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**NICMAR University, Pune**  
**School of Project Management**  
**And**  
**NICMAR Business School**

**National Level Post Graduate Research  
Symposium (NLPGRS-2026)**

**NLPGRS-2026 PROCEEDINGS**

**Digitalization, Sustainability and  
Strategic Evolution in Construction**



Conference and  
Publication Partner

**EDITORS**

**Dr. Sushma S. Kulkarni**  
**Dr. Anil Agarwal**  
**Dr. Harish Kumar Singla**  
**Dr. Devang Desai**



# **NICMAR Univeristy, Pune**

**School of Project Management  
and  
NICMAR Business School**

## **National Level Post Graduate Research Symposium (NLPGRS 2026)**

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**NLPGRS-2026 Proceedings: Digitalization,  
Sustainability and Strategic Evolution in Construction**

### **Editors**

**Dr. Sushma S. Kulkarni  
Dr. Anil Agarwal  
Dr. Harish Kumar Singla  
Dr. Devang Desai**



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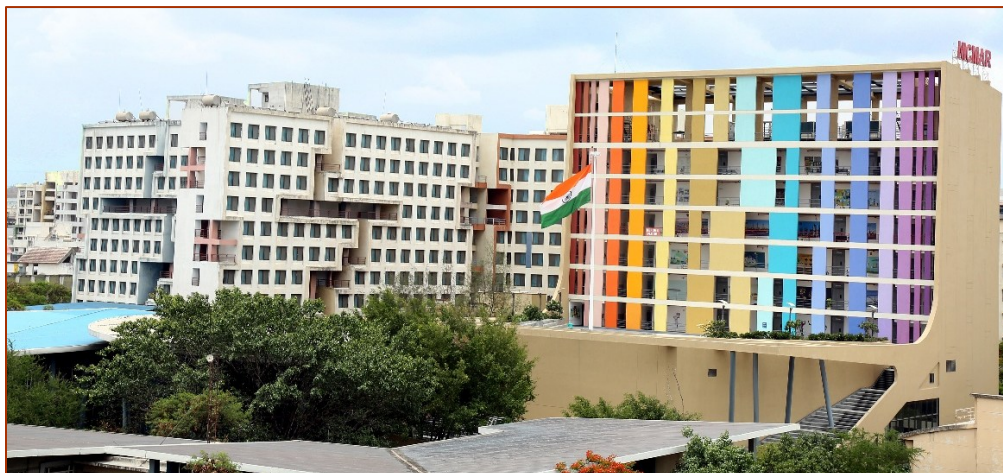
## About the Symposium

The rapid technological advancements and evolving socio-economic dynamics within the Construction, Real Estate, Infrastructure, and Project (CRIP) sectors emphasize the necessity of examining these transformations through rigorous basic and applied research. The National Level Post Graduate Research Symposium (NLPGRS-2026), held on 14th March 2026 at NICMAR University, Pune, stands as a significant academic platform aimed at fostering research, innovation, and interdisciplinary exchange of ideas among postgraduate scholars across India. Organized jointly by the School of Project Management (SOPM) and the NICMAR Business School (NBS), the symposium serves as the second edition of NICMAR's national initiative to nurture a strong research culture in areas related to the built environment across the globe. As an exercise in academic rigour, the NICMAR-NLPGRS 2026 serves as a quintessential platform for the dissemination of high-level theoretical and empirical research. The predominant objective is to cultivate a research ecosystem where post-graduate students can move beyond theoretical abstraction toward the development of actionable, innovative solutions for the built environment world.

NLPGRS-2026 is structured around seven thematic tracks, including Contemporary Issues in Management, Civil Engineering and Construction Management, Real Estate and Facility Management, Architecture and Planning, Energy and Sustainability, Engineering and Project Management, and Innovation and Entrepreneurship. These tracks reflect the symposium's commitment to covering a wide disciplinary spectrum while maintaining relevance to emerging construction industry and societal challenges.

Moreover, the collaboration with Journal Press India ensures that the intellectual output of the symposium is not ephemeral. The provision for publication in an esteemed journal ensures that the research findings presented during these sessions are archived within the permanent record of global research. This archival process is vital for the cumulative growth of the field, allowing future leaders to build upon the “empirical and conceptual findings” established by the participants of NLPGRS 2026.

## About the Institution



### About NICMAR University, Pune

NICMAR University, Pune stands as the preeminent academic institution for the Construction, Real Estate, Infrastructure, and Project (CRIP) sectors, successfully synthesizing technical knowledge with rigorous construction management industry body of knowledge in India. Established as a response to the burgeoning complexities of the global infrastructure sector, NICMAR has evolved from a pioneering institute into a preeminent university, serving as the intellectual cornerstone for the Construction, Real Estate, Infrastructure, and Project (CRIP) industries. The university offers various undergraduate and post graduate programs as well MBA with specializations across CRIP sector and general management domain. Further, it also offers doctoral program to encourage cutting edge research and executive education for the industry professionals.

The historical mandate of NICMAR is rooted in a visionary mandate: to professionalize the construction management education of the built environment. Since its inception in 1983, supported by the doyens of the Indian construction industry, the institution has functioned as a “knowledge hub,” bridging the traditional chasm between engineering theory and the pragmatic exigencies of large-scale project execution. As a University, it now operates fostering a research-intensive environment that prioritizes evidence-based practices and sustainable innovation.

Furthermore, NICMAR’s institutional vitality is sustained by its formidable synergy with the built environment industry. In the tradition of the finest research universities, NICMAR does not exist in academic isolation. Rather, it maintains a recursive relationship with global construction giants and infrastructure conglomerates. The presence of state-of-the-art facilities, various labs and a comprehensive digital library underscore a commitment to providing an academic environment and ecosystem where “intellectual capital” is both sustained and proliferated.

## About the Institution

The university's social and economic impact is perhaps most visible in its prolific alumni network across the globe, which constitutes a global diaspora of leadership within the CRIP sectors and allied industries. This network serves as a testament to the institution's success in fostering leadership competencies that transcend geographic and cultural boundaries. Through its rigorous doctoral programs and executive education initiatives, the university continues to push the boundaries of "innovative inquiry," contributing significantly to the global body of knowledge for the built environment. As the global community grapples with the imperatives of sustainable urbanization and carbon neutrality, the role of NICMAR as a facilitator of high-level scholarly discourse and professional development becomes increasingly indispensable. It remains a beacon of intellectual discipline, dedicated to constructing the resilient foundations of the future through the power of structured knowledge and visionary research.

## About the Schools

### **About School of Project Management (SOPM)**

The School of Project Management (SOPM), a constituent of NICMAR University, has been established with the objective of preparing specialized human resources to manage and deliver complex engineering as well as non-engineering projects. Its flagship programme, MBA in Advanced Project Management (APM), adopts a multidisciplinary approach blending project management with systems engineering. This equips aspiring project managers to work confidently across a wide range of industries including oil and gas, software development, energy, manufacturing, infrastructure, and construction, as well as in client, contracting and consulting organizations. Furthermore, sectors like education, healthcare, and rural development also require such trained project management professionals.

The MBA APM uniquely caters to the techno-managerial requirements of projects in different industries. Graduates from diverse academic backgrounds such as Engineering, Planning, Architecture, Computer Science, Information Technology, Science, Commerce, Arts, Pharmaceuticals, and Agriculture benefit from the programme through its multidisciplinary curriculum, gaining comprehensive exposure to the functioning of modern, technology-driven projects. This course is one of its kind in India, with very few reputed institutions offering such specialized education in Advanced Project Management. The curriculum is continuously reviewed and updated to incorporate global advances and ensure that graduates build high-level competencies for industry effectiveness.

The Vision of SOPM is to provide world-class education in advanced project management that develops professionals capable of leading and managing sustainable projects across diverse sectors with unwavering ethics and professionalism. Its Mission is to prepare industry-ready project leaders by offering a contemporary curriculum integrated with state-of-the-art tools, fostering sustainability and lifelong learning through innovative pedagogy, nurturing faculty excellence via international collaborations, and enhancing global employability prospects of graduates by promoting international exchanges and outreach initiatives.

### **NICMAR Business School (NBS)**

NICMAR Business School (NBS), a constituent of NICMAR University, is committed to delivering holistic management education that develops dynamic leaders for the businesses of tomorrow. By creating an immersive and experiential learning environment, NBS helps students explore creativity, build critical knowledge, and develop essential life skills. Its broader mission is to contribute pragmatic solutions to industry and society through cutting-edge research and academic excellence. NBS plays a vital role in meeting industry needs by preparing graduates who are not only academically proficient but also socially responsible.

## About the Schools

The School offers three distinct programmes catering to varied career aspirations: MBA, MBA in Family Business & Entrepreneurship (FBE), and the Integrated MBA (I-MBA). The multidisciplinary MBA programme is built around key areas such as Business Analytics, Infrastructure Management, Financial Strategies, Supply Chain Management, Marketing and Digital Strategies, Management Consulting, and People & Communication. It combines theoretical learning with practical exposure, developing analytical capabilities that make students agile and ready to meet the changing demands of the industry.

The MBA – Family Business & Entrepreneurship (FBE) is a two-year full-time programme designed to nurture leaders in family business and entrepreneurs building innovative ventures. Uniquely flexible, it offers students the option to exit after the first year with a Post Graduate Diploma in Family Business & Entrepreneurship. The programme especially caters to those engaged in businesses in construction, real estate, project management, and infrastructure, while also equipping students to launch and scale start-ups in new sectors.

The Integrated MBA (I-MBA) is a five-year, ten-semester programme that provides a seamless blend of undergraduate and postgraduate-level management education. Designed for students entering management studies immediately after schooling, it develops a strong academic foundation along with practical skills, grooming graduates to excel in multiple domains of management and adapt confidently to dynamic business environments.

The Vision of NBS is to evolve into a global Centre of Excellence in business management education, preparing industry-ready management professionals for the Built Environment and allied industries. Its Mission is to realize this vision by promoting resilience for impactful research and sustainable business solutions, nurturing creativity through enterprising values and modern tools, cultivating ethical responsibility towards society and the environment, and fostering confidence, empathy, and lifelong learning for holistic personal and professional growth.

## About the Partner



**Journal Press India (JPI)** is a publishing house devoted to the publication of high-quality research journals in the areas of commerce, management, finance, accounting, Indian economy, international business and taxation. All the journals are peer-reviewed and invite innovative research from experts, addressing topical issues in their respective areas.

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## About the Editors

### **Dr. Sushma S. Kulkarni**

*Vice Chancellor, NICMAR University, Pune, India*

Dr. Sushma Shekhar Kulkarni stands as a transformative force in academia, leading NICMAR University as Vice Chancellor while steering the Global Engineering Deans Council. With a distinguished academic pedigree spanning doctoral, postgraduate and undergraduate qualifications in Civil Engineering, her visionary governance has shaped higher education for nearly four decades. An internationally recognized expert in Concrete Technology and Educational Transformation, her research legacy includes 155+ publications, two patents, and mentorship of 12 Ph.D. candidates. Global thought leadership is evidenced through 140+ keynote addresses at premier forums including IUCEE, IFEEES, and GEDC, while editorial contributions enhance academia through JEET (Scopus-indexed) and the Journal of Real Estate, Construction and Management.



Honoured with 35+ prestigious accolades including the Duncan Fraser Global Award and ISTE's Best Engineering College Principal recognition, she serves as Fellow of IEL, Promoter of IUCEE Foundation, and Lifetime Member of ISTE/ISTD - continuing to pioneer advancements in engineering education worldwide.

### **Dr. Anil Agarwal**

*Professor & Dean of Academics, NICMAR University, Pune, India*

Dr. Agarwal Anil, a paragon of construction management intellect, has been the architect of NICMAR University Pune's rise to university status as its Dean of Academics. Celebrated with dual Teaching Excellence Awards, his mastery spans curriculum innovations, BIS standards reforms, and corporate training for industry giants. His scholarly contributions, including 60+ publications and pivotal roles in national committees, position him among India's leading authorities in the Construction Quality and Project Management domain.



### **Dr. Harish Kumar Singla**

*Professor & Dean, NICMAR Business School, NICMAR University, Maharashtra, India*

He serves as Professor and Dean of NICMAR Business School at NICMAR University, Pune, bringing over 25 years of academic expertise in finance and management. His career spans prestigious institutions, including Thapar University, Patiala, Arun Jaitley National Institute of Financial Management, Faridabad, ICFAI University, Dehradun and others.



## About the Editors

A UGC-NET qualifier in management and IIM Ahmedabad alumnus via a 2005 four-month Faculty Development Programme, he holds a PhD in Finance from Maharishi Dayanand Saraswati University, Ajmer and an MBA in Finance, and a bachelor's in Commerce. Dr. Singla has published extensively, with over 30 papers in ABDC/SCI/SCOPUS/Web of Science journals covering intellectual capital, construction firm performance, PPP corruption, employee disengagement, and real estate valuation. His teaching focuses on Financial Accounting, Strategic Financial Management, and training for executives from DANICS, PTC India, and Power Grid. Research interests include intellectual capital, family firms, behavioral finance, and construction management issues.

### **Dr. Devang Desai**

*Associate Professor & Dean, School of Project Management,  
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He is a Mechanical Engineer from NIT, Surat and has postgraduate and doctorate degree in Marketing Management. He has more than 25 years of experience in corporates and academics. His teaching & research interest includes Marketing Management, Business Development & Project Marketing, Strategic Management, Human Resource Management, and Entrepreneurship & Innovation Management. He is currently dean and Senior Associate professor of School of Project Management.



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## Preface

In an era defined by unprecedented infrastructure development in India and accelerated urbanization across the globe, technological disruption, and growing imperatives for environmental stewardship and sustainable development, the world of built environment stands at a critical juncture of redefinition. It is within this context that the edited volume, “*Proceedings: Digitalization, Sustainability, and Strategic Evolution in Construction*”, comprising abstracts is presented as a timely scholarly intervention, meticulously charting the delineations of this profound transformation.

This compendium represents a principal scholarly outcome of the National-Level Postgraduate Research Symposium (NLPGRS-2026), convened by NICMAR University, Pune. It embodies the academic rigor, industry relevance, and innovative inquiry cultivated within the postgraduate community. Uniquely authored by students, the collected chapters perform a dynamic integrative function, synthesizing perspectives from construction management and infrastructure, real estate, project management and public policy. Each contribution confronts seminal challenges within construction, infrastructure, and real estate through a lens of strategic foresight, supported by methodical research.

The thematic scope of this volume is deliberately expansive, engaging with critical domains including digital transformation in construction, sustainable development frameworks, circular economy principles, advanced risk and project management, urban mobility solutions, and innovative models in real estate and logistics. These core investigations are further augmented by cross-disciplinary analyses in contemporary issues in management, supply chain resilience, and policy formulation, thereby mirroring the intrinsically interconnected nature of the contemporary built environment. Designed to function simultaneously as a substantive research archive and a prospective roadmap, this volume provides students, academics, and practitioners with a critical assemblage of emergent paradigms and analytical frameworks. This edited volume offers not only technical and managerial depth of construction management world but also deliberately aligns with overarching national and global sustainability agendas.

We extend our deep appreciation to the dedicated student authors, the meticulous reviewers, and the guiding academic mentors whose collective intellectual commitment and scholarly endeavour have been instrumental in realizing this publication. Their diligence, academic scholar and insights are reflected in every chapter.

We cordially invite you to engage with these converging horizons and to consider the transformative ideas herein, which promise to inform and shape the future trajectory of Indian built environment and construction management.

## Acknowledgments

The successful convening of the National Level Post Graduate Research Symposium (NLPGRS-2026) and the subsequent realisation of this publication, *“Proceedings: Digitalization, Sustainability, and Strategic Evolution in Construction”*, constitute a collective intellectual achievement of NICMAR University, Pune. It is with profound appreciation that we acknowledge the group of individuals and institutions whose expertise, guidance, and support were indispensable to this symposium.

Foremost, we are indebted to the visionary leadership of Dr. Vijay N. Gupchup, President of NICMAR University. His steadfast commitment to fostering a culture of academic innovation and research excellence provided the essential institutional framework and inspiration for this undertaking. We similarly express our deep gratitude to Dr. Sushma S. Kulkarni, Vice Chancellor of NICMAR University, for her erudite stewardship and unwavering encouragement throughout the conference. The academic rigour and interdisciplinary scope of this work were further fortified by the scholarly guidance of the University’s Deans, faculty members, and dedicated faculty research mentors, to whom we extend our sincere thanks.

This endeavour would not have been possible without significant institutional and professional partnerships. We also wish to formally recognise our publishing collaborators, Journal Press India, for their expert guidance and professionalism in shepherding these complex volumes through to publication.

The foundational core of this publication resides in the original research and intellectual curiosity of the postgraduate student authors. Their scholarly investigations, which critically engage with pressing issues within management & the built environment, are both commendable and form the essential substance of these volumes. The scholarly integrity of their work was assured through the meticulous evaluations and constructive critiques provided by our panel of reviewers and academic mentors, whose diligence we gratefully acknowledge.

Finally, we must recognise the influential role of the NLPGRS-2026 organising committee and its members. Their meticulous planning, adept coordination, and sustained dedication were the operational catalysts behind both the seamless execution of the symposium and the successful culmination of this published work. To all who have contributed, in varied and vital capacities, we offer our most cordial and scholarly thanks.

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**TRACK 1**

**CIVIL ENGINEERING AND  
CONSTRUCTION MANAGEMENT**

## **A Lean Construction Approach to Tower Crane Selection**

*Vivek Baldaniya\* and Mohiuddin Shaikh\*\**

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### **ABSTRACT**

Crane selection is a critical factor in construction projects, significantly influencing efficiency, cost management, and safety performance. Traditional practices often depend on subjective decisions and experiential knowledge, which can lead to inefficiencies, delays, and increased costs, especially in complex modern practices such as prefabricated and modular construction. This paper proposes a systematic, value-driven framework for crane selection by integrating Lean Construction (LC) principles, guided by the Transformation-Flow-Value (TFV) theory. The framework redefines crane selection by emphasizing waste elimination, smooth workflow management, and stakeholder value maximisation. By reducing non-value-adding activities and ensuring efficient material flow, lean-based crane selection enhances overall project coordination and optimises equipment utilisation. Additionally, advanced optimisation techniques, including digital modelling, simulation, and algorithm-based planning tools, are explored to refine crane deployment strategies, improve accuracy, and minimise risks. Embedding lean thinking into crane selection not only boosts productivity and cost-effectiveness but also contributes to sustainable project delivery while ensuring safer construction operations.

**Keywords:** Crane selection; Lean construction; TFV theory; Workflow optimisation; Sustainable project delivery.

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## **A Study on Delay Analysis in CRIP Sector**

*Purva Mangle\*, Abhijeet Belkune\*\*, Askanda Uchale\*\*\* and Jonardan Koner\*\*\*\**

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### **ABSTRACT**

The Construction, Real Estate, Infrastructure, and Projects (CRIP) sector is a major contributor to the global economy but consistently struggles with project delays. These delays lead to cost overruns, reduced investor confidence, and strained relationships among stakeholders. Delays can be caused by a variety of internal and external factors, including design changes, procurement issues, labor shortages, contractual disputes, adverse weather, and regulatory requirements. The growing complexity of large-scale projects makes a systematic approach to analyzing these delays even more crucial. This study aims to investigate the root causes and effects of delays in the CRIP sector and to critically assess existing methodologies for delay analysis. It will examine different methods like As Planned versus As-Built, Time Impact Analysis, and Window Analysis, and highlight their strengths and weaknesses. The research will also identify gaps in current practices, such as a lack of standardized approaches and integration of digital tools. Ultimately, the goal is to provide recommendations for improving project management and delivery efficiency, which will help reduce disputes and strengthen stakeholder confidence in the CRIP industry.

