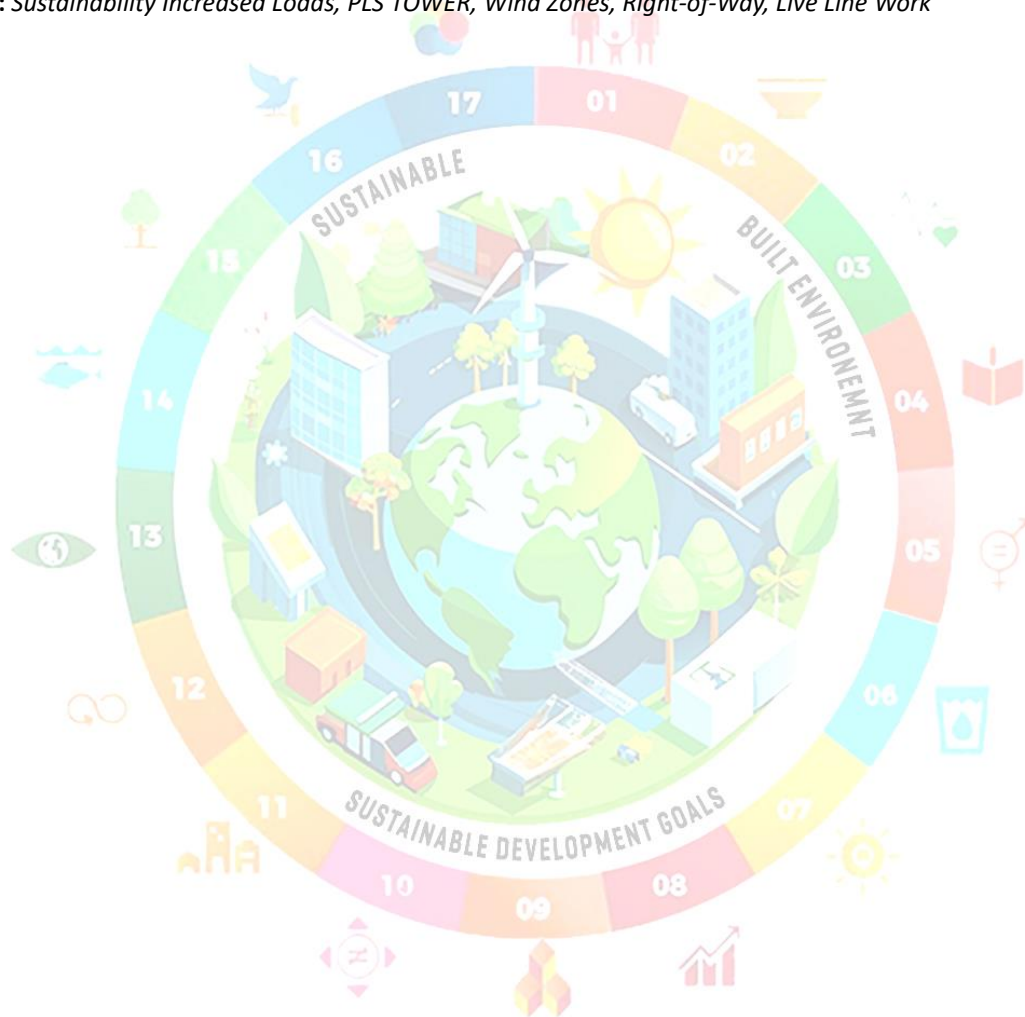
Findings

- It is found that the revised wind load affects the tower members which is significant in nature. To deal with it, we have proposed star leg connections to reinforce failing corner legs with suitable joints and stitch plates.
- Additional redundant members (such as lattices, cross arm members, belt members, and peak members) were added to improve the overall load-carrying capacity of the tower components.

Implications

- Safety and Reliability
- Cost-Effectiveness
- Operational Continuity
- Regulatory Compliance

Keywords: Sustainability Increased Loads, PLS TOWER, Wind Zones, Right-of-Way, Live Line Work



Assessing the Strategies for Disaster Resistant Technology in Seismic Zone III and Above

Dhruvit Bansal¹; Ritabrata Ghosh²; Snigdha Chaudhary³



Dhruvit Bansal



Ritabrata Ghosh



Snigdha Chaudhary

Purpose

This research explores disaster-resistant strategies in India, focusing on earthquake-prone areas classified under Seismic Zone III and above. As urban development rapidly expands in these regions, ensuring seismic resistance in buildings becomes crucial to mitigate the devastating effects of earthquakes. The study aims to analyse and propose effective strategies that enhance structural resilience.

Approach and Method

Key seismic-resistant strategies such as base isolation, dampers, advanced composite materials, and retrofitting solutions are analysed to determine their effectiveness in reducing structural damage. Additionally, the research reviews relevant building byelaws and government policies that promote disaster-resistant construction practices. Case studies of various building typologies that have successfully implemented these technologies provide practical insights into their real-world applications.

Findings

The study evaluates both traditional and modern seismic resistant techniques to understand their efficiency in different contexts. It identifies key strategies that have been effective in reducing earthquake induced structural damage and highlights the role of regulatory frameworks in ensuring safe construction practices.

Implications

Based on the findings, a framework of seismic-resistant strategies has been proposed for three different building typologies—low rise, high-rise, and skyscrapers—across Seismic Zones III, IV, and V. This framework serves as a guideline for architects, policymakers, and engineers to adopt the most suitable approaches for minimizing earthquake risks and enhancing community resilience.

Keywords: *Seismic Zones, Disaster-Resistant Technologies, Building Resilience, Earthquake Preparedness, Structural Integrity*

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Assessment and Experimental Investigation on the Mechanical Behavior and Properties of the Concrete Incorporating Waste Tyre Crumb

Girish Kumar¹; Pawan Sen²; Priyanka Himanshi³; Priyanka Singh⁴



Girish Kumar



Pawan Sen



Priyanka Himanshi



Priyanka Singh

Purpose: The primary objective of this study is to assess the mechanical properties of concrete incorporating waste tyre crumb as a partial replacement for fine aggregates. By investigating the effects of different replacement levels, the study aims to determine the optimal proportion that balances mechanical performance with environmental sustainability. Additionally, the research seeks to contribute to sustainable waste management solutions by promoting the reuse of waste tyres in construction.

Approach: An experimental approach was adopted, involving the preparation of concrete samples with varying percentages of waste tyre crumb (5%, 10%, 15%, 20%, and 25%). Standardized tests, including compressive strength, flexural strength, density, and workability tests, were performed. The results were compared with conventional concrete to evaluate performance differences and determine the viability of tyre-crumb-modified concrete.

Findings: The experimental results show that incorporating waste tyre crumb decreases the density of concrete, making it lighter. Higher tyre crumb content leads to a reduction in compressive and flexural strength, but the material remains suitable for non-load-bearing and lightweight structural applications. Additionally, the improved impact resistance and ductility make tyre-crumb concrete advantageous for applications requiring energy absorption, such as pavement layers and protective barriers. An optimal replacement level was identified to balance mechanical performance and sustainability.

Implications: This research supports the adoption of sustainable construction materials by demonstrating the feasibility of using waste tyre crumb in concrete. The study contributes to environmental conservation efforts by offering a viable method for waste tyre reuse, reducing landfill accumulation. The findings suggest potential applications for tyre-crumb concrete in lightweight structures, pavements, and impact-resistant elements, paving the way for future studies on long-term durability and performance optimization.

Keywords: Waste tyre crumb, Sustainable concrete, Mechanical properties, Environmental impact, Lightweight construction

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Development of Integrated Project Management Frameworks for Warehousing Sector

Sujay Rawat¹; Ashmita Rupal²



Sujay Rawat



Ashmita Rupal

Purpose

Over the past ten years, the logistics industry and its surrounding environment have undergone significant upheaval, particularly in India. From subpar godowns to state-of-the-art Big Box warehouses with automated assistance, the sector has expanded significantly across industries, surpassing the general adoption of technology like automated storage and retrieval system and warehouse management system. This research work discusses the development of integrated project management frameworks tailored for the warehousing sector, leveraging Artificial Intelligence (AI) to address inefficiencies, sustainability challenges, and operational complexities.

Approach and Method

The research evaluates existing policies such as the National Logistics Policy (NLP) 2022 and state-level initiatives in Haryana and Uttar Pradesh, identifying critical gaps in governance, technology adoption, and sustainability practices. By integrating AI-driven solutions, such as predictive analytics, real-time monitoring, and automated decision-making, the proposed framework enhances warehouse efficiency and cost-effectiveness. Methodologies include case studies, data-driven insights, and stakeholder interviews to assess the feasibility and scalability of AI technologies in warehousing.

Findings

This research paper emphasizes on analysis of the data collected related to green practices, smart warehouses, and multi-modal logistics hubs to achieve sustainability and operational resilience. The research work discussed here indicates that AI-powered frameworks can significantly optimize resource utilization, reduce logistics costs, and improve alignment with global standards. It promotes green logistics and eco-friendly practices as part of an integrated plan.

Implications

This paper contributes to bridging policy and technology gaps, with the aim of transforming India's warehousing sector into a global leader. It also advocates for public-private partnerships (PPPs) in large-scale logistics projects and provides suggestions for mandating energy-efficient designs and integrating renewable energy into warehouses.

Keywords: Artificial Intelligence, Warehousing, Integrated Project Management, Logistics Optimization, Predictive Analytics, Smart Warehouses, Multi-Modal Hubs, Public-Private Partnerships.

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Evolving Paradigms in Healthcare Design: A Bibliometric Analysis of Built Environment, Perception, and Well-being

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Mohd. Haseeb Rangrej



Anil Pawade

Abstract

The built environment plays a vital role in healthcare, influencing patient recovery, staff efficiency, and overall well-being. Responsive healthcare spaces, which adapt through architectural and technological innovations, have gained increasing research attention. Moving forward, integrating evidence-based design, smart technologies, and sustainability will be essential to creating equitable, patient-centered healthcare environments, aligning with SDG 3 (Good Health and Well-being), SDG 9 (Industry; Innovation, and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action).

Purpose

This bibliometric study provides a comprehensive analysis of research on responsive healthcare spaces, identifying emerging trends, influential contributions, and thematic progressions. By mapping the evolution of this field, the study supports data-driven decision-making for researchers, designers, and policymakers to enhance healthcare environments and improve patient well-being and hospital efficiency.

Approach and Method

A systematic bibliometric analysis was conducted using the Scopus database, extracting research articles based on predefined keywords related to healthcare environments, perception, built form, and well-being. The study employed Biblioshiny for citation analysis, network mapping, and thematic clustering to identify critical research trends, collaborations, and emerging themes.

Findings

Research on responsive healthcare spaces has grown significantly, with an increasing focus patient-centered design, smart hospital technologies and sustainability. However, studies remain concentrated in developed nations, with limited exploration of low-resource settings. Key themes include evidence-based design, indoor environmental quality, and biophilic healthcare spaces, yet interdisciplinary collaboration and standardized hospital design frameworks remain underdeveloped. Emerging areas such as AI-driven hospital planning, climate-responsive healthcare infrastructure, and post-occupancy evaluations present opportunities for future research.

Implications

Findings provide valuable insights for academics, policymakers, and healthcare designers to develop inclusive, sustainable, and patient-friendly healthcare environments. The study underscores the need for cross-disciplinary collaborations to advance knowledge in responsive healthcare spaces, ensuring better health outcomes and reducing global healthcare inequalities.

Keywords: *Responsive Healthcare Spaces, Built Environment, Well-being, Evidence-Based Design, Healthcare Inequalities*

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Exploring Machine Learning Models for Predicting Compressive Strength of Concrete Incorporating Construction and Demolition Waste

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Paras Tejpal



Vansh Chauhan



Priyanka Singh



Md Zia Ul Haq

Purpose: The growing concerns over environmental sustainability and waste management in the construction industry have necessitated the exploration of alternative materials for concrete production. Construction and demolition waste (CDW) presents a viable solution for reducing the environmental impact while maintaining structural integrity. This study aims to investigate the application of machine learning (ML) models in predicting the compressive strength of concrete incorporating CDW. By leveraging data-driven techniques, this research seeks to enhance the understanding of how CDW influences concrete properties, enabling optimized mix designs for sustainable construction.

Approach: A comprehensive dataset comprising experimental results from various studies on CDW-incorporated concrete is collected and pre-processed. Key variables include cement content, water-to-cement ratio, aggregate proportions, CDW replacement percentage, curing time, and compressive strength. Several ML models, including Multiple Linear Regression (MLR), Support Vector Regression (SVR), Random Forest (RF), Gradient Boosting Machines (GBM), and Artificial Neural Networks (ANN), are implemented and evaluated. Model performance is assessed using statistical metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R-squared (R^2). Hyperparameter tuning and cross-validation techniques are employed to enhance predictive accuracy.

Findings: The study reveals that ensemble learning models, particularly RF and GBM, outperform traditional regression models in predicting compressive strength. ANN models exhibit superior accuracy by capturing complex nonlinear relationships among concrete mix parameters. Feature importance analysis indicates that CDW replacement percentage, water-to-cement ratio, and curing time significantly influence compressive strength. The results demonstrate the efficacy of ML approaches in accurately modelling the mechanical properties of sustainable concrete, reducing reliance on empirical formulas.

Implications: This research contributes to sustainable construction practices by providing a data-driven approach to optimizing CDW-incorporated concrete mix designs. The adoption of ML models can assist engineers and researchers in making informed decisions regarding material selection, leading to more efficient and eco-friendly construction methodologies. Future studies should focus on expanding datasets, integrating advanced deep learning techniques, and developing hybrid models for enhanced predictive capabilities. The findings underscore the potential of ML in revolutionizing the field of construction materials science, promoting circular economy principles in the built environment.

Keywords: Machine Learning, Compressive Strength Prediction, Concrete, Construction and Demolition Waste, Artificial Intelligence

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External Factors Affecting Delays in Commercial Projects and Technology-Driven Solutions for Sustainable Outcomes

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Shibin Binshad Thendath



Taqdees Anjum

Purpose

The construction industry faces significant delays in commercial projects due to external factors, impacting project timelines and budgets. This research investigates these external factors in the Delhi NCR region and assesses the potential of modern technological solutions to mitigate these challenges. Furthermore, this study aims to explore the impact of these technologies on promoting sustainability within the construction sector.

Approach and Method

This research employs a mixed-methods approach, combining quantitative and qualitative surveys with industry professionals, including project managers, architects, and contractors, in the Delhi NCR region. Data collected will identify key external factors contributing to delays and evaluate the effectiveness of modern technological solutions in addressing these delays and promoting sustainable practices.

Findings

The findings of this research will highlight the most significant external factors causing delays in commercial construction projects in Delhi NCR. It will also demonstrate how modern technologies can effectively mitigate these delays and contribute to more sustainable construction processes through optimized resource utilization, waste reduction, and improved project management.

Implications

By addressing the identified external factors and leveraging modern technological solutions, stakeholders can enhance project management practices, improve communication, and reduce delays in commercial projects. This study provides actionable insights for a more efficient and resilient construction industry, contributing to project timelines and promoting sustainable construction practices through technology-driven solutions.

Keywords: Construction Delays, Commercial Projects, External Factors, Technology Driven Sustainability, Modern Technologies

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Influence of Raw Materials on Mechanical Properties of Sustainable Ultra High Performance Fibre Reinforced Concrete: A Review

Aditya Punia¹; Sanjay Kumar Sharma²



Aditya Punia



Sanjay Kumar Sharma

Purpose

Increasing demand of Ultra High-Performance Fibre Reinforced Concrete (UHPFRC), as a result of its enhanced mechanical, structural, and durability properties, making it suitable for a wide range of civil engineering applications has resulted in over consumption of natural mineral resources used as raw materials in its production. This review study aims to investigate the partial replacement of these natural mineral resources with supplementary cementitious materials (SCMs) to make UHPFRC more sustainable and environment friendly.

Approach and Method

Existing literature was studied to determine the influence and effectiveness of SCMs on mechanical properties of UHPFRC. Various researchers have used materials such as m-sand, fly-ash, alccofine, micro-silica, silica-fume etc. as partial replacement of raw materials of conventional UHPFRC.

Findings

From literature review, it was observed that incorporating industrial waste materials in the mix design of UHPFRC not only has environmental benefits, but also improves its micro-structural properties, resulting in a denser and more durable concrete matrix which has enhanced fresh concrete properties, such as flowability and workability, and enhanced hardened concrete properties, such as compressive strength, tensile strength, and flexural strength. Researchers have replaced between 10-50% of quartz sand and cement content by supplementary materials, and optimum percentage replacement was found to be between 20-35% to achieve the desirable compressive strength between the range of 140-162 MPa. However, the optimum percentage replacement is widely dependent upon factors such as particle size and shape of replacing material, and mix design parameters of UHPFRC.

Implications

SCMs are either industrial waste or by-products of industrial waste. Incorporating these materials in UHPFRC provides dual benefits towards making it more sustainable and environment friendly, firstly, by reducing the required quantity of natural minerals such as quartz sand and secondly, by addressing the problem of disposal of industrial waste.

Keywords: Quartz sand, Alccofine, Silica fume, Micro silica, Fly ash, UHPFRC, Sustainability

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Integrating Traditional Water Systems and Nature-Based Solutions for Urban Water Security: Insights from Rajasthan and Hyderabad

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Rama Shobhithanjali



Afreen Fatima

Abstract

Ensuring urban water security is a critical challenge in water-scarce regions amid rapid urbanization and climate change impacts. Historically, Traditional Water Systems (TWS) played a crucial role in water management across India, but many have been abandoned in favor of centralized infrastructure. This study conducts a comparative analysis of Hyderabad's urban water systems and Rajasthan's traditional conservation models to explore how reviving rainwater harvesting techniques can enhance climate resilience and groundwater recharge. Hyderabad, a rapidly growing city, historically relied on a network of stepwells, tanks, and lakes to manage its peri-urban hydrology. However, shifts toward centralized infrastructure and weak water governance have led to groundwater depletion, seasonal scarcity, and urban flooding. In contrast, Rajasthan's communities have successfully revived decentralized and nature-based solutions, such as johads (earthen ponds) and baoris (stepwells), to conserve runoff, recharge aquifers, and ensure long-term water sustainability. These community-driven efforts have resulted in rising groundwater levels and the revival of once-dry streams, demonstrating the effectiveness of circular water management and watershed restoration. The findings of this study underscore the risks of neglecting traditional water infrastructure in urban areas while emphasizing the potential benefits of integrating nature-based strategies into sustainable urban planning. Key recommendations include protecting periurban hydrology through landscape-based rainwater harvesting, restoring urban wetlands, and implementing integrated water governance approaches. By leveraging traditional wisdom alongside modern innovations, cities like Hyderabad can reduce reliance on engineered infrastructure, enhance climate adaptation, and ensure water security for future generations.

Purpose

This research explores how we can learn from Rajasthan's traditional water conservation methods and apply them in Hyderabad to tackle water scarcity and urban flooding. By reviving rainwater harvesting, restoring wetlands, and using nature-based solutions, we can create a more sustainable and resilient water future for the city.

Approach and Method

- Comparative Analysis: Study of TWS in Hyderabad vs Rajasthan's water systems.
- Hydrological Assessment: GIS mapping, groundwater statistics, and rainfall pattern analysis.
- Implementation Strategy: Identifying feasible locations for pilot projects in Hyderabad.

Findings

Findings from Comparative Study:

- Rajasthan's decentralized water conservation models are effective in aquifer recharge and drought mitigation.
- Hyderabad's historical water systems are deteriorating due to urban expansion and policy gaps.

Potential Solutions for Hyderabad:

- Watershed restoration to protect peri-urban hydrology.
- Decentralized rainwater harvesting in residential and commercial zones.
- Urban wetland revival to reduce flood risks and recharge groundwater.
- Green infrastructure such as bioswales, permeable pavements, and afforestation.

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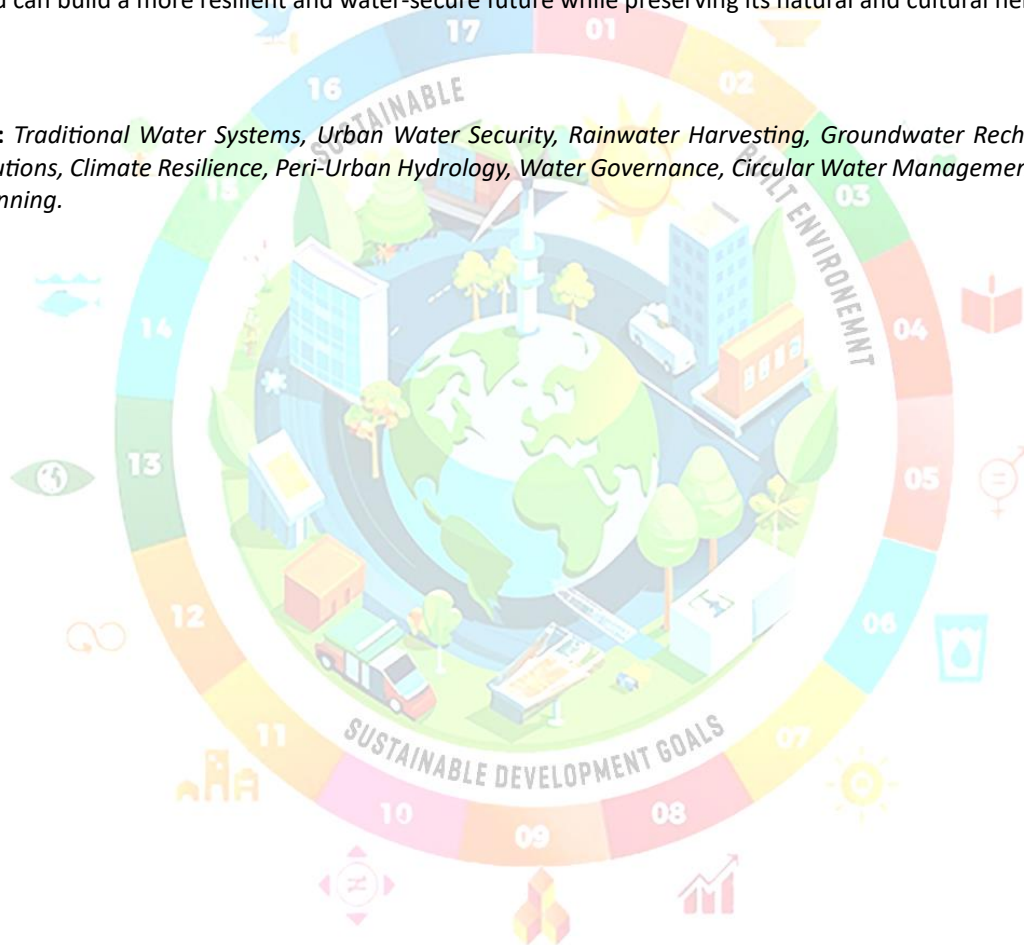
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Implications

This research highlights how reviving traditional water systems and using nature-based solutions can make Hyderabad more water-secure and climate-resilient.

- **Better Water Availability:** Restoring stepwells, lakes, and wetlands can recharge groundwater and reduce urban water shortages.
- **Flood & Drought Protection:** Smart rainwater harvesting and watershed restoration can prevent floods while storing water for dry seasons.
- **Cost-Effective & Sustainable:** Nature-based approaches reduce dependence on expensive infrastructure, making water management cheaper and more efficient.
- **Empowering Communities:** Involving locals in water conservation creates jobs, awareness, and stronger community ownership over water resources.
- **Policy & Urban Planning Impact:** The study urges city planners to integrate traditional water systems into Hyderabad's modern urban design, ensuring long-term sustainability. By learning from Rajasthan and applying its water wisdom, Hyderabad can build a more resilient and water-secure future while preserving its natural and cultural heritage.

Keywords: *Traditional Water Systems, Urban Water Security, Rainwater Harvesting, Groundwater Recharge, Nature-Based Solutions, Climate Resilience, Peri-Urban Hydrology, Water Governance, Circular Water Management, Sustainable Urban Planning.*

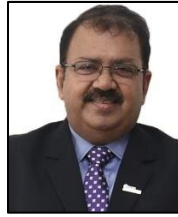


LEED Certification and Challenges in its Implementation in India

S Nikhil¹; Deva D Dubey²; Rutik V Gaikwad³



S Nikhil



Deva D Dubey



Rutik V Gaikwad

Purpose

Fostering energy efficiency, environmental awareness, proper resource utilisation, Leadership in Energy and Environmental Design (LEED) certification has made its mark and is continuing to be recognized as a standard for sustainable practises in the Built Environment. Adoption and Implementation of LEED certification in India has seen a rise in sectors like residential and commercial projects. LEED certification has its advantages. But despite this, there are persistent barriers that come in the way of implementation. Some of the challenges are high initial costs, limited to no awareness about the certification among important stakeholders, and a shortage of skilled expertise in design and execution. Widespread adoption complicates itself because of lack in incentives and a preference towards traditional way of construction methods. There can also come a shortage in locally sourced sustainable materials in some regions. This research paper explores the importance of this certification in the industry and identifies key challenges that come with implementation in India.

Approach and Method

The paper closely examines live examples of successful LEED-certified projects in India to adopt strategies for smoother implementation. India's leading Real Estate developers and other players have been studied. The role of Government policies, incentives and awareness initiatives that can be done for adoption of green building practises are also studied.

Findings

Some Indian states have provided incentives for Green certified building and for LEED certified developments. Additionally, Training programs can help enhance skills and knowledge in the area of green construction. Creation of a robust supply chain for sourcing local materials will provide a foundation for future growth. Collaborative efforts from policymakers, industry stakeholders and educational institutions that shape the future experts in green building sector, play a key role in creating an ecosystem which makes way for success in this sphere of industry.

Implications

The study concludes by offering actionable and practical recommendations to enhance scale and feasibility of LEED certification in India, giving importance to solutions that are crafted keeping in mind the cost, enhancing awareness and strong policy support. In successfully addressing the above challenges, India could transition towards sustainable built environment in significantly faster pace contributing towards Sustainable Development Goals (SDG 11) too.

Keywords: LEED certification, Challenges, Implementation, Stakeholders, Incentives, Awareness, SDG11.

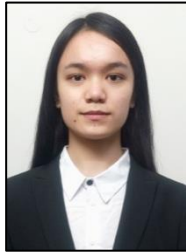
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Optimization and Prediction of Compressive Strength of Rubberized Concrete

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Elizabeth Khaidem



Priyanka Singh



Md Zia Ul Haq

Purpose: Rubberized concrete is a solution for disposing huge amounts of unprocessed waste rubber. Rubber improves frost resistance in concrete. The incorporation of recycled rubber particles into concrete, aimed at creating a sustainable construction material, presents challenges concerning compressive strength. This study explores the optimization and prediction of the compressive strength of rubberized concrete through a combination of experimental analysis.

Approach: Assessment of the compressive strength of the concrete as compared to the conventional type of concrete. This can be assessed by casting of normal concrete and the rubberized concrete. It can further be assessed by using linear regression model and to check upon the performance of existing concrete structures, Non-Destructive Testing (NDT) gives an accurate approach to evaluate the efficiency of concrete structures. The model of regression depends on an ordinary exponential theory, integrating main parameters. The concrete made with the crumb rubber powder as a replacement for adding of fine aggregate will lead to better workability. Key variables, including rubber content, water-cement ratio, and curing conditions, were systematically analyzed to identify their impact on performance. Advanced predictive modelling methods was employed to estimate compressive strength under varied compositions.

Findings: The findings demonstrate that optimized mix designs can achieve acceptable strength levels while leveraging waste rubber as an eco-friendly aggregate replacement. It also highlights that, through strategic optimization, rubberized concrete can achieve satisfactory strength levels while promoting eco-friendly construction practices by repurposing waste rubber.

Implications: This work underscores the potential of rubberized concrete as a durable, sustainable alternative for structural applications, addressing environmental challenges without sacrificing quality and gives the potential of rubberized concrete as a sustainable alternative in construction, addressing environmental concerns without compromising structural integrity. The result indicates the reduction on the dependency of aggregates and leads to a better workability. This study can reduce the dependency of fine aggregates as a whole and can lead to the sustainable construction in the future.

Keywords: Rubberized Concrete, Compressive Strength, Non-Destructive Testing, Concrete Efficiency, Sustainable Construction.

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Optimized Data Center Workload Prediction Using OptiBalancer With Carbon Footprint Analysis

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Amrit Ranjan



Mayank Manoj Gupta



Anusooya G

Data centers are the backbone of the digital economy, supporting cloud computing, artificial intelligence, and global online services. However, their energy-intensive nature poses significant environmental challenges, with data centers accounting for approximately 1% of global electricity consumption. Inefficient workload management and server underutilization exacerbate energy waste and increase carbon emissions. Existing approaches to energy efficiency in data centers primarily rely on reactive methods rather than predictive strategies, leading to suboptimal resource utilization.

This study explores the integration of predictive modeling and workload optimization to enhance energy efficiency and reduce carbon footprints in data center operations. By leveraging machine learning algorithms, workload demand can be anticipated, enabling dynamic scheduling and efficient resource allocation. Additionally, incorporating carbon footprint analysis into workload optimization strategies ensures a sustainable approach to IT infrastructure management. The findings of this research contribute to the advancement of green computing by promoting energy-efficient computing, reducing dependence on non-renewable energy sources, and fostering a more sustainable digital ecosystem.

Purpose: To analyze the role of predictive modeling in optimizing data center workload management while reducing energy consumption and carbon footprint.

Approach: A machine learning-based predictive workload model is employed to estimate server demand dynamically. The study incorporates energy-efficient workload allocation techniques and carbon footprint analysis to develop a sustainable IT infrastructure framework.

Findings: The research highlights the effectiveness of predictive workload management in reducing energy waste and lowering carbon emissions. The integration of machine learning improves resource utilization and enhances overall data center efficiency.

Implications: The study provides valuable insights for data center operators and IT infrastructure managers by offering an energy-aware scheduling model. The proposed approach supports green computing initiatives and contributes to global sustainability efforts.

Keywords: Workload prediction, Energy efficiency, Carbon footprint analysis, Green computing

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Predictive Modelling of Mechanical Properties for Recycled Aggregate Concrete

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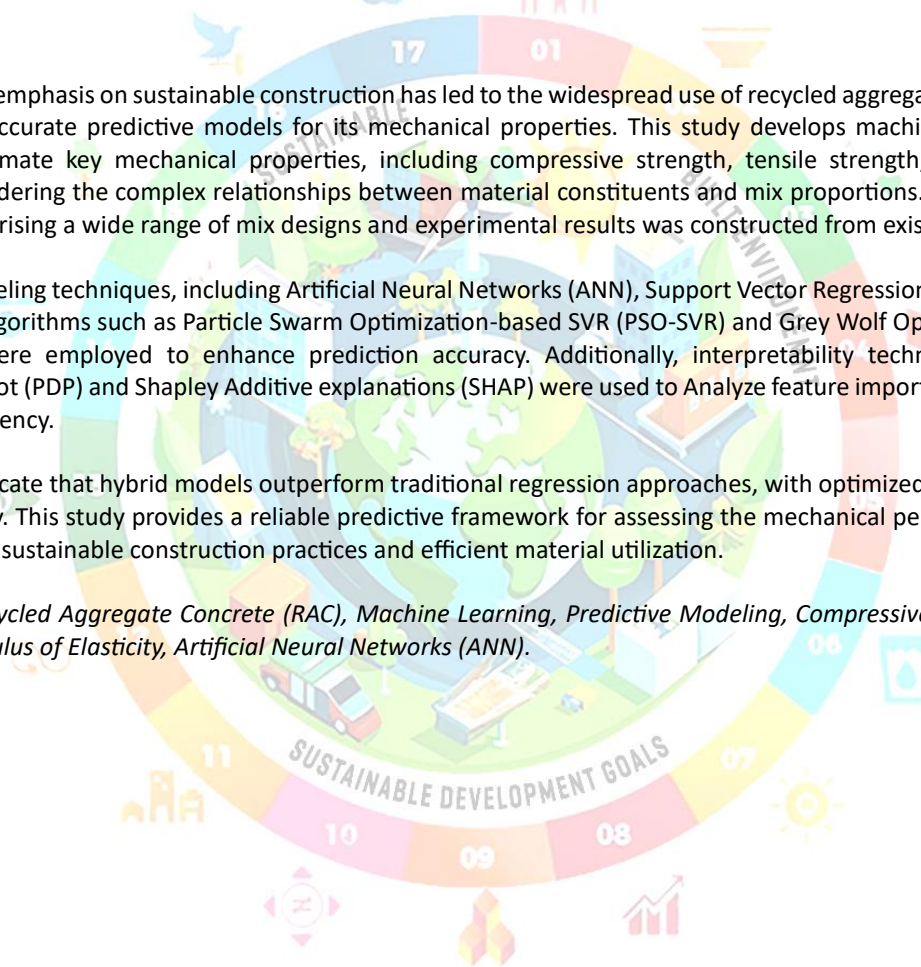
Abstract

The increasing emphasis on sustainable construction has led to the widespread use of recycled aggregate concrete (RAC), necessitating accurate predictive models for its mechanical properties. This study develops machine learning-based models to estimate key mechanical properties, including compressive strength, tensile strength, and modulus of elasticity, considering the complex relationships between material constituents and mix proportions. A comprehensive database comprising a wide range of mix designs and experimental results was constructed from existing literature.

Advanced modeling techniques, including Artificial Neural Networks (ANN), Support Vector Regression (SVR), and hybrid optimization algorithms such as Particle Swarm Optimization-based SVR (PSO-SVR) and Grey Wolf Optimizer-based SVR (GWO-SVR), were employed to enhance prediction accuracy. Additionally, interpretability techniques like Partial Dependence Plot (PDP) and Shapley Additive explanations (SHAP) were used to Analyze feature importance and improve model transparency.

The results indicate that hybrid models outperform traditional regression approaches, with optimized models achieving higher accuracy. This study provides a reliable predictive framework for assessing the mechanical performance of RAC, contributing to sustainable construction practices and efficient material utilization.

Keywords: Recycled Aggregate Concrete (RAC), Machine Learning, Predictive Modeling, Compressive Strength, Tensile Strength, Modulus of Elasticity, Artificial Neural Networks (ANN).



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Renewable Energy Adoption in LEED Platinum Buildings: Assessing Impact and Policy Significance for Commercial Real Estate in India

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Akshay Bharadwaj



Saurabh Verma

Purpose

60% of India's energy mix comes from non-renewable resources, making it the third-largest energy consumer in the world (Commission, 2024). The nation has set lofty goals to meet its Nationally Determined Contributions (NDCs), including achieving net-zero emissions by 2070 and 500 GW of non-fossil energy capacity by 2030 (MOP, 2024). Adopting renewable energy in commercial real estate, especially in the Commercial and Industrial (C&I) sector, is essential to achieving these sustainability goals. Commercial buildings in India use rating systems like LEED to demonstrate their sustainable footprint. This study investigates the LEED Platinum-certified buildings' attained scores to determine the relative impact of onsite and offshore renewable energy adoption. By evaluating empirical data, the study hopes to uncover critical characteristics that contribute to LEED Platinum certification, giving evidence-based insights for developers looking to maximize their sustainability initiatives. Have green buildings focused on renewable energy adoption to get higher ratings? Out of renewable energy adoption should building focus on onsite or offsite to attain the highest rating?

Approach and Method

The methodology is based on secondary research, which will include comparing the data from the Energy and Atmosphere category under LEED certification systems for commercial buildings (demand side) and the state-wise policy regulations for renewable energy (supply side).

Findings

Renewable energy adoption, both onsite and offsite, has the greatest impact on getting LEED Platinum certification, with energy efficiency and planning playing a secondary role.

Implications

These insights can help developers, lawmakers, investors, and sustainability consultants maximize strategies for getting LEED Platinum certification. The study emphasizes the importance of renewable energy adoption in leading stakeholders toward educated decisions on green building investments and regulatory frameworks.

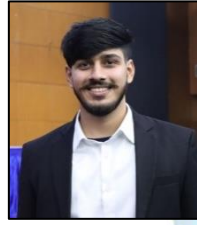
Keywords: Renewable energy, commercial, LEED, green power, Platinum, Onsite, Offsite

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Strategic Analysis of Feasibility and Risks in Site Selection for Greenfield Airport Projects: The Case of Noida International Airport Project and Navi Mumbai International Airport

Nayan Bhatt¹; Vanita Ahuja²



Nayan Bhatt



Vanita Ahuja

Purpose

India's aviation sector is expanding to meet growing air traffic demands, with greenfield airports playing a crucial role. Site selection for such projects presents complex challenges, including legal disputes, public protests, and socio-economic impacts. This study examines the strategic considerations of site selection for Noida International Airport and Navi Mumbai International Airport, addressing feasibility and risk management issues. The study aims to assess the impact of site selection on the feasibility and risks of greenfield airport projects. By comparing Noida and Navi Mumbai airports, it identifies key challenges and strategic approaches to mitigating risks, ensuring effective stakeholder engagement, and promoting sustainable development.

Approach and Method

This research uses a comparative case study approach. Primary data was collected through surveys for Noida International Airport, capturing insights from local stakeholders and Real Estate Consultants regarding site selection challenges and economic development. For Navi Mumbai International Airport, secondary data, including project reports and articles, was analyzed to examine the socio-economic, legal, and environmental issues related to its site selection.

Findings

The study reveals that site selection is critical to the success of greenfield airports. Noida International Airport faces challenges related to land acquisition and community displacement, while Navi Mumbai International Airport grapples with environmental concerns and rehabilitation issues. Both airports highlight the importance of transparent decision-making, proactive risk management, and community engagement in mitigating risks and ensuring project feasibility.

Implications

The findings emphasize that integrating sustainability, stakeholder collaboration, and clear communication in the site selection process is essential to minimize delays and opposition. The insights gained from Noida and Navi Mumbai airports offer valuable lessons for future greenfield airport projects, helping policymakers and developers create more effective and feasible infrastructure plans.

Keywords: *Greenfield airports, site selection, feasibility analysis, risk management, stakeholder engagement, sustainable development, Noida International Airport, Navi Mumbai International Airport.*

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Strategies to enhance the efficiency of Public Transportation system in Hilly Regions: A case of Kohima

Anei Kesiyie¹; Yogesh Bharadwaj²



Anei Kesiyie



Yogesh Bharadwaj

Purpose

Kohima, the capital of Nagaland, consist steep slopes, narrow roads, and has a growing demand for effective mobility solutions. Public transportation system in hilly regions like Kohima faces unique challenges because of their rugged terrain, scattered settlements, and limited accessibility. Enhancing the efficiency of public transportation system in hilly areas like Kohima is critical to meet the growing mobility needs of people and promote sustainable development. This study explores strategies to improve the efficiency of public transport system in Kohima, focusing on integrating multiple modes of transportation, expanding network coverage, and upgrading existing facilities.

Approach and Method

The approach taken is GIS-based assessment which will be carried out to map accessibility, evaluate the efficiency of the road network, and pinpoint critical problem areas. Adopting (SLB) Service Level Benchmark for Urban transport by Ministry of Urban Development (MoUD), the benchmark helps in evaluating the performance, identify gaps and implement measures for improvement.

Findings

Public transport options in Kohima are insufficient, with limited coverage and having low service frequency. Due to that its forcing people to rely heavily on private vehicle and shared taxis. On top of that the conditions road is poor, worsened by harsh weather and inadequate maintenance, resulting in affecting the transport reliability and safety. Expanding the public transportation network, upgrading existing facilities like the bus shelter, frequency and introducing electric buses, ropeways can address the current challenges and promote sustainable development.

Implications

The study provides a sustainable model for improving public transportation system in hilly regions by offering solutions to enhance accessibility, efficiency, and sustainable modes of transportation. The findings can help professional authorities to developed and offer alternative transport solutions that are suited for hilly terrains.

Keywords: Public transport, accessibility, Hill station, mobility, Geographic Information System, Service Level Benchmark

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Study to understand the effects of environmental, social and economic impacts of a depleting water table on local community

Aditya Damle¹; Afreen Fatima²



Aditya Damle



Afreen Fatima

Abstract

Water is precious natural resource for sustaining life and environment. Effective and sustainable management of water resources is vital for ensuring sustainable development. In view of the vital importance of water for human and animal life, for maintaining ecological balance and for economic and developmental activities of all kinds, and considering its increasing scarcity, the planning and management of water resource and its optimal, economical and equitable use has become a matter of the utmost urgency. Proper management of water resources is of paramount importance to sustain one billion plus population.

Water management is a composite area with linkage to various sectors of Indian economy including the agricultural, industrial, domestic and household, power, environment, fisheries and transportation sector. The water resources management practices should be based on increasing the water supply and managing the water demand under the stressed water availability conditions. For maintaining the quality of freshwater, water quality management strategies are required to be evolved and implemented.