**Keywords:** CRIP sector; Project delays; Delay analysis; Cost overruns; Stakeholder management.

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## Quality Management Practices in RMC Plant

*Kedar Deshpande\*, Ashwin Bahe\*\* and Rushikesh Borkar\*\*\**

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### ABSTRACT

Ready Mixed Concrete industry is the crucial part of overall construction process. RMC is providing the quality, uniformity, efficiency compared to conventional site mixed concrete. Concrete being the leading used construction material globally requires strict quality control, particularly as the demand for RMC constantly increasing. RMC as per IS 4926:2003 is produced in the controlled environment and supplied in fresh state making the quality assurance critical at every stage from raw material selection to delivery. This research presents the comparative assessment of codal provision related to the quality practices recommended by the IS 4926:2003 and actual quality practices will be followed on the RMC plant and in the industry. This assessment will provide the similarities, differences and gaps between the code and on field practices that influence the quality of RMC production and supply. Based on the onsite observation and discussion with the industry experts which will share the current situation of the industry about the quality practices followed by them. These findings are expected to provide the perceptible into the industry practices and highlight the necessary areas that need to be improved as per the IS 4926:2003 to strengthen the regulatory framework to enhance the quality of the RMC.

**Keywords:** Ready mixed concrete; Quality control; IS 4926:2003; Codal provision vs industry practices.

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## **Comparative Analysis of Public-Private Partnerships (PPP) in Metro Projects Across India**

*Arun Francis Chirayath\*, Vishwaraj Arun Wankhede\*\* and  
Aaditya Suryawanshi\*\*\**

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### **ABSTRACT**

This research conducts a comparative economic analysis of the Mumbai and Pune Metro projects, specifically focusing on their financial viability and implementation under the Public-Private Partnership (PPP) model. The study employs a Mixed Methods approach, integrating quantitative data—such as project costs, ridership, funding mechanisms (e.g., NPV, IRR), and operational metrics—with qualitative insights gathered through surveys, focus group discussions, and semi-structured interviews with commuters, officials (MMRDA/PMRDA), and private stakeholders. The comparison highlights two distinct PPP experiences: the Mumbai Metro Line-1, an operational DBFOT/BOOT model which experienced significant cost overruns (escalating from ₹ 2,351 crore to ₹4,321 crore) and later policy disputes over fare risk resulting in an ex-post public fiscal exposure; and the Pune Metro Line-3, a greenfield DBFOT project executed by a Tata-Siemens JV, which leverages a large ex-ante government Viability Gap Funding (VGF) of ₹ 1,224.8 crore sanctioned by the government to offer greater financial certainty to the private concessionaire. By contrasting these institutional setups, VGF strategies, and private sector roles, the research aims to assess the strengths and weaknesses of the PPP framework in the Indian metro sector, providing evidence-based recommendations for enhancing the long-term economic sustainability of urban rail transport projects.

**Keywords:** Public-Private Partnership (PPP); Metro; Comparative economic analysis; Viability Gap Funding (VGF).

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## **Cost Performance Analysis in Construction Projects**

*Akanksha Karande\*, Raviprakash Choudhary\*\* and Pratik Kajwe\*\*\**

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### **ABSTRACT**

The management of construction costs is a major factor that determines the success of a project and it is normally quantified in terms of deviations to the approved budget, which include monetary and timing overruns. In India, despite highly developed estimating and monitoring procedures, the construction projects are often faced with cost over runs. The cost performance of construction projects in the Pune region is the focus of this research which provides a pragmatic framework towards optimization of decision making and fiscal control. The identification of critical cost drivers, i.e., rework, inefficient coordination, schedule delays, payment delays, and inaccurate estimates, was proven with the help of a controlled survey of the construction professionals. Cost Performance Index (CPI), Cost Overrun Percentage (COP), Schedule Performance Index (SPI), Rework Cost Percentage, Payment Delay Days and Estimate Accuracy Percentage were identified as the most salient indicators which were transformed to measurable Key Performance Indicators (KPIs). With the help of forecasting methods, sensitivity analysis, decision rules, an organised frame was developed on the basis of these indicators. The framework provides a statistical approach to the monitoring of project performance that enables quick corrective action in construction projects.

**Keywords:** Cost performance; Key performance indicators; Cost drivers; Framework.

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## **Impact of Infrastructure Development (Major Ports) on Economic Growth: An Empirical Study**

*Tapasya Jadhav\*, Harshita Jaghnani\*\* and Jonardan Koner\*\*\**

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### **ABSTRACT**

This study is the relationship between the development of major ports infrastructure and economic growth in India based on five main objectives: Port throughput, review regional economic performance, evaluate the contribution of Ports to job creation and the growth of GDP; State economic growth, and improved port infrastructure supports a competitive trading environment by enhancing logistics connectivity and operational efficiency. Case studies of major Indian Ports including Jawaharlal Nehru Port Trust, Chennai Port Trust, and Visakhapatnam Port Trust are analysed to demonstrate the inter-relationship between port facilities and regional development. Government initiatives that enable ports to promote regional economic development. The results indicate that port infrastructure is significant to economic transformation, the ability for sustainable port infrastructure to maintain itself over the long term. The results of the study also indicate that establishing a port infrastructure through sustainable investments will bring India's trade capabilities to a higher level, creating job opportunities, and supporting the balanced development of regions; thereby fulfilling India's mission of building resilient and inclusive economic growth. In addition to examining sustainable practices, the research aims at determining a balance between developing economically viable means of conducting business, while protecting the environment, and fulfilling one's social responsibilities.

**Keywords:** Major ports; Port infrastructure; Economic growth; Sustainable development.

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## **Evaluation of Reusable Formwork Systems for Sustainable RCC Construction**

*Siddhi Magdum\**, *Aniket Thakur\*\**,  
*Ganesh Bagalkoti\*\*\** and *Abhishek Raj Singh\*\*\*\**

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### **ABSTRACT**

Formwork, acting as a temporary mold for structural elements, has long been a key component of reinforced concrete construction. Traditionally, it was regarded as a costly necessity with little focus on its impact on sustainability or project efficiency. However, modern construction theory views formwork as a crucial system influencing quality, cost, time, and environmental performance. Contemporary frameworks now emphasize lifecycle cost analysis, safety integration, and compatibility with digital construction methods in addition to material behavior. This study employs a qualitative research approach supported by literature review and field observations to assess reusable formwork systems from theoretical and industrial perspectives. It highlights the shift from conventional plywood systems to lightweight, modular, reusable systems made of aluminium, plastic composites, and engineered polymers. Reusability is central to this study, with systems evaluated on adaptability, ease of maintenance, durability, and usage cycles. Industrial evidence shows that advanced modular systems enable more reuse cycles, reducing per-use costs and environmental impact. The study also examines digital advancements in formwork design and planning. Formwork has evolved from expensive temporary structures to intelligent, reusable, digitally compatible systems. This research investigates the synergy and gaps between theoretical understanding and practical implementation of formwork reusability.

**Keywords:** Formwork; Sustainable; Digital advancement in formwork.

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## **BIM-enabled Smart Construction Framework for Stakeholders and Risk Management in Metro Rail Projects**

*Priyang Patel\*, Preeti Shingade\*\* and Raghavendra Kumar\*\*\**

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### **ABSTRACT**

Urban transit projects are inherently complex due to the involvement of multiple stakeholders and numerous potential risks that impact project schedule, cost, and sustainability. Metro rail projects, a major part of urban infrastructure in India, are being developed across cities such as Delhi, Nagpur, Mumbai, Kochi, Chennai, Bengaluru, and Pune to promote efficient and sustainable transportation. These projects increasingly adopt smart construction technologies, particularly Building Information Modeling (BIM), to enhance planning and execution. However, persistent challenges in stakeholder management, risk assessment, and project execution often lead to delays, cost overruns, and inefficiencies. This study focuses on developing a BIM-enabled stakeholder engagement framework to strengthen risk management within metro rail projects, emphasizing the Pune Metro in Maharashtra. Through BIM integration, the research aims to enable real-time project monitoring, data-driven decision-making, and sustainable construction practices. A key gap identified is the lack of standardized BIM-based risk management systems, which limits effective risk identification and mitigation. To address this, the study proposes a 6D-BIM-integrated risk analysis model that can be scaled across metro projects in India. This framework promotes collaboration, sustainability, and resilience, providing a foundation for future research and implementation strategies to optimize metro rail project execution in India and beyond.

**Keywords:** Building Information Modelling (BIM); Metro rail projects; Risk assessment; Smart construction; Stak.

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## **Leveraging Marketing Analytics to Enhance the Marketability of Contracting Companies**

*Sonya Thomas\*, Akshita Saklani\*\* and Maria Joseph\*\*\**

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### **ABSTRACT**

Construction, Real estate and infrastructure contracting firms lag in adopting data-driven marketing, relying on traditional methods. This thesis investigates marketing analytics as a transformative tool to enhance their marketability, competitiveness, and profitability. The research uses a mixed-method approach, combining a literature review with a comparative case study analysis of 14 companies, supplemented by a survey of 51 key stakeholders. The findings reveal a critical disconnect while experts recognize the value of marketing analytics, its adoption among contractors is hampered by data fragmentation, a lack of expertise, and cost constraints. Case studies show a direct correlation between analytics use and superior outcomes in crisis management and bid success. Conversely, a lack of analytical foresight was linked to reputational damage and financial distress. The study concludes that marketing analytics is a critical strategic imperative. It proposes tailored strategies, emphasizing affordable tools for sentiment analysis and bid optimization, enabling companies to navigate complexities and secure sustainable growth.

**Keywords:** Marketing analytics; Data-driven marketing; Construction sector; Contracting firms.

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## **Evaluating BIM Effectiveness in Indian Mass Housing Projects through Impact Pathway Framework**

*Sakshi Doijode\**, *Vibhash Kumar\*\**,  
*Nayan Chotaliya\*\*\* and Hindavi Tikate (Gavali)\*\*\*\**

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### **ABSTRACT**

The rapid expansion of India's mass housing sector has created a pressing need for digital solutions that enhance efficiency, affordability, and sustainability. Building Information Modelling (BIM) offers transformative potential; however, its adoption in large-scale Indian housing projects remains uneven. This study evaluates BIM effectiveness through the Impact Pathway Framework (IPF), which systematically connects inputs, processes, outputs, outcomes, and long-term impacts. Drawing on survey data from government, private, and consultancy stakeholders, analysed using structural equation modelling (SEM), the research demonstrates how enablers such as policy support, skilled manpower, and resource readiness strengthen BIM processes, including 4D/5D simulation, clash detection, and digital approval systems. The findings reveal that these enhanced processes significantly improve project outputs like time and cost efficiency, quality assurance, and regulatory compliance, which subsequently translate into outcomes of sustainability, transparency, and stakeholder coordination. Long-term impacts include accelerated housing delivery, improved affordability, and alignment with national housing policies such as PMAY-U. By moving beyond project-level performance metrics, this research provides a systemic evaluation of BIM adoption and underscores its strategic role in achieving sustainable, affordable housing delivery in India. The study offers critical insights for policymakers, developers, and practitioners seeking to institutionalize BIM in mass housing.

**Keywords:** BIM; Impact pathway framework; Mass housing; Sustainability; India.

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## **Development of a Model for the Dynamic Pricing in Construction Project for Modifying Tendering Techniques**

*Ruturaj Patil\*, Parth Shah\*\* and Vishal Yadav\*\*\**

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### **ABSTRACT**

The Indian construction projects face recurring challenges due to frequent changes in the prices of materials, labour, and fuel. Existing tendering systems rely on static Bill of Quantities (BOQ) and outdated escalation clauses that do not capture market volatility in construction resources. This paper introduces a formula-based dynamic pricing model that integrates the District Schedule of Rates (DSR) with national indices, such as the Wholesale Price Index (WPI) and the Consumer Price Index (CPI). The framework dynamically adjusts tender rates at defined intervals, ensuring a near-accurate representation of market costs and a fair compensation solution for both the client and the contractor. The study analyzes datasets from the Public Works Department (PWD), national inflation indices, and historical cost trends to validate the model's responsiveness. Results show that static systems underestimate costs by 15–25%, while dynamic formula-based methods improve accuracy, transparency, and contract efficiency. The paper advocates adopting a national framework for dynamic tendering to modernize India's construction procurement process.

**Keywords:** Construction procurement; Dynamic pricing; Tendering reform; WPI-CPI integration.

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## **A Study on Impact of Logistics in Construction Delays**

*Sumeet Singh\*, Akshat Shah\*\* and Harshvardhan Bhoje\*\*\**

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### **ABSTRACT**

Efficient logistics management is fundamental to the success of construction projects, directly influencing timelines, cost control, and overall productivity. Despite advances in project management, logistics-related inefficiencies continue to cause significant delays in the construction industry. This study, titled “A Study on the Impact of Logistics in Construction Delays,” aims to examine how planning, coordination, and technology adoption affect project performance. Primary data were collected through a structured questionnaire distributed to professionals across various construction domains, including engineers, planners, and procurement specialists. The responses were analyzed to identify the key factors contributing to logistics-related delays and to propose potential improvement strategies. The study also emphasizes the growing relevance of digital transformation through technologies. The findings indicate that poor pre-planning, lack of coordination among site and procurement teams, and limited use of digital tools are major causes of logistics delays. This study emphasized the importance of early procurement, detailed scheduling, strong vendor relationships, and effective communication to mitigate such issues.

**Keywords:** Logistics; Delay; Construction.

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## **Behavioural Safety on Mega Construction Projects in India**

*Kunal Patne\*, Tushar Singh\*\*, Shreyas Yadav\*\*\* and Abhishek Raj Singh\*\*\*\**

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### **ABSTRACT**

Indian construction sector transforming rapidly through the development of mega infrastructure projects. The findings suggest that there is a low level of behavioural safety awareness among the construction workers, with the rate of accidents exacerbated by use of improper safety gears. Putting production ahead of safety, due to timeliness of the projects, engenders poor disposition to safety among site workers. The more proactive approaches to safety management are essential for engendering behavioural safety among the operatives. The study focuses on Behaviour-Based Safety (BBS), an emerging approach that emphasizes modifying worker behaviour to reduce accidents. Drawing from Ajzen's Theory of Planned Behaviour and international case studies, particularly from Qatar and Hong Kong, the research highlights how workers' attitudes, peer influences, and perceived control impact their safety behaviour. A quantitative research methodology is employed, utilizing a structured questionnaire designed to assess key behavioural variables—safety knowledge, cultural and communication barriers, managerial pressure, and worker attitudes. Data collected from multiple Indian mega project sites were analysed using Smart PLS software. The findings aim to support the development of behaviour-focused safety strategies and provide a framework for integrating behavioural science into construction safety management, offering practical solutions for enhancing worker well-being on India's mega projects.

**Keywords:** Behaviour based safety; Ajzen's theory; Mega project.

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## **Traditional vs. AI-Enhanced Road Safety Audits: Study on Applicability in India**

*Sayali Dabholkar\*, Aditi S.\*\* and Shubh Patel\*\*\**

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### **ABSTRACT**

Traditional RSAs in India are characterized by manual site visits and qualitative assessments, as outlined in IRC SP:88-2019, often lacking predictive capability and digital documentation. This paper presents a pilot study comparing conventional RSA techniques with modern AI-driven methods. It analyses secondary data that was collected using (a) manual audits and checklists and (b) AI-assisted tools such as YOLOv8-based visual detection and GPS-enabled data logging. Comparative analysis conducted revealed that AI-assisted RSAs improved hazard detection accuracy and reduced audit time compared to traditional methods. The machine learning models successfully predicted high-risk crash zones, enabling targeted interventions before incidents occurred. While AI-based systems improved efficiency, challenges were identified including unavailability of data, infrastructure readiness gaps, and the need for skilled manpower which limit nationwide scalability. The study concludes that hybrid models, integrating human expertise with AI-enabled analytics, are the most practical solution for India's diverse road network in the near term.

**Keywords:** Road safety audits; Traditional methods; Artificial Intelligence; Machine Learning; Highway infrastructure.

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## **BIM in Action: Evaluating Its Impact on Communication and Collaboration in Construction Projects**

*Ajay Patil\*, Prajwal S. \*\*, Jayanth S. Gowda\*\*\* and Harish Reddy\*\*\*\**

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### **ABSTRACT**

This research examines how Building Information Modelling (BIM) is transforming the way people communicate and work together in the Indian construction industry. The study focuses on how BIM helps overcome long standing issues such as project delays and poor coordination between stakeholders. Its main goal was to understand the real impact of BIM on information sharing and decision-making by gathering feedback from professionals working on live projects. A mixed-method approach was used combining survey data with personal insights from interviews on a major housing project that adopted BIM. The results show that BIM has a very positive influence on communication, helping teams make faster decisions and reducing confusion by detecting design clashes early and avoiding rework. However, the study also found several challenges, including limited access to proper training, the high cost of software, and resistance to adopting new technology. Another major concern is the lack of strong legal and institutional support to encourage BIM implementation. In conclusion, while BIM has proven to be an effective solution for improving project-level communication, its long-term success depends on better legal frameworks, structured training programs, and the mandatory use of cloud-based Common Data Environments (CDEs) for smooth collaboration and information sharing.

**Keywords:** Building information modelling; Coordination; Communication; Common data environments; Collaboration.

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## **Delay Analysis of Stadium Construction Projects using RII Methodology and Formulating Mitigation Strategies**

*Vinit Chavan\*, Kritika Goyal\*\*, Advetya J. K.\*\*\* and Chetan More\*\*\*\**

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### **ABSTRACT**

**Aim:** The purpose of this research paper is to analyse delay factors of stadium construction projects using the Relative Importance Index (RII) methodologies and formulate efficient mitigation strategies. **Methodology:** The study uses a mixed-method approach that combines both quantitative and qualitative data collection techniques. A thorough literature review identifies common causes of delay in stadium construction. Purposive sampling is employed to select professionals with relevant experience and expertise in stadium construction projects. Surveys and interviews with industry professionals collect primary data on these causes and their perceived importance. RII analyses rank and prioritize the delay factors. Based on these findings, specific strategies to reduce delays are proposed and assessed for their potential effectiveness. **Limitations and Gaps:** The research is limited to stadium construction projects, which may not apply to other types of construction. The study depends on expert opinions, which can introduce personal bias. Moreover, the effectiveness of the proposed strategies is theoretical and needs practical application and long-term evaluation. Future research should tackle these gaps by broadening the focus to include various construction projects, using more objective methods to measure delays, and performing long-term studies on the application of the strategies.

**Keywords:** Delay analysis; Stadium construction; Relative Importance Index (RII); Mitigation strategies.

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## **Socio Economic Analysis of Women in the Construction Sector**

*Aryan Bhoir\*, Akash Dandhare\*\*, Kamal Pardeshi\*\*\* and Abhijat Abhyankar\*\*\*\**

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### **ABSTRACT**

The construction industry plays a vital role in global employment, providing jobs to millions. However, it continues to be largely male dominated, with women comprising only a small portion of the workforce. This gender imbalance has notable socio-economic consequences, affecting both women's financial independence and the industry's overall growth and sustainability. Increasing women's participation in construction can drive economic development, reduce poverty, and improve livelihoods while also introducing diverse perspectives and skills that promote innovation and sustainable building practices. This research seeks to examine the socio-economic status of women in the construction sector by exploring the key challenges, opportunities, and factors that impact their participation. Utilizing a mixed-method approach, data is gathered through survey questionnaires, in-depth interviews, and focus group discussions with women construction workers. To ensure a diverse representation, the study employs purposive and sampling strategies, taking into account factors such as experience, age, and occupation. The findings reveal several socio-economic factors influencing women in the construction industry, including wage gaps, job stability, working conditions, and career growth. The study also compares the role of female workers in construction with those in other industries, highlighting challenges such as workplace discrimination, physical labor demands, and limited opportunities for career advancement.