Decision support systems are required to be developed for planning and management of the water resources project. There is interplay of various factors that govern access and utilization of water resources and in light of the increasing demand for water it becomes important to look for holistic and people-centered approaches for water management. Drinking water is too fundamental and serious an issue to be left to one institution alone. It needs the combined initiative and action of all, if at all we are serious in socioeconomic development. Safe drinking water can be assured, provided we set our mind to address it.

Keywords: Fresh water, growth, sustainability, drinking water, water management

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Sustainable Construction Practices and Resilient Infrastructure for Mitigating Urban Flooding in Mumbai

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Shuvam Dash



Ashmita Rupal

Purpose

Mumbai, one of India's most densely populated metropolitan cities, faces recurring urban flooding due to its low-lying coastal geography, rapid urbanization, poor drainage infrastructure, and extreme monsoon events. This study aims to evaluate sustainable construction practices and resilient infrastructure strategies to mitigate urban flooding in Mumbai's real estate sector. The research identifies key vulnerabilities, assesses current policies, and proposes innovative, climate-adaptive solutions for future urban development.

Approach and Method

The study employs a mixed-method approach combining qualitative and quantitative research techniques. It includes Literature Review – Analysis of global and Indian flood-resilient construction practices. Case Study Analysis – Examination of successful urban flood mitigation projects in Mumbai and other flood-prone cities. Stakeholder Surveys & Interviews – Gathering insights from real estate developers, urban planners, policymakers, and residents regarding challenges, awareness, and willingness to adopt sustainable construction. GIS & Flood Risk Mapping – Identifying flood-prone zones and evaluating land-use patterns affecting water drainage. Comparative Analysis – Assessing the effectiveness of traditional vs. sustainable construction methods in reducing flood risks.

Findings

The research highlights that poor land-use planning, loss of natural flood buffers (mangroves, wetlands), and inadequate stormwater management systems significantly contribute to Mumbai's flood vulnerability. Sustainable construction practices such as permeable pavements, green infrastructure, elevated structures, and sponge city concepts can significantly enhance urban resilience. While government initiatives like the Mumbai Climate Action Plan (MCAP) and Coastal Regulation Zone (CRZ) policies provide a framework for sustainable development, challenges such as high implementation costs, lack of incentives, and regulatory gaps hinder large-scale adoption.

Implications

The study provides actionable recommendations for real estate developers, policymakers, and urban planners to integrate flood-resilient construction techniques into Mumbai's urban development policies. It emphasizes the need for policy reforms, public-private collaborations, and financial incentives to promote sustainable real estate development. The findings contribute to the broader discourse on climate-resilient urban planning, serving as a blueprint for other flood-prone cities facing similar challenges.

Keywords: *Urban Flooding, Mumbai, Sustainable Construction, Resilient Infrastructure, Climate Adaptation, Real Estate Development, Flood Mitigation, Green Infrastructure, Urban Planning, Stormwater Management.*

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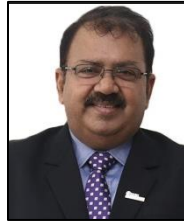
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Sustainability in Hospitality: Integrating Eco-friendly Practices for a Resilient Future

Kalyani Adhau¹; Deva Dutta Dubey²; Malthi Lakamanahalli³



Kalyani Adhau



Deva Dutta Dubey



Malthi Lakamanahalli

Purpose

The primary aim of the research is to analyse the hotel industry's uptake and implementation of sustainable practices in its operations and processes. For instance, in circular economy models, sustainable supply chain management, waste management, water conservation, energy efficiency, community involvement, carbon footprint reduction, and using renewable energy can be considered key areas of emphasis. The utilization of innovative techniques in water management and green building materials is also evaluated in minimizing environmental impact.

Approach and Method

The present study adopts a qualitative and limited quantitative approach. It focuses on sustainable practices among the leading listed hotels in India. The case studies are derived from hotels that have successfully implemented eco-friendly practices, such as advanced water management systems, circular economy models, and renewable energy deployment.

Findings

The research has shown that sustainable practices adopted by hotels bring a number of benefits, such as lower operating costs, reduced environmental impact, and increased brand strength and market image. These are both environmental and business advantages to the hotels adopting these practices.

Implications

The study points out the sustainability factor as a catalyst for the sustainable, resilient, and ethical hospitality industry. Eco-friendly processes, advanced water management systems, sustainable building materials, and minimization of ecological footprint help hotels minimize their impact and improve operational efficiency and branding. The findings guide stakeholder advice on balancing social and environmental responsibility with corporate growth and support for global sustainability goals with the SDGs.

Keywords: Sustainable supply chain, Environmental impact, Hospitality Industry, SDG.

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Sustainable Rice Milling Unit (Industrial Building)

Sourabh Khanchi¹



Sourabh Khanchi

Purpose

This study aims to identify the impact of Rice milling units (industrial buildings) on the environment and the carbon footprints emitted by them during their normal operations throughout the year and various methods that must be implemented to reduce their impact on the nature and make their operations sustainable and move towards making them green and energy efficient.

Approach and Method

This study includes data from both primary and secondary sources as data has been taken from reports, papers, articles etc. along with the data taken from the site which is an 8MTPH rice milling unit located in Karnal, Haryana. Data taken from both sources has been used to analyze the current impact that the building is exerting on the environment and the ways it has been used or the ways it could have been used to reduce it along with proper planning and forecasting of financials, environmental impact etc.

Findings

It is found that the rice milling units especially the older or traditional rice milling units are one of the major participants in polluting the environment and depleting resources. It has been found that these units are still using coal-powered boilers rather than gas-powered boilers and using highly polluting raw materials for combustion rather than bio pellets, also these industries are consuming at least 14,000 – 15,000lt of water every day just for cleaning paddy which makes them water heavy industries and not using renewable energy make them one of the most unsustainable industries. Apart from this, various ways of transforming them into sustainable industries have been identified along with proper procedures, planning and forecasting regarding their financial and environmental impacts along with energy efficiency of the buildings.

Implications

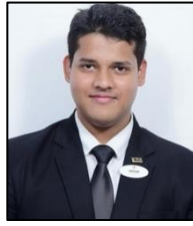
There is an urgent need for implementing sustainability measures in these rice milling units especially in traditional rice milling units to reduce their impact on the environment and human resources which includes an increase in the usage of renewable energy, changing raw material for boilers or replacing them with gaspowered boilers, improving air quality and comfort, replacing energy-intensive machinery, installing STP's etc. These measures might be capital intensive but will benefit the firm in the long run by both reducing costs and increasing goodwill. The research renders a practical framework to help mill owners, policymakers, and industry stakeholders go beyond the powers of uninformed decision-making into the realms of sustainable operations, thus contributing to an eco-friendly agricultural processor sector.

Keywords: Rice milling unit, Carbon footprints, Pollution control, Resource depletion Coalpowered boilers , Gas-powered boilers, Biomass pellets, Renewable energy, Financial forecasting STP(sewage treatment plant), Industrial sustainability, Energy-intensive machinery

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The Impact Of Climate Change On Resilient Building Design

Divyam Tyagi¹



Divyam Tyagi

Purpose

With the increasing frequency and intensity of extreme weather events, resilient buildings have become essential in mitigating climate change risks. This study examines how climate change impacts building resilience and explores design strategies that enhance adaptability, durability, and sustainability in the built environment.

Approach and Method

This research adopts a qualitative approach, reviewing case studies of climate-resilient buildings across various climates and geographies. It analyses key factors such as thermal performance, material selection, structural strength, and passive design techniques. Additionally, the study assesses how policies and construction standards influence the adoption of resilient building practices.

Findings

The study finds that resilient buildings incorporate innovative solutions such as advanced insulation, renewable energy systems, flood-resistant designs, and smart technologies for energy efficiency. These features significantly improve a building's ability to withstand extreme temperatures, storms, and rising sea levels. However, widespread implementation is challenged by high construction costs, policy gaps, and limited public awareness. Case studies highlight successful examples where adaptive strategies have minimized environmental impact while enhancing long-term building performance.

Implications

The research emphasizes the importance of integrating climate resilience into building codes, urban planning, and construction practices. Policymakers, architects, and developers must collaborate to create incentives and regulations that encourage climate-responsive designs. Strengthening resilience in buildings not only mitigates climate risks but also promotes energy efficiency and long-term sustainability.

Keywords: *Climate resilience, sustainable construction, adaptive design, extreme weather mitigation, energy efficiency.*

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Understanding Adaptive Thermal Comfort in the Warm and Humid Climate: A Bibliometric Analysis

Ketaki Gupte¹; Deva Dutta Dubey²



Ketaki Gupte



Deva Dutta Dubey

Abstract We are at the crossroads of experiencing the multiple impacts of climate change, making sustainable development the only viable path forward. Under these circumstances, Adaptive Thermal Comfort (ATC), which addresses the dynamic interactions between occupants, buildings, and the environment, has emerged as a crucial approach for warm and humid climatic regions. This aligns with global initiatives such as Carbon Neutrality and the Sustainable Development Goals, specifically SDG 03 (Good health and wellbeing), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals).

Purpose This paper aims to explore the research landscape of ATC through bibliometric analysis, identifying key trends, influential contributions, and knowledge gaps in this domain. It seeks to understand the evolution of ATC research, the methodologies employed, and its implications for energy efficiency and occupant comfort in warm and humid climates.

Approach and Method A bibliometric analysis was conducted using a comprehensive database of peer-reviewed journals, conference proceedings, and academic resources. The study maps the evolutionary trends of ATC research, identifying dominant methodologies, influential research clusters, and emerging themes. The analysis focuses on key indicators such as citation patterns, co-authorship networks, and keyword co-occurrence to provide a structured understanding of ATC's development

Findings Key observations indicate a growing emphasis on occupant-centric studies and ATC's significant potential for enhancing energy efficiency. However, the research remains fragmented, with a noticeable disconnect between theoretical advancements and practical implementation strategies. Additionally, a critical gap exists in the development of location-specific, building-typology-based ATC models, limiting their real-world applicability.

Implications This study has significant implications for policymakers, architects, and the construction industry. Prioritizing ATC can substantially improve energy efficiency and occupant comfort in built environments within warm and humid climates. Developing customized ATC models tailored to specific localities and building typologies will pave the way for more sustainable and adaptable built environments. By fostering interdisciplinary collaboration and bridging the research-practice divide, this study can help create a more integrated and effective approach to ATC, ensuring its practical implementation aligns with global sustainability goals.

Keywords: Adaptive Thermal Comfort, Warm and Humid Climate, Bibliometric Analysis, Building Energy Efficiency, Occupant Comfort Studies, Sustainable Development Goals.

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Application of Circular Economy in Indian Built Environment: Learning from Global Experiences

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Ujjwal Kapoor



Ritabrata Ghosh



Snigdha Choudhary

Purpose

The construction industry significantly contributes to global resource depletion, waste generation, and carbon emissions, underscoring the urgent need for sustainable practices. This research aims to critically assess international best practices for implementing circular economy principles in construction and explore their applicability within the Indian context, where rapid urbanization intensifies environmental challenges.

Approach/Method

The study employs a qualitative research approach, integrating comprehensive literature reviews, policy analyses, and comparative case studies. It systematically examines global circular economy strategies and evaluates their transferability to India. The research also investigates cultural, regulatory, and infrastructural factors unique to India that influence the adoption of circular practices, identifying gaps and opportunities for contextual adaptation.

Findings

The study reveals that while several global strategies can be adapted to India, significant contextual modifications are required to address local challenges such as fragmented waste management systems, regulatory gaps, and cultural diversity in construction practices. A critical finding is the absence of India-specific circular economy guidelines, which hampers widespread adoption. The research proposes the development of comprehensive frameworks tailored to India's socio-economic and environmental conditions, emphasizing resource efficiency, cost reduction, and sustainability.

Implications

The findings have important implications for policymakers, industry professionals, and stakeholders in the Indian construction sector. Implementing tailored circular economy practices can reduce construction waste, lower carbon emissions, and promote sustainable urban development, aligning with the United Nations Sustainable Development Goals (SDGs). The study recommends integrating circular principles into national building codes, enhancing awareness through education initiatives, and fostering collaborative efforts among public and private sectors. Incentive-based certification systems and clear regulatory roadmaps are also proposed to facilitate the transition towards a circular construction model. This research offers a strategic pathway for transforming India's construction industry, promoting environmental stewardship, and supporting sustainable growth. The proposed guidelines and strategies aim to create a resilient, resource-efficient built environment, contributing to India's broader sustainability objectives.

Keywords: Circular Economy, Resource Optimization, Sustainable Development Goals, Indian Built Environment

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Barriers to the Application of Circular Economy Practices in Construction and Demolition Waste Management

Siddharth Mohan¹, Ashish Gupta²



Siddharth Mohan



Ashish Gupta

Purpose

This research aims to explore the barriers to implementing circular economy (CE) practices in construction and demolition waste management (CDWM). Despite the potential benefits of CE, including resource efficiency and reduced environmental impact, various obstacles impede its adoption. A comprehensive literature review has identified 17 distinct barriers categorized into five primary groups: Economic, Political and Regulatory; Technological; Social; and Legal Barriers.

Approach/ Method

To gather primary data, a questionnaire survey is currently being conducted among industry stakeholders, utilizing the Relative Importance Index (RII) to rank these barriers before performing factor analysis. This approach will help quantify the impact of each barrier and prioritize them for effective intervention. Additionally, a case study approach will be employed by visiting several construction and demolition (C&D) plants to gain practical insights into the operational challenges and best practices in waste management. This hands-on investigation will complement the survey findings and provide a more holistic understanding of the barriers faced.

Findings

Preliminary insights indicate that a significant cultural shift within the construction industry is necessary to overcome resistance to change. The findings will contribute to a deeper understanding of the challenges faced by the construction industry in transitioning towards sustainable waste management practices.

Implication

This research not only aims to highlight these barriers but also seeks to provide actionable insights for policymakers and industry leaders to facilitate a smoother transition towards a circular economy.

Keywords: Circular Economy, Construction and Demolition Waste Management, Barriers, Sustainable Practices, Factor Analysis.

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Building a Resilient Real Estate Sector: Circular Economy and Regulatory Mechanisms for Fraud Prevention in India

Rekee Prashar¹, Amit Dhall²



Rekee Prashar



Amit Dhall

Purpose

The real estate sector in India is a major driver of economic growth but remains vulnerable to fraud, financial mismanagement, and regulatory inconsistencies. With the increasing adoption of circular economy principles, there is an opportunity to strengthen regulatory frameworks to ensure transparency, resource efficiency, and sustainability while mitigating fraudulent activities. This study examines how integrating circular economy models with real estate regulations can enhance fraud prevention, promote sustainable development, and build resilience in the sector.

Approach/Method

The research adopts a mixed-method approach, combining qualitative and quantitative analysis. A systematic review of regulatory frameworks governing India's real estate sector, including the Real Estate (Regulation and Development) Act (RERA), 2016, the Consumer Protection Act, 2019, and the Benami Transactions Act, 1988, is conducted. Additionally, case studies of global best practices in circular economy applications in real estate are examined to identify key insights. The study also includes stakeholder interviews with developers, policymakers, and legal experts to evaluate the effectiveness of current fraud prevention mechanisms and opportunities for integrating circular economy principles.

Findings

The study finds that existing regulatory mechanisms in India primarily focus on fraud detection and punishment rather than fraud prevention through sustainable practices. The integration of circular economy principles—such as resource optimization, waste reduction, and lifecycle accountability—can significantly improve regulatory compliance and minimize fraudulent activities. Case studies from European and Middle Eastern real estate markets demonstrate how circular economy-driven regulatory mechanisms enhance transparency, financial accountability, and long-term sustainability.

Implication

The research underscores the need for policy reforms that align real estate regulations with circular economy strategies to prevent fraud while ensuring environmental sustainability. It provides policy recommendations for integrating digital innovations, such as blockchain for transparent property transactions, and AI-driven compliance monitoring to improve fraud detection and mitigation. The findings offer valuable insights for policymakers, urban planners, and real estate developers to create a resilient and fraud-free real estate sector in India.

Key Words: *Circular Economy, Real Estate Regulation, Fraud Prevention, RERA, Sustainable Development, Regulatory Compliance*

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Circular economy and C and D waste management integration

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Amrik Singh



Ashish Gupta

Purpose

This study investigates the application of circular economy principles to enhance construction and demolition (C&D) waste management. Specifically, it focuses on sustainable resource recovery practices, such as the reuse, recycling, and repurposing of C&D waste materials. The core aim of this research is to analyze how these circular strategies can reduce environmental harm and drive long-term sustainability in the construction industry by minimizing waste and promoting resource efficiency.

Approach/ method

To achieve this, the research adopts a comprehensive mixed-method approach. It integrates both quantitative and qualitative methodologies. First, secondary data is used to assess the current streams of C&D waste and identify key areas for improvement. Simultaneously, qualitative insights are drawn from case studies of construction projects that have successfully employed circular economy models along with primary data questionnaire survey.

Findings

The study's findings highlight the significant potential of integrating circular economy principles within C&D waste management. It was observed that the adoption of these principles can result in a reduction of material waste by over 40%. Moreover, high-value materials like metals and concrete showed increased rates of reuse, demonstrating a more resource-efficient model. These gaps need to be addressed for widespread, long-term adoption of circular economy strategies.

Implications

The findings underscore the critical need for enhanced collaboration between government bodies, the construction sector, and waste management organizations. To fully realize the benefits of circular economy models in C&D waste management, it is essential to invest in supporting infrastructure and develop clear, enforceable policies.

Key Words: *Circular economy, C&D waste management, resource recovery, sustainable construction*

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Effective Waste Management Through Behavioral Nudges for Sustainable Cities

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Dharani A



Pooja Mehra



Sharath Kumar M P

Purpose

Waste generation is inevitable in any habitation, whether large or small. With rapid urbanization, expanding consumerism and breakneck industrialization, the volume of waste generation has reached staggering proportions in the metropolitan cities. The most significant impediment in addressing this issue is the lack of efficient waste segregation at the source. Waste segregation at the source is critical for lowering pollution, conserving resources, reducing waste management costs and encouraging recycling in India. Cities promote economic growth through their thriving business ecosystem, which creates jobs, attracts investment and contributes to urban infrastructure and industrial output. Noida, an emerging city, plays a significant role in the Indian economy as a major IT, manufacturing and real estate development hub. Cities need effective waste management and regulatory compliance for a cleaner, healthier, and more sustainable city. The study aims to investigate the crucial factors that impact waste segregation attitudes among Noida's working population to understand better how they contribute to a sustainable city.

Approach

The research delves deeply into the complexities of lifestyle influences on decision-making, categorizing participants into four uniquely defined groups. By employing the extended theory of planned behaviour, the study identifies how various factors (social norms, personal attitudes, and perceived control) shape their choices. On the other hand, the structural equation modelling emphasizes the significance of understanding these dynamics in fostering effective nudges and promoting positive behavioural changes.

Findings

The studies on Theory of Planned Behaviour reveal that intentions drive consumer behaviour. Therefore, this research identifies key factors that shape consumer's intention to segregate the waste at the source that limits the waste going to landfill. The study also explores effective nudges that can be adopted for building sustainable urban environments. By leveraging behavioural insights, these nudges can significantly enhance compliance and engagement, ultimately leading to more successful outcomes. Thus, nudges play a crucial role in ensuring the successful implementation of waste management policies and programme.

Implications

Adherence to rules and regulations is vital for improving waste management, especially in developing nations by ensuring that practices differ based on region type. Thus, the insights gained from this study can guide policymakers in addressing waste management challenges in emerging cities by understanding consumer motivations and strategies can be devised to promote more sustainable practices among residents.

Keywords: Waste Segregation at Source, Sustainable Waste Management, Consumer Behaviour, Theory of Planned Behavior and Behavioral Nudges

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Exploring Fragmentated Nature Of Construction Supply Chain And Developing Unified Energy Efficient Framework

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Azeem Nisar Bhat



Mohd Suhail Khan

Purpose

The construction industry is currently grappling with significant challenges stemming from a fragmented supply chain. This fragmentation arises from the involvement of multiple stakeholders, evolving project demands, and uncoordinated workflows, which complicate collaboration among parties. As a result, inefficiencies proliferate, leading to wasted resources and increased carbon emissions. To foster a more energy-efficient and sustainable construction process, it is crucial to delve into the root causes of this fragmentation and devise solutions that effectively address these issues.

Approach

This study aims to identify the key factors contributing to supply chain fragmentation within the construction sector, assess their impact, and propose a comprehensive framework for improving coordination and efficiency. The research follows a structured approach, commencing with an extensive review of academic and industry literature to pinpoint the causes of fragmentation. Following this, insights are gathered from construction professionals including contractors, suppliers, and project managers through surveys designed to assess the importance of the various factors contributing to supply chain fragmentation. Factor analysis will then be employed to prioritize the most critical barriers to supply chain unification.

Findings/Implication

The final outcome of this research is the development of a unification framework, designed to address the identified challenges at their core by focusing on the critical factors affecting the supply chain unification. With a focus on enhancing the construction supply chain, the framework seeks to foster a more streamlined and interconnected process, ultimately supporting the creation of an overall energy-efficient system within the construction industry.

Key Words: Construction Supply Chain, Fragmentation factors, Unification Framework, Energy Efficient Supply Chain, Supply Chain Planning

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Feasibility Study of Implementing Circular Economy Principles for MEP Systems in India

Mirza Hyder Ali Baig¹, Ashmita Rupal²



Mirza Hyder Ali Baig



Ashmita Rupal

Purpose

This study investigates the feasibility of implementing circular economy (CE) principles within Mechanical, Electrical, and Plumbing (MEP) systems in the Indian context. The research aims to assess the technical, economic, and policy viability of transitioning from linear "take-make-dispose" practices to circular models focused on resource efficiency, waste reduction, and renewable integration. The methodology combines a comprehensive review of relevant Indian policies and regulations, including the National Circular Economy Framework and the Energy Conservation Building Code, with stakeholder surveys targeting MEP professionals, policymakers, and building owners. Case studies of existing projects incorporating CE principles in MEP design are also analyzed. The findings reveal significant potential for CE adoption in India, driven by factors such as the increasing cost of resources, growing environmental awareness, and governmental sustainability targets. Key opportunities include the reuse of MEP components through design for disassembly. However, several barriers are identified, including insufficient recycling infrastructure for MEP materials, high upfront costs of sustainable technologies, and a lack of awareness and technical expertise among stakeholders. The study recommends policy reforms to incentivize CE practices, the development of pilot projects demonstrating circular MEP systems, and enhanced stakeholder collaboration and education. The results suggest that implementing CE principles in MEP systems could significantly reduce waste generation, lower carbon emissions, and contribute to India's broader sustainability goals, offering a pathway for a more resource-efficient and environmentally responsible built environment.

Approach/ method

The research employs a mixed-methods approach, combining a review of India's policy landscape (e.g., ECBC, NCEF), stakeholder surveys with MEP professionals and policymakers, and case studies of CE practices in Indian buildings. Key Performance Indicators (KPIs) such as waste reduction, energy savings, and cost-benefit ratios are analyzed to evaluate technical and economic viability.

Findings

The study identifies significant potential for CE adoption in MEP systems, driven by opportunities in renewable energy integration (e.g., solar), water recycling, and material reuse. However, challenges such as weak policy enforcement, high upfront costs, and low stakeholder awareness hinder progress. Stakeholder surveys highlight demand for subsidies, technical training, and improved recycling infrastructure.

Implication

The study recommends policy reforms (e.g., MEP-specific CE guidelines), pilot projects for modular MEP systems, and stakeholder collaboration. Findings suggest CE practices could reduce MEP-related waste by 50% and lower carbon emissions, aligning with India's NDCs and SDGs.

Key Words: *Circular Economy, MEP Systems, Sustainability, Renewable Integration, India*

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Integrating Circular Economy and Climate Finance in Architecture: A Case Study on Waste-Based Construction for a Sustainable Built Environment

Nikita Gautam¹, Nikita Deelip Patil²



Nikita Gautam



Nikita Deelip Patil

The construction sector plays a substantial role in environmental deterioration, producing a substantial quantity of waste and utilizing substantial natural resources. In response to these challenges, the circular economy has emerged as a sustainable approach to architectural design, emphasizing the reuse, recycling, and repurposing of materials to minimize environmental impact, climate finance has emerged as a vital tool in promoting sustainable construction by providing financial support for projects that prioritize low-carbon and waste-reducing approaches. Climate finance plays a crucial role in promoting sustainable construction by providing financial support for projects that focus on reducing carbon emissions and minimizing waste. Proper use of management practices during and after construction offers a cost-effective and environmentally friendly approach to building construction.

Purpose: The research paper explores the application of the circular economy in architecture by examining a case study of a 5 by 5-meter library constructed exclusively from waste materials in the city of Bhopal.

Approach and Method: The structure was built from reclaimed vents, salvaged doors, overburnt terracotta tiles, and debris from old buildings, serving as an example of how adaptive reuse can be implemented in small-scale construction projects. This involved the process of sourcing the materials, which had to be modified, as well as designing and constructing the structure more simplistically.

Findings: Based on the findings, it was revealed that using certain waste-based materials could lower the construction cost, carbon emissions, and landfill contributions by a substantial amount without compromising the design or structure of the building. The findings of the study indicate that circular construction methods can be economically feasible for larger architectural projects and offer opportunities to integrate them into urban planning, affordable housing initiatives, and other development endeavors.

Implications: This paper emphasizes the need for increased government assistance, financial backing for climate adaptation measures, and the removal of regulatory barriers to expedite the adoption of environmentally sustainable construction practices. This was a case study, which will serve as a foundation for many others to develop innovative architectural designs using waste materials, ultimately promoting sustainable construction practices and policies that prioritize environmental considerations.

Keywords: Circular economy, Sustainable construction, Adaptive reuse, Climate finance, Waste-based materials

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Macroeconomic Variables and NIFTY Realty: A Comparative Analysis of Pre- and Post-COVID Eras

Amartya Biswas¹, Jyoti Bhoj²



Amartya Biswas



Jyoti Bhoj

Purpose

This research explores the Nifty Realty Index from January 1, 2015, to January 1, 2025, and examines its relationship with macroeconomic factors such as Metal nifty, GDP growth, Prime lending rate, Exchange rate(dollar), and inflation. By dividing the analysis into two phases—pre-COVID (2015–2020) and post COVID (2020–2025)—the study assesses how these factors influenced real estate trends before and after the pandemic. It highlights market stability before COVID 19 and the significant shifts in demand, pricing, and investment in the post pandemic era. The goal is to equip investors, policymakers, and developers with valuable insights for informed decision-making in a dynamic economic environment.

Objective

The primary objective of this study is to determine the macroeconomic elements that have played a crucial role in shaping the real estate market. It evaluates the effects of changes in GDP growth, Metal nifty, Exchange rate (dollar), Prime lending rate, and inflation on property values and investment trends. Additionally, it aims to help investors analyse potential risks and returns, assist policymakers in designing effective market regulations, and guide developers in making strategic long-term decisions. By comparing pre- and post-COVID periods, the study provides an understanding of the evolving nature of the real estate sector.

Approach/Method

The study employs both descriptive and inferential statistical techniques to analyse market patterns. Descriptive statistics such as mean and standard deviation summarize key data trends, while a correlation matrix identifies significant relationships between macroeconomic factors and the Nifty Realty Index. Regression modelling is applied to determine the impact of these variables, with F statistics and P-Value ensuring the accuracy and reliability of the findings. By contrasting pre- and post-pandemic trends, the research highlights how economic conditions have shifted over time, offering a deeper understanding of sector performance.

Findings

The analysis reveals that Metal Nifty, GDP growth, Prime lending rate, Exchange rate (dollar), and inflation have significantly influenced the Nifty Realty Index. The COVID-19 crisis led to major disruptions in demand, pricing, and investment flows. While the pre-pandemic period showed relative market stability, the post-COVID era reflects changing investor behaviour and economic recovery patterns. These findings provide critical insights for investors, policymakers, and developers, offering a structured approach to navigating India's evolving real estate landscape.

Key Words: *Nifty Realty, Macro variables, COVID-19, Regression, Investment*

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Policy Effectiveness in Construction and Demolition Waste Management: A Global Comparative Study and Learnings for India

Qatada Mujahid¹, Ashish Gupta²



Qatada Mujahid



Ashish Gupta

Purpose

With an emphasis on India, which has major issues because of fast urbanization and poor infrastructure, the study assesses the effectiveness of global construction and demolition (C&D) waste management strategies and policies. Less than 1% of the 150 million tons of construction and demolition trash produced in India each year is recycled. Inadequate infrastructure limited public knowledge, and tax enforcement of legislation are the reasons behind this low recycling rate.

Approach/ method

A thorough literature review, policy analysis, and data collection from primary and secondary sources are all used in this work. To evaluate the effectiveness of the chosen countries' policies, a comparative analysis will be carried out. Also, surveys and interviews with important stakeholders will shed light on the difficulties and real-world applications of demolition and circular waste management regulations.

Findings

Important conclusions show that the absence of financial incentives for recycling and material reuse keeps these regulations from being implemented effectively. Developed nations offer tax breaks and incentives for recycled goods, but India mainly lacks these systems. Furthermore, uncontrolled dumping makes environmental problems worse, and municipal and building organizations don't do anything to help. Despite the implementation of the C&D Waste Management Rules, 2016, there are flaws in India's current structure, including poor monitoring, no financial mechanisms, and limited stakeholder engagement.

Implication

The study highlights how India's C&D waste management must be improved. Expanding recycling infrastructure, giving financial incentives like tax benefits for employing recycled materials, and empowering local authorities to enforce current restrictions are some of the key consequences. Furthermore, encouraging cooperation between public and private developers as well as trash management firms can improve recycling and waste collecting efficiency. India can greatly lessen its effects on the environment and encourage sustainable urban development by tackling these issues.

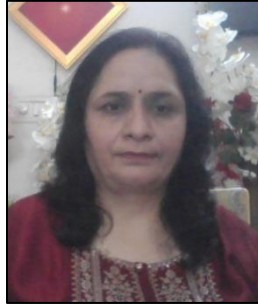
Key Words: *Construction and Demolition Waste, Waste Management Policies, Recycling, Sustainability, Global Comparative Analysis*

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Regenerative Development as a new approach to Sustainable Design : A Case Study of IRRAD Building at Gurgaon 29

Anisha Bajpai¹, Santosh Pal Singh², Arvind Varshney³



Anisha Bajpai

Abstract

The idea of environmentally conscious architecture and building, which is predicated on creating minimal harm to the surroundings, is unable to adequately address these concerns given the rate at which contemporary life is developing. As a consequence, regenerative thought is becoming more and more relevant since it is shifting the approach in the building regarding the creation of an atmosphere that concentrates on individuals which, when partnered with the principles of the circular economy, seeks to allow the environment as a whole to change. In this paper, a number of concepts for Regenerative Design are studied to understand how it works in the construction of buildings for the benefit of the environment.

Regenerative design focus on coordination with nature, different from other structural progress work. Seeing this, many fields of study and practice have called for a new method to sustainable growth in the built surrounds through regenerative design. A regenerative method is associated to a closed-loop life span. Every object or element is indistinguishably related to the others. The attention is on the natural plants, place, and the ecology adjoining the site in a determined enhancement of design in a restorative style that benefits all investors to maintain green environment. Sustainable Design, Green/ Restorative Design are all closely related.

Using all of these design principles, knowing the context of a structure or other human invention before executing it, giving equal weight to other ecological aspects, planning their future evolution, and then creating could result in a regenerative system. Regeneration is an act or a process of regenerating, with regenerating meaning renewal, refurbishment, or rebuilding. Investigating the methods, techniques, and technology used in the planning and building of an IRRAD building at Gurgaon 29 is the goal. For the study to completely comply with the requirements of the IRRAD at Gurgaon 29, the results highlight the key design elements and obstacles, and they also explore the possibility of wider implementation in urban as well as rural contexts. The case-study design and construction assessment can provide important insights for the delivery of future sustainable structures and expedite their adoption in the housing sector.

Keywords: *Green building Design, Sustainable Design, Regenerative Design, Restorative design, Environmentally Conscious design*

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Urbanization and its impact on e-waste generation and economic growth among developed and emerging countries

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Mahek Chawla



Pooja Mehra

Purpose

E-waste has increased at an unprecedented rate due to the rapid electrification of society that is caused by digital transformation. World e-waste was 62 billion kg in the year 2022 and is predicted that the production will reach 82 billion kg by 2030, this is growing at an average annual rate of 2.3 billion kg. The growing e-waste contributes greatly to major worldwide issues such as resource depletion, environmental degradation and health risks. As universal connectivity increases and many devices become more integrated into daily life, it becomes crucial to investigate the connection between e-waste generation and socio-economic variables to understand its main drivers. It is necessary to study both developed and emerging countries because it covers countries with different economic structures, technological advancement, and regulatory strategies so that a globally representative analysis of ewaste production is ensured. Developed countries share information about high consumption habits and the effective policies whereas emerging economies point to the impact of fast urbanization and economic growth on e-waste. Taken together, these countries offer a thorough grasp of the socioeconomic factors affecting the production of e-waste.

Approach/ Method

Using panel data analysis, this study examines the relationship between e-waste generation, GDP, population, urban population, internet users, corruption control, and human development index (HDI) in 10 developed and 10 emerging countries between 2018 and 2022.

Findings

The results show that e-waste is mostly driven by GDP and internet penetration, with emerging economies impacted by fast urbanization and developed countries producing more due to higher consumption. Higher HDI and corruption control aid in lowering the amount of e-waste.

Implication

This will further help researchers and policymakers in developing focused strategies to address the factors that influence e-waste generation. It also highlights the need for governments to work hard to enact effective laws to deal with the amount of ewaste and also support programs that actively reduce its accumulation through sustainable methods of production and consumption.

Keywords: E-waste, GDP, urban population, population, individuals using the internet, HDI, control of corruption, developing and emerging countries, panel data

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A Comprehensive Review of the Feasibility of Green Leasing in the National Capital Region

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Aftab Ahmed Khan



Rekee Parashar

Purpose

This study aims to assess the viability of green leasing in the National Capital Region real estate market by coordinating leasing procedures with the objectives of sustainable development. It investigates how to combine ecologically conscious and energy-efficient tactics to advance sustainability in the industry.

- 1) The primary objective of this study is to bridge the gap between conventional leasing models and sustainability principles by evaluating the feasibility of adopting green leasing practices.
- 2) The research seeks to identify market acceptance barriers, assess cost-benefit implications, and explore the long-term effects of green leasing on asset valuation and operational efficiency.

Approach and Method

Empirical survey of 50 people and interview of 10 people, where 5 people are from academic background and 5 people are from real estate sector.

Findings

According to the study's findings, there is a notable lag in the National Capital Region's adoption of green leasing because of low knowledge, a lack of standardised frameworks, and reluctance to pay upfront fees. The unwillingness of landlords and renters to share sustainability duties, fragmented stakeholder participation, and legal ambiguity are major market hurdles. Widespread adoption is also hampered by issues including high implementation costs, restricted access to green funding, and a lack of obvious incentives. By filling up these gaps, this study offers useful suggestions and legislative frameworks to promote the use of green leasing and establish it as a calculated opportunity that strikes a balance between financial gains and environmental stewardship. To promote a more resilient and sustainable real estate market in the area, it calls for more industry cooperation.

Implications

Green lease to increase better growth of the National Capital Region in future.

Keywords: Green leasing, sustainable development, stakeholder collaboration, environmental responsibility, regulatory challenges

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Analysing Legal Aspects of Built Environment in the Himalayan Region

Harshita Singh¹ ; Jyoti Bhoj²



Harshita Singh



Jyoti Bhoj

Purpose

The built environment in the Himalayan region, encompassing infrastructure, urban settlements, and rural development, is shaped by a complex interplay of legal, cultural, and environmental factors. This paper analyses the legal dimensions of the built environment in the Himalayan region, focusing on the frameworks that govern land use, construction practices, environmental protection, and indigenous rights. Given the region's unique geographical and cultural context, the legal systems often blend traditional practices with modern regulations, creating a distinct legal landscape that influences sustainable development, urbanization, and environmental conservation.

Approach and Method

The research examines the convergence of national and regional legislation, including land tenure frameworks and zoning ordinances. It evaluates the efficacy of these legal mechanisms in addressing the problems presented by the delicate ecological conditions of the Himalayas, encompassing risk management for natural disasters such as landslides and earthquakes, along with the effects of climate change. The study methodology integrates a literature examination that includes government reports and case studies, with legal analysis of statutory and regulatory frameworks, case law evaluations, and primary data collecting through interviews, surveys, and focus groups.

Findings

The Himalayan region is highly vulnerable to the impacts of climate change, including rising temperatures, glacial retreat, and unpredictable monsoon patterns. As these environmental changes exacerbate the risks associated with the built environment, the literature discusses the role of laws in promoting adaptation strategies.

Implications

The paper provides a comprehensive analysis of how legal frameworks impact both the construction of infrastructure and the preservation of the Himalayan ecosystem. The study concludes by suggesting legal reforms that could promote sustainable, equitable, and culturally sensitive development in the region, while balancing the needs of modern growth with environmental and social justice.

Keywords: Resource management, Himalayan region, Built Environment, Legal Frameworks, Sustainable Development, Land Use, Indigenous Rights, Environmental Law.

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Analysing Critical Delay Factors, Impact, and Developing Framework/Strategies for Effective Claim Management in Construction Projects.

Aftab Ahmed Khan¹ ; Suhail Khan²



Aftab Ahmed Khan



Suhail Khan

Purpose

This study aims to investigate the critical factors causing delays in construction projects, identify the root causes and impacts of claims, and propose sustainable strategies for effective claim management. The goal is to enhance project performance by minimizing disputes and ensuring timely, cost-efficient, and project delivery.

Approach and Method

A comprehensive review of research papers, industry reports, and case studies was conducted to analyse delay factors, claim causes, and best practices in claim management. The study also emphasizes integrating sustainability principles into project management to reduce delays and claims, by introducing advanced tools and technologies.

Findings

The research identifies that administrative inefficiencies, resource shortages, and external factors such as weather disruptions and regulatory hurdles primarily drive delays. Claims mainly stem from project delays, scope changes, and contractual ambiguities, leading to cost overruns, schedule extensions, and quality compromises. Effective claim management relies on robust contract documentation, proactive risk identification, continuous project monitoring, and open stakeholder communication. However, the adoption of advanced tools like Building Information Modelling (BIM), smart contracts, and digital project tracking systems remains limited.

Implications

The study emphasizes the urgent need to integrate sustainability into claim management practices. Digital solutions like BIM and smart contracts enhance transparency, while AI and predictive analytics aid proactive decision-making. The adoption of digital documentation and the CESS framework ensures structured, eco-friendly claims handling. By embedding these tools, construction projects can reduce delays, optimize resources, and minimize their environmental footprint, leading to improved efficiency, cost control, and sustainability in the sector.

Keywords: *Construction Projects, Delay Factors, Claim Management, Cost Overruns, Schedule Delays, Contract Documentation, Stakeholder Communication, Dispute Resolution, Construction Disputes, Project Delays, Contractual Disputes, Construction Claims.*

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Can Healthcare REITs Improve Healthcare Infrastructure in India?

Vatsal Singh¹ ; Ashish Gupta²



Vatsal Singh



Ashish Gupta

Purpose

This research assesses the potential of Healthcare Real Estate Investment Trusts (REITs) to improve institutionalized healthcare infrastructure in India and facilitate the development of a medical tourism hub, drawing lessons from the experiences of Global healthcare REITs.

Approach and Method

A combined-methods approach will be adopted for this research. Qualitative data will be collected through interviews with industry experts, healthcare professionals and regulatory authorities to gather insights on the feasibility and challenges of implementing healthcare REITs in India. In conjunction to these primary interviews, detailed secondary research will be conducted by analysing industry reports and performance metrics. The research will analyse key performance indicators (KPIs) used in Global healthcare REITs like occupancy rates, rental yields, debt service coverage ratios and asset valuation trends. This dual approach provided a comprehensive framework to compare the operational efficiencies and financial stability of healthcare REITs with the potential market dynamics in India.

Findings

India faces a significant deficit of hospital beds and healthcare infrastructure compared to international standards. These deficits, coupled with the rising burden of non-communicable diseases and increasing demand for medical facilities presents an opportunity for high-yield real estate investments in the healthcare sector. Healthcare REITs can play a crucial role in bridging this gap by attracting both domestic and foreign investments, as demonstrated by the increase in Foreign Direct Investment (FDI) in healthcare over the past decade. Healthcare REITs benefit from stable cash flows, robust occupancy rates, and strong capital structures largely driven by long-term lease agreements and strategically managed property portfolios. When translated to the Indian market, these findings suggest that adopting a similar REIT model could mobilize private investment, reduce dependence on public funding and stimulate the modernization of healthcare facilities.