**Keywords:** Empowerment; Gender imbalance; Survey questionnaires; Wage gaps; Women in construction.

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## **A Study on Delays in Pune Metro Construction**

*Karan Katre\*, Saurabh Pailwan\*\* and Shahu Zade\*\*\**

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### **ABSTRACT**

In rapidly growing cities like Pune, where urban expansion strains existing infrastructure, developing efficient urban mass transit systems has become essential. To address severe traffic issues, the Purple and Aqua Lines were introduced in Phase 1 of the Pune Metro. However, the project faced a delay of about 27 months, emphasizing the need to examine the underlying causes and impacts of these delays. This study investigates the major factors contributing to delays in Pune Metro Phase 1 and aims to fill the research gap in metro infrastructure delay analysis within the Indian urban context. Data were collected through a structured questionnaire survey targeting stakeholders involved in planning, implementation, and supervision—including engineers, project managers, consultants, and contractors. The responses were analyzed using the Relative Importance Index (RII) to rank delay factors based on their influence on the project timeline. Additionally, frequency and severity responses were applied to construct a 5×5 risk matrix, enabling risk-based prioritization of delay factors. Findings revealed that land acquisition issues, administrative approval delays, utility relocations, and shortage of skilled labor were the primary causes. The COVID-19 pandemic and inter-agency coordination challenges further aggravated delays. These insights will help stakeholders implement corrective measures for timely project delivery.

**Keywords:** Metro construction delays; Relative Importance Index (RII); Risk matrix analysis; Infrastructure pro.

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## **Evaluating the Effectiveness of BIM-enabled Formwork Management in Indian High-rise Construction**

*Hrishikesh Dongre\*, Aman Mahant\*\*, Harsh Zilpelwar\*\*\* and Hindavi Gavali\*\*\*\**

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### **ABSTRACT**

Formwork accounts for nearly 30–40% of total concrete construction costs in high-rise projects. Traditional formwork management practices are often manual, time-consuming, and error-prone, resulting in material wastage, scheduling delays, and increased project costs. The lack of integration between design and execution phases further causes coordination issues and rework. The study aims to identify challenges in current formwork management, assess the feasibility of BIM integration, analyze drivers and barriers to its adoption, and develop a standardized framework for effective and sustainable implementation in high-rise construction. This research evaluates the effectiveness of BIM-enabled formwork management in enhancing accuracy, efficiency, and productivity in Indian high-rise construction. A structured methodology was adopted, focusing on five dimensions: Organizational Support, BIM Use in Processes, Immediate Outputs, Project Outcomes, and Long-Term Impacts. Data were collected through a questionnaire survey using a five-point Likert scale (Strongly Agree to Strongly Disagree), supported by literature review. Results show that most respondents strongly agreed that BIM improves modeling accuracy, scheduling, and resource utilization. The study concludes that BIM-based formwork management significantly enhances coordination, reduces rework, and supports sustainability. The proposed framework offers a structured approach for BIM implementation, fostering innovation and best practices in construction management.

**Keywords:** Building Information Modeling (BIM); Formwork management; High-rise construction; Digital transformation

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## **Analysis of Critical Factors Affecting Successful Arbitration**

*Samarth Kachwe\*, Heramb Bhogate\*\* and Bhushan Ingle\*\*\**

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### **ABSTRACT**

Abstract This study investigates the key factors influencing the effectiveness of adjudication and arbitration in the Indian construction industry. It focuses on the procedural, legal, and systemic barriers that hinder the efficiency of these Alternative Dispute Resolution (ADR) methods and explores practical solutions to enhance their application. A mixed-methods approach was adopted, combining a literature review with primary data collection. A structured questionnaire, using a point rating scale to evaluate critical factors, was distributed among experienced professionals such as project managers, contractors, and legal advisors. In-depth interviews were also conducted to gain further insights. Findings reveal that while ADR is designed to be faster and more efficient than traditional litigation, it often fails to deliver these benefits in India due to delays, inefficiencies, and a lack of trust among stakeholders. The most critical success factors identified include the arbitrator's subject-matter expertise, speed of resolution, fairness of procedure, and enforceability of decisions. The study offers recommendations for legal and procedural reforms, aiming to improve the effectiveness of ADR in resolving disputes within the construction sector.

**Keywords:** Construction disputes; Arbitration; Alternative dispute resolution (ADR); India; Success factors.

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## **Bridging the Gap: Industry Readiness and Challenges in 4D BIM Adoption for Construction Projects**

*Rishi Koya\*, Gaurav Toraskar\*\*, Jainam Panchal\*\*\* and Sagar Malsane\*\*\*\**

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### **ABSTRACT**

Based on a conducted survey and the literature review, this paper discusses familiarity, perceived usability and barriers to the adoption of 4D Building Information and Model-ling by construction professionals in relation to the use of the time scheduling parallel with the 3D building models, the capability to accomplish a superior level of visualization, better organization of resources, established safety and reduction in cost and schedule overruns. Despite this, its popularity has not yet been widely owned. The question survey conducted among construction stakeholders examined the demographic profiles, level of BIM awareness and the perception of the stakeholders on the 4D BIM features characteristics such as visualization capacity, level of safety, clash detecting, procurement planning, influence on productivity and reduction of conflicts. The results indicate that with the growing awareness of the field there are still crucial barriers including the lack of talented individuals, excessive software and training cost, interoperability and a lack of knowledge of the payback. A deficiency of organization preparedness and the fragmentation of schedule and model information into the project functions was also apparent among respondents, it may be proposed to involve all stakeholders in the 4D BIM process.

**Keywords:** Project management innovation; 4D Building Information Modeling (4D BIM); Construction Industry.

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## **Contractual Risks in Construction Projects**

*Aiswarya A. \*, Sandra Manoj\*\* and Krishna R. \*\*\**

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### **ABSTRACT**

Construction projects are inherently complex undertakings characterized by multiple stakeholders, dynamic environments, and intricate contractual frameworks. Contractual risks are one of the main causes of disagreements, cost overruns, and schedule delays among the many difficulties encountered. Through a thorough analysis of scholarly literature and case laws, this study critically investigates the terrain of contractual risks in construction projects. Design liability, payment delays, force majeure situations, unclear contract language, and the changing difficulties brought on by digital technologies are important areas of focus. Using a qualitative approach, the study examines dispute trends among significant Indian contracting companies to pinpoint the underlying reasons behind persistent contractual disputes. The results show that unclear contracts and misaligned risk allocation are the two common causes of project failures. The study also emphasises how formal contract documents and actual execution realities continue to diverge, particularly in cross-cultural and multi-jurisdictional settings. The need for better readability through tiered dispute resolution procedures and plain language draughting to increase accountability and transparency is emphasised in the recommendations. The construction sector can move closer to a more cooperative and risk-resilient project delivery environment by tackling these problems.

**Keywords:** Contractual risks; Dispute resolution; Risk allocation; Construction projects; Transparency.

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## **Road Infrastructure Management using BIM: A New Era of Predictive Maintenance**

*Bhargavi Bawane\* and Bhargavi Deshmukh\*\**

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### **ABSTRACT**

This research paper examines how Building Information Modelling (BIM) can transform road infrastructure management through predictive maintenance and smart technologies. By combining BIM with Artificial Intelligence (AI), the Internet of Things (IoT), and digital twins, we can make decisions based on data, monitor in real time, and implement proactive maintenance strategies. The study reviews effective practices from countries like South Korea and Singapore, where integrated Intelligent Transport Systems (ITS) use AI, 5G, and real-time analytics, and compares them to India's developing expressway network. Using quantitative analysis and comparative benchmarks, the research highlights significant technological gaps in India's road management systems, such as inconsistent digital adoption, fragmented data infrastructure, and limited use of AI. The findings show that increasing AI integration and sensor density cuts down maintenance frequency and incident response times by more than 50%, which boosts operational efficiency and safety. The study suggests a phased roadmap from 2025 to 2035 for India's shift to an intelligent expressway ecosystem that includes predictive analytics, digital twins, and unified data platforms. Overall, this research positions BIM as a key element for smart and resilient road infrastructure, providing practical insights for policymakers and engineers to improve India's transportation network for the future.

**Keywords:** Building Information Modelling (BIM); Predictive maintenance; Intelligent Transport Systems (ITS).

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## **Analysing Critical Success Factors Contributing to Successful Delivery of Construction: Specific Reference to Real Estate Project**

*Tejas Tiwaskar\*, Hariprasad Madrewar\*\* and Madhav Deshmukh\*\*\**

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### **ABSTRACT**

The construction industry is still plagued by persistent project performance impediments in terms of cost overruns, schedule delays, and quality degradation, which are detrimental to the satisfaction of project stakeholders and organizational outcomes. In this context, the aim of this study is to identify CSFs that enable the successful delivery of real estate construction projects through a mixed-methods research approach. The SLR based on the PRISMA guidelines was conducted using around 1,000 research articles from the Scopus database. Through rigorous multi-stage screening based on publication year, geographical relevance, and thematic alignment, the dataset was reduced to 50 high-quality studies for detailed content analysis. Through review, 193 potential success factors were identified across technical, managerial, and contextual dimensions, which, after expert consultation, were consolidated into three categories: Time-related, Cost-related, and Quality-related factors. Out of these, 14 key CSFs were shortlisted for empirical investigation. For the empirical phase, Multi-Criteria Decision-Making (MCDM) models were used along with structured questionnaires that were administered to key stakeholders in the Indian construction industry. The data were analyzed using Relative Importance Index, Spearman's rank correlation, and integrated ranking analysis to develop an experience-specific framework for improving real estate project performance in India.

**Keywords:** Construction project management; Project efficiency; Project performance; Critical project factors.

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## **Strategies to be Implemented in Contract Formulation to Avoid Disputes**

*Malhar Wajpe\*, Nandini Sahu\*\* and Abhishek Wankhade\*\*\**

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### **ABSTRACT**

This thesis looks at the main causes of disputes in construction infrastructure projects. It points out problematic clauses that often create conflicts. Common causes include vague contract terms, unclear responsibilities, payment delays, changes in scope, and differing views on key clauses. These issues often stem from incomplete or incorrect paperwork, poor communication, and mistakes in contracts. Such problems can lead to legal disputes and delays in projects. The study shows how unresolved uncertainties and poorly written contracts play a major role in these disputes. To tackle these challenges, it offers practical strategies. These strategies include clearly defining unclear terms, maintaining thorough documentation, and establishing standard guidelines for contract drafting. These steps aim to improve understanding, reduce misunderstandings, and build a solid foundation for resolving disputes. By using these strategies in contract creation, projects can achieve clearer communication, reduce conflicts, and ensure smoother execution, resulting in construction projects that proceed without disputes. The research provides valuable insights and practical solutions to improve clarity and teamwork in large infrastructure projects.

**Keywords:** Contract formulation; Interpretation; Red flag clauses.

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## **Analysis of Causes of Disputes in the Infrastructure Industry using Analytical Network Process**

*Rugved Sherekar\*, Anand Pawar\*\* and Aditya Tarale\*\*\**

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### **ABSTRACT**

Infrastructural projects usually face challenges due to conflicts. Such conflicts may contribute to increased costs and delayed completion. This study employs the Analytical Network Process (ANP) for determining and analyzing primary causes of such conflicts. The ANP methodology incorporates the relationships between different causes, providing a straightforward mechanism for interpreting their intricate relationships. Primary causes considered are ambiguous contracts, stakeholder problems, communication problems, and socio-economic factors. Data were collected from contractors, project managers, and legal advisers to achieve a general overview. Pairwise comparisons of the ANP model enabled ranking these factors according to influence and interdependencies over the course of the project period. The findings indicate that ambiguous contracts and lack of communication are the main causes of disputes. In addition, research focuses on the necessity for proactive stakeholder involvement in mitigating conflicts. Collaboration prevents early misunderstandings, which decrease the likelihood of disputes escalating. The results provide valuable recommendations for enhancing communication tactics and contract clarity in upcoming infrastructure projects to enhance project performance and dispute handling.

**Keywords:** Analytical network process; Causes of disputes; Infrastructure projects.

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## **Conflict Management and Communication Strategies in Construction Projects**

*Vikarna Dhopte\*, Vishwas Adhia\*\* and Dvij Patel\*\*\**

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### **ABSTRACT**

Conflicts are inevitable in construction projects due to multiple stakeholders, complex coordination, and dynamic site conditions. This study explores conflict management and communication strategies in construction projects to identify key causes, assess existing practices, and evaluate their impact on project performance. The research aims to enhance understanding of how structured communication and proactive frameworks can reduce disputes and delays. Data was collected from 25 industry professionals through questionnaires and analyzed using descriptive techniques to identify patterns and trends. Findings reveal that payment delays, miscommunication, and unclear scope are the major causes of conflicts. While most professionals prefer collaborative resolution, lack of formal frameworks and communication protocols limits effectiveness. Integration of digital tools such as BIM and ERP improves transparency and coordination across teams. The study emphasizes the need for a hybrid framework combining structured communication, digital adoption, trust-building, and formal conflict resolution mechanisms. Such a framework can significantly enhance efficiency, teamwork, and trust among stakeholders, leading to improved project performance and sustainable management practices within the construction industry. The findings contribute valuable insights for both academic research and professional application in managing construction project conflicts effectively.

**Keywords:** Conflict management; Communication strategies; Construction projects; Dispute resolution.

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## **Competencies of Construction Graduates**

*Rau Chaudhari\* and Vinit Patil\*\**

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### **ABSTRACT**

The study aims to investigate the essential competencies required by construction graduates to meet industry expectations and improve employability. It focuses on NICMAR University's Advanced Construction Management (ACM) alumni to assess the alignment between academic learning and professional requirements. Recognizing the dynamic transformation of the Indian construction sector driven by technology, sustainability, and project complexity, the research emphasizes the need for graduates to possess both technical and managerial capabilities. A structured quantitative approach using questionnaire surveys and statistical tools such as descriptive and gap analysis has been adopted. The research seeks to identify and categorize competencies into five major domains: core knowledge, tools and software, legal-contractual, analytical-cognitive, and communication-interpersonal. Additionally, it aims to evaluate how these competencies vary across different professional roles to understand domain-specific needs. The objective is to evaluate the existing competency gap between industry expectations and graduate preparedness and to understand key areas for improvement. The study is expected to provide valuable insights for academia, employers, and policymakers in bridging skill gaps and enhancing industry readiness.

**Keywords:** Competency mapping; Employability; Skill gap; Industry expectations; Construction graduates.

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## **Factors Affecting the Adoption of Construction Estimation Technologies: A Regional Study of Residential Developers in Pune**

*Ajit Kale\*, Gandhar Uttekar\*\* and Bhagyashri Wanjari\*\*\**

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### **ABSTRACT**

The use of estimation software in the Pune construction industry is important for improving project cost accuracy, productivity, and decision-making. However, the rate of adoption differs because of various factors. This study aims to identify and rank the main factors affecting the use of estimation software among construction professionals in Pune. A structured questionnaire with a five-point Likert scale was distributed to contractors, project managers, consultants, and local builders through Google Forms and direct field visits. In addition, interactions with local builders were conducted to understand their practical challenges and barriers to adoption. The collected data was analysed using descriptive statistics and the Relative Importance Index (RII) to prioritize the influencing factors. The results show that ease of use, management support, cost, training needs, and compatibility with existing systems are the most significant factors influencing adoption. These findings provide practical insights for construction firms and industry stakeholders to support smoother implementation and wider use of estimation tools. The study enhances understanding of technology adoption in the construction sector and offers guidance for accelerating digital transformation in Pune's construction projects.

**Keywords:** Software; Adoption; Construction; Digital transformation.

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## **Digitalization in Construction Safety: An Indian Scenario**

*Shreyas Patane\*, Onkar Khutwad\*\* and Shivani Kirdat\*\*\**

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### **ABSTRACT**

The Indian construction industry, a vital contributor to the national economy, continues to face persistent challenges related to occupational safety. With the rise of digital technologies, there is growing potential to improve safety performance; however, limited research exists on how widely these tools are adopted and what factors enable their use in the Indian context. This study aims to address this gap by evaluating the current level of digitalization in construction safety, identifying key enablers that drive its adoption, and proposing strategies for effective implementation. Using a sequential mixed-methods approach, the research first conducts a broad survey among construction professionals to assess adoption levels, analysed statistically. This is followed by qualitative interviews with senior industry experts, analysed thematically to uncover deeper insights and contextual factors. Studies conducted reveal that digital adoption in safety is emerging but remains inconsistent, influenced by factors such as digital maturity, perceived return on investment, and government support. The study aims to deliver a practical framework that guides construction stakeholders in integrating digital safety solutions and assists policymakers in fostering a technology-enabled, safer construction environment across India.

**Keywords:** Digitalization in safety; Statistical analysis; Safety management; Thematic analysis.

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## **Construction Contract Claims and Settlement with Use of AI**

*Chirag verma\*, Abuzar Khan\*\* and Hariprakash K.\*\*\**

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### **ABSTRACT**

In the construction industry, contract administration, claim management, and dispute resolution often cause project delays, financial strain, and legal conflicts. Traditional manual methods for handling claims and arbitration are time-consuming, inefficient, and unpredictable. This research paper explores how Artificial Intelligence (AI) can revolutionize these processes by introducing automation and data-driven decision-making. The study proposes an AI-aided system for claim assessment, clause verification, and risk prediction through the integration of natural language processing (NLP), machine learning, and predictive analytics. Drawing on recent case studies, it evaluates how AI can automate the review of legal documents, identify key contract provisions, and forecast dispute outcomes. Results indicate that AI can significantly reduce resolution time, improve decision accuracy, and enhance transparency in contract enforcement. The paper also discusses implementing an AI-based claim management tool tailored to India's legal and administrative systems. By incorporating real-time data, legal precedents, and predictive support, the proposed framework aims to achieve faster, fairer, and more efficient dispute settlements in the construction sector.

**Keywords:** Artificial Intelligence (AI); Construction claims; Dispute resolution; Contract manage.

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## **Mapping the Risk Landscape of High-speed Rail Projects: A Systematic Literature Review**

*Ranjana Raj\*, Gayathri J. K.\*\* and Preet Gunji\*\*\**

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### **ABSTRACT**

High-speed rail (HSR) projects are exposed to multifaceted risks that can influence financial viability, governance, political continuity, social acceptance, technological resilience, and environmental sustainability. The purpose of this research is to establish a structured understanding of these risks through a comprehensive literature survey and to lay the foundation for future analytical assessment. Adopting a systematic review methodology guided by PRISMA principles, the study screened and refined a wide pool of academic publications to a focused set of 25 papers. Identified risks were classified under six dimensions: financial & economic, organizational & governance, political & legal, social, technological & safety, and environmental. The findings reveal recurring and interdependent risks such as cost overruns, funding uncertainty, land acquisition challenges, political transitions, public opposition, and technical failures that shape project outcomes. Consolidation of diverse risk-related studies provides a one-stop reference for identifying and structuring HSR project risks. Future research can validate the impact of these risks on project performance and further explore their interdependencies to build a deeper understanding of systemic dynamics in HSR projects.

**Keywords:** High-speed rail; Risk assessment; Infrastructure governance; Risk management; Systematic review.

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## **Evaluating the Impact of Contingency Reserve on Quality in Construction Projects**

*Madhumitha S. \*, Manoj S. \*\*, Ramchandran S. \*\*\* and Milind D. Jagtap \*\*\*\**

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### **ABSTRACT**

This is a study that investigates the influences of contingency reserve on performance of quality in construction, broadly focusing on the effectiveness of financial planning supporting risk mitigation and Total Quality Management practices. This research largely aims in establishing a linkage between contingency allocation, its utilization, and overall outcomes of quality in projects. A mix of methods was used in combining literature analysis, surveys from professionals, and a case study of a hotel project towards an interior fit-out project in Chennai to evaluate current practices in contingency estimation and budget management. The findings indicate implementing a risk-based contingency model in projects experiences better quality control, reduced rework, and greater client satisfaction in comparison to those using a traditional fixed percentage. However, delays in approval of funds and poor coordination between quality, finance, planning, and execution departments often hinder the effective application of contingency reserve. This study emphasizes that integration of contingency planning along with quality frameworks and project management tools can enhance construction performance to a great extent, building resilience and long-term sustainability.