Implications

A successful implementation of healthcare REITs in India could yield long-term transformative impacts on the nation's healthcare landscape. By providing a stable investment platform, healthcare REITs can attract long-term capital, stimulate infrastructure development, and improve access to quality healthcare services.

Keywords: *Healthcare real estate investment trusts, healthcare infrastructure, public private partnerships (PPPs), medical tourism.*

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Developing a Comprehensive Framework for Public-Private Partnerships (PPPs) in India to Achieve Sustainable Development Goals (SDGs)

Sarthak Sehrawat¹ ; Taqdees Anjum²



Sarthak Sehrawat



Taqdees Anjum

Purpose

This study investigates the integration of sustainability and performance measures into Public-Private Partnership (PPP) projects in India, focusing on significant advancements, challenges, and best practices. It aims to provide insights for optimizing PPPs to enhance sustainable development across various sectors, including healthcare, education, and infrastructure.

Approach and Method

The study employs a multimethod approach:

- 1) Expert Interviews: Conducted to ensure the framework's relevance and gather new insights from professionals involved in PPP projects.
- 2) Literature Review: A comprehensive review of existing knowledge to identify gaps and collect relevant information on PPPs and sustainability.
- 3) Case Study Analysis: Used to evaluate the proposed framework and extract valuable lessons from real-world PPP projects.

Findings

The study highlights the critical importance of incorporating sustainability standards into PPP assessments. It reveals a strong connection between financial value and sustainable development, suggesting that PPPs can be more effective when they balance private investments with long-term sustainability goals and social welfare. The findings emphasize that a balanced approach is essential for PPPs to contribute positively to social well-being and economic progress.

Implications

- Effectiveness: PPP initiatives can be made more impactful by integrating sustainability indicators, ensuring that projects contribute to sustainable development.
- Guidance for Stakeholders: Offers practical suggestions for decision-makers, practitioners, and stakeholders involved in PPP projects, helping them to optimize their strategies.
- Contribution to Sustainable Development: Adds to the ongoing conversation on sustainable development, providing a framework for future PPP projects to align with SDGs.

Keywords: Public-Private Partnerships (PPPs), Sustainable Development Goals (SDGs), Sustainability metrics, Key Performance Indicators (KPIs), Environmental Impact, Economic benefits.

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Feasibility Analysis of Municipal Solid Waste from Ghazipur Landfill for Road Embankment Construction

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Santosh Kumar



Akash Dubey



Abdul Rehman



Saurabh Kumar

Purpose

Managing municipal solid waste (MSW) is a major challenge for cities worldwide, especially as landfills continue to overflow.

Approach and Method

This study explores whether waste from the Ghazipur landfill in New Delhi could be repurposed for building road embankments. To assess its suitability, researchers conducted various geotechnical tests, including density, swelling, particle size distribution, and soil consistency evaluations.

Findings

The results show that the MSW samples meet the necessary standards for embankment materials. The waste had a maximum dry density of 1.808 gm/cc at an optimal moisture level of 10.5%, a Free Swelling Index of 3.33%, and a composition of 13.85% gravel, 73.95% sand, and 12.20% silt/clay. Additionally, the material exhibited non-plastic behaviour, with a liquid limit of 20.6%, and achieved 95.96% compaction in field tests.

Implications

These findings suggest that processed MSW could be a viable and eco-friendly alternative for road construction. Not only does this approach offer a sustainable way to manage waste, but it also helps conserve natural resources and improve urban infrastructure.

Keywords: *Municipal Solid Waste (MSW), Road Embankment Construction, Sustainable Infrastructure, Waste Management, Ghazipur Landfill*

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From Policy to progression: Mapping India's commercial built sector towards Net-Zero emissions

Akanksha Amba¹ ; Saurabh Verma²



Akanksha Amba



Saurabh Verma

Purpose: India's pledge to achieve net-zero greenhouse gas emissions by 2070 marks a transformative shift in the nation's climate policy. As the world's third-largest greenhouse gas emitter, contributing approximately 7–8% of total global CO₂ emissions, India faces a critical challenge in aligning its energy efficiency and renewable energy initiatives with its sustainability goals. The construction sector alone accounts for 23% of these emissions, driven by energy-intensive practices and material consumption.

The rapid expansion of the industrialization has fuelled urbanization, increasing the demand for construction and further intensifying energy consumption. In the financial year 2022, India's commercial sector consumed approximately 107.5 terawatt-hours of electricity, reflecting a significant increase from 86.9 terawatt hours in 2020. With buildings responsible for nearly one-third of India's total energy use and an estimated 40 billion m² of new construction expected by 2050, highlighted by the Bureau of Energy Efficiency (BEE). A policy-driven, impact assessed approach to energy efficiency is critical.

Additionally, the Climate Action Tracker rates India's current policies as "Insufficient," underscoring the urgent need for a more credible and effective regulatory approach. One of the key regulatory measures in place is the Energy Conservation Building Code (ECBC), and Eco Niwas Samhita (ENS) designed to enhance building energy efficiency. However, the effectiveness of national and sub-national policies remains inconsistent, necessitating a comparative evaluation.

Approach and Method: The methodology is based on secondary research, including rankings, policy effectiveness assessments, and findings from State Designated Agencies (SDAs). It incorporates State-wise Impact calculation analysis to identify areas for regulatory intervention. The study applies the Net-Zero Readiness Score (NZRS) framework, which evaluates policy frameworks, implementation and compliance, and measurable impact to assess India's decarbonisation progress in the built environment. Expanding the framework by integrating quantitative and qualitative indicators, ensuring a structured policy evaluation that informs regulatory improvements, and targeted interventions to accelerate India's net-zero transition. States are categorized as Leaders, Advancers, Beginners, or Laggards based on their performance in building & energy efficiency adoption.

Findings: The effectiveness of national and sub-national policies remains inconsistent, necessitating regulatory improvements. Given that energy and construction regulations fall under state jurisdiction, assessing state-level policies is crucial for understanding implementation challenges and identifying areas for improvement.

Implications: This study provides insights into India's regulatory landscape, offering recommendations to enhance policy effectiveness and bridge gaps in implementation. The findings aim to guide policymakers, industry stakeholders, and researchers in developing a more robust and coherent strategy for achieving net-zero targets in the construction sector.

Keywords: energy sector, net-zero, construction industry, sustainable growth, regulatory frameworks

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Review of CSR actions of leading Indian Companies named in the BSE Realty Index

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Kunal Mange



Deva Dubey



Aditya Kumbar

Purpose

This study explores the role of Corporate Social Responsibility (CSR) in promoting sustainable development within the India's leading companies in real estate and construction sectors, named in the Realty Index. It highlights how businesses can move beyond regulatory compliance to strategically integrate CSR into their core operations. Given the industry's significant contribution to GDP and employment, enhance transparency in reporting, and align their CSR efforts with Sustainable Development Goals (SDGs).

Approach and Method

The research is based on a review of CSR policies, sustainability reports, and academic studies on CSR implementation in the Indian real estate and construction industries. It examines trends, challenges, and best practices through a qualitative content analysis of existing literature, focusing on regulatory frameworks, corporate initiatives, and industry-wide sustainability strategies.

Findings

The study finds that while CSR initiatives are widely adopted in the sector, many companies still view them as philanthropic obligations rather than strategic business investments. Transparency and accountability in sustainability reporting remain a challenge, with reports often lacking depth. Additionally, small and medium enterprises (SMEs) need greater encouragement and regulatory support to integrate CSR into their operations effectively to cater community welfare programs.

Implications

The findings bring out the practices followed by real estate and construction companies must shift from a based on their disclosures. Companies need to move from a compliance-based CSR approach to a more integrated, strategic framework that aligns with long-term business sustainability. Strengthening regulatory guidelines, improving sustainability disclosures, and fostering industry-wide collaboration can enhance the effectiveness of CSR initiatives. This research provides valuable insights for policymakers, industry leaders, and academics.

Keywords: Corporate Social Responsibility, Real Estate Industry, Construction Sector, CSR Compliance, Business Strategy, SDG-17 goal.

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Adoption of Green Practices in Urban Residential Spaces: Insights from Mumbai

Faran Ahmed¹, Deva Dutta Dubey²



Faran Ahmed



Deva Dutta Dubey

Purpose

Looking to the current state of the construction industry, there is no substitute of including elements of sustainability in construction of residential spaces. This study focuses on analysis of sustainable practices that are being included in Mumbai's housing sector with the increasing demand of green house building.

Approach and Method

In this study, we focus on features of apartments in different residential projects in Mumbai, located all over the city. The paper attempts to analyse the supply side relating to residential spaces in Mumbai, looking at over 500 housing projects that are either constructed, are in operational stage or are under construction. The critical aspect of the paper is providing insights of urban sustainable practices such as stormwater management, sewage and sullage water treatment, solid waste disposal, rainwater harvesting, energy efficiency, fire protection, and recreational open spaces.

Findings

The results indicate diverse degrees of implementation, wherein practices such as stormwater drainage systems (85.5%) and rainwater harvesting (88.5%) are extensively utilized, whereas other methods, including energy management (38%) and sewage treatment (38.6%), exhibit considerable deficiencies, which could be increased in the days to come.

Implications

This paper provides overview to policymakers, developers, and urban planners to take necessary actions to fill the gaps to improve overall sustainable development in built environment and reduce the carbon footprint. This paper helps in achieving the goals envisaged under Sustainable Development Goals of the United Nations – SDG 11 and SDG 12.

Keywords: Sustainable Urban residential spaces, stormwater drainage system, rainwater harvesting, energy management, sewage treatment, SDG 11, SDG 12

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Advancing Sustainable Development Goals through Construction Technology in Viksit Bharat

Ramandeep Singh Gurudatta¹, Ashmita Rupal²



Ramandeep Singh Gurudatta



Ashmita Rupal

Purpose

The Viksit Bharat Mission seeks to make India a developed country by 2047, and sustainable infrastructure is a key factor in this process. This research examines how the development of construction technology can help hasten the realization of Sustainable Development Goals (SDGs), especially SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities), SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

Approach and Method

The study adopts a combination of methods that draws from case studies of sustainable construction technologies, policy evaluation, and literature reviews. It investigates cutting edge technologies such as prefabrication, smart materials, AI-assisted project management, Building Information Modeling (BIM), and the use of renewable energy sources into building construction. The contributions of policy efforts such as the Pradhan Mantri Awas Yojana (PMAY), the Smart Cities Mission, and the GRIHA rating to the advancement of sustainability are examined.

Findings

The research detects that although India has progressed to some extent towards the adoption of green building technology, high expenses, regulatory impediments, and lack of technical skills are keeping it from its large-scale acceptance. Financial rewards for green initiatives, simplified procedures for regulation, skill development projects, and improving public private partnership (PPP) are essential in order to extend sustainable construction at a large scale. The infusion of AI and IoT in planning cities can again maximize resource optimization and minimize carbon footprints.

Implications

The study gives idea for policymakers, urban planners, and industry players to improve sustainability in the construction industry. Through the use of advanced technologies and streamlining policy frameworks, India can speed up its path toward Viksit Bharat while meeting international commitments to sustainability. The study emphasizes the importance of a comprehensive approach combining technology, policy, and financial instruments to promote sustainable urban development.

Keywords: Sustainable construction, Smart Cities, Green building technologies, Viksit Bharat, SDGs

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Analysis of valuation practices in India: Does it incorporate the sustainability Considerations?

Josmer Jose¹, Ashish Gupta²



Josmer Jose



Ashish Gupta

Purpose

This study examines the extent to which sustainability considerations are integrated into real estate valuation practices by Indian valuation professionals. It explores market practices, the level of adoption, and the barriers and challenges faced by valuation professionals. Additionally, the paper identifies key sustainability factors that can be incorporated into valuation and outlines how these elements are integrated into the valuation process.

Approach and Method

A structured questionnaire survey is administered to valuation professionals across India, with the collected data analysed to derive insights into current practices and trends.

Findings

While organizations such as RICS and IVSC provide guidance notes and perspective papers on sustainability in real estate valuation, existing literature and international surveys indicate that valuers in some countries incorporate sustainability considerations through attributes such as site orientation and energy efficiency. However, no comprehensive, evidence-based study has been found specific to the Indian real estate market.

Implications

Valuation professionals play a critical advisory role in decision-making processes pertaining to transactions. Therefore, awareness and understanding of sustainability in valuation are crucial. A lack of such awareness may result in inaccurate valuations, potentially hindering sustainable development. Furthermore, this study provides insights for policymakers and regulatory bodies to better understand the challenges and barriers in the Indian market, facilitating the development of improved frameworks and policies valuation standards.

Keywords: valuation practice, sustainability, green buildings, real estate

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Balancing heritage conservation and urban transformation in Jammu's old city

Aksheen Gupta¹; Yogesh Bhardwaj²



Aksheen Gupta



Yogesh Bhardwaj

Purpose: The old city of Jammu is an important place with a rich historical and cultural heritage. However, modern urban pressures are creating significant challenges that threaten its identity. Rapid development, unplanned growth, and increasing commercial activities are putting stress on its infrastructure and heritage sites. This study aims to explore strategies for balancing heritage preservation with the demand of urban transformation in Jammu's old city, ensuring sustainable development while retaining historical and cultural identity.

Approach and Method: To understand these challenges, the research includes detailed surveys and assessments of key issues affecting old city of Jammu. Some of the major concerns are poor infrastructure, encroachments around heritage sites, and traffic congestion due to unplanned commercialization. The study also reviews the impact of gentrification, where rising property prices and new developments are forcing local communities to move out. A significant part of this research focuses on the lack of community participation in heritage preservation. Many residents and business owners are unaware of the importance of heritage preservation, leading to the neglect or even unauthorized modifications of historic city. Additionally, the research looks at government policies related to heritage conservation, including national initiatives. It also identifies governance issues, weak policy implementation, and coordination gaps among authorities that make it difficult to protect and maintain the old city's historical character.

Findings: The study finds that many heritage sites in old city of Jammu are under threat due to poor maintenance, illegal constructions, and uncontrolled commercialization. The lack of awareness among the local population leads to further deterioration, as many people fail to recognize the value of preserving historic buildings and sites. Gentrification has also changed the social fabric of the area, pushing out long-time residents and traditional businesses. Governance inefficiencies, weak infrastructure planning, and a lack of strict regulations further worsen the situation. The study highlights the urgent need for sustainable urban development strategies that integrate modern needs with heritage preservation.

Implications: To solve these challenges, the study suggests several solutions. The implementation of well-planned heritage conservation programs is necessary. Sustainable urban development guidelines should be introduced to control commercialization and gentrification while ensuring that development does not harm historical sites. Promoting community-based tourism can help create economic opportunities while encouraging locals to preserve their heritage. Public awareness campaigns and educational programs are also essential to help people understand the importance of maintaining their cultural identity. Strengthening governance, improving infrastructure, and ensuring better coordination among authorities are crucial steps toward preserving old city of Jammu. A balanced approach is required to protect the city's heritage while allowing for modernization and urban growth in a sustainable manner.

Keywords: *Heritage conservation, culture conservation, urban transformation, sustainable development, public participation, improving infrastructure*

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Bibliographic Analysis of Financing Options for Sustainable Urban Development in India

Shiv Prasad Singh¹



Shiv Prasad Singh

Purpose

The objectives of SDG 11 cannot be achieved until we implement the sustainable development agenda at the city level. The present focus on green buildings needs to shift towards green and net zero cities. Indian urban development finance is primarily government grant or taxation based, which is always falling short to meet the urban development challenges and provision of municipal services. Besides, developing nations are also inflationary economies, experience high land values, suffer from shortage of affordable housing, have inefficient public transport systems and have poor quality habitat. To organize the additional financing for sustainable and net zero cities, alternative financing options need to be explored, which are pragmatic, perennial and scalable. In absence of viable sources of finance for our urban development, sustainable and net zero cities would be a distant dream. This research would undertake bibliographic analysis of financing options at the global platform and review the implementation possibilities of these options for Indian cities.

Approach

This research shall be undertaken through bibliographic analysis on Scopus index database using software and qualitative analysis.

Findings

The research would conclude with summary of viable financing options available globally for sustainable urban development and an analysis of their applicability in India. This research would also summarize the issues in sustainable urban development financing and strategy to overcome them.

Implications

This research would add to the body of knowledge in sustainable financing options for the urban development and their viability for Indian cities.

Keywords: Sustainable Finance, Cities, Urban Development, Green Finance, Project Finance, SDG 11

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Construction Claim Rejections in India: Key Drivers, Regional Comparison, and Sustainable Mitigation Strategies

Sandeep Pandey¹, Triveni Prasad Nanda²



Sandeep Pandey



Triveni Prasad Nanda

Purpose

Construction projects in India often face significant delays and cost overruns due to claim rejections, leading to financial and operational inefficiencies. This study aims to identify the key factors contributing to claim rejection across Indian public works projects and compare trends with those observed in Delhi NCR. Additionally, the research explores sustainable strategies for improving claim acceptance rates and reducing disputes.

Approach and Method

This research follows a mixed-methods approach, integrating quantitative analysis of claim rejection data and qualitative insights from industry professionals. Data is collected from public infrastructure projects across India, including Delhi NCR, to conduct a comparative analysis. Statistical tools are used to develop a predictive model assessing the likelihood of claim rejection, while thematic analysis of expert interviews helps identify best practices in claim management and dispute resolution.

Findings

The study identifies poor documentation, delayed submissions, contractual ambiguities, and lack of awareness among project stakeholders as primary factors leading to claim rejection. A regional comparison highlights variations in claim management efficiency, with Delhi NCR showing a relatively structured approach compared to other regions. The predictive model provides an evidence-based framework for assessing claim rejection risks, and the findings emphasize the need for improved documentation practices, streamlined negotiation processes, and contract modifications to enhance claim success rates.

Implications

This research contributes to improving claim resolution mechanisms in the Indian construction industry by proposing data-driven mitigation strategies. The study underscores the importance of digital documentation systems, enhanced site staff training, and policy-level interventions to reduce disputes and facilitate smoother project execution. Additionally, by minimizing claim-related disruptions, the findings support sustainability goals by optimizing resource utilization and reducing construction waste.

Keywords: Claim rejection, construction disputes, public infrastructure, claim management, sustainability

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Designing Climate-Resilient and Sustainable Habitat Solutions for Hyderabad's Growing Urban Population

Valishetti Pradeep Chakri¹, Ashmita Rupal²



Valishetti Pradeep Chakri



Ashmita Rupal

Purpose

As Hyderabad rapidly urbanizes, the population will grow from 7 million in 2010 to over 12 million by 2030. This boom will increase the pressure on housing needs while posing additional environmental pressures of increased temperature, water shortage, and high energy consumption. The objective of this research is to develop climate-resilient and sustainable housing solutions that optimize energy efficiency, include passive cooling strategies, and have long-term adaptability to composite climate conditions of Hyderabad.

Approach and Method

The study discussed here follows a multi-disciplinary approach involving population forecasting, climate-responsive design principles, and urban zoning analysis. Population growth trends were projected for the precise estimation of demand for housing by 2030, 2040, and 2050. The climatic parameters of Hyderabad were studied to determine design specifications for sustainable infrastructure. GHMC zoning regulations, and sustainability standards were also evaluated to develop practical design solutions for different residential typologies.

Findings

In Hyderabad's housing infrastructure, the study finds climate-responsive techniques that are essential for improving thermal comfort, energy efficiency, and urban resilience. Key findings include are Solar Shading devices, Ventilated Cavity walls, Thermal mass materials, Vegetation and Green Roofs, etc.

Implications

This study offers a strategic framework for urban planners, and architects to design sustainable and climate-resilient urban habitats in Hyderabad. The solutions proposed are aligned with Telangana's Housing Policies, and climate adaptation goals. Through the integration of sustainability with the design of urban housing, this study offers adaptable, and environmentally responsible models that can be implemented in other rapidly urbanizing cities within composite climatic zones.

Keywords: Sustainable Infrastructure, Climate-Resilient Housing, Hyderabad Population, Green Building Design, High-Density Housing, Population Forecasting

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Enhancing Urban Walkability: Design Principles for Social Equity, Sustainability, and Mobility

Rashmi Baluja Tandon¹; Santosh Tiwari²



Rashmi Baluja Tandon



Santosh Tiwari

Purpose

The purpose of this research is to examine the impact of physical, social, and design aspects on urban walkability and sustainability. The study's goal is to uncover critical drivers such as roadway connection, accessibility, safety, land use, and the design of public places that encourage walking. Furthermore, it investigates the broader implications of walkable spaces for social interaction, environmental effects, and quality of living. Understanding these links aims to help build urban places that support sustainable and equitable mobility alternatives.

Approach and Method

A mixed-methods approach will be used to conduct a thorough evaluation of urban walkability. The project will use both qualitative and quantitative data collection tools, such as pedestrian behaviour surveys, comparative spatial analysis, and case studies of cities with different levels of walkability. A detailed literature review will integrate current understanding about walkability and its relevance to urban design. Empirical research will include observational studies, pedestrian pathway mapping, and assessments of environmental and infrastructure factors that influence walkability. The Space Syntax Analysis and Urban Network Analysis (UNA) methodologies will assess connectivity patterns, accessibility, and land-use combinations in various urban environments.

Findings

The expected findings will focus on important urban design principles that promote pedestrian movement and contribute to social and environmental sustainability. The study will look at key elements that influence walkability, such as well-connected roadway networks, mixed land-use design, pedestrian-friendly infrastructure, and perceived safety. It will also look at how public places might encourage community engagement and improve general well-being. The study will provide comparative insights into how different urban environments promote or impede pedestrian activity and sustainable mobility.

Implications

The findings will have substantial implications for urban planners, architects, and legislators as they provide practical advice for constructing walkable cities. Increased walkability can help to reduce reliance on private vehicles, lower carbon emissions, promote public health, and strengthen social cohesion. The study will advocate for integrated urban planning techniques that prioritize pedestrian-friendly environments while maintaining accessibility, safety, and inclusivity. By tackling modern urban difficulties, the research will contribute to the development of resilient, habitable, and environmentally sustainable cities that meet the changing requirements of urban populations.

Keywords: *Walkability, Built Environment, Pedestrian Mobility, Sustainable Urban Development, Public Spaces, Neighbourhood Connectivity, Social Interaction.*

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Evaluating the Adoption and Impact of Delay Analysis Tools in Karnataka's Road Construction Projects for Enhanced Efficiency and Sustainability Integration of BIM

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Triveni Prasad Nanda

Purpose

Delay analysis is crucial for the successful management of construction projects, particularly in road infrastructure development, where delays significantly impact project timelines and costs. With advancements in technology, specialized software tools such as Primavera P6 and Microsoft Project (MSP) have become integral to construction project management. However, their implementation for delay analysis in Karnataka's Road construction projects remains underexplored. This research aims to evaluate the extent of their adoption, assess their impact on timelines, costs, and delay claim success rates, and examine their role in supporting sustainability goals.

Approach and Method

The study employs a mixed-method approach, incorporating surveys, interviews, and case studies with key stakeholders, including contractors and project managers in Karnataka. A combination of quantitative and qualitative data analysis is used to assess adoption levels, identify barriers, and evaluate the tools' effectiveness in improving project outcomes.

Findings

The research highlights that Primavera P6, and MSP streamline scheduling processes, improve delay management efficiency, and contribute to cost savings. Despite their benefits, barriers such as high costs, lack of expertise, and resistance to technology adoption hinder widespread implementation. The study also underscores how these tools facilitate proactive delay mitigation strategies, leading to improved project performance and better adherence to sustainability principles.

Implications

The findings provide actionable recommendations for increasing adoption, including cost-benefit analysis, structured training programs, and policy incentives to encourage non-users. By integrating digital delay analysis tools, Karnataka's Road construction projects can achieve higher efficiency, improved project sustainability, and better alignment with sustainable development goals (SDGs).

Keywords: Delay Analysis, Primavera P6, Microsoft Project (MSP), Efficiency, Sustainable Development

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Evaluating the Effectiveness of Zonal Development Planning in Achieving Sustainable Urbanization: A case of Dwarka, Delhi

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Vyom Kulshrestha



Shashwat Gaur



Millicent Ayemi



Sandeep Kumar

Purpose: This study evaluates the effectiveness of Zonal Development Planning in promoting sustainable urbanization in case of metropolitan areas. The analysis encompasses key metrics such as distribution of land use, green space allocation, infrastructure development, waste management strategies, water conservation, and the enhancement of public transport systems. Initial findings suggest that while the plan has made significant strides in increasing green cover, improving public transport and providing necessary physical and social infrastructure, it faces challenges in the realms of waste management and water conservation as well as providing inadequate social services. The integration of sustainable practices across all sectors remains inconsistent

Approach and Method: The study highlights the need for comprehensive policy adjustments and strategic and innovative initiatives so as to address these gaps and enhance the plan's overall impact. The study has been conducted after thoroughly understanding the methodology used for Zonal Development Planning in India, specifically using the Zonal Development Plan of Zone K-II, Dwarka, Delhi so as to establish a theoretical framework for the study. Interviews of various stakeholders have been extremely useful. On-ground surveys as well as GIS-based analysis have also been integral part of the study.

Findings: The study has highlighted various key issues, majorly the implementation of the Zonal Development Plans or late implementation of the plan. Recommendations include the adoption of innovative waste management technologies, improvements and expansions of existing water and sewage systems, and redevelopment plans for areas with haphazard urban growth. By addressing these areas, Zonal Development Planning can better align with broader sustainability goals, specifically SDG-11 (Sustainable Cities and Communities), and serve as a model for urban development in other metropolitan regions.

Implications: The study has been undertaken in the Dwarka sub-city area of Delhi. Data was collected primarily from on-ground surveys and through various secondary sources including Delhi Development Authority (DDA), Delhi Jal Board, Delhi Pollution Control Board etc. This study highlights the challenges and issues of Master Plan implementation amidst changing ground realities and looks forward to provide recommendations for key decisions and policy revisions pertaining to the urban development at zonal and city level.

Keywords: Development Planning, Zone K-II Dwarka, Sustainable Cities and Communities, Urban Infrastructure, Land use planning, Plan Implementation etc.

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Evaluating the Sustainability of Smart Development Initiatives in Varanasi: A Framework for Environmental and Urban Planning under the Smart City Mission

Shah Mohammad Atif¹, Ashmita Rupal²



Shah Mohamed Atif



Ashmita Rupal

Purpose

The study assesses the sustainability of smart city initiatives in Varanasi under India's Smart City Mission. It investigates effective urban planning and environmental management strategies and provides policy recommendations to integrate sustainability in smart city projects.

Approach and Method

The research involves literature review to identify gaps in existing frameworks and then evaluation of smart city initiatives using a sustainability assessment framework.

Key methods include:

Analysis of smart city policies to see how sustainability is integrated. Examination of technological interventions like IoT based resource management and environmental sustainability indices. Assessment of governance and financial challenges to sustainability implementation.

Findings

The study highlights the gaps in sustainability evaluation of smart city initiatives as: No localised framework for Varanasi. Inconsistent implementation of sustainability driven technologies due to governance and financial challenges. Limited public participation affecting smart development strategies. Need of robust policy frameworks for environment conservation, waste management and climate adaptation.

Implications:

The findings suggest that sustainability metrics must be included in smart city planning. The research provides a framework for policymakers, urban planners and stakeholders to take informed decisions. By aligning smart city projects with global sustainability standards, Varanasi can become more resource efficient, environment friendly and inclusive. The study can be applied to other Indian cities facing similar urbanization and sustainability challenges.

Keywords: Sustainability, smart City, Framework, Policy Integration for Sustainability, Smart City Performance Metrics.

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Exploring Visual Perception Factors Shaping Urban Aesthetics: A Bibliometric Analysis

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Dinesh Gopal Zope



Deva Dutta Dubey

Purpose

Urban aesthetics significantly influence the quality of life, cultural identity and social cohesion within cities. Understanding the visual perception factors that shape this aesthetics is crucial for creating vibrant, inclusive and visually appealing urban environments. This systematic review aims to explore and analyse literature relating to key visual perception factors that impact urban aesthetics, deriving from interdisciplinary insights from urban planning and design, behavioural preferences, environmental studies and visual arts. Previous research on visual perception analysis has been limited and has not been reviewed and synthesised. This research tries to understand the evolution and extent of research on visual perception worldwide.

Approach and Method

The study synthesizes findings from a comprehensive range of peer-reviewed articles, books, and case studies published and categorically reviewed 771 relevant publications from the Scopus database (2019-2024) and conducted a bibliometric analysis to provide a comprehensive description of the analysis undertaken in various locations across the world that focused on recurring themes such as colour, form, texture, scale and spatial arrangement.

Findings

Our findings highlight that according to literature visual coherence, cultural context, and the inter-relation between art and humanities are central to visual perception. The study also shows that there has been a significant growth since 2018 in the literature that focuses on the idea of visual perception. Furthermore, the study highlights that research contributes from the United States, United Kingdom, China and Germany have been particularly prominent. Key word analysis informs that decision making, space perception, visual pattern and cues, movement & imagery has garnered attention for research and future directions. The current literature lacks comprehensive study particularly regarding the influence of emerging technologies and dynamic urban changes on visual perception.

Implications

The study emphasises the importance of bibliometric analysis for identifying research patterns and guiding further investigations into human-centered urban design strategies. Future study should investigate multidisciplinary approaches that combine cognitive science and urban design to improve understanding of aesthetic preferences and their impact on urban planning thus contribute to SDG 11 sustainable cities and communities.

Keywords: *Visual perception, urban planning and design, behavioural preferences, visual art, sustainable cities and communities, bibliometric analysis, SDG 11*

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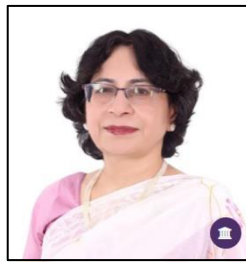
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Mainstreaming Resilience in India's Urban Planning Framework

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Anurita Bhatnagar



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Purpose: The federal structure of India's planning process and policy-making, along with the presence of multiple agencies responsible for different aspects of urban development, creates a multi-point entry system for introducing reforms in the existing planning framework. This complexity, while posing coordination challenges, also provides multiple opportunities for integrating resilience-based planning into urban governance at various levels.

This paper identifies key stakeholders in the urban planning process, including central and state governments, municipal authorities, urban development agencies, private sector entities, and community organizations. Each of these stakeholders play a critical role in shaping urban resilience by influencing infrastructure projects, policy formulation, economic strategies, and community engagement programs.

Approach and Method: This paper presents a framework for incorporating resilience enhancement initiatives and targeted interventions in the development planning process in Indian cities. Multiple methods of data collection and assessment were used during this research. The baseline was developed using secondary sources of information from governmental as well as credible non-governmental sources. Experts consultations were conducted to collect the feedback on development planning process and its interface with urban resilience measures. The data was synthesized and analysed using SPSS-AMOS. The framework, thus prepared was validated through a high-level experts' consultation.

Findings: The paper emphasizes that a multi-dimensional approach is crucial for embedding resilience into urban planning. This includes strengthening infrastructure through investment in disaster-resistant housing, smart grids, and efficient public transport systems. It recommends that policy reforms at various government levels should focus on integrating resilience principles into city master plans, land-use policies, and zoning regulations. Economic diversification is another key pillar, as resilient cities require a strong and adaptive economic base that can withstand financial shocks and disruptions. Community participation is equally vital, as informed and engaged citizens contribute to disaster preparedness, environmental conservation, and local governance initiatives. Finally, disaster risk reduction and emergency preparedness must be prioritized by enhancing early warning systems, emergency response mechanisms, and climate adaptation strategies.

Implications: The paper highlights the importance of multi-sectoral collaboration to ensure that resilience planning is not viewed in isolation but as an essential component of urban development.

To institutionalize resilience-based planning, this paper proposes a policy framework that aligns national, state, and local planning processes. By integrating resilience into governance structures, urban India can enhance its ability to withstand future shocks and provide a safer, more sustainable environment for its growing population.

Keywords: *Urban Resilience, Governance Framework, Policy Integration, Urban Planning; stakeholder engagement*

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Navigating in the High-Density Areas of Historic Towns: An Assessment of Urban Legibility in Shahjahanabad, Delhi

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Sandeep Kumar



Ekta Singh



Devendra Pratap Singh

Abstract

Planning in high-density urban contexts has always been a challenge for planners as these areas are more complex and diverse in nature. Due to the high number of households moving to urban areas and the resulting repercussions, cities in the majority of developing nations worldwide have been receiving a lot of attention. It occurs as a result of the centrality of the commodities and services provided by metropolitan regions. More people will reside in and around cities than in rural regions by the end of this century, a common occurrence that indicates urbanization in its most natural form. However, at the same time, a situation occurs due to the growing population and the ensuing unplanned growth, which puts strain on the environment and land. A city with historical roots has a responsibility to develop in a balanced way that is compatible with both the built environment and future demands.

In early fifties, certain schemes for improvement and clearance of slums were planned which did not prove very effective. Slum clearance scheme was also initiated subsequently, but in the practical sense, it became a difficult task to take up the improvement, clearance and redevelopment to the provisions laid down by the government and their implementation thereafter. Now, with reduced area and scope for further improvement, a handful of efforts are being undertaken in the walled city to improve the urban legibility and quality of life. Historical Monuments are spread all over the area which is also supposed to be integrated while taking up large-scale redevelopment of residential activity.

Shahjahanabad, the seventh city of Delhi has always been a historic sanctuary of an urbane and sophisticated culture. Migration and partition have left several impressions on the walled city, and intrusion from all type of trade and industry has reduced the city to depressing spectacle of congested landuses and sub-humane conditions which in turn have led to serious environmental and built form hazards which further led to gradual blight and decay of its neighborhoods. Commercial and industrial activities are mixed with residential land use throughout Shahjahanabad. Despite of its rich Cultural Heritage, old settlements of Delhi and along with Shahjahanabad are a "planner's nightmare".

This paper will examine and assess the status of urban legibility and way-finding in the high-density urban context of Shahjahanabad area in Delhi, India. In the context of Delhi, the land use policy and development plan methods for the old urban regions will be examined. To determine the degree of risk associated with spatial growth, the land use policy and its instrument, the Master Plan, will be examined. As a result, the parameters for the risk assessment and planning procedures for Delhi's historic urban regions would be determined and relevant policy recommendations will be proposed to supplement the existing policy framework.

Keywords: *Urban Legibility, High Density, Wayfinding, Urban Density, Land use, Built Environment*

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NOIDA: Case Study of Urban Development through Public-Private Partnerships

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Gautam Agrawal



Karina Bhatia Kakkar



Bidisha Banerjee

Purpose

NOIDA (New Okhla Industrial Development Authority) is a prominent sub-city of Delhi, conceptualized as one of India's earliest planned industrial townships' post-independence in 1947. The city aimed to address industrial growth following Chandigarh in the 1950s and Ahmedabad in Gujarat. The study aims to critically analyse the impact of urban land development, with a particular focus on the role and regulatory influence of statutory authorities in shaping sustainable urban growth and to assess the key challenges associated with managing public-private collaboration projects, with an emphasis on stakeholder interests, governance structures, and policy frameworks.

Approach

This study adopts a qualitative research approach to explore the dynamics of public-private partnerships (PPPs) in urban planning, specifically focusing on the development of NOIDA city. A case study methodology is employed to understand the governance structures, stakeholder interactions, and policy implications associated with PPP-led urban development. The case study approach allows for a context-specific exploration, providing rich, descriptive insights into the mechanisms that shape NOIDA's urban transformation. A multi-method data collection strategy, such as semi-structured interviews, secondary research, and field observations, are employed to ensure triangulation and enhance the validity of findings.

Findings

Transcribed interviews and field notes were analysed using coding techniques to identify recurring themes. Data was categorized into key themes: regulatory frameworks, financial models, stakeholder collaboration, and sustainability outcomes. A comparative analysis assessed best practices and policy gaps in NOIDA's PPP framework.

Implications

By employing a qualitative case study methodology, this research aims to comprehensively understand the effectiveness and challenges of public-private partnerships in NOIDA's urban development. The findings will contribute to policy discussions on improving governance frameworks and achieving sustainable urban planning in emerging metropolitan regions.

Keywords: PPP, Urban, NOIDA, Development Policy, Sustainable Urban Planning

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Qualitative Data Analysis of reporting of Corporate Governance Philosophy by leading Indian Realty Companies

Deva Dutta Dubey¹



Deva Dutta Dubey

Purpose

This study analyses the disclosures of corporate governance philosophy of Indian companies included in the BSE Realty Index, over a period of 5 years. As required by SEBI, listed companies have to submit Corporate Governance Report as mandatory disclosure. Whereas several parts of the report have to be presented using comparable /standardized parameters, the Corporate Governance Philosophy is a free form submission and reflects the thinking of the management in that direction.

Approach and Method

The study is a qualitative data analysis using Voyant Tools. It attempts to do a qualitative data analysis of the contents of the corporate governance philosophy of India's leading listed companies in the Built Environment industry.

Findings

Several common key words were found to be used by companies while describing their philosophy. A conceptual map describing word frequency and relative weightage is presented. Words used point towards themes aligned with themes suggested by other authors.

Implications

The analysis helps understand how corporate governance disclosures are presented in annual reports in India. Previous research has brought out the need for Qualitative Data Analysis in the domain of Corporate Governance as several quantitative studies are available, however the findings are mixed as several areas may be remaining to be analysed. Further, while the western model on the topic is widely researched, however, not many studies are available on Indian companies.

Keywords: *Corporate Governance Philosophy, Stakeholders, ESG, Business Responsibility, Sustainable Consumption and Production Patterns (SDG 12)*

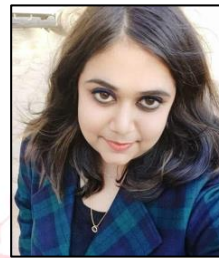
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Smart strategies for improving IPT on Transit Corridors Through a User- Centric Approach: A Case Study of Gurugram

Yash Gupta¹, Snigdha Choudhary²



Yash Gupta



Snigdha Choudhary

Abstract

Intermediate Public Transport (IPT) is an important aspect of urban transport in the developing countries like India. It includes the low-capacity vehicles like auto-rickshaws, Erickshaws with passenger seating capacity ranging 3-4 passengers, the hired Taxis, Cabs etc. Medium-capacity vehicles with seating capacities of 8-10 passengers like Grahmin sewa, and High-capacity vehicles like feeder buses with seating capacities of 40 to 50 passengers to take daily urban trips in Indian cities where the city public transport is not available to provide an alternative mode of travel to reach where public transport is available. Intermediate Public Transport (IPT) or para-transit is a mode of travel that provides first and last-mile connectivity and fills the gap in the existing public transport system. It also offers door-to-door services to passengers on demand such as occasional trips to the airport or emergency trips for healthcare, without having to rely on private vehicles or public transport. This research adopts a user-centric approach to evaluate and improve IPT services across Gurugram's transit corridors. The study is to examine and analyzes IPT policies in India and outline the obstacles hampering its effectiveness. An end-to-end appraisal of user-driven parameters—e.g., cost, reliability, accessibility, security is undertaken in order to review their impact on commuter satisfaction as well as on service efficiency. Through the analysis of commuter choices along chosen public transit routes, the study proposes to develop smart solutions and strategies for Intermediate Public transport on the Transit Corridors of Gurugram.

Keywords: Intermediate Public Transport (IPT), User-Centric Approach, Transit Corridors, Urban Transport, Urban Mobility, Smart solutions

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Study of Urban Growth Pattern in Cities for Sustainable Urban Form: A Bibliometric Analysis and Future Directions

Anita Shyam Panicker¹, Deva Dutta Dubey²



Anita Shyam Panicker



Deva Dutta Dubey

Purpose

In India, urbanization is occurring at a rapid pace, which poses challenges for urban planning and infrastructure development. Urban growth patterns have been a subject of significant research, particularly in the context of rapid urbanization and its impacts on sustainable development. Limited empirical evidence, relevant to urban growth analysis in cities is available and where available it has rarely been summarized and synthesized. This study undertakes a bibliometric analysis to study the evolution of the literature in the domain and the canvas of study on urban growth patterns in cities across the globe focusing on common trends and parameters influencing urban expansion, including infrastructure growth, socioeconomic forces, policy interventions, and technological advancements.

Approach and Method

To bridge the knowledge gap, the present paper systematically reviewed 681 relevant publications in the Scopus database (2019–2024) and conducted a bibliometric analysis to indicate a comprehensive outline of the analysis conducted in various cities across the globe with respect to how cities have grown and growth patterns have been developed, focusing on global research trends, prevalent research ideas, and future directions.