**Keywords:** Contingency reserve; Construction quality; Total quality management; Risk-based planning.

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## **A Multi-dimensional Inventory Framework for Construction Materials**

*Abinav E. \*, Gokul Krishna\*\*, Shravan Nair\*\*\* and Arjita Biswas\*\*\*\**

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### **ABSTRACT**

Inventory management is crucial in construction projects, where delays and budget overruns may arise from inefficient and inadequate inventory management techniques. Traditional techniques such as ABC and VED analysis alone are limited by their one-dimensional focus, and they fail to address the complex, multi-layered nature of material management. This study applies a multi-dimensional inventory optimization framework to road infrastructure projects, integrating Analytic Hierarchy Process (AHP) to make the model data-driven, practical, and applicable in the real world. Key inventory management criteria are evaluated through expert assessments using AHP, and their relative importance is identified to obtain the most critical ones and adopt them as the axes of the inventory control matrix. Data collected from subject matter experts within the industry are analyzed to classify the materials and evaluate the model's efficiency and effectiveness in improving material availability, cost efficiency, and project timelines. The final framework will be able to offer a structured, analytical, applicable, and adaptable approach to inventory control, enhancing decision-making and resource optimization in road infrastructure projects.

**Keywords:** Inventory management; Multi-dimensional framework; Analytical hierarchy process.

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## **Integration of Modern Construction Technologies for Enhancing Cost and Schedule Performance in Construction Projects**

*Roumya Mohanty\*, Mehul Singh\*\*, Talha Dabir\*\*\* and Nilesh Patil\*\*\*\**

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### **ABSTRACT**

Managing construction projects is rarely straightforward—tight budgets, fast timelines, and constant surprises come with the territory. Now, with the rise of specialized project management software like R-DASH, ASANA, Plan View, Smartsheet, LEAN, MSP, P6, BIM, and IPD, construction teams are finding smarter ways to track progress, communicate, and control costs. These tools enable real-time monitoring of schedules and budgets, making it easier to catch issues early and adapt to changes. Through direct surveys with project stakeholders, this study explores how familiar professionals are with such software, how easy they find it to use, and the real-world impact these platforms have on project outcomes—from better task tracking to improved risk management and collaboration. While awareness and appreciation of digital tools are growing, the research highlights ongoing challenges: lack of training, hesitance to move away from traditional practices, cost concerns, and fragmented workflows. Integration issues between scheduling and execution data also limit seamless adoption. The study recommends focused training, strategic rollout of software, and greater stakeholder involvement to unlock the full benefits. By addressing barriers proactively, construction companies can leverage software to boost efficiency, lower costs, and deliver projects more reliably in today's fast-paced environment.

**Keywords:** Construction project management software; Cost and schedule performance; Software adoption barriers.

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## **Impact of Construction Logistics Risks on Infrastructure Projects**

*Mayank Choudhary\*, Rounak Mukherjee\*\* and Rajat Raghuvanshi\*\*\**

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### **ABSTRACT**

Construction logistics in Indian infrastructure projects often lead to delays and budget overruns. While previous studies have pointed out common disruptions, there's a noticeable lack of a focused framework that specifically addresses these issues in India. This study aims to bridge that gap by using a hybrid approach that combines the Relative Importance Index (RII) with Fuzzy AHP. It's backed by a structured survey involving over 100 construction and logistics professionals, a review of existing literature, and case studies from various firms. The goal is to pinpoint and rank the logistics risks that arise during the construction phase. The study suggests several feasible mitigation strategies, including low-tech solutions like mobile alerts, regional buffer hubs, and standardised inventory protocols, along with some selective digital tools and a hybrid push-pull procurement model. These strategies can help reduce the risks associated with scheduling and costs. The report wraps up with a practical toolkit and policy suggestions aimed at helping project teams allocate resources more effectively and transition from a reactive approach to a proactive risk management strategy. Plus, this framework can be adapted for use in other emerging economies.

**Keywords:** Construction logistics; Risk management; Relative Importance Index (RII); Fuzzy AHP.

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## Utilisation of AI for Forecasting Price Escalation in Construction Industry

*Atharva Gaikwad\*, Saloni Patil\*\*, Atharva Joshi\*\*\* and Piyush Chandak\*\*\*\**

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### ABSTRACT

Fluctuations in construction material prices present significant challenges in cost estimation, planning, and budgeting of construction projects. To achieve financial stability and make well-informed decisions accurate forecasting of such price variations is necessary. This study utilizes Seasonal Autoregressive Integrated Moving Average (SARIMA) to forecast the Wholesale Price Index (WPI) of crucial construction materials such as Steel, bitumen, cement, bricks, etc. The main objective of this study is to determine the effectiveness and potential usability of this prediction model in predicting the material price trend in the Indian construction context. The data required for the WPI is extracted from the Office of the Economic Adviser database, Government of India. To ensure the quantitative evaluation of the forecast accuracy, the model utilizes the Root Mean Squared Error (RMSE). Moreover, the study aims to explore the correlation between material WPI and macroeconomic factors. The findings will help formulate a reliable forecasting framework that can form the basis to establish the Construction Cost Index (CCI), which can assist in a more precise and data-driven cost management and control in the Indian construction industry.

**Keywords:** Price forecasting; Construction material prices; SARIMA; Wholesale Price Index (WPI); Root Mean Square.

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## **Corporate Social Responsibility Strategies and their Impact on Business Performance in the Indian Construction Industry**

*Mridul Nenwani\*, Chandranshu Likhar\*\* and Sameer Gujar\*\*\**

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### **ABSTRACT**

Corporate Social Responsibility (CSR) has become an essential element of sustainable growth in the construction industry, which faces increasing scrutiny for its social and environmental impacts. This study explores the relationship between CSR strategies and business performance in the Indian construction sector. A mixed-methods approach was adopted, combining quantitative survey responses (n = 190) with qualitative insights from industry professionals. The analysis focused on four CSR dimensions—organizational awareness, community and environmental initiatives, employee engagement, and business outcomes. Statistical results indicated positive perceptions of CSR across firms. Regression analysis revealed that community and environmental CSR activities significantly enhance business performance ( $\beta = 0.179$ ,  $p < 0.05$ ), while awareness and employee-related factors showed positive but insignificant effects. These findings highlight that external, community-focused CSR efforts contribute more directly to firm performance than internal initiatives. The study offers empirical evidence from India's construction industry and emphasizes the strategic role of socially responsible practices in improving organizational reputation and long-term competitiveness.

**Keywords:** Corporate Social Responsibility (CSR); Construction industry; Business performance.

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## Airport Construction Issues and Challenges: Legal Perspective

*Shweta Sulke\*, Sakshi Nannaware\*\* and Satyajit Lenka\*\*\**

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### ABSTRACT

Airports are strategic infrastructure serving as vital nodes in domestic and global transportation networks, contributing significantly to economic growth, regional integration, and urbanization. However, airport planning, design, and construction are inherently complex due to multiple stakeholders, stringent regulations, and high capital investment. This research, titled “Airport Construction Issues and Challenges: Legal Perspective,” systematically explores the legal, regulatory, and contractual challenges affecting project efficiency, timelines, and cost control. It identifies key issues such as land acquisition disputes, environmental clearance delays, compliance with aviation safety standards, and contractual disagreements as primary causes of project overruns. The study also examines the influence of public-private partnership (PPP) frameworks, government policies, and regulatory mechanisms in mitigating these challenges. Employing a qualitative approach, it analyses case studies of major Indian and international airport projects to highlight common legal barriers and effective dispute resolution techniques, including arbitration, mediation, and conciliation. The findings emphasize the importance of a robust legal framework and efficient governance structures to enhance coordination, ensure compliance, and support sustainable airport infrastructure development. This research bridges the gap between legal principles and construction management, offering actionable insights for policymakers, developers, and project managers engaged in complex airport projects.

**Keywords:** Airport construction; Legal challenges; Regulatory compliance; Land acquisition; Environmental clear.

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## **Implementing Agile Project Management in Construction Firms**

*Rutuja Tilekar\*, Harshali Jawarkar\*\*, Kriti Shrivastava\*\*\* and Milind Jagtap\*\*\*\**

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### **ABSTRACT**

This study assesses the application and effectiveness of Agile Project Management (APM) approaches in the construction industry, famous for its uncertainty and reliance on traditional linear methods e.g. the Waterfall model. Research Objective: The study surveys two Agile frameworks, Scrum and Kanban. Scrum is a repetitive model based on sprints that divides projects into 2 to 3-week increments. It assigns specific roles to improve collaboration. Kanban is a visual, flow-based system that uses boards with columns (to-do, in progress, done) and a work-in-progress (WIP) system. This setup helps improve workflow efficiency and prevents overload. Challenges: Experts note resistance to change, hierarchical structures, and tight awareness as key barriers to adopting Agile methods in construction. Case Studies: Execution of Scrum at first case study enhanced teamwork, flexibility, and decision-making through everyday stand-ups and sprint reviews. Kanban adoption at second case study demonstrated smoother workflows, better prioritization, transparency, and efficient resource allocation. Conclusion: The study assumes that adopting Agile Project Management in construction is feasible and can remarkably enhance adaptability, collaboration, and overall project effectiveness across the supply chain.

**Keywords:** Agile; Scrum; Kanban; Project management; Agile in construction Industry.

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## **Analysis of Cost Overruns and Time Delays in Ahmedabad-Gandhinagar Metro Rail Project**

*S. Faizur Rahman\*, Neet Kathiria\*\*,  
Kush Udecha\*\*\* and Raghavendra Kumar\*\*\*\**

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### **ABSTRACT**

Metro rail projects are complex urban infrastructure ventures that frequently face time delays and cost overruns due to Labor Shortages and Subcontractor Issues, Contractor Performance Issues, Security Incidents Affecting Operations. This study identifies the key factors contributing to Schedule Slippages and Budget Escalations in metro projects, focusing on the Gandhinagar-Ahmedabad Metro (GMRC). Major causes include delays in land acquisition, utility shifting, design changes, inter-agency coordination issues, and ineffective procurement risk management. To address these challenges, the research emphasizes enhancing stakeholder engagement and procurement management. It proposes replacing GMRC's existing Linear Sequential Workflow with an Iterative Feedback Loop Workflow that promotes continuous consultation, feedback integration, and adaptive decision-making across planning, design, and construction stages. The study employs literature review, case analysis, and stakeholder workflow comparison to derive practical recommendations. The iterative model enables early conflict detection, Strengthens Collaboration among Stakeholders, and improves communication transparency. Combined with strategic procurement practices, this approach minimizes rework, disputes, and cost escalation-contributing to timely, efficient, and sustainable metro project delivery.

**Keywords:** Budget escalations; Gandhinagar-Ahmedabad Metro (GMRC); Iterative feedback loop workflow.

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## **Investigating the Feasibility of Modular Construction in Affordable Housing in India**

*Spriha Chakravorty\* and Jigar Waghela\*\**

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### **ABSTRACT**

Rapid urbanisation in India has heightened the need for affordable housing and highlighted the shortcomings of traditional construction as time-consuming, resource-intensive, and prone to cost and schedule overruns. Modular construction, characterised by off-site manufacturing and on-site assembly, has emerged as an alternative approach with potential advantages in construction speed, quality and sustainability. Primary data was gathered through semi-structured expert interviews with diverse stakeholders across the construction industry. The analysis of the qualitative data identifies the existing patterns related to the technical performance, cost and time dynamics, industry readiness, regulatory environment, financing perception, and market acceptance. The results show that there is a high degree of consensus regarding the technical feasibility, time efficiency, and quality consistency of modular construction. Feasibility, however, is informed by lifecycle economic factors as opposed to initial cost saving and is also subject to the scale of the project, institutional familiarity and maturity of the ecosystem. The major challenges are the lack of clarity in regulations, conservative financing, poor industry standardisation, skill shortage, market perception, and technological constraints. This paper suggests a strategic model that would assist in aligned policy, industry, financial, and market intervention to facilitate scalable implementation of modular construction of affordable housing in India.

**Keywords:** Modular construction; Affordable housing; Pre-fabrication.

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## Comparative Analysis of Township Projects in Pune, India

*Avinash Purandare\*, Suhreet Saha\*\*, Bhuvanesh Koli\*\*\* and Aishwarya Mane\*\*\*\**

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### ABSTRACT

In India, urbanization has grown very fast with a lot of pressure on housing, infrastructure and governance. Old fashioned municipal systems have found it hard to keep up with this and so township projects have become an example of integrated and sustainable development. This paper, which is titled Comparative Analysis of Township Projects in Pune, India, will look at how the various township projects have evolved, the type of projects, policy frameworks, and the performance of these townships that include Magarpatta City, Amanora Park Town, Blue Ridge, Life Republic, and Nanded City. It evaluates such dimensions as land use planning, infrastructure, affordability, sustainability, connectivity and inclusiveness. The results indicate that townships enable decentralization and encourage modern facilities although they have a problem of exclusivity, cost and environmental implication. The article brings out the role of these developments towards sustainable and inclusive urban development and gives suggestions to policymakers and developers to develop future models of townships that are economically feasible, socially just and environmentally friendly.

**Keywords:** Urbanization; Sustainability; Integrated development; Affordability; Inclusiveness.

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## **An Analysis of the Impact of Quality Management Practices on Residential Construction Project Performance**

*Pranjal Mukherjee\*, Viraj Mehata\*\*, Atharva Kale\*\*\* and Mangesh Kapote\*\*\*\**

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### **ABSTRACT**

Total Quality Management remains a critical yet underutilised philosophy within the Indian construction sector. Despite its global success, regional projects continue to suffer from fragmented procedures and significant financial losses, necessitating a customised quality strategy tailored specifically for the operational constraints of Small and Medium Enterprises (SMEs). This study used a mixed-methods approach by collecting survey data from 79 participants in the industry to connect the gap between theory and practice. The data was processed using the diagnostic visualisation tools (Power BI) for the identification of patterns in the industry and statistically validated using the statistical tools of Pearson Correlation and One way ANOVA Tests to provide empirical correlations using SPSS software. The result highlights that almost 50% of businesses within the construction industry are reluctant to pursue quality improvement programs, due in large part to the perceived additional expense associated with such efforts. Conversely, the analysis demonstrated a strong negative correlation between spending on quality and the amount of waste produced. More specifically, the research identified that the largest contributor to material waste greater than 10% of total cost is a result of failure to allocate adequate funds to quality assurance activities.

**Keywords:** Construction industry; Quality methodology; Small to medium-sized construction businesses (SMEs); TOT.

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## Climate Resilient Infrastructure in PPP Road Projects

*K. V. Naga Vamsee\**, *A. Rohan Kumar Subudhi\*\**,  
*Shubham Paldiya\*\*\** and *Smita K. Patil\*\*\*\**

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### ABSTRACT

The increasing frequency of extreme weather events due to climate change poses significant threats to road infrastructure, highlighting the need for resilient and adaptive systems. Public-Private Partnerships (PPPs), widely used for road development, can integrate resilience through innovative financing, adaptive contracts, and risk-sharing mechanisms. However, current PPP frameworks are largely financially driven and often lack provisions for climate risk assessment and long-term sustainability. This study proposes strategies to enhance climate resilience in PPP road projects by incorporating risk-based planning, flexible contractual structures, and stakeholder collaboration. Through an extensive literature review, global case studies, and proposed expert insights, key challenges such as limited climate data, rigid contracts, institutional gaps, and high initial costs are identified. The research also highlights best practices like the ROADAPT-RIMAROCC framework and flood adaptation models that improve lifecycle performance and reduce disruptions. The findings underline the need for resilience integration across all project stages—planning, procurement, design, construction, and maintenance—to ensure PPP road infrastructure remains sustainable, cost-effective, and aligned with global climate goals and SDGs.

**Keywords:** Climate resilience; Public-Private partnerships; Road infrastructure; Risk-based planning; Sustainable.

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## **Crack Propagation in Precast Element During Transportation**

*Jai Sai Tenepalli\*, Palak\*\*, Parveen Karan\*\*\* and Jay Satish Brahmabhatt\*\*\*\**

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### **ABSTRACT**

Precast concrete element transportation is vital to modern construction logistics, especially in urban areas like Pune where prefabrication is rapidly expanding. Although structurally strong, precast components are vulnerable to handling pressures, vibrations, and shocks during transit. This project statistically evaluates the dynamic loads experienced by precast elements through a vibration monitoring module using an MPU-6050 inertial sensor (accelerometer and gyroscope) integrated with a GPS module. The system records real-time triaxial acceleration, angular motion, and geolocation data for analyzing vibration characteristics such as peak acceleration, RMS acceleration, frequency spectrum, and shock events. Experimental runs on industrial, highway, and urban routes help identify key vibration zones, dominant frequencies, and shock intensities under varying road and vehicle conditions. Findings enable the development of a Vibration Severity Index (VSI) to classify stress levels on precast components during transport. The study reveals how road conditions, support arrangements, and transport speeds influence vibration response. Recommendations are proposed to minimize structural distress through optimized routes, vehicle speeds, and cushioning materials. This research demonstrates how low-cost sensor technology and data analytics can enhance quality assurance, risk assessment, and supply chain efficiency in the precast construction industry.

**Keywords:** Vibrations; Cracks; Precast; Transportation.

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## **Effects of Contract Documents on Project Delays and Cost Overruns in Construction Projects**

*Sai Jyoti Pradhan\*, Sushil Kumar Swain\*\* and Anjan Pratapsingh\*\*\**

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### **ABSTRACT**

This study is being conducted in order to investigate the influence of contractual frameworks on construction project performance, emphasizing that the quality and clarity of contracts play a decisive role in minimizing delays and disputes. Through a combination of literature review and questionnaire-based analysis among construction professionals, the research identifies that ambiguities in risk allocation, payment terms and scope definition are primary contributors to cost and time overruns. The findings will highlight how contractual clauses and terms impact on construction projects and thereby stating what clauses can cause delays and cost overruns on construction projects. We A questionnaire was prepared, which has various questions related to what are the clauses which lead to delays and cost overruns. These questions will give us data of which all clauses create these problems and thereby analyse these data and highlight what all clauses are creating discrepancies and thereby try to suggest some remedial clauses which could be implemented to rectify this discrepancy caused.

**Keywords:** Contractual clauses; Project delays; Cost overruns.

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## **Assessing the Feasibility of Co-operative Housing Society Redevelopment in Maharashtra: Challenges and Opportunities**

*Ameya Patil\* and Kul Vaibhav Sharma\*\**

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### **ABSTRACT**

In many cities across Maharashtra, especially Navi Mumbai, cooperative housing societies (CHSs) have long provided affordable homes and a sense of community. However, with time, many of these buildings have become old, unsafe, and inadequate for modern living. Redevelopment has therefore become a vital way to renew these neighbourhood's and improve residents' quality of life. This study explores how feasible CHS redevelopment really is, by looking closely at its legal, financial, and social aspects. At the same time, it highlights the opportunities redevelopment can bring modern infrastructure, better amenities, higher property values, and more sustainable urban environments. Through a review of policies, literature, and case experiences, the study identifies key factors that influence successful redevelopment. It emphasizes the importance of transparent decision-making, cooperation among stakeholders, and the growing potential of self-redevelopment models. In conclusion, the research offers practical recommendations for policymakers, developers, and housing society members to make redevelopment more inclusive, financially sound, and sustainable for the future of Maharashtra's cities.

**Keywords:** Co-operative Housing Society (CHS); Redevelopment; Urban regeneration; Maharashtra; Navi Mumbai.

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## **Adoption of Circular Economy in CRIP Sector**

*Karthik Kumar Agirisetti\* and Thanuj Sai Andhavarapu\*\**

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### **ABSTRACT**

The construction sector plays a central role in economic development while simultaneously exerting significant pressure on natural resources and the environment. In India, rapid urbanization and large-scale infrastructure development have intensified concerns related to construction and demolition waste, material inefficiency, and environmental impacts. This study examines the adoption of Circular Economy (CE) practices in the Indian Construction, Real Estate, Infrastructure, and Project (CRIP) sector and analyses their effects on operational performance, competitiveness, and organizational performance. A quantitative research approach was adopted using primary data collected through a structured questionnaire administered to 30 industry professionals. Descriptive statistics, reliability analysis, correlation analysis, and regression analysis were employed to test the proposed hypotheses. The findings indicate that supply chain and organizational readiness significantly influence circular economy adoption, while perceived barriers play a critical role in shaping adoption decisions. Furthermore, circular economy adoption positively affects operational performance, which subsequently enhances competitiveness and overall organizational performance. The study highlights the strategic importance of circular economy practices in improving sustainability and performance outcomes in the Indian construction sector.

**Keywords:** Circular economy; CRIP sector; Supply chain; Barriers; Adoption.

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## **Supply Chain Risks in Modular Construction: A Comprehensive Literature Review**

*Dhinaharan R. \*, Ritesh Thute\*\* and Rachit Phundipalle\*\*\**

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### **ABSTRACT**

Modular construction offers substantial advantages in efficiency, sustainability, and cost control; however, its success is critically dependent on robust supply chain management. The highly prefabricated and interdependent nature of modular projects introduces complex vulnerabilities that can disrupt project performance. This study systematically investigates the risks associated with supply chain management in modular construction and evaluates their influence on key project parameters. The study employed the PRISMA methodology to systematically identify, screen, and select relevant literature for comprehensive analysis. A thorough review spanning 2015 to 2024 consolidates current research to identify prevailing themes affecting cost, schedule, quality, and operational stability. Building on this synthesis, a quantitative assessment framework employing a Likert-scale survey is proposed to measure the relative impact of these risks. The results are expected to serve as a practical foundation for designing effective and resilient supply chain risk management approaches, thereby supporting policymakers, project managers, and industry stakeholders in enhancing decision-making. Ultimately, the study contributes to strengthening supply chain resilience and promoting the sustainable adoption of modular construction practices.

**Keywords:** Supply chain risks; Modular construction; Risk management.

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## **Integrated Quality and Progress Tracking in Construction Projects using BIM**

*Harshita Shetty\*, Sakshi Gajbhiye\*\* and Krutika Bind\*\*\**

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### **ABSTRACT**

Construction projects are generally plagued by inflated costs and delayed delivery, usually the results of poor communication between teams or lack of supervision. This study is intended to address such issues through a system developed by Building Information Modelling (BIM) that can be used to enhance quality management and progress tracking. The research employs several methods such as analysis of existing literature, conducting surveys of industry professionals, and examining major construction projects reports. The results clearly show that integrating BIM with 3D scanning and cloud-based tools reduces rework drastically and defect detection has now become less complicated. However, some of the limitations in using these technologies are staff deficiency and incompatible software. Most importantly, it is revealed that superimposition of the 3D scan data on the BIM models will enable very accurate measurements of the deviations between as-built and as designed; hence, transparency and quality are promoted. In this paper, an explanation of how digital quality control through BIM adoption can be implemented for project progress optimization is included, besides pointing out the potentials of this technology in bringing automation into the Indian construction industry.

**Keywords:** Building Information Modelling (BIM); Quality management; Progress tracking; Defect detection.t

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## **Challenges in Adopting Green Building Materials: A Study on Cost and Schedule Implications**

*Shreeganesh Deshmukh\*, Akash Nagargoje\*\*, Sanket Patil\*\*\* and J. C. Edison\*\*\*\**

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### **ABSTRACT**

This research examines the key issues that have been preventing the extensive use of green building materials (GBMs) within the construction sector, with emphasis on their cost and scheduling implications. Using a methodology of a questionnaire survey among 29 industry experts and the Relative Importance Index (RII) application, the study finds that High Initial Cost (RII = 0.724) and Lack of Trained Labor/Contractor Knowledge (RII = 0.690) are the most prominent barriers. Schedule impacts are mainly influenced by Long Lead Times for Procurement (RII = 0.690) and Certification/Compliance Processes (RII = 0.655). The research also identifies that most professionals see a cost premium of 11-30% for GBMs, which tends to lower project feasibility for typical projects. In order to overcome such difficulties, respondents often use measures like Life-Cycle Cost Analysis (LCCA), value engineering, and buffer time in schedules. The report ends by suggesting targeted mitigation measures such as intensified supplier coordination, government policy support, and industry-wide skill development to speed up the use of sustainable materials in mainstream construction practices.

**Keywords:** Green building materials; Sustainable materials; Construction sector; Cost implications.

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## **The Financial and Environmental Burden of C&D Waste: An Analysis for Sustainable Practice**

*Vishal Bhalla\*, Himanshu Verma\*\*, Satyam Verma\*\*\* and Sakshi Shiral\*\*\*\**

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### **ABSTRACT**

The construction industry is one of the largest consumers of natural resources and a major contributor to solid waste generation globally. This contributes around 20-30% C&D waste in which 70-80% is mainly concrete and masonry. If Construction and demolition (C&D) waste not managed properly this will leads to serious environmental, social and economic impacts. This research examines models for estimating construction site waste and includes cost estimation model to assess financial impact on the project. Costs are estimated based on the number of trucks required, collection, transportation and disposal. This model helps estimating the financial burden of waste management in construction. Analysis of such data reveals the strong link between waste volume, logistics and disposal costs. It also identifies inefficiencies in current practices and highlights major waste components which contributes to total volume. This research also explores alternate sustainable disposal methods which includes reuse of demolition waste, recycling of materials and implementation of onsite segregation of waste. By adopting these, will significantly reduce the impact of construction activity on the environment. In conclusion, this study aims to provide construction professionals and stakeholders with the insights needs to develop more efficient strategies for waste reduction promote sustainable construction practices.

**Keywords:** C&D Waste; Cost assessment; Reuse and recycling.

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## **Feasibility of Bitumen and Concrete Blend in Construction of Roads**

*Akash Patil\*, Digvijay Patankar\*\* and Vishwajeet Deshmukh\*\*\**

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### **ABSTRACT**

The road construction industry faces persistent issues such as cracking, rutting, and potholes in conventional bitumen and concrete pavements, leading to frequent repairs and high maintenance costs. To address these challenges, this study develops a bitumen–concrete hybrid pavement system, a joint-less, durable, and low-maintenance alternative combining the flexibility of bitumen with the compressive strength of concrete. The research investigates the feasibility, mechanical performance, and interfacial bonding behavior of hybrid mixes under laboratory conditions. Various mix proportions of bitumen and concrete were tested with bonding agents, chemical admixtures, and surface treatments to improve adhesion. Standard tests, including compressive, flexural, and tensile strength along with water penetration, were conducted to assess durability. Optimization of mixing temperature, bitumen viscosity, and surface treatment achieved a stable and well-bonded composite. The optimized hybrid mix demonstrated enhanced strength, reduced permeability, and better durability than traditional pavements. This study confirms the viability of a sustainable hybrid pavement system that minimizes surface defects, extends service life, and offers a cost-effective solution for modern road infrastructure.

**Keywords:** Concrete hybrid pavement; Interfacial bonding; Durability; Sustainable pavement design.

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## **Streamlining the Start Line: A Comparative Synthesis of Pre-construction Permissions and Their Influence on Project Timelines for Pune and Mandi**

*Shreyash Bante\*, Shrihari Nahulikar\*\* and Surya Sharma\*\*\**

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### **ABSTRACT**

In India, obtaining various permissions—including land records, planning sanctions, statutory NOCs, and service clearances—determines when a project can proceed from design to completion. This study examines pre-construction approval procedures in two different settings: the Himachal Pradesh hilly district of Mandi and the metropolitan area of Pune. We examined previous research and integrated it with firsthand evaluations of regional practices and digital systems using a comparative and exploratory methodology. The study suggests reforms like early NOC mapping, integrated single-window platforms, standardized timelines with accountability clauses, and capacity building for applicants and officials in order to address these problems. These actions can speed up project completion, improve predictability, and reduce time as well as holding costs. This comparative synthesis contributes empirical clarity on how place-specific factors and institutional design jointly shape the pre-construction timeline and offers practical, evidence-based steps for planners and policymakers seeking to shorten the often-overlooked “start line” of construction projects.

**Keywords:** Pre-construction approvals; NOC; Project delays; Single window; Comparative synthesis.

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## **Quality Related Risks in Highrise Buildings**

*Lokesh Dacharla\*, Sahil Kumar\*\* and Utsav Soni\*\*\**

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### **ABSTRACT**

High-rise structures entail intricate designs, superior building materials, and accomplished workmanship, making sound quality management highly critical. Small construction defects have the potential to impact the building's quality of durability and safety, besides escalating overall construction cost. This research seeks to discover, synthesize, and mitigate prominent quality risks inherent in high-rise construction projects. A structured research method is employed where literature review, questionnaires, and expert opinions are utilized to gather credible information. Risk analysis is conducted using techniques such as the Risk Matrix and Failure Modes and Effects Analysis (FMEA) to categorize and assess possible quality concerns. Findings are confirmed and authenticated using real-case scenarios and expert opinions. With these outcomes, a realizable framework for managing quality risk effectively is constructed where preventive measures are implemented and quality control during construction is enhanced. The framework also aims to improve construction project performance, guarantee structural security, reduce rework and cost escalation, and accommodate safe and sustainable construction.

**Keywords:** Construction quality control; Risk analysis; Risk mitigation.

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## **Assessment of Construction Quality through Drone Technology – Comparing Drone-based and Ground-based Inspections**

*Rahul Bandgar\*, Syeda Aisha Banu\*\*,  
Apeksha Ghate\*\*\* and Utkarsh Chaudhary\*\*\*\**

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### **ABSTRACT**

Abstract In recent years, drones have become an important tool in the construction industry, helping project teams monitor site progress and improve safety. However, their use for assessing construction quality is still not fully understood. This study explores how accurately drones can evaluate on-site construction quality compared to traditional manual inspections. The focus is on identifying which aspects such as surface finishing, alignment, and workmanship can be reliably observed through drone images and videos, and which still require close human inspection. By comparing the findings from drone-based and ground-based inspections on selected sites, the research highlights the strengths and limitations of drone technology in quality monitoring. The study also suggests practical ways to improve drone-based inspections through better image capture, and standardized guidelines. Overall, the research aims to bridge the gap between technology and human expertise, helping construction teams use drones more effectively for quality control and decision-making to complete the project.

**Keywords:** Drone technology; Construction quality; Inspection; Quality control.

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## **Understanding Road Safety Problems Faced by Vulnerable Road Users**

*Sri Harini Reddy Chiluka\*, Yashraj Jadhav\*\* and Preeti Sardar\*\*\**

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### **ABSTRACT**

Road accidents have become a critical urban safety concern in rapidly growing cities like Pune. Rising vehicle ownership, inadequate road design, and weak enforcement have increased vulnerability, particularly for pedestrians, cyclists, and two-wheeler riders. This study aims to identify accident hotspots, analyze causative factors, and propose practical, evidence-based solutions to improve road safety. Using Geographic Information Systems (GIS), high-risk locations are mapped and classified into Red, Orange, Yellow, and Green zones based on accident frequency and severity. Key linear hotspots include the Mumbai-Pune Highway, Pune-Nashik Highway, and Aundh-Ravet Road, while major junction hotspots are Nigdi Chowk, Kasarwadi Chowk, and Bhosari Chowk. Primary causes identified are over speeding, poor road geometry, insufficient pedestrian facilities, inadequate lighting, and weak enforcement. Short-term interventions involve engineering corrections at blackspots, stricter enforcement of speed limits and helmet use, and improved pedestrian crossings. Medium-term measures include AI-based traffic monitoring and establishing a permanent Road Safety Cell, while long-term strategies focus on developing an Intelligent Traffic Management System and strengthening non-motorized transport infrastructure. By integrating spatial analysis, behavioral studies, and field observations, this research proposes a comprehensive, evidence-driven approach to enhance road safety, aiming to reduce accidents and foster a safer, sustainable urban transport environment.

**Keywords:** Road safety; Accident hotspots; GIS mapping; Traffic management; Vulnerable road users.

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## **Utilization of Construction & Demolition (C&D) Waste and Plastic Fiber for Production of Geopolymer Paver Blocks**

*Yash Diwase\*, Pareexit Timmavagol\*\*,  
Anjali Khandare\*\*\* and Mohammed Rihan Maaze\*\*\*\**

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### **ABSTRACT**

The rapid urbanization of India has given rise to increasing Construction and Demolition (C&D) waste and a subsequent rise in the plastic waste, which presents significant environmental challenges. This study aims at constructing sustainable geopolymer paver blocks of high performance through the use of C&D waste. The geopolymer binder is developed with fly ash, concrete sludge and an alkaline activator consisting of sodium hydroxide (NaOH) and sodium silicate (Na<sub>2</sub>SiO<sub>3</sub>). The study focuses on producing M30–M35 grade paver blocks that meet IS 15658:2006 (PRECAST CONCRETE BLOCKS FOR PAVING — SPECIFICATION) for light vehicle and pedestrian purposes. The tests carried out in the laboratory include compressive strength, water absorption and density tests, which meet specifications. It has been demonstrated that the geopolymer paver blocks perform either equivalently or better than cement paver blocks, while also providing benefits beyond the environmental impact and cost. The study focuses on sustainable construction and net waste reduction through circular material use.

**Keywords:** Geopolymer concrete; C&D waste; Plastic fibers; Paver blocks; Sustainable construction.

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## **Assessing the Causes and Mitigation Strategies of Delays in Indian Infrastructure Projects: An RII and Factor Analysis Approach**

*Jatin Jhalniya\*, Pranshu Agrawal\*\* and Mahima Dohare\*\*\**

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### **ABSTRACT**

This research thoroughly examines the reasons and delay mitigation for delays in India's rapidly expanding infrastructure projects in the construction of roads and bridges. A systematic questionnaire survey of 65 construction experts was evaluated based on the Relative Importance Index (RII) and Exploratory Factor Analysis (EFA). Results indicate the most significant delay causes are material-related problems (RII = 0.562), site management problems (RII = 0.555), and contractor inefficiencies (RII = 0.506). Land acquisition delays (RII = 0.68) are the major delays for road projects, and design errors (RII = 0.55) are for bridges. Factor analysis formed four clusters of delay causes: Resource & Supply Chain, Government & External, Contractor Management, and Design & Planning. The research further suggests practical mitigation measures with a focus on proactive coordination among various project stakeholders, trustworthy supply chains for materials, and technology such as BIM to improve overall project efficiency and timely completion in India's dynamic infrastructure industry.

**Keywords:** Construction delays; Infrastructure projects; Relative Importance Index (RII); Factor analysis.

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## **Stakeholder Management in Pune Metro: A Comprehensive Literature Review**

*Amit Hiray\*, Swami Dhatrak\*\*,  
Mayuresh Shrimangale\*\*\* and Vedant Munnarwar\*\*\*\**

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### **ABSTRACT**

The Pune Metro is positioned as a flagship urban mobility project where technical delivery alone is insufficient without robust stakeholder participation, underscoring the significance of participatory governance for sustainable, inclusive infrastructure outcomes in fast-growing Indian cities. The literature-based review sets objectives to systematically map stakeholder groups, code their roles and interactions, and evaluate influence via a Power–Interest matrix while assessing engagement typologies across inform, consult, involve, collaborate, and empower stages throughout the project lifecycle. Key findings indicate that multi-channel communication, Metro Samvad forums, formal feedback loops, and institutionalized grievance mechanisms fostered trust, inclusivity, and timely dispute resolution, yet gaps persist in translating consultation into empowerment, bridging the digital divide for the poorest, and sustaining post-resettlement engagement with displaced families. The review recommends standing stakeholder committees, integrated traditional–digital outreach for accessibility, continuous post-implementation reviews, and third-party audits of grievance outcomes, contributing both to academic understanding of stakeholder governance and to practical management guidance for authorities and policymakers pursuing inclusive urban transformation.

**Keywords:** Pune metro; Stakeholder management; Literature review; Power interest matrix.

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## **Homebuyer Perception and Adoption Pathways for Modular Housing in Pune, India**

*Pradhyumna M. \*, Germark Fenzking N. \*\* and Sai Srujan K. \*\*\**

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### **ABSTRACT**

The Indian housing sector is witnessing a gradual shift toward modern construction technologies such as modular and prefabricated systems. Despite their technical and economic advantages, adoption among homebuyers remains limited. This study applies the Theory of Purchase Intention (TPI) to understand the psychological and perceptual factors influencing urban homebuyers' intention to adopt modular housing in India. A structured questionnaire based on TPI constructs — Perceived Value, Perceived Risk, Trust, Product Knowledge, and Purchase Intention — was administered to potential homebuyers. Data were analysed through descriptive statistics, reliability testing, correlation, and regression analysis. The results indicate that Perceived Value, Trust, and Product Knowledge significantly and positively influence purchase intention, while Perceived Risk has a negative impact. The findings suggest that while homebuyers recognize the benefits of modular housing, concerns related to durability, resale value, and unfamiliarity continue to hinder adoption. This research contributes to existing literature by adapting the Theory of Purchase Intention to the Indian real estate context and provides actionable insights for developers and policymakers to enhance buyer trust, reduce risk perception, and improve awareness through targeted communication strategies.

**Keywords:** Prefab; Precast; Modular housing; Homebuyers perspective.

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## **Comprehensive Delay Analysis in Construction Projects: Causes, Analytical Frameworks and Technological Advancements**

*Pranav Aher\*, John Ramalingam\*\*, Aditya Thorat\*\*\* and Anil Agarwal\*\*\*\**

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### **ABSTRACT**

Delays in construction projects remain a significant challenge affecting time, cost and project performance globally. This paper examines the causes, impacts and mitigation strategies of project delays by reviewing studies from India, Egypt, UK, Kuwait and other regions. Common causes include poor planning and scheduling, weak site management, design errors, financial issues and external factors such as regulatory changes and supply chain disruptions. Quantitative tools such as the Relative Importance Index (RII), regression analysis and probabilistic modelling help identify and rank these factors. Advanced techniques such as Window Analysis and Time Impact Analysis improve accuracy in evaluating concurrent and compensable delays. However, the absence of standardized methodologies and limited technological integration hinders effective delay analysis. Emerging technologies such as Building Information Modelling (BIM), blockchain and artificial intelligence can enhance accountability, automate analysis, and support dispute resolution. The study concludes that integrating digital platforms and data driven control systems can substantially reduce delays and improve project performance. Future research should emphasize real time delay assessment frameworks and context specific mitigation strategies suited to regional construction environments.

**Keywords:** Construction delays; Building Information Modelling (BIM); Time impact analysis; Mitigation strategi.

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## **Comparative Study of Construction Safety Standards between Developed and Developing Countries**

*Shilpa Jadhav\*, Pauravi Nimaiyar\*\* and Pratiksha Mayekar\*\*\**

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### **ABSTRACT**

Construction Safety is the fundamental aspect, it forms the backbone of construction industry, ensuring worker welfare, minimizing accidents, project quality and enhancing overall productivity. Despite growing awareness of Construction safety and its importance, significant disparities in safety standards enforcements and monitoring exists between the Developed and developing countries. This study, titled “Comparative Study of Construction Safety Standards between Developed and Developing Countries” urges to identify the differences across the countries and bridge the gap. This study employs Mixed-Method approach, combines Qualitative and Quantitative methodologies to acquire holistic insights. The data was collected through structured interviews with construction professionals and surveys via Google forms. This study focuses on parameters, including existence of safety regulations, effectiveness of training, frequency of meetings, adherence to standards, and the prevailing safety culture within organizations across countries. The study highlights that developed countries follow a structured approach to construction safety through regular training, tool-box meetings, strict policy enforcement, and corrective actions for non-compliance. The research paper assert that understanding these differences is crucial in improving safety standards in developing countries. Best practices from developed countries, such as audits, continuous training, and enforcement of safety regulations will lead to stronger safety culture in Construction Industry.

**Keywords:** Construction safety; Safety standards; Developed vs developing countries; Safety culture; Risk management.

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## **Comparative Analysis of Contractual Frameworks for Risk Allocation in Road Infrastructure Tenders**

*Sandesh Uniyal\*, Saket Bawane\*\* and Amith Sanjay\*\*\**

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### **ABSTRACT**

The Indian Road infrastructure industry has experienced a booming development due to the rise in government spending and the application of the public-private partnership schemes. Consequently, efficient risk sharing has become paramount in reducing project delays, cost overruns, and financial strain. This paper combines a comparative analysis of risk allocation practices in three key contract systems in India: Engineering, Procurement and Construction (EPC), Build-Operate-Transfer (BOT), and the Hybrid Annuity Model (HAM). The study will be conducted through a structured questionnaire survey involving key stakeholders in the industry, such as contractors, consultants, concessionaires, and government representatives. The survey encompasses the perception of the stakeholders regarding pre-construction risks, construction and cost risks, financial and revenue risks, regulatory issues, dispute resolution mechanisms, and the overall project performance. The responses obtained are examined to compare risk distribution among the stakeholders of the different contractual models. The research seeks to pinpoint unmet needs in the current practice of risk allocation and assess the idea of whether hybrid models of contracting offer more equitable risk-sharing arrangements. It is anticipated that the findings will aid in improving policies and enhancing the creation of more efficient and sustainable tendering frameworks for highway infrastructure projects in India.

**Keywords:** Risk allocation; Road infrastructure tenders; EPC; BOT; Hybrid Annuity Model (HAM).

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## **Evaluating Cost Management Practices in Construction Projects: Enablers, Barriers and Performance Implications**

*Rupesh Ahire\*, Ruchika Sahu\*\*, Pranav Kumar\*\*\* and Prahlad R.\*\*\*\**

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### **ABSTRACT**

The construction industry has continued to struggle to deliver projects as planned in both cost and time. This thesis evaluates project performance in terms of cost and schedule through the means of Earned Value Management (EVM) which incorporates a project scope with time & cost parameters to evaluate project performance. Data for the study is obtained from a survey of construction industry participants & from a case study of construction project uses project cost records, earned value information & project policies. The method evaluates common EVM metrics such as Cost Performance Index (CPI), Schedule Performance Index (SPI), & Cost Variance (CV) to identify cost & schedule impacts & inefficiencies in the project delivery process. A root-cause analysis is conducted on factors related to cost and schedule overruns, including changes in design, improper resources deployment, material delays, and provisioning activities affected by planning. This investigates the use of Standard Cost Coding (SCC) for improved cost control and reporting in real time, and control of project costs. The intended outcomes of the study to develop a systematic and structured process for evaluation of project performance, improve accuracy of project forecasting, and provide recommendations for improved cost governance and decision-making in construction projects.

**Keywords:** Cost management practices; Construction industry; Project performance; Earned Value Management (EVM).

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## **Compliances and Non-compliances of Safety Standards on Construction Sites**

*Mayuresh Kumbhar\**, *Shikhar Nigam\*\** and *Aryan Gupta\*\*\**

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### **ABSTRACT**

The construction industry maintains its position as a dangerous sector worldwide because workers face numerous accidents and injuries. The research investigates the ongoing difference between safety standards that exist in theory and their actual execution in construction environments. The research used a quantitative survey of N workers and M site managers from P construction sites together with qualitative in-depth interviews. The research focused on four main areas which included management support for safety and the effectiveness of safety training and PPE availability and proper usage and site-specific safety protocols and current safety practices at the construction site. The research demonstrates that sites with leaders who actively demonstrate their commitment to safety achieve better results in terms of worker adherence to safety protocols. It shows that three main obstacles exist which prevent workers from following safety rules: weak enforcement systems and insufficient training that fails to deliver practical knowledge. The research outcomes led to a three-part intervention plan which includes 1) creating personalized safety training programs with interactive elements and 2) creating a clear accountability framework that connects top executives to ground-level staff and 3) using technology-based systems for compliance tracking through sensors and computer vision.

**Keywords:** Construction safety; OHS compliance; Safety standards; Safety culture; Personal protective equipment.

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## **Barriers to Adopt Potential Stone Waste in Construction Industry a Review**

*Rana Teja Buthagadda\*, Mohammad Altaf Hussain Shaik\*\*,  
Avanish Vuttur\*\*\* and Sudarshan Kore\*\*\*\**

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### **ABSTRACT**

India generates large quantities of stone waste, mainly limestone, sandstone, granite, and marble, across many states. These wastes remain mostly unexploited, creating environmental and economic challenges. From the literature it was depicted that, some of the stones having potential to adopt as building materials. Despite of this, the construction industry is not able to adopt it. To understand the reason for not being used, we have conducted a rigorous analysis. This study investigated the physical, chemical and mechanical properties of these stone wastes and conducted a structured questionnaire survey among construction professionals to assess practical usage and barriers. Analysis of the survey responses highlighted major barriers such as absence of technical guidelines, limited awareness, durability concerns, and high processing costs. Importantly, willingness to adopt stone waste increased greatly up to 90% when supported by clear standards, regulatory approval, and performance validation. The results highlight that establishing standards, policy support, and awareness programs can significantly enhance the sustainable use of stone waste, promoting resource efficiency and eco-friendly construction practices.

**Keywords:** Limestone; Sandstone; Granite; Marble; Waste management.

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## **Corruption in Procurement and Its Effect on Construction Quality**

*Gowtham Nalisetty\*, Srikanth Achini\*\*,  
Vijay Varshit Reddy Dasari\*\*\* and Arpita Mathur\*\*\*\**

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### **ABSTRACT**

This research investigates the impact of procurement system related corruption on construction quality. The study explores how unethical behavior during different phases of project procurement and implementation result in substandard technical quality and reduced durability. Information was collected using qualitative interviews from 14 professionals and employees from the construction industry. The results show that when there is accounting manipulation during procurement processes material exchange follows and subsequent poor supervision as well as a culture of breaking established rules also a result. Private moral disengagement refers to the ethical standards and institutional tolerance refers to systematic acceptance effectively collaborate to create conditions in which corruption becomes normalized. The absence of transparency, accountability and protection for whistleblowers then magnifies this chain, which makes it difficult to identify or detect the issue and also effects the quality. The study concludes by giving special importance to the need for transparent governance, integrity-based procurement evaluation, and also strict quality monitoring mechanisms.

**Keywords:** Construction; Procurement; Corruption; Quality; Ethics.

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## **AI-driven Decision Support Systems for Construction Project Planning and Risk Management**

*Abhigyan Dey\*, Darpan Dutta\*\*, Shwetha S.\*\*\* and P. K. Samanta\*\*\*\**

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### **ABSTRACT**

Construction projects face high uncertainty, fragmented information, and ongoing coordination challenges among stakeholders. Traditional planning and control methods often struggle to process diverse data, anticipate risks, and support timely decisions. Advances in Artificial Intelligence (AI) have led to intelligent Decision Support Systems (DSS) that integrate large-scale project data and generate actionable insights. This research explores how AI-driven DSS enhance construction project planning and risk management through an analytical study of a digitally enabled project. The study examines the impact of machine learning, optimization, and contextual analytics on scheduling accuracy, cost estimation, hazard identification, and adaptive risk response. A structured system architecture illustrates the process from data acquisition to decision execution and organizational learning. Findings show that AI-driven DSS improve decision accuracy, responsiveness, and transparency, but also highlight challenges in data interoperability, governance, and workforce acceptance. The study concludes that AI-enabled DSS can transform construction planning by enabling proactive, data-driven, and resilient project management.

**Keywords:** Artificial Intelligence; Decision support systems; Construction project planning; Risk management.

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## **Impact of Scope Change Management in Cost and Time Overrun of Projects**

*Aswin Chandran S. B. \*, Namitha M. \*\*,  
Ajeesh V. \*\*\* and Sanjay Dnyaneshwarrao Bhoyar \*\*\*\**

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### **ABSTRACT**

Effective scope management is one of the key drivers of successful construction project delivery, ensuring that objectives are achieved within defined time and cost limits. When properly managed, it enhances coordination, stakeholder satisfaction, and overall project performance. However, in practice, construction projects often experience unanticipated scope changes due to evolving client needs, design inconsistencies, and inadequate communication—leading to cost overruns and schedule delays. This study examines the impact of scope change management on project performance, focusing specifically on cost and time outcomes. A mixed-methods approach was employed, integrating literature review, questionnaire survey, and expert interviews. Data analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4 identified four major constructs: Poor Communication, Stakeholder Influence, Errors in Design, and Change in Client Needs. The findings reveal that Project Complexity and Change Control significantly influence cost and time overruns, while Stakeholder Influence and Design Errors show limited impact. The study proposes a practical framework for construction professionals to manage scope changes effectively, thereby enhancing cost efficiency, schedule adherence, and project success.

**Keywords:** Scope change management; Cost overrun; Time delay; Construction projects; PLS-SEM.

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## **Artificial Intelligence in Project Scheduling: A Comprehensive Review of Techniques, Applications and Future Opportunities**

*Mohanranga Siryala\*, Pratik Sahu\*\*, Pratyush Bavanari\*\*\* and Vijaya Desai\*\*\*\**

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### **ABSTRACT**

The growing complexity of modern construction projects demands efficient scheduling to meet time, cost, and quality goals. Traditional methods like Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and Gantt charts, though widely used, struggle to handle uncertainties, dynamic conditions, and limited resources. This study reviews both conventional and Artificial Intelligence (AI)-based scheduling approaches to evaluate their effectiveness in construction project management. A comprehensive literature review of traditional methods identifies their strengths in simplicity and proven reliability but also highlights limitations in adaptability and resource optimization. Emerging frameworks such as the Fuzzy-GERT model, Repetitive Scheduling Method (RSM), and BIM-based scheduling have attempted to improve flexibility and precision. The paper further examines AI-driven techniques—Machine Learning (ML), Deep Learning (DL), Genetic Algorithms (GA), Reinforcement Learning (RL), and Fuzzy Logic—that enhance prediction, optimization, and automation. Integration with Building Information Modeling (BIM) and the Internet of Things (IoT) demonstrates promising potential for intelligent scheduling systems. Ultimately, the study compares both traditional and AI-based methods, offering insights into selecting suitable scheduling approaches based on project characteristics and emphasizing the future integration of AI with conventional techniques for adaptive and efficient project scheduling.

**Keywords:** Artificial Intelligence; Project scheduling; Optimization; Traditional scheduling methods.

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## Study of Corporate Travel Demand for Mumbai Pune Hyperloop Project

*Manideep Amruteswar Thota\**, *Vinay Kumar Burugupalli\*\**,  
*Mrutyunjay Pangannavar\*\*\** and *Nagarjuna Pilaka\*\*\*\**

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### ABSTRACT

The Mumbai–Pune route is one of the busiest travel corridors in India, used by thousands of people every day for work and leisure. With the proposal of the Hyperloop system, which promises faster, safer, and more sustainable travel, it becomes important to understand how much demand this new mode of transport could generate. This study focuses on analyzing the potential travel demand for the Mumbai–Pune Hyperloop. A questionnaire survey is being carried out to collect responses from regular commuters to understand their travel habits, preferences, and willingness to shift to the Hyperloop. The questions are based on key factors such as travel time, cost, comfort, and safety. Secondary data on current transport options are also used to support the analysis. The responses will be examined using statistical methods to identify possible travel trends and user interest. The study aims to provide practical insights for future planning and assessment of high-speed transport options in India.

**Keywords:** Hyperloop; Mumbai Pune corridor; Transportation planning; Travel demand; Mode shift.

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## **Arbitration and Conciliation Act 1996: A Study on Construction Dispute Resolution**

*Sahil Koli\*, Ankit Narwade\*\* and Kushal Hankare\*\*\**

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### **ABSTRACT**

The Indian construction sector is extremely dispute-ridden owing to delay in projects, cost escalation, and contract uncertainty. Arbitration has become the increasingly favored method of dispute settlement owing to its flexibility and quicker resolution in comparison to the conventional litigation. Nevertheless, even though legislative guidance has been offered by the Arbitration and Conciliation Act, 1996 doubts remain as to its functional effectiveness, impartiality, and institutional strength. The present research analyzes to what extent the existing arbitration procedures in India are in conformation with this Act, specifically paying attention to construction dispute-related cases. The primary data were gathered through a combination of both quantitative and qualitative methods. A questionnaire survey, conducted in a structured format, was administered to project managers, arbitrators, advocates, and judges for quantitative analysis, and interviews were conducted for qualitative analysis. The analysis is intended to determine significant issues like procedural delays, inadequate institutional support, and lack of sufficient technological adoption in the arbitration process. The study finally suggests policy-level and institutional changes to improve the efficiency, transparency, and credibility of arbitration as a mechanism of resolving disputes in the Indian construction industry.

**Keywords:** Construction disputes; Arbitration and Conciliation Act 1996; Dispute resolution; Legal reforms.

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## **Block Chain Technology for Document Management in Construction Projects**

*Shubham Patidar\*, Trushik Malviya\*\* and Anirudha Pachore\*\*\**

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### **ABSTRACT**

The construction sector generates and utilizes vast quantities of project documentation, such as contracts, drawings, approvals, invoices, compliance documents and so on. Dated Construction document management systems still exist as fragmented, centralized repositories that are highly susceptible to out-of-sync records, data manipulation and disputes of versioning and approvals. Facing such challenges, this work explores the promise of blockchain adoption as an innovative tool for document management in construction. The objective of the research is to investigate how blockchain can help improve the security, traceability and transparency of documents as well as the efficiency of workflow in construction project lifecycles. Moreover, the study uses a qualitative and exploratory research methodology by integrating an extensive review of existing scholarly articles, industry reports as well as selected cases of blockchain implementation in construction. Preliminary results suggest that a documentary management system, based on blockchain can ensure data integrity because of its immutability, reduce dispute some disputes from single source of truth, and simplify approval processes by implementing smart contracts. Adoption is hindered by difficulties such as the cost of implementation, scalability and lack of regulatory guidance.

**Keywords:** Blockchain technology; Document management; Construction industry; Smart contracts.

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## **Assessing the Determinants of Construction Cost Overruns: An Empirical Analysis of Design, Coordination and Managerial Factors in Indian Projects**

*Purnahari Govind Pegada\*, Nussy Chand Neduri\*\*,  
Kishore Kumar B.\*\*\* and Edison J. C.\*\*\*\**

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### **ABSTRACT**

This study investigates the key factors contributing to cost overruns in construction projects in India by performing an integrated quantitative–qualitative analysis of 42 industry experts, which included architects (23.8%), site engineers (19%), and contractors (14.3%). Respondents evaluated the 17 cost drivers using a 5-item Likert scale (From “No impact at all” (1) to “Very high impact” (5)). Descriptive statistics demonstrate high agreement, and changes of design (Mean = 4.40, SD = 0.65), efficiency of coordination and communication (Mean = 4.36, SD = 0.63), and rework (Mean = 4.34, SD = 0.61) were the three most frequent drivers. The Relative Importance Index (RII) confirms design changes (RII = 0.900), coordination and communication inefficiencies (RII = 0.891) and lack of planning (RII = 0.876) were classified as “Very High Importance.” Thematic analysis of open-ended responses identified pre-construction planning, risk-sharing contracts, and continuous monitoring as important measures in addressing cost overrun and improving project delivery.

**Keywords:** Construction cost overruns; Coordination; Managerial efficiency; Cost control; Indian construction.

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## **Weather Related Delays and It's Impact in Construction**

*Smita Patil\*, Vaishnavi Agrawal\*\*, Abhash Aryan\*\*\* and Akansha Singh\*\*\*\**

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### **ABSTRACT**

Construction projects in India, particularly large-scale infrastructure developments such as highways, bridges, and buildings, frequently encounter delays due to adverse climatic conditions, including monsoons, heavy rainfall, floods, and cyclones. These environmental disruptions not only impede project timelines but also give rise to contractual disputes between contractors and clients, often culminating in costly and time-consuming arbitration proceedings. This study systematically examines a collection of arbitration awards from diverse cases to understand how climatic factors influence dispute outcomes. By analyzing both intrinsic factors such as case specific facts, contractual clauses, and evidentiary strength and extrinsic factors including arbitrator related attributes and underlying psychological considerations - the research aims to uncover patterns that shape arbitral decisions. The insights derived from this analysis will contribute to the development of a predictive framework enabling stakeholders to better anticipate likely outcomes, make informed decisions about pursuing claims, and promote amicable, out of court resolutions. Ultimately, the study aspires to support more efficient dispute management and reduce the judicial burden in India.

**Keywords:** Construction delays; Climatic conditions; Monsoons; Arbitration awards; Predictive framework.

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## **Cost Escalation in Infrastructure Projects: Identifying Causes, Challenges & Recommending Solutions – A Case Study Approach**

*Shaad Ahmad Siddiqui\*, Sahil Bagwan\*\* and Puspen Sahu\*\*\**

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### **ABSTRACT**

The Construction Industry is one of the most complicated and dynamic industries, full of uncertainties. Infrastructure projects, which are time-intensive with project durations of more than 2 years, often face cost escalations during execution. Cost escalation leads to conflicts among stakeholders, legal issues and delays in project delivery. The paper aims to identify the root causes of cost escalation and the challenges associated with it, and to recommend solutions to mitigate the risks of cost escalation using a study of the Wholesale Price Index (WPI) and the Consumer Price Index (CPI). This study investigates the primary causes of escalation, evaluates existing frameworks and proposes solutions through a survey of industry professionals and a comparative analysis of contractual practices across the industry. Survey data shows that statutory approval delays, material price fluctuations, and design changes during execution are the most critical reasons for cost escalation in infrastructure projects. The study recommends combining Proactive Risk Management, Enhanced Planning Rigor, and Strengthened Project Controls to help reduce the risk of cost escalation. Such an approach can mitigate financial risks and ensure the timely project delivery. This study contributes to the development of practical strategies to mitigate cost escalation in infrastructure projects.

**Keywords:** Cost escalation; Wholesale price index; Consumer price index.

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## **IOT (Internet of Things) For Safety and Efficiency in Construction Building Site Operations**

*Unnati Agrawal\*, Anujkumar Bhadane\*\*,  
Ajinkya Vibhandik\*\*\* and Pranil Thorat\*\*\*\**

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### **ABSTRACT**

The construction industry is currently experiencing issues of safety hazards, inefficiencies and project delays. The paper examines how the Internet of Things (IoT) can be used to improve the safety performance and operational efficiency in construction site management. Wearable sensors, drones, RFID systems, and environmental monitoring devices are IoT technologies that allow collecting data in real-time, predicting hazards, and responding automatically to them, changing the conventional approach to safety and workflow. The study adheres to the comparative-based approach to examine the effects of IoT-based systems to traditional systems, in terms of accident reduction, resource optimization, and process optimization. Measurements will be made of the safety compliance and the visibility of operations by use of on-site observations, safety logs and workforce surveys. Other important challenges that are noted in the study are expensive implementation, lack of connectivity, and human resource training requirements. It is expected to result in a framework that illustrates the role of IoT integration in the reduction of human error, enhanced real-time monitoring, and data-driven decision-making. On the whole, the study aims at establishing the concept of the IoT as an essential facilitator of safer, more effective, and technologically flexible construction site operations.

**Keywords:** Internet of Things (IoT); Resource optimization; Operational efficiency.

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## **Relationship between ColabTool Implementation and Performance of Construction Projects**

*Harshali Patil\*, Shreeyash Temghare\*\* and Rajan Karpe\*\*\**

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### **ABSTRACT**

The Indian construction industry continues face persistent challenges such as the project delays, budget overruns, and poor communication among stakeholders. despite digital transformation is gaining impulsion across the world, the implementation of integrated project management technologies within the sector remains limited and inconsistence. This study analyses the effectiveness of ColabTool software in preventing delays and cost overruns in projects by increasing efficiency, strengthening coordination, and improving clarity. A mixed-method design such as, combining qualitative information collect through company visits, interviews, and in-real-time software demonstrations with quantitative analysis carried out with the aid of Smart PLS-SEM. Analysis the relationships between Colabtool implementation, project efficiency and performance of project. This Findings show that the use of ColabTool greatly enhances coordination, access to real-time data, and accuracy in decision-making, results in quantifiable cost, time, and quality performance improvements. The study adds value to digital construction management implementation by presenting empirical insights into the impact of collaborative software tools on project performance.

**Keywords:** ColabTool software; Construction technology; Cost and time optimization; Smart PLS-SEM.

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## **Barriers to 3D Printing Adoption: A Study on India's Construction Sector**

*Anuj Vanjari\* and Nayan Motghare\*\**

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### **ABSTRACT**

The construction industry in India is experiencing a gradual technological transformation, with 3D printing emerging as a promising tool for sustainable and rapid building solutions. However, the adoption of this technology remains slow due to multiple barriers spanning technical, economic, regulatory, and social domains. This study investigates the key obstacles hindering 3D printing adoption within India's construction sector, including high initial investment costs, lack of skilled labor, limited awareness of its benefits, and absence of standardized regulations. Using a mixed-methods approach involving literature review, expert interviews, and survey analysis, the research highlights critical factors that influence stakeholder resistance and evaluates their impact on project viability. Findings indicate that addressing policy gaps, improving workforce training, and aligning supply chain ecosystems are vital for successful integration. The paper concludes by proposing a framework for overcoming these barriers through collaborative efforts among government bodies, technology providers, and construction firms, paving the way for efficient and sustainable housing development in India.

**Keywords:** 3D printing technology; Construction industry; Adoption barriers; India.

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## **Integrated Financial Risk Modeling in PPP Infrastructure Projects**

*Sairaj Sairaj Chavhan\*, Yash Choudhary\*\*,  
Omkar Jagtap\*\*\* and Managesh Kapote\*\*\*\**

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### **ABSTRACT**

Public–Private Partnerships (PPPs) have become a key driver in India’s infrastructure development strategy, particularly in transport and highway sectors. However, financial feasibility evaluation in most projects is done using net present value and internal rate of return, which fails to consider for uncertainties. This limitation has further lead to project delays and financial distress. This study aims to identify key financial risk factors which influence PPP projects and to develop integrated financial risk modelling framework that incorporates traditional (NPV, IRR) and advanced indicators—Project Present Value (PPV) and Project Rate of Return (PRR). The new framework utilizes Probabilistic simulation to simulate uncertainties, for model verification, the model is validated with the case of the NH-4 Mumbai–Pune Expressway (Yashwantrao Chavan Expressway), which is one of the key Indian PPP roads. The most sensitive financial risk parameters that affect project results are obtained through sensitivity analysis. The findings shows that the consideration of risk-adjusted indicators provides a better and more realistic representation of the project’s financial viability in the face of uncertainty than conventional deterministic analysis. The study highlights the framework’s potential to advance risk-informed decision-making, enhance financial transparency, and strengthen the financial viability of PPP infrastructure projects in India.

**Keywords:** Financial risk modelling IRR; NPV; PPV; Probabilistic simulation.

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## **Determination of Slab Cycle Time in High-rise Construction using SPSS Analysis**

*Disha Rane\*, Dhruva Phansekar\*\*, Ayush Kasliwal\*\*\* and Jaisai Tenepalli\*\*\*\**

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### **ABSTRACT**

The slab cycle is a very critical factor that determines the pace and efficiency of high-rise construction projects. It refers to the time required to complete one floor slab that directly affects the overall project schedule. This study aims to determine and analyze the slab cycle duration using SPSS software through a data-driven approach. A structured questionnaire was prepared and distributed among construction professionals, including engineers, site supervisors, and project managers, to gather insights on factors affecting the slab cycle. The collected data was statistically analysed in SPSS to identify key parameters and factors such as formwork efficiency, labor productivity, concreting and curing duration, material availability, and site coordination. The analysis provides an understanding of the relationships among these variables and their combined impact on the slab cycle duration. The study offers practical insights for optimising the construction planning and resource management, ultimately contributing to improved project performance and time efficiency.

**Keywords:** Slab cycle; Construction scheduling; SPSS analysis; Data-driven study; Project efficiency.

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## **Optimizing Transportation Efficiency in Construction: Applying Lean Six Sigma Principles to Reduce Waste and Improve Performance**

*Unnati Agrawal\*, Hrushikesh Dhokale\*\*,  
Aditya Bhandurge\*\*\* and Aashish Kumar\*\*\*\**

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### **ABSTRACT**

The construction industry plays a vital role in economic growth but faces persistent challenges such as material wastage, delays, and inefficiencies, particularly in transportation processes. This study focuses on optimizing transportation efficiency in construction by applying Lean Six Sigma (LSS) principles through the DMAIC (Define–Measure–Analyze–Improve–Control) framework. The research aims to identify and quantify transportation-related waste, analyze root causes, and propose a lean-based strategic framework to enhance material flow and reduce non-value-adding activities. A case study approach involving site visits, time–motion studies, and stakeholder interviews is employed to collect data and validate the proposed framework. The study specifically targets mid-scale construction projects in developing regions like India, emphasizing material movement rather than heavy equipment logistics. The outcome provides a practical and replicable model for minimizing transportation waste, improving project performance, and promoting sustainable construction practices. By integrating Lean and Six Sigma methodologies, the research contributes to developing efficient, cost-effective, and environmentally responsible construction operations.

**Keywords:** DMAIC; Lean construction; Transportation waste.

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## **Construction Safety Management in Construction Project**

*Sandeep Pitchika\*, Hemanth Reddy Pynam\*\*,  
Saiteja Reddy Sadhu\*\*\* and Sameer Gujar\*\*\*\**

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### **ABSTRACT**

Construction safety has gained critical importance in recent years due to expanding development activities and heightened public concern for occupational health and safety in the sector. The primary purpose of this study is to review the safety management procedures and practices within the construction industry, focusing specifically on Indian projects such as roads, bridges, and small civil works. The methodology adopted includes surveys and focused group discussions with various stakeholders-builders, workers, managers-as well as expert interviews, aiming to gather comprehensive insights into current safety practices and policy implementation. The outcome of the study highlights significant gaps in both the execution and awareness of safety management systems, with deficiencies noted in policy implementation, training, hazard identification, and risk assessment. The findings are important because they help to identify loopholes in existing policy implementation and provide authorities and decisionmakers with the knowledge needed to design more inclusive and robust safety management systems in the construction sector.

**Keywords:** Construction safety; Safety policies; Training programmes; Risk assessment; Safety management.

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## **Identifying Challenges and Barriers in Implementing BIM for Just-in-Time (JIT) Supply Chains: A Thematic Analysis**

*Shibaram Krishna Singh\*, Souvik Maiti\*\*,  
Ajvin Biju\*\*\* and Abhishek Raj Singh\*\*\*\**

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### **ABSTRACT**

BIM and Just-in-Time (JIT) supply chain management have potential to considerably enhance efficiency in material procurement through design, logistics and on-site implementation. However organizational and operational barriers hinder the adoption of BIM based JIT systems from being widely adopted. This study aims to identify the key challenges hindering BIM implementation for JIT supply chains and propose viable suggestions to overcome them. It was decided to accept a qualitative research design based on the structured interviews with the representatives of the industries, and the information was interpreted with the help of the thematic analysis to determine common patterns. The findings reveal that the interoperability between BIM and procurement systems as a low factor, the lack of preparedness of suppliers, lack of consistency in data, and high implementation expenses are amongst significant challenges. Nevertheless, the respondents were aware of the potential of BIM in improving material visibility, efficiency of delivery, and control of inventory. The research finds that integration of BIM and JIT needs to be successful and this entails standardized digital processes, special training and enhanced stakeholder cooperation.

**Keywords:** Building information modelling; Just-in-time; Supply chain; Procurement; Thematic analysis.

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## Study and Analysis of the Procurement Strategies in Construction Sector

*Sandipta Ghose\* and Mangesh Kapote\*\**

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### ABSTRACT

Procurement practices in the Indian construction industry often contribute to significant project delays and cost escalations. While earlier studies have identified general disruptions, limited attention has been given to a structured framework to addressing these specific challenges in the Indian context. The aim of this study is to bridges that gap through a hybrid methodology combining a survey of over 75 construction industry professionals, an analysis of existing literature, and case studies from different firms. The objective is to identify, rank, and evaluate key risk factors emerging during different construction procurement phases. Findings reveal that conflicts in selecting appropriate contract types, inaccurate budgeting, and ineffective material scheduling are major contributors to delays and cost overruns. To mitigate these risks, the study proposes strategies such as detailed project planning, accurate estimation, adoption of advanced digital tools, and minimizing unethical practices. These measures can enhance procurement efficiency, reduce uncertainties, and improve overall project performance. The insights derived can also serve as a reference for other emerging economies facing similar procurement challenges.

**Keywords:** Construction industry; Cost overrun; Delay mitigation; Procurement practices; Risk factor.

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## **Concrete Blocks using Light Weight Expanded Clay Aggregate**

*Somu Basavaraj Malagali\*, Rohit Gurappa Dandoti\*\* and Sahil Nasir Pathan\*\*\**

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### **ABSTRACT**

Abstract The construction industry is increasingly focusing on sustainable and energy-efficient building materials to reduce environmental impact. This study investigates the development and performance of concrete blocks incorporating Lightweight Expanded Clay Aggregate (LECA) as a partial or complete replacement for conventional coarse aggregates. LECA, produced by heating natural clay at high temperatures, forms a porous, lightweight, and strong aggregate that significantly reduces the self-weight of concrete without compromising structural integrity. The experimental program includes the preparation of concrete mixes using varying percentages of LECA, followed by testing for compressive strength, density, water absorption, and thermal insulation properties. The results indicate that replacing traditional aggregates with LECA effectively decreases the density of concrete blocks, leading to improved thermal performance and easier handling. Although a slight reduction in compressive strength is observed at higher replacement levels, the mechanical properties remain within acceptable limits for non-load-bearing applications. This research demonstrates that LECA-based concrete blocks present a sustainable alternative to conventional materials, offering benefits such as reduced dead load, enhanced insulation, and improved environmental performance, aligning with the goals of green and sustainable construction.

**Keywords:** Lightweight Expanded Clay Aggregate (LECA); Concrete blocks; Sustainable construction.

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## **Assessment of Delay Factors Contributing to Schedule Overruns in Real Estate Projects in Tamil Nadu Region**

*Palaniappan C. \*, Nitish V. \*\* and Harshithan A. V. K. \*\*\**

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### **ABSTRACT**

This study examines the key factors of overruns in schedule during real estate projects in Tier-2 cities of Tamil Nadu, which will help fill a significant gap in the construction management literature. In contrast to the past research that has been performed on megacities of Mumbai, Delhi, and Chennai, it examines the issue of project implementation in the developing cities, such as Arakkonam, Trichy, Vellore, and Chengalpattu. It is aimed to identify, analyze and rank delay factors through the Analytic Hierarchy Process (AHP) and suggest countermeasures. The literature review identified potential delay cause, and questionnaire survey were carried out for data collection from registered construction firms under the MSME in the study areas. The AHP procedure entailed pair-wise comparisons on 1-9 scale by Saaty, normalization of matrices, and weighting and consistency ratio on factors. The results show that the major factors are funding limitations, slow decision-making by stakeholders, and insufficient planning of the project, then there are the material shortages, scarcity of labour and poor management of the site. The AHP-based prioritization framework has been developed that will help the stakeholders to maximize resource use and enhance the effectiveness of scheduling projects within the real estate sector in Tamil Nadu.

**Keywords:** Delay analysis; Analytical hierarchy process; Real estate; Schedule overrun.

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## **Time and Cost Overruns in Residential Construction Projects**

*Rushikesh Pande\*, Nishant Baviskar\*\*, Raviraj Kamble\*\*\* and Jyotish Singh\*\*\*\**

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### **ABSTRACT**

Construction is one of the most vibrant and intricate industries with various stakeholders and regular uncertainties. Cost and time overruns are recurring problems that affect project profitability as well as timely delivery. Such overruns typically occur in India because of inadequate planning, material scarcity, inefficiency in labor, and irregular market conditions. Therefore, it is essential to determine and analyze the main drivers of such overruns. This study aims to examine the factors behind cost and time overruns in construction projects based on the Relative Importance Index (RII) technique. The literature review was carried out extensively to determine the likely factors, preceded by a systematic questionnaire survey of owners, contractors, and consultants. Data collected were calculated based on RII to assess the relative importance of each factor. The findings show that material shortages, material price escalation, improper scheduling, owner tardiness in payments, equipment failure, and lack of skilled manpower are the most significant factors. To solve these problems, pragmatic solutions were put forward based on the Detection– Neutralisation–Avoidance (DNA) strategy. The research concludes that proactive planning, better material management, and efficient coordination with stakeholders can drastically reduce cost and time overruns, resulting in improved project performance and timely project completion.

**Keywords:** Construction industry; Cost overrun; Time overrun; Relative Importance Index (RII).

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## **Performance Evaluation of Paver Blocks Made with Recycled Fine and Coarse Aggregates**

*Meraz Ali\*, Gauresh Shetty\*\*, Devesh Nauhawar\*\*\* and Rihan Maaze\*\*\*\**

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### **ABSTRACT**

The construction sector consumes a vast number of natural aggregates and generates a large volume of construction and demolition (C&D) waste, leading to environmental degradation and resource depletion. Much of this waste is improperly managed, causing unsustainable disposal practices. This study investigates the sustainable production of paver blocks (as per IS 15658:2021 – Precast Concrete Blocks for Paving – Specification) by partially replacing natural aggregates with recycled concrete aggregates (RCA) and recycled fine aggregates (RFA) derived from C&D waste. The experimental program uses a Taguchi L9 orthogonal array design to optimize mix proportions and evaluate the effects of RCA and RFA replacement levels on the mechanical performance of paver blocks. The recycled aggregate-based paver blocks were tested and compared with conventional cement concrete paver blocks to determine an optimal mix that ensures structural integrity and sustainability. This research addresses a crucial issue in sustainable construction, promoting a circular economy by reusing waste materials and reducing dependence on virgin resources. The results are expected to demonstrate that incorporating RCA and RFA in paver block production not only minimizes environmental impact but also offers a cost-effective and eco-friendly alternative for modern construction practices.

**Keywords:** Recycled Concrete Aggregate (RCA); Recycled Fine Aggregate (RFA); Construction and demolition waste.

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## **Assessment of Delays in Construction of Water Distribution Network Projects and Their Cost Escalations**

*Bala Suryanarayana Pasumarthi\*, SriCharan Ippili\*\*,  
Bhagyashri Sanjay Asole\*\*\* and Dinesh S. Aswar\*\*\*\**

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### **ABSTRACT**

This study explores the key causes and impacts of delays in medium-scale drinking water supply projects in Sri Lanka, drawing lessons from global examples such as trenchless sewer rehabilitation in Nashville, U.S., and water management in Mexico's Colorado River Basin. Common factors leading to project delays include adverse weather conditions, financial instability of contractors, labour shortages, regulatory constraints, and inadequate planning. To overcome these challenges, the research adopts a hybrid approach that combines qualitative methods (stakeholder interviews, case study analysis) with quantitative techniques (water allocation modelling, performance evaluation). A major focus is on Integrated Project Delivery (IPD), an innovative contracting model that promotes collaboration, shared risks and rewards, and value-driven design to improve project performance. Insights from Nashville's IPD pilot, which emphasized real-time field coordination and tri-party agreements, and Mexico's sustainability-based water allocation models, provide valuable guidance for implementation in Sri Lanka. Additional lessons from China's rural governance reforms and Arizona's data-based asset management strategies highlight the importance of context-specific adaptations. By merging global best practices with local realities, the research offers practical strategies for policymakers, contractors, and water authorities to deliver projects more efficiently, ensuring timely, cost-effective, and sustainable water infrastructure development.

**Keywords:** Cost escalation; Time overrun; Delay analysis; Project scheduling; Major infrastructure projects.

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## Utilization Of RMC Waste/Debris in Construction

*Ishika Suryawanshi\*, Apurva Suryawanshi\*\*,  
Karan Deokate\*\*\* and Piyush Chandak\*\*\*\**

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### ABSTRACT

The rapid growth of Ready-Mix Concrete (RMC) production has increased concrete waste, often dumped without reuse. This study explores recycling RMC debris by converting it into Recycled Concrete Aggregate (RCA) to partially replace natural coarse aggregate in pervious concrete. Waste concrete was broken using hammers and mechanical breakers to extract coarse aggregates, which were cleaned, sieved, and brought to a Saturated Surface Dry (SSD) condition to control water absorption. A laboratory M25 grade pervious concrete mix was prepared as per IS 12727:1989. The control mix used 180 kg cement, 1440 kg coarse aggregate, and a water–cement ratio of 0.45 with 25–30% target voids. For 60% RCA replacement, cement was increased by 10% (to 198 kg/m<sup>3</sup>), and aggregates were reduced to 1400 kg/m<sup>3</sup> to maintain volume and workability. Tests for density, void ratio, permeability, and compressive strength showed that the 60% RCA mix achieved 25–26 MPa at 28 days with good permeability and pore structure. Thus, up to 60% replacement of natural aggregate with RMC waste is feasible for light-load pavements, walkways, and parking areas, promoting sustainable and eco-friendly construction.

**Keywords:** Recycled concrete aggregate; Pervious concrete; Sustainable construction.

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## **Smart Parking Management: AI and Sensors-enabled Real-time Spot Tracking**

*Tejil Shah\*, Dinesh Aswar\*\*, Animesh Tamang\*\*\* and Akshat Pathak\*\*\*\**

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### **ABSTRACT**

Due to a lack of infrastructure and the fast increase in the number of vehicles, parking problems are becoming more prevalent in urban areas. Because they lack automation and real-time data, traditional parking systems are frequently inefficient, which increases pollution, fuel loss, and traffic congestion. Using Artificial Intelligence and Internet of Things technologies, the project “Smart Parking Management: AI and Sensors-Enabled Real-Time Spot Tracking” aims to develop a clever and effective parking solution. The system uses cameras, Raspberry Pi units, and ultrasonic sensors to find parking spots and send data in real time to a cloud-based platform like Firebase or SharePoint. After that, AI algorithms analyze the data to forecast parking demand, control space distribution, and give users real-time updates via a mobile app. To assess its cost effectiveness and practical performance, the suggested framework was put to the test at NICMAR University in Pune. The system greatly shortens search times, improves convenience, and encourages environmentally friendly urban transportation, according to the results. A 50-slot setup has an estimated return on investment of 1.09 years, making it both economical and efficient. Overall, the project shows how combining AI and IoT can make conventional parking systems more intelligent, data-driven, and ecologically friendly.

**Keywords:** Smart parking; Artificial Intelligence; IoT; Ultrasonic sensors.

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## **Cost and Time Efficiency in Construction: A Comparative Study of Mivan, Conventional and Hybrid Methods**

*Shubham Bagade\*, Sumit Lokare\*\* and Pranav Shinde\*\*\**

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### **ABSTRACT**

This study examines the cost and time efficiency of three construction methods Mivan, Conventional, and Hybrid systems by performing a comparative analysis on the same project using each method. A quantitative research approach was adopted, employing a 5-point Likert scale to capture expert evaluations of parameters such as cost, time, and quality. The analysis utilizes the Multi-Criteria Decision-Making (MCDM) framework through the Analytic Hierarchy Process (AHP) to rank the methods based on performance efficiency. Cost estimation and quantification were conducted for the same project on a per square meter basis, while time efficiency was analyzed using Microsoft Project (MSP) to compare scheduling durations across all construction methods. The findings indicate that Mivan technology demonstrates superior time and quality performance, whereas hybrid systems offer a balanced trade-off between cost and flexibility. The study provides a data-driven and systematic framework for selecting suitable construction methods, supporting improved project planning and resource optimization.

**Keywords:** Mivan; Construction; Cost; Time; Efficiency.

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## **A Comparative Study on Conventional, Pre-Engineered Construction Methods using BIM in India**

*Parag Devdhare\*, Hrithik Baviskar\*\* and Aakash Phuge\*\*\**

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### **ABSTRACT**

The construction industry in India is undergoing a significant transformation. Rapid urban growth, shortage of affordable houses, and government initiatives like PMAY and the National Infrastructure Pipeline are pushing the sector to adopt faster and smarter ways of building. Traditional construction methods are no longer enough to handle the increasing demand, both in terms of cost and timely completion. This study compares three methods — conventional, precast, and pre-engineered — to find out how they perform in cost, time, and overall efficiency. The research uses a mixed approach, combining BIM-based simulations done in Revit and Navisworks with expert interviews and survey feedback. Data analysis through Smart PLS helped identify how cost, time, and stakeholder opinions are related. The findings show that precast and pre-engineered construction can cut project time by about 15–30% and cost by 20–30% when compared with traditional methods, especially for large-scale projects. But there are still some issues — such as lack of skilled labor, high starting cost, and limited awareness of these modern methods. The study suggests that by improving policies, worker training, transport systems, and digital approval processes, India can move towards advanced construction practices. Doing so will make building projects more efficient, sustainable.

**Keywords:** Precast construction; Pre-engineered buildings; BIM; Conventional construction; Cost-time analysis.

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## **Implementation of Value Engineering Techniques in Commercial Building: A Case Study Approach**

*Shivani Gadpayle\*, Jeet Bhoir\*\*, Nihar Jadhav\*\*\* and Smita Patil\*\*\*\**

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### **ABSTRACT**

The construction industry is increasingly challenged to deliver projects that are cost-effective, sustainable, and high performing. Value Engineering (VE) offers a systematic approach to achieve these goals by enhancing functionality and reducing costs without compromising quality or performance. This thesis examines the application of VE techniques in commercial building projects through a case study approach. Three interventions are explored: Adopting spray plastering instead of traditional plastering, incorporating zeolite into Plaster, replacing conventional facades with Building-Integrated Photovoltaic (BIPV) panels. These alternatives were selected for their potential to improve energy efficiency, material use, and sustainability. The methodology includes literature review, case study selection, implementation of alternatives, cost-benefit analysis, and comparative performance evaluation. The Use of BIPV panels reduce energy consumption, spray plastering saves time and labor costs while ensuring better surface quality, and zeolite reduces cement-related emissions. Overall, the study highlights that implementing VE in commercial construction can deliver significant cost savings, environmental benefits, and efficiency improvements. By focusing on innovative and sustainable techniques, VE proves to be a valuable tool for achieving long-term performance and sustainability in modern building projects.

**Keywords:** Value Engineering (VE); Sustainable construction; Cost optimization; Comparative performance.

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## **Barriers for Implementing Ultra-high Performance Concrete (UHPC) in Indian Construction**

*Saurabh Gawali\*, Tejas Salunkhe\*\* and Likitha Reddy\*\*\**

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### **ABSTRACT**

Ultra-High-Performance Concrete (UHPC) is a significant innovation in new construction technology since it has greater mechanical strength, ductility, and durability characteristics compared to common concrete. In this research, the hindrances to the use of UHPC in Indian construction are discussed based on studies in other nations. The characteristics of UHPC, including compressive strength of more than 150–200 MPa, enhanced durability, and enhanced sustainability, qualify it to be a suitable candidate for use in infrastructure with a prolonged service life. The key impediments towards wider implementation of UHPC in India will be high material cost, unavailability of suitable design standards, complexity in manufacturing and fabricating UHPC, and inexperience with UHPC among the concerned communities. Literature discussed placed major focus on improved UHPC mix design, performance of nanomaterials and fiber reinforcement in UHPC, and improving modeling through artificial intelligence-based modeling. Whereas UHPC possesses excellent properties and holds promise for environmental gains, obstacles like excessive autogenous shrinkage, reduced workability, the lack of complete-scale design standards or specifications to follow may impede the practical use of UHPC. This research presents the demand for low-cost material replacements, locally produced fabrication technologies, and revised design guides and regulations to further adoption of UHPC in India.

**Keywords:** Ultra-High-Performance Concrete (UHPC); Durability; Cost barriers; Sustainability.

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## **Delay Analysis and Remedial Major for the Project Name - Execution of 3 Nos Individual Rural Piped Water Supply Projects Pertaining to Bhograi Block of Balasore District & GB Nagar and Saraskana Block**

*Deepakkumar Patnaik\*, Arnob Roy\*\*,  
Agnel Koriyan\*\*\* and Piyush Govind Chandak\*\*\*\**

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### **ABSTRACT**

The Water Supply and Sanitation Project under RWSS (Balasore, Bhograi) involve the execution of three rural piped water supply schemes under RWSS in Bhograi Block of Odisha. Scope involves providing potable water through an integrated system including intake wells, treatment plants, reservoirs and distribution networks, ensuring reliable water access for rural communities. The project has faced significant execution challenges due to RoW delays, supply chain disruption, shortage of skilled manpower and delays due to cyclones and flooding near the intake well. These factors have collectively led to project delays, cost escalations and interruption in providing reliable water access to local population. This research aims to analyze the underlying causes of these delays and assess their impact on the project timeline, quality and operational efficiency. The study employs project crashing to compare total project cost under normal, delayed and crashed schedules for the time and cost saving. The SCOR Model is applied to evaluate supply chain performance, identify bottlenecks for continuous improvement. The study proposes a disaster-resilient planning framework to cyclone-prone and flood-affected regions to enhance project sustainability and adaptability during extreme weather events. The outcomes are expected to improve resilience in the execution of rural water supply infrastructure Project.

**Keywords:** Project delays analysis; Supply chain disruptions; Disaster-resilient planning; Project crashing.

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## **Development Model for Urban Land through Public–Private Partnership (PPP) Framework**

*Makrand Jadhav\*, Pranav Chakote\*\*,  
Sahil Darbeshwar\*\*\* and Nagarjuna Pilaka\*\*\*\**

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### **ABSTRACT**

This study aims to develop a comprehensive and strategic framework for transforming an underutilized urban land parcel of approximately 7–8 acres through the Public–Private Partnership (PPP) approach. The objective is to ensure optimal land utilization, long-term sustainability, and financial feasibility while fostering collaboration between public authorities and private investors. The research methodology involves a detailed review of existing PPP-based infrastructure and urban development projects in India, along with an evaluation of different PPP structures such as BOT, DBFOT, and Hybrid Annuity models. Various parameters including risk allocation, investment structure, revenue generation potential, and long-term operational efficiency are critically analyzed. The findings reveal that the DBFOT model provides an ideal balance between risk sharing and financial sustainability for mid-scale urban development projects. The study further emphasizes the importance of transparent governance mechanisms, stakeholder engagement, and policy alignment in achieving successful PPP implementation. The proposed framework can act as a replicable model for future urban infrastructure projects, contributing to sustainable urbanization, economic growth, and efficient resource utilization.

**Keywords:** Public–Private Partnership (PPP); Urban land development; Infrastructure planning.

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## **Risk Assessment of Dam Deterioration a Study on Material Fatigue and Environmental**

*Satish Ramhari Ghavane\*, Harshwardhan Vilas Kolhe\*\* and  
Venkat Sainadh Guntupalli\*\*\**

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### **ABSTRACT**

Dams play a crucial role in fields like farming, power generation, solving drought in various regions of the world. These are also considered as a lifeline in many regions of the world and especially in India. However, over time due to factors like ageing, hydrological and operational factors can lead to deterioration increasing risk of dam failure. This gives a false assurance to the people regarding the safety and well-being of the dams and surrounding regions of the structures. This study focuses on the risks and assessment of the dam deterioration by identifying the key causes. A systematic approach involving data collection, risk analysis methods are adopted to evaluate the condition of dam structure. The research shows the importance of regular monitoring, and strong risk management plans to ensure dam safety and sustainability. The factors such as poor maintenance practices, and prolonged exposure to harsh environmental conditions collectively reduces the dam's load bearing capacity and increases the chances of seepage and cracking.

**Keywords:** Dam safety; Risk assessment; Deterioration; Structural integrity.

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## **Adaptive Road Planning in Western Maharashtra's Terrain: A BIM-GIS Integrated Approach**

*Pavan Chavan\*, Rohit Renake\*\* and Jayesh Pawar\*\*\**

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### **ABSTRACT**

Road infrastructure in areas like Western Maharashtra suffers from recurring financial and operational problems in the form of high monsoon rains, landslides, and intricate topography. Recurring maintenance interventions, unscheduled repairs, and design inefficiencies considerably increase lifecycle expenditures. This research examines the capability of merging Building Information Modeling (BIM) and Geographic Information Systems (GIS) as an integrated digital platform to realize cost savings and increase the effectiveness of road infrastructure planning and maintenance. The GIS-based hazard mapping and terrain modeling were employed for delineation of flood- and landslide-prone areas, while BIM provided accurate cost estimation, design optimization, and lifecycle performance assessment. Comparative evaluation of conventional and BIM-GIS-integrated methodologies indicated significant cost savings, such as an estimated 14% total lifecycle cost reduction and average savings of ₹4.58 crore per kilometer. Furthermore, the integration reduced rework, enhanced construction scheduling, and minimized monsoon-driven repair and maintenance expenditures. The findings illustrate that BIM-GIS integration facilitates data-driven decision-making, resource optimization, and proactive infrastructure management. This strategy presents a cost-effective and long-lasting model for creating strong, inexpensive road networks in ecologically sensitive and topographically areas.

**Keywords:** BIM; GIS; Infrastructure.

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## **Examining the Effect of Material Management Issues at Precast Yards on Project Schedule and Cost Performance**

*Vinayak Bhukya\*, Smit Diwanjee\*\*, Anvesh Kotagiri\*\*\* and Nilesh Patil\*\*\*\**

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### **ABSTRACT**

Management of materials has a significant impact on ensuring that a continuous production of precast concrete elements and their delivery on time in construction projects. When management is mishandled in the areas of planning, procurement, storage and coordination within precast yards, there are schedule slippages and the cost goes up. This paper examines the role of material management-related problems in affecting schedule and cost performance in precast yard operations. The study is based on a step wise review of published past research focusing on infrastructure and metro rail projects where precast construction is highly adopted. Material-related issues were greeted and analysed to determine their effects on productivity and project performance. The paper discovered that cases of insufficient early planning, material supply delay, shortage, excessive inventory, storage problems, poor coordination and financial problems, etc. are among the factors that severely disrupt the operations of the precast yards. Besides, the paper outlines best practices including lean construction principles, enhanced procurement planning, supplier diversification and the use of digital technologies like BIM etc. The results highlight the necessity of a material management framework that is coordinated and integrated to improve schedule reliability and cost efficiency in precast yards.

**Keywords:** Precast yards; Material management; Schedule performance; Cost performance; Structural equation mode.

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## **Developing a Comprehensive Framework of Risk Management in Metro Infrastructure**

*Pratham Vaidya\*, Aditya Gupta\*\* and Shabaz Shaikh\*\*\**

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### **ABSTRACT**

The Project includes designing an efficient risk management framework for major infrastructure metro rail transit projects. (Pune metro rail) with a perception of mitigating the risk behind it through the appropriate study from Initiation up to post-construction stage of the project. Connectivity through infrastructure always solve major problems of peoples and helps building economy of India and this inspires to carried out such projects with advance knowledge of risk management framework. This study will carry out with help of quantitative approach, Regulations and guidelines of metro rail co-operation ISO, IS codes (18001) and with expert's interviews. The findings of this research highlight the need for proactive risk governance, stakeholder collaboration, and adaptive risk mitigation strategies to ensure the sustainability, cost-effectiveness, and timely delivery of metro infrastructure projects. This research contributes to the body of knowledge by offering a strategic, adaptable and scalable risk management model for metro infrastructure projects, thereby enhancing decision-making and risk resilience in large-scale urban transit developments.

**Keywords:** Risk management; Metro rail projects; Risk mitigation; Risk management framework

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## **Safety and Risk Assessment of Tower Crane in Construction using BIM**

*Tanish Thole\*, Aashirwad Ghuge\*\*, Yash Panwar\*\*\* and Amol Pawar\*\*\*\**

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### **ABSTRACT**

This research aims to create a practical safety framework using Building Information Modeling (BIM) to improve the management and risk assessment of tower crane operations on construction sites. Tower crane lifts are among the highest-risk activities in construction, often leading to serious accidents and delays. Current safety methods are mostly reactive, focusing on addressing problems only after they occur, which leaves critical risks unanticipated during early project stages. The study uses a blend of qualitative and quantitative methods including literature review, site visits, interviews, and data collection at a commercial high-rise project near Baner, Pune. Using BIM's 3D and 4D modeling, potential hazards like crane conflicts, boom overlaps, and load safety are identified and simulated to foresee and reduce risks. Various mitigation strategies are developed, such as adjusting crane placement to avoid boom collisions, enforcing exclusion zones, implementing wind speed monitoring, and enhancing communication protocols among crane operators and supervisors. The framework also integrates AI-based anti-collision systems for real-time safety monitoring. Results show that embedding safety in the planning stages through digital tools helps significantly reduce risks, improves coordination, and promotes a safer and more efficient work environment. This approach encourages proactive safety culture and aligns with construction safety standards.

**Keywords:** Tower crane; BIM; Safety.

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## **Developing Bid/No-Bid Analysis Framework using Structural Equation Modelling**

*Harsh Gosai\*, Jayveersinh Sarvaiya\*\* and Virajsinh Mori\*\*\**

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### **ABSTRACT**

The decision to bid or not to bid for a project is a critical process for contractors in the highly competitive Indian construction industry. A hasty or poorly informed decision made under competitive pressure can result in severe financial losses or project underperformance. While international studies have identified key bidding factors and developed models such as the Structural Equation Modelling (SEM) approach for Chinese contractors, there is a lack of an empirically validated framework addressing these factors in the Indian context. This research aims to develop a comprehensive bid/no-bid decision framework specifically for Indian construction contractors, examining the interrelationships among critical decision factors. A quantitative methodology is adopted, beginning with an extensive literature review that identifies 17 key factors classified into five groups. Data will be collected through a structured questionnaire survey of experienced professionals in the Indian construction sector. Factor analysis will be used to categorize variables, and SEM will test hypothesized relationships among them. The validated framework will offer data-driven insights into how latent factors such as Project Characteristics, Financial Considerations, and Organizational Considerations collectively influence bid decisions, providing both a strategic decision-support tool for practitioners and an empirically grounded model for the academic community.

**Keywords:** Bid/No-bid decision; Structural Equation Modelling (SEM); Factor analysis; Decision-support framework.

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## **A Work Sampling-based Methodology to Study Productivity and Root Causes of Delay in Residential Construction**

*Kumar Pawar\*, Lava Kumar Sai Killi\*\*,  
Yogesh K.\*\*\* and Shobha Ramalingam\*\*\*\**

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### **ABSTRACT**

In high-rise residential construction projects, productivity loss and schedule delays are recurring problems that are frequently brought on by workflow limitations, activity interdependencies, and difficulties with on-site coordination. Conventional project monitoring techniques offer little insight into execution-level limitations and productivity losses and mainly compare planned and actual progress. In order to investigate schedule delays and productivity in a residential construction project, this study uses an integrated analytical approach. Workflow constraints affecting slab-level construction activities were identified and baseline and actual schedules were tracked using VisiLean software. To identify the underlying root causes of delays, a 5-Why analysis was conducted based on the constraints that were found. In order to evaluate on-site productivity during slab casting operations, random tour-based work sampling was carried out concurrently. Value-Added (VA), Non-Value-Added (NVA), and Non-Value-Added but Required (NVAR) categories were created from the observed activities. Non-value-added activities were then mapped to pertinent Lean waste categories. The combined analysis links workflow constraints and root causes with observed productivity losses and schedule deviations. The study highlights the usefulness of integrating digital Lean tools for constraint identification with Work Sampling for productivity and waste assessment, providing a structured approach for diagnosing delay mechanisms in residential construction projects.

**Keywords:** Work sampling; Lean construction; Root cause analysis; Lean waste; VisiLean.

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## **Overcoming Barriers to Sustainable Building: A Case Study on Life Cycle Costs and Public Perception in Nashik, India**

*Abhimanyu Singh Rajput\*, Rohit Singh\*\*, Aman Singh\*\*\* and Chetan More\*\*\*\**

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### **ABSTRACT**

The construction sector plays a significant role in environmental degradation, and hence, taking up sustainable construction practices is inevitable. However, in the latest urban centers, such as Nashik, green practices are being scaled up by long-standing financial, technical, and social challenges. This research, “Overcoming Barriers to Sustainable Building: A Case Study on Life Cycle Costs and Public Perception in Nashik, India,” analyzes these barriers through a mixed public perception survey and case study analysis. A semi-structured questionnaire completed by homeowners, construction professionals, and Nashik experts questioned attitudes towards cost constraints, level of awareness, technical problems, and social influence that affect the uptake of sustainability. A G+7 residential complex was built and analyzed to compare conventional and green building practices. Using the EDGE software, sustainability performance was measured in terms of Energy, Water, and Materials. Studies have shown that although sustainable construction is more expensive in initial terms, it has long-term benefits, like a reduction of 31.4% in energy, 28.17% in water consumption, and 49.34% less material-related embodied carbon. From the study, it is concluded that awareness, technical training, and economic incentives are sources through which hindrances towards and promotion of sustainable construction in Nashik’s growing urban environment can be considered.

**Keywords:** Sustainable construction; Environmental degradation; Green building; Sustainability.

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## **The Effect of Working Capital Management on Firm Profitability: Empirical Evidence from the Indian CRIP Sector**

*Reddy Sravan Pothuraju Venkata\**, *Wajahat Ali Sayyed\*\**,  
*Rahul Trivedi\*\*\** and *Vigneswara Rao K. T.\*\*\*\**

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### **ABSTRACT**

This study empirically examines the influence of Working Capital Management (WCM) on firm profitability in India's Construction, Real Estate, Infrastructure, and Project Management (CRIP) sector, a capital-intensive industry characterized by long project cycles and high liquidity requirements. Effective management of working capital is critical to sustaining operational efficiency and profitability in such contexts. A panel dataset comprising 15 non-financial firms listed on the Bombay Stock Exchange (BSE) from 2020 to 2025 is analyzed using Ordinary Least Squares (OLS) multiple regression. Return on Assets (ROA) serves as the dependent variable representing profitability, while Cash Conversion Cycle (CCC), Days Accounts Receivable (AR), Days Inventory (INV), and Days Accounts Payable (AP) are employed as key indicators of WCM efficiency. Firm size, leverage, growth, and liquidity are incorporated as control variables to ensure analytical robustness. The findings demonstrate a significant relationship between efficient WCM practices and improved firm profitability. The results underscore the necessity for strategic liquidity and working capital optimization to enhance financial performance. This study contributes to the understanding of WCM's role in financial decision-making and offers actionable insights for managers and policymakers within the Indian CRIP sector.

**Keywords:** Working capital management; OLS regression; Firm profitability; Cash conversion cycle.

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## **Labour Safety at Construction Site: Issues and Challenges**

*Nimish Loke\*, Shreevishwaradhaya Swami\*\* and Aayush Chambavade\*\*\**

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### **ABSTRACT**

Ensuring labour safety on construction sites remains a persistent challenge in India's rapidly urbanizing environment, where diverse workforce characteristics, cost constraints, and complex project dynamics coexist. This study investigates the multidimensional aspects of labour safety with the objective of identifying critical factors influencing hazard awareness, behavioural compliance, and the adoption of modern safety practices. Data were collected through a structured bilingual questionnaire distributed among labourers, supervisors, engineers, and safety officers across residential construction sites of varying scales—small, medium, and large—around Pune, Maharashtra. The study evaluates traditional versus interactive safety training methods, the utilization of emerging technologies such as wearable sensing devices and VR-based modules, and the influence of organizational culture, leadership commitment, and peer communication on promoting a proactive safety climate. Psychological factors including stress, fatigue, and motivation were also examined to understand their impact on workers' safety participation. Furthermore, the research explores the economic perspective by assessing the cost-effectiveness and productivity benefits of investing in preventive safety measures. Preliminary analysis indicates that interactive training and strong supervisory leadership significantly enhance hazard awareness and compliance, while high implementation costs limit technological adoption in small-scale projects.

**Keywords:** Labour safety; Interactive training; Hazard awareness; Technological adoption; Supervisory leadership.

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## **Risk Analysis Strategies for Mitigating Cost Overruns in Sustainable Construction Projects**

*Shruti Gadekar\*, Varsha Alsande\*\*, Kunal Gupta\*\*\* and Monish S.\*\*\*\**

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### **ABSTRACT**

The purpose of this research paper is to achieve environmental responsibility while ensuring long-term economic viability in Sustainable Construction. However, many such kind of projects experience cost overruns due to factors such as fluctuating prices due to sustainable materials, complex regulatory requirements for sustainable projects, design uncertainties, and limited availability of skilled labour