Findings

The review highlights the diverse methodologies employed in urban growth analysis, such as spatial modelling, remote sensing, and Geographic Information Systems (GIS), and underscores their relevance in capturing the complexity of urban landscapes. The review also indicates that since 2020, there has been a continuous growth in publications, active journals, and knowledge-generating organisations. Further the study indicates that research from United States, China, United Kingdom and India has been more dominant. Key word analysis suggests that urban growth, land use, urbanisation, urban development and watershed have attracted attention for research and future directions. The study also shows steady increase in interdisciplinary studies that combine urban planning with environmental science, social science and economics.

Implications

Urban growth analysis has made significant progress globally but, gaps stay in understanding in urban dynamics in the region of Global South exist. Research in the future could aim at technological interventions, and studies related to policies to promote sustainable urban development thereby contributing to sustainable cities and communities (SDG 11).

Keywords: *urban growth, cities, infrastructure, urban development, bibliometric analysis, SDG 11*

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Study on overcoming barriers to effective project planning and scheduling in Indian Construction Industry

Labina Das¹, Suhail Khan²



Labina Das



Suhail Khan

Purpose: Project planning and scheduling in the Indian construction industry face significant obstacles, including labor shortages, supply chain disruptions, poor risk management, and a lack of communication among stakeholders. These challenges, if not adequately addressed, can lead to delays, cost overruns, and project failures. Many previous research

highlighted that this sector are constrained by reliance on MS Excel, insufficient stakeholder engagement, regulatory challenges, and economic conditions. There is also a notable lack of exploration into innovative methodologies and modern technologies that could enhance project success. Addressing these barriers are essential for improving overall project performance and achieving timely completion within budget. The study focuses on overcoming barriers to effective project planning and scheduling in the Indian construction industry by identifying, analyzing, and providing mitigation strategies for technological, financial, and legal obstacles that hinder successful project execution. To eliminate waste and improve resource efficiency while fostering a culture of continuous improvement, the study aligns with sustainable practices, minimizes environmental impact, and enhances project efficiency. This approach not only addresses existing challenges but also promotes innovative methodologies and technologies that can significantly contribute to project success.

Approach and Method: The study begins with a literature review by identifying common causes and impacts from previous research, followed by questionnaire surveys directed to working Planning Managers, Project Managers, Consultant (PMC) to gather qualitative and quantitative data on delay factors. Additionally, the data is analyzed by using RII analysis technique to identify the important factors or causes of delay factors.

Findings: This study aims to not only uncover the barriers faced in project planning and scheduling within the Indian construction industry, but also to recommend strategies for overcoming these obstacles through the adoption of new technologies and efficient practices, ultimately ensuring effective and realistic planning and boosting project success rates by integrating sustainable construction practices.

Implications: The study's implications extend to improving overall project performance by addressing key barriers in project planning and scheduling within the Indian construction industry. By identifying and mitigating technological, financial, and legal obstacles, the research promotes the adoption of innovative methodologies and modern technologies that enhance project efficiency. Additionally, aligning with sustainable practices minimizes environmental impact, reduces waste, and fosters resource efficiency. The findings provide actionable insights for industry stakeholders, enabling them to implement effective and realistic planning strategies that contribute to timely project completion, cost control, and overall success in the construction sector.

Keywords: India, project planning & scheduling, barriers, sustainable practice.

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Study on penetration of commercial real estate in tier 2 cities of India in alignment with Vikshit Bharat and Sustainable Development Goals

Shivam¹



Shivam

Purpose

Much talked about target of achieving 5 trillion dollar economy is incomplete without integration of infrastructure and commercial real estate in tier 2 cities of India which comprises of major urban population. Thus, holistic development aligning with goals of Vikshit Bharat and Sustainable Development Goals will complete the growth story of India. This paper lays down proposals of policy interventions, public private partnerships and more Capital infusion in infrastructure for prompting growth in tier 2 cities while maintaining economic growth and environmental governance. This paper provides actionable inputs for think tanks, developers and capital markets to capitalize on the less explored potential of tier 2 cities, rendering to India's growth toward a sustainable and equitable future in harmony with ESG.

Approach and Method

The given study is carried out by examination of case studies and market trends which highlights the transformative potential of these centres as hub for businesses, Commerce and innovation.

Findings

The study underlines the consequences of Sustainable Urban Design and green building practices to minimize environmental impacts and enhance resource efficiency. It aligns with SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and communities), and SDG 8 (Decent Work and Economic Growth) by portraying how commercial real estate can drive employment, make regional economies robust and narrow down the urban-rural disparity.

Emerging micro markets by means of expressways and parallel self-sustaining economy growing along its stretch, far and wide. Advance Urban Mobility such as metro in cities like Jaipur and Lucknow significantly reducing carbon emissions has contributed in overall achievement of environmental goals of Vikshit Bharat.

Implications

The expediated urbanization of Tier 2 cities of India has led to manifold growth of the commercial real estate sector which aligns with Vikshit Bharat(Developed India) and Sustainable Development Goals(SDGs) of India. This paper explores the evolution of commercial real estate in tier 2 cities, which is emphasized on Inclusive growth, infrastructure development and economic socialism.

Keywords: *Urban Mobility, Vikshit Bharat, SDGs, Capital, Policy*

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Sustainable Real Estate Development: A critical review of TOD implementation in Delhi

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Arshiya Jain



Shiva Prasad Singh

Purpose

Sustainable cities and communities, as envisaged in SDG 11, cannot be realized without a robust and sustainable urban transport system. Metro Rail-led Transit-Oriented Development (TOD) policy is Delhi's strategic initiative to advance this goal. Over the past two decades, Delhi Metro has emerged as a pivotal force and is driving the real estate development, primarily in the suburban areas.

TOD holds significant potential to deliver high economic, social, and environmental value by integrating land use and transport planning to create compact, walkable, and sustainable communities (NIUA, 2016). Despite its potential, the implementation of TOD policy in Delhi has been slow and fragmented, limiting its anticipated benefits (Mohan, 2020; Kumar et al., 2018). Delays in project approvals and the inability to encourage private sector participation have hindered the city from harnessing TOD's full economic benefit. This necessitates a critical analysis of the economic impact of TOD implementation in Delhi, with a focus on real estate development.

Approach and Method

This research will evaluate the economic impact of TOD projects on Delhi's real estate market, in terms of property values, property tax, stamp duty, employment generation and the economic trickle-down effect. Further, by examining the existing TOD framework, drawing insights from successful case studies both within India and abroad, and conducting a real estate development simulation on selected nodes and corridors of the Delhi Metro, this study aims to quantify the economic potential of expedited TOD implementation.

Findings

The findings will highlight the economic value that could be unlocked through the expedited implementation of TOD projects. The analysis will identify gaps in the current framework and emphasize the need for strategic measures to overcome implementation delays.

Implications:

The study aims to propose actionable strategies to accelerate TOD project implementation in Delhi, including financial incentives, tax breaks, planning interventions, regulatory reforms, and fostering robust public-private partnerships. The research seeks to address existing barriers and leverage the real estate sector as a key driver of sustainable urban development, providing a roadmap to maximize the economic benefits of TOD projects in Delhi.

Keywords: *Transit-Oriented Development (TOD), Real Estate Sector, Sustainable Urban Development, Economic Impact Analysis, Urban Finance*

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Sustainable Urban Infrastructure in the UAE

Kaviya R.¹; Ashish Gupta²



Kaviya R.



Ashish Gupta

Purpose

The United Arab Emirates (UAE) has risen to become a global leader in sustainable real estate development. This paper explores three key areas where sustainability has reconfigured the real estate landscape in the UAE. The first aspect of this analysis will present the various types of sustainability practices followed in the UAE, highlighting the significance of sustainable practices in iconic projects like Masdar City and Dubai Sustainable City. The second aspect will investigate the social and economic benefits of sustainable urban planning, including mixed-use developments and smart city technologies, which have upscaled the quality of life attracting foreigners to invest in the UAE. The third aspect will present an overview of challenges and opportunities of future sustainable development.

By analysing these three aspects, this paper accentuates the UAE's take on implementing sustainability at a large scale and its impact on urban development which transformed the real estate sector. Furthermore, this paper explains how the UAE's sustainable urban infrastructure can serve as a model for India.

Approach

A secondary study has been done for sustainable urban infrastructure and the UAE's real estate market. The data used for the study was mainly collected from reliable and relevant sources.

Findings

Sustainable real estate has become more attractive to investors due to its emphasis on environmental benefits. Many studies have shown that the UAE's dedication towards the sustainable goals has made it a better urban landscape like Dubai, Abu Dhabi, Masdar City, and Al Ain. Green energy and sustainable practices have made the city more sustainable. Due to smart urban planning and services, there is a great influx of people from all around the world which brought in more foreign investments and economic growth.

Implications

- Based on the above findings, Urban planners of other countries can adopt UAE's sustainable strategies to enhance their respective nation's energy efficiency reducing the reliability of non-renewable resources.
- The UAE's contribution to the sustainability side has made the world to believe that sustainability can transform an urban landscape into fastdeveloping regions.

Keywords: UAE, Masdar City, Sustainable Urban housing, Green Transportation System, UAE Net Zero 2050, Green Energy, Sustainable real estate, Sustainable Construction

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A Comparative analysis of the degree of social sustainability and inclusivity of post-independence Indian Markets with 'Mall' in Indian cities: A case of Bhopal city

Nikita Deelip Patil¹, Bulbul Shukla²



Nikita Deelip Patil



Bulbul Shukla

Social sustainability in the built environment inculcates inclusion, in which all people feel valued and respected and have an equal opportunity to participate in society. It means ensuring that everyone, regardless of age, gender, and socio-cultural background, has access to the facilities and opportunities needed for their growth in society. As cities modernize, the rapid change in the urban growth pattern creates multiple opportunities but challenges social sustainability and inclusivity.

Purpose:

This study aims to investigate social inclusion in New Market, Royal Market, and DB Mall, i.e., traditional markets and a shopping center in Bhopal, respectively.

Approach and Method:

Using the comparative analysis method as the tool for the analysis of the degree of social inclusion in both urban shopping typologies. Through urban design drawings, spatial analysis, and user surveys, this study explores how certain urban design measures can balance modernization with social sustainability by integrating user-inclusive design and social equity.

Findings:

The study findings add to conversations about urban resilience towards modernization as well as the significance of inclusive markets in terms of social inclusion in developing cities like Bhopal.

Implications:

The objective of this study is to emphasize the significance of social inclusion in promoting social equity in urban public spaces, especially marketplaces.

Keywords: *Social Inclusion, Social Sustainability, Indian Market, urban public space, social equity.*

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Adoption of Sustainable Materials in Commercial Real Estate: Impact on Tenant Preferences and Rental Premiums

Apurva Singh¹; Rekee Prashar²



Apurva Singh



Rekee Prashar

Purpose: Sustainability strategies are being adopted by the commercial real estate industry more and more in order to fulfil changing tenant expectations and address environmental concerns. The impact of adopting sustainable materials on rental premiums and tenant preferences is examined in this study. Research on the effects of using certain sustainable materials, like recycled steel, cross-laminated timber (CLT), low-carbon concrete, and energy-efficient glazing, on tenant demand and financial returns is scarce, despite the extensive study of green certifications like LEED and BREEAM. This study attempts to close that disparity by determining whether or not buildings using these materials are actively preferred by tenants and whether or not these preferences result in higher rental prices.

Approach and Method: The association between sustainable materials and rental performance is investigated using a mixed-method approach. First, opinions on sustainable materials, their impact on leasing choices, and their readiness to pay higher rates are evaluated by a poll of real estate agents and commercial renters. Second, an empirical study isolates the effect of material choice on rental surcharges by comparing rental data from buildings that employ sustainable materials with those that do not. Finally, qualitative interviews with sustainability specialists and property managers shed light on how sustainable materials influence long-term asset value and tenant preferences.

Findings: According to the survey, tenants are giving sustainability more weight when making lease decisions, especially in sectors where businesses have made significant corporate ESG (Environmental, Social, and Governance) commitments. Sustainable building materials are thought to provide advantages like increased energy efficiency, better indoor air quality, and happier workers. Although renters indicate a preference for these materials, their willingness to pay higher rates varies depending on the building's location, industry sector, and level of market awareness. The results indicate that, particularly in markets where sustainability is a crucial business factor, buildings that use sustainable materials see better occupancy rates and moderate rental premiums.

Implications: For developers, property owners, and legislators looking to advance sustainable real estate practices, the findings offer practical insights. Developers may be able to increase the long-term asset value of their homes by using sustainable materials to set them apart from the competition and draw in eco-aware renters. Nonetheless, the report emphasises that sustainability standards must to go beyond conventional certifications because material selections alone affect leasing results and market perception. In the end, these insights can improve sustainability in commercial real estate by influencing investment plans, legal frameworks, and tenant engagement programs.

Keywords: Sustainable materials, commercial real estate, tenant preferences, rental premiums, green construction

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Comparative Analysis of Commercial REITs in identified Five Global Real Estate Markets

Siva Balan I¹; Shiv Prasad Singh²



Siva Balan I



Shiv Prasad Singh

Purpose

Real Estate Investment Trusts (REITs) offers a dematerialized and regulated form of investment to retail investors so that they can hold attractive income generating commercial real estate. This research aims to undertake a comparative analysis of performance of REITs across five identified countries i.e. United States of America, United Kingdom, Australia, Hong Kong, and Singapore. The focus of the research is to identify broad performance indicators based on annualized returns and capital appreciation, so that REIT can be compared with other instruments of investment available for the retail investors such as National Pension Scheme, Bank Deposits, Provident Funds and similar low risk investment options. This research would also attempt to assess the acceptability of REIT among retail investors, so that it can be considered as an alternative exit option for real estate developers and benefit the built environment. Further, this study will explore how REIT investment paves the way for achieving sustainable financial goals by providing a balanced approach to wealth creation while supporting environmentally conscious real estate development.

Approach and Method

The study would combine quantitative and qualitative analysis. Quantitative data on key performance indicators (KPIs) such as total returns, market capitalization, and occupancy rates are collected for Office Park REITs from 2019 to 2024. Statistical tools, including descriptive statistics and performance ratios, are used to assess risk-adjusted returns and compare Indian REITs with global benchmarks. Qualitative insights into regulatory environments and retail investors' behavior shall be examined to understand the reasons behind the reasons of under or over adoption of REITs among retail Investors.

Findings

This research would conclude with a global comparative analysis of REIT performance and the reason for success or failure. Research would also analyze the Indian REIT products with other low risk investment options.

Implications

This area is less researched. This will add to the body of knowledge. It will help with the expansion of the REIT market, which will help with commercial real estate development.

Keywords: REITs, Retail Investors, Sustainable financial goals, Commercial Real Estate, Comparative Analysis, Regulatory Framework, Risk-Adjusted Returns, Market Efficiency, India, Global Markets.

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Comparative Analysis of Stakeholder Engagement Strategies in Leading Indian Real Estate Companies

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Nidhi Pandit



Deva Dutta Dubey



Nadshri Ladke

Purpose

This study examines and compares stakeholder engagement practices in leading Indian real estate firms, assessing their impact on corporate social responsibility (CSR), sustainability, trust-building, and transparency. It explores how companies adopt different methods to strengthen stakeholder relationships. By analyzing best practices and identifying differences in the methods, the study provides insights into improving engagement strategies for long-term corporate growth, regulatory compliance, and enhanced stakeholder trust thereby contributing to Sustainable Development Goals 12 and 16.

Approach and Method

A combination of qualitative and quantitative analysis is employed in a mixed-methods approach. Leading real estate companies' disclosures eg annual reports, sustainability disclosures, CSR programs, and corporate websites provide secondary data for the study. Comparative benchmarking and theme analysis are used to evaluate four important dimensions: transparency, corporate social responsibility (CSR) initiatives, communication strategies, and compatibility with the Sustainable Development Goals (SDGs).

Findings

Different companies demonstrate different approaches eg SDG alignment and transparency which exhibit best practices in stakeholder involvement; ensure real-time participation by efficiently using digital channels for stakeholder communication, prioritize effective CSR programs, especially in the fields of healthcare and education, transparency issues, a lack of digital outreach, and inadequate stakeholder engagement tactics.

Implications

By increasing transparency, growing CSR programs, incorporating digital communication tools, and coordinating corporate plans with SDGs, organizations can improve stakeholder participation. In addition to promoting stakeholder trust, strengthening these areas will help leading Indian real estate companies remain competitive and sustainable.

Keywords: *Stakeholder Engagement, Corporate Social Responsibility (CSR), Sustainability, Transparency, Trust-Building, Digital Transformation, Real Estate, Sustainable Development Goals (SDGs), SDG 12, SDG 16*

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Evaluating Cost Overruns Due to Poor Planning: An Expert-Based Study

Sanchit Grover¹; Suhail Khan²



Sanchit Grover



Suhail Khan

Purpose

Cost overruns remain a persistent issue in the construction industry, with poor planning being a significant contributing factor. Despite extensive research on cost overruns, expert perspectives on the root causes of poor planning and their financial impacts remain underexplored. This study aims to evaluate the relationship between poor planning and cost overruns using insights from industry experts. A thorough literature review establishes a foundation for understanding the key variables affecting cost overruns.

Approach and Method

This research adopts a qualitative, expert-based approach to analyse cost overruns resulting from poor planning. Data is collected through structured interviews with experienced construction professionals, including project managers, engineers, and construction consultants. Consensus analysis is employed to categorize the primary causes of poor planning, while expert judgments provide quantifiable estimates of their cost impact.

Findings

Preliminary findings suggest that factors such as ineffective scheduling, inadequate risk assessment, and resource misallocation are commonly associated with cost overruns in construction projects. Communication gaps among stakeholders are often linked to poor planning, potentially leading to design changes and rework. The use of advanced planning tools, such as AI-driven scheduling and Building Information Modelling (BIM), is generally observed to contribute to cost overrun reduction. An expert-driven framework may support the improvement of poor planning practices and the mitigation of cost overruns in construction projects.

Implications

This study provides valuable insights for construction professionals, and academicians. By incorporating expert opinions, the research bridges the gap between theoretical models and practical industry challenges. The implementation of effective strategies is often associated with improved cost predictability, integrating these approaches into construction management practices may contribute to minimizing poor planning and supporting sustainable project execution.

Keywords: *Cost overrun, poor planning, expert-based study*

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Impact of Vertical Greenery Systems on Workplace Performance and Well-being: An Analysis of Perceived Benefits and Challenges in Delhi

Irfan Haider Khan¹



Irfan Haider Khan

Purpose This study investigates employee perceptions of vertical greenery systems (VGS) in office environments in Delhi, India, focusing on perceived benefits, challenges, and their impact on workplace factors, including productivity, stress, job satisfaction, and well-being. The research also examines employees' willingness to pay for VGS installations in their workplaces.

Approach and Method A structured questionnaire was administered to 439 office employees in the Delhi NCR through an online survey. This study employed exploratory factor analysis to identify the underlying dimensions of perceived benefits and challenges. Kruskal-Wallis tests were conducted to examine differences across sociodemographic groups, followed by post-hoc analyses using Dunn's test with Bonferroni corrections.

Findings Factor analysis revealed four distinct benefit dimensions (environmental comfort, functional enhancement, ecological benefits, and community benefits) and three challenge dimensions (maintenance management, aesthetic and spatial constraints, and ecological concerns). Environmental comfort benefits were rated the highest across all employee groups, with air quality improvement, aesthetic improvements, and temperature reduction emerging as the top three perceived benefits. Significant differences were found between males and females in their perceptions of environmental comfort ($p=0.011$) and functional enhancement benefits ($p=0.008$). Income level significantly influenced benefit perceptions, with lower-income groups generally rating benefits more positively than higher-income groups. High costs and potential building envelope damage were identified as the primary concerns. Regarding workplace impact, employees particularly emphasised VGS's positive effects on stress reduction and health/well-being, indicating strong support for biophilic design elements in office spaces. Nearly 60% of participants expressed willingness to pay ₹500-1500 monthly for VGS installation in their workplaces, suggesting significant employee buy-in for green infrastructure investments.

Implications The findings provide valuable insights for workplace designers, facility managers, and organizational decision makers in implementing VGS. Strong employee support for VGS, particularly regarding stress reduction and well-being benefits, suggests potential returns on workplace biophilic investments. The identified sociodemographic variations in perceptions can help tailor VGS implementation strategies. The demonstrated willingness to pay indicates the financial feasibility of cost-sharing models in VGS installation and maintenance, potentially making widespread adoption more viable in Delhi's office environments.

Keywords: vertical greenery systems, workplace well-being, employee perception, biophilic workplace design, office productivity

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Integrating Behavioural Leadership and Client Relationship Management for Sustainable construction: A strategic framework

Rishabh Singh¹; Jyoti Singh²



Rishabh Singh



Jyoti Singh

Purpose

The primary objective of this study is to investigate the role of behavioral leadership in promoting sustainability, assess the integration of CRM systems into construction management practices, evaluate the impact of leadership behaviors on CRM implementation and develop a strategic framework that integrates these elements to support sustainable outcomes.

Approach and Method

A mixed- methods approach was employed, comprising quantitative surveys and qualitative interviews. A total of 50 construction managers, 50 customers contacts and 50 individuals in leadership roles participated in the study. Descriptive statistics were utilized to analyse the average ratings of various dimensions related to behavioral leadership, CRM integration and sustainability goals.

Findings

The data collected for this study was based on structured questionnaires that target the major metrics of leadership effectiveness, CRM integration and sustainability. The study employs both descriptive and inferential statics to evaluate the relationships between variables. The findings of the study are displayed on multiple graph forms including bar charts, pie charts, scatter plots and multi series chart to give a clear sense of comparative performance of different participant categories.

Implications

The study provides valuable insights for construction organizations aiming to improve their sustainability practices. It emphasizes the necessity of developing leadership skills that align with CRM strategies to achieve optimal project efficiency and customer satisfaction. The proposed strategic framework serves as a guide for integrating behavioral leadership and CRM practices, which can facilitate more sustainable outcomes in construction.

Keywords: Leadership effectiveness, CRM integration, Sustainability, Construction sector, Sustainable development, Correlation Analysis

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Planning strategies for the development of physical infrastructure of urban village (case of urban village South Delhi)

Vishal Kumar¹; Yogesh Bhardwaj²



Vishal Kumar



Yogesh Bhardwaj

Purpose

Urban villages are a mix of urban and rural characteristics. They are often left out of official urban planning which leads to challenges in creating spaces for their development. Residents of urban villages face various difficulties in achieving their right to a high quality of life. They are rapidly transforming due to the pressure of urbanization and facing the same problems like lack of infrastructure, unplanned growth, and poor living conditions. Villages are converting into slum-like conditions. This research aims to assess the physical infrastructure in South Delhi urban villages, identify challenges, and propose strategic planning solutions to enhance their living conditions

Approach and Method

The methodology of the study includes primary and secondary sources in which primary sources are mainly visiting the site and surveying the residence. There and secondary study involved a literature review and government reports due to which we gained various parameters on Physical infrastructure and compared it with various service level benchmarks Which helped us to get a better understanding of the status of the basic amenities and physical infrastructure of the urban villages of our study.

Findings

The key findings include that South Delhi villages are undergoing rapid transformation due to the process of urbanization which poses various critical issues like inadequate infrastructure, uncontrolled development, and poor living conditions. primary problems, identified insufficient water supply, poor sanitation, and a general lack of adequate public facilities. these challenges are contributing to degrading the resident's quality of life. Various encroachments are common in villages, especially on streets and line sides. public toilets are also in poor condition and almost all the villages. drainage and sewage pipelines are often clogged and poorly maintained which causes hygiene issues. designated parking areas are either unmaintained or absent in various villages. on-street parking remains a widespread practice. Solid waste collection of the urban villages is limited to their main streets due to restricted vehicle access leaving many interior areas without proper waste management. They provide low-cost accommodation for various income groups with the presence of small businesses and markets within their residential areas, their proximity to urban centers offers employment opportunities for residents. The area also faces, poor ventilation in adequate sunlight and overcrowding.

Implications

The strategy is confined to a specific area and is not generally applicable to other villages as every village has its own character. A framework designed specifically for Physical infrastructure.

Keywords: *Urban Village, Master Plan, Lal Dora, Urban Infrastructure, Urban expansion, services and utilities*

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Sustainable and Ethical Marketing for Internet of Things (IOT)

Shikhar Sharma¹; Rekee Prashar²



Shikhar Sharma



Rekee Prashar

Purpose

It is vitally Important that companies and Corporations understand that adopting ethical policies for Sustainable Marketing as the main objective of the study is to analyze the marketing ethics with taking in considerations of Internet of things adopted by the companies and their roles in creating a sustainable organization.

Approach and Method

The structure in which the methods are being presented to Business World is causing remarkable changes due to the irresistible potential derivable from the Internet of things which include the digital marketing sector having maximum benefits.

Findings

Through a variety of digital marketing platforms, including pay-per-click advertising, social media marketing, online marketing, and email marketing, technology gathers a variety of customer data. The Organization findings creates many ethical and moral challenges while executing the strategies for Sustainable marketing for Internet of things (Iot) like conflicts between moral judgements and corporate objectives, as well as the need for authenticity and transparency and the effectiveness of marketing messages, provide difficulties.

Implications

Since these issues are closely related to customer trust and brand image, they have a significant impact on the company's communication strategy. This study offers valuable insights for companies creating and implementing sustainable marketing strategies as the issue needs to be reviewed from various points of view, such as opportunities, advantages, disadvantages, legal, ethical and technical considerations. The paper is an attempt to review different aspects of using Internet of Things for marketing purposes, identify some of the major problems and present possible ways of solution.

Keywords: Sustainable Marketing, Marketing Ethics, Internet of Things, Digital Marketing, Customer Support, Ethical Challenges, Corporate Transparency

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Sustainable Luxury: Mediating Role of Aesthetics and Design in influencing consumer Buying Behaviour in Green Luxury Residential Real Estate – Study in Jaipur

Swarna Agarwal¹; Nitesh Rohilla²



Swarna Agarwal



Prof. Nitesh Rohilla

Purpose As the demand for sustainable luxury real estate continues to grow, developers must gain a comprehensive understanding of the factors that drive consumer decisions in the green residential sector. While traditional determinants such as location, price, and amenities remain significant, the visual and experiential appeal of a property—encompassing eco-conscious architectural design, sustainable interior aesthetics, and energy-efficient spatial planning—has emerged as a critical factor influencing consumer preferences. This study aims to investigate the mediating role of aesthetics and design in consumer purchasing behavior within the green luxury residential real estate sector, with a specific focus on Jaipur. It seeks to examine how sustainable aesthetics and eco-friendly design interact with key determinants such as location, price, and amenities, shaping consumer decision-making processes and enhancing the perceived value of green luxury homes.

Approach and Method This research employs a mixed-methods approach, integrating both primary and secondary data sources to examine the mediating role of aesthetics and design in consumer buying behavior for green luxury residential real estate. Primary data will be collected through structured surveys targeting prospective homebuyers, real estate developers, and industry experts to understand consumer preferences for sustainable aesthetics and energy-efficient design. Secondary data will be gathered from an extensive review of relevant literature on green building practices, luxury real estate trends, and consumer behavior theories. The study will apply statistical techniques, including descriptive analysis, factor analysis, and mediation analysis using Structural Equation Modelling (SEM), to assess the relationships between key determinants such as location, price, amenities, aesthetics, and sustainability, validating the proposed hypotheses.

Findings The study will provide empirical evidence on the role of aesthetics and design as mediators in consumer decisions for green luxury real estate. It will examine how sustainable aesthetics enhance perceived property value and buyer preferences. Additionally, the research will compare the impact of aesthetic and sustainable design with traditional factors like location, price, and amenities, highlighting their influence on demand for eco-friendly luxury homes.

Implications The insights from this research will provide recommendations for developers, architects, planners, and marketers to refine strategies for green luxury real estate. Recognizing the mediating role of aesthetics and sustainable design will help optimize planning, architecture, and marketing to meet consumer demand for eco-friendly yet luxurious homes. The findings will also aid in developing design frameworks that integrate sustainability without compromising luxury, supporting policymakers and industry leaders in promoting environmentally responsible real estate solutions.

Keywords: *Luxury residential real estate, Sustainable Aesthetics, Consumer Buying Behavior, Eco-Conscious Design, Sustainable Architecture*

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The Intersection of AI and Ethical Leadership: Shaping Inclusive and Socially Sustainable Organizational Futures

Mekee Kumar Prashar¹; Paritosh Mishra²; Sandeep Kumar Gupta³



Mekee Kumar Prashar



Paritosh Mishra



Sandeep Kumar Gupta

Purpose

The rapid advancement of Artificial Intelligence (AI) has transformed organizational structures, decision-making processes, and leadership dynamics. This paper explores how AI influences ethical leadership, particularly in fostering inclusion and social sustainability within organizations. The study examines how AI-driven insights enhance transparent decision-making, ethical governance, and equitable workforce practices, ultimately shaping a socially responsible organizational future.

Approach and Method

This research adopts a qualitative and analytical approach, integrating systematic literature review and case study analysis to evaluate AI's role in ethical leadership. A comparative assessment of AI-integrated leadership models is conducted to identify best practices for balancing technological efficiency with human-centered ethics. The study also investigates real-world implementations of AI-driven leadership in fostering inclusivity and socially sustainable business strategies.

Findings

The study finds that AI significantly impacts ethical leadership by minimizing bias, enhancing accountability, and enabling data-driven ethical decision-making. However, challenges such as algorithmic biases, ethical dilemmas in AI deployment, and the risk of over-reliance on technology in leadership roles persist. Organizations that effectively integrate AI with ethical leadership practices demonstrate higher inclusivity, enhanced stakeholder trust, and improved social sustainability outcomes.

Implications

The research highlights the need for AI-ethics frameworks that align with leadership values and organizational Corporate Social Responsibility (CSR) goals. It provides practical recommendations for leveraging AI to reinforce ethical leadership competencies, diversity, and inclusive work cultures. The findings serve as a roadmap for policymakers, corporate leaders, and AI developers to ensure that AI-driven decision-making aligns with social sustainability principles.

Keywords: AI Ethics, Ethical Leadership, Social Sustainability, Inclusive Organizations, AI-Driven Decision-Making, Corporate Governance

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The Role of Stakeholder Mindset in Achieving Sustainability: Psychological and Behavioural Barriers in Sustainable Project Implementation

Anwin V George¹; Sonali Joglekar²; V K Aditya³; S Nidhin⁴



Anwin V George



Dr Sonali Joglekar



V K Aditya



S Nidhin

Purpose The study's goal is to investigate the behavioural and psychological obstacles that affect stakeholders' dedication to sustainable projects. By concentrating on the organisational factors, decision-making processes, and cognitive biases that influence the adoption of sustainability, it seeks to close the gap in the body of existing research. Additionally, the study aims to offer practical suggestions for encouraging sustainability-driven decision-making.

Approach and Method The study combines qualitative and quantitative methodologies in a mixed-method approach. While surveys and behavioural evaluations are used in quantitative analysis, stakeholder interviews and case studies are used to collect qualitative data. By comparing successful and unsuccessful projects, it is possible to assess how mentality changes impact the adoption of sustainability and gain a better understanding of stakeholder decision-making.

Findings The study pinpoints behavioural and psychological obstacles that impede stakeholders' dedication to sustainability. Short-term financial prioritisation, loss aversion, and status quo bias are examples of cognitive biases that obstruct sustainable decision-making. Strong, sustainability-focused organisational culture and dedicated leadership boost engagement, thus these factors are crucial. Moreover, structured rewards and stakeholder education are examples of behavioural incentives that impact decision-making and encourage long-term sustainability thinking. By addressing these obstacles with focused interventions, a sustainability-driven mentality can be promoted. In order to successfully implement sustainability efforts across industries and guarantee long-term environmental and economic advantages, the study highlights how important it is to change stakeholder perspectives.

Implications The behavioural and psychological obstacles to sustainability must be addressed by organisations and legislators. In order to overcome cognitive biases, it is necessary to use behavioural nudges, emphasise long-term advantages, and present successful case studies. Assuring leadership commitment and incorporating sustainability into business policies are two ways to strengthen organisational culture. Financial incentives and stakeholder education are examples of behavioural incentives that can promote sustainable decision-making. Subsidies, public-private partnerships, and regulatory frameworks can also help sustainability initiatives. Combining these tactics can help companies and legislators cultivate a sustainability-driven attitude, which will guarantee the long-term acceptance of environmentally friendly practices and increase the success of sustainability programs in a variety of industries.

Keywords: Stakeholder mindset, sustainability, cognitive biases, behavioural barriers, decision-making, organizational culture, leadership commitment, sustainable projects, incentives, perception.

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5. Competitions and Workshop



5.1. Competition 1: Viksit Bharat Blueprint

[ICSBE 2025]

SUSTAINABLE DEVELOPMENT COMPETITION:

VIKSIT BHARAT BLUEPRINT

Design a product or system that addresses the conference themes and sub themes related to SDGs. Entries should reflect innovations in sustainability, emphasizing the convergence of technological advancements and Sustainable Development Goals (SDGs). The design must focus on environmental impact reduction, energy efficiency, resource management and social inclusivity.

SUB-THEMES

- Technology Driving Sustainability
- Green Building and Energy Efficiency
- Sustainable and Climate-Resilient Infrastructure
- Circular Economy, Climate Finance and Waste Management
- Public Policy for Sustainable Development
- Smart Cities and Urban Planning
- Social Sustainability and Inclusivity

Visit Conference page: www.ricssbe.org/conference/icsbe2025/



IMPORTANT DATES

Launch of Competition: 25th Dec 2024

Submission Deadline: 10th March 2025

Date of Conference: 20 & 21st March 2025

Eligibility

Category A : School students (grade 8-12)

Category B : Higher education institution students/Professionals/ Practitioners

Competition Guidelines



Submission link



Category A

1st ₹15,000

2nd ₹10,000

3rd ₹5,000



Category B

1st ₹30,000

2nd ₹20,000

3rd ₹10,000



5.2. Competition 2: Eco-Vision Bharat: SDG Poster Challenge

[ICSBE 2025]



ECO VISION BHARAT

SDG POSTER CHALLENGE

Create a poster that effectively communicates a sustainability concept. It should educate the audience on topics like green buildings, climate resilience, circular economy, or social sustainability, with a focus on visual clarity and content relevance.

IMPORTANT DATES

Launch of Competition: **25th Dec 2024**

Submission Deadline: **10th March 2025**

Date of Conference: **20th & 21st March 2025**

SUB-THEMES

- Technology Driving Sustainability
- Green Building and Energy Efficiency
- Sustainable and Climate-Resilient Infrastructure
- Circular Economy, Climate Finance and Waste Management
- Public Policy for Sustainable Development
- Smart Cities and Urban Planning
- Social Sustainability and Inclusivity

Competition Guidelines



Submission link



Eligibility

Category A : School students (grade 8-12)

Category B : Higher education institutions students/ Professionals/ Practitioners

	1	2	3
Category A	₹5,000	₹3,000	₹2,000
Category B	₹10,000	₹8,000	₹5,000

Visit Conference page: www.ricssbe.org/conference/icsbe2025/



5.3. AI-Drone Inspection Technology Workshop



RaSpect

#ICSBE2025

Elevate Your Future: AI-Drone Inspection Technology Workshop

Organized by RaSpect Intelligence, a pioneering innovator in AI-driven drone technology in collaboration with RICS, SBE, Amity University, Noida.

During this period, all participants will gain in demand skills for built environment sector, including:

- Demonstration of AI-driven drone technology.
- Presentation on Inspectica a proprietary tool for inspection, data processing and report generation.
- Presentation on AI/ML workflow for defect detection.
- Question and answer session.



Date - 21st March 2025
Time - 2:00PM – 5:00PM

Who may attend - Architects, Engineers and Estate/Facilities Management Professionals

Fee Structure:

Conference (ICSBE-25) Registered Attendees: Rs. 500 per participant
Non-registered Participant : Rs. 700 per participant

All participants will receive a certificate.
Limited seats available. Secure your spot now!



Venue: F2 Auditorium, Ground floor,
Amity University, Noida.



Scan the QR code to register

5.4. Jury Members for Competitions

5.4.1. Jury for Viksit Bharat Blueprint



Ms. Mamata Gautam
Associate Senior Faculty at
National Institute of
Design, Haryana



Ms. Mariyam Zakiah
Senior Project Manager,
environmental design
solutions



Prof. Shiv Prasad Singh,
Faculty Member, RICS
School Built Environment,
Amity University, Noida

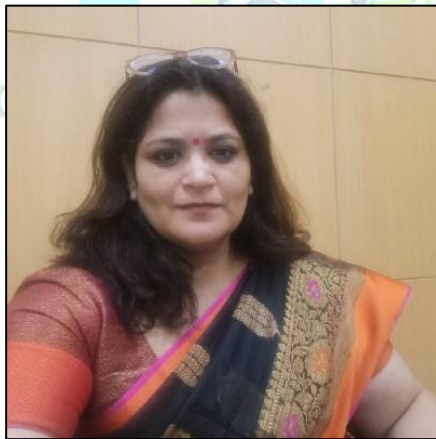
5.4.2. Jury for Eco-Vision Bharat: SDG Poster Challenge



Mr. Md. Waseem Akram
Studio Head and Founder,
Interiogenesis



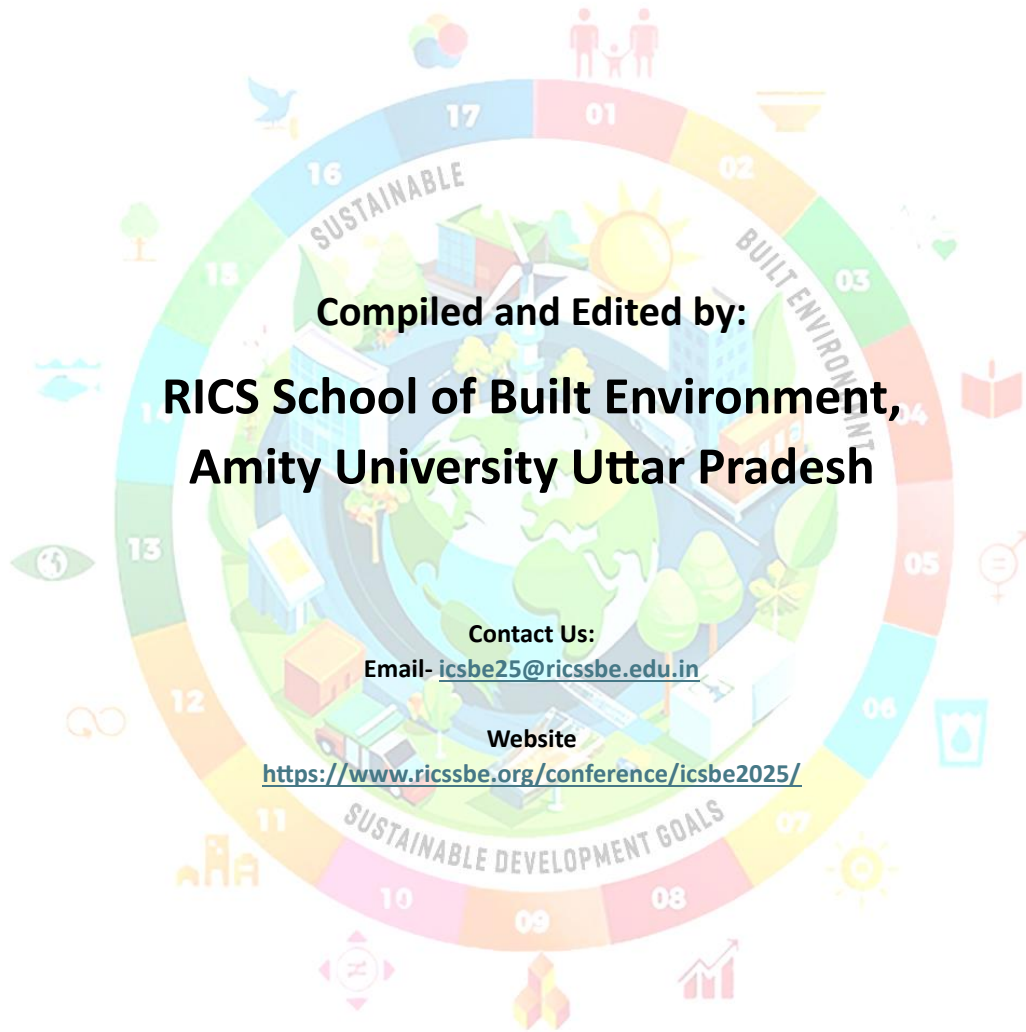
Ms. Rashi Sharma
Designer, Alumni National
Institute of Design
Ahmedabad



Dr. Shalini Sharma
Assistant Director at Amity
School of Design, Amity
University, Noida



Dr. Saurabh Verma
Faculty Member, RICS
School Built Environment,
Amity University, Noida



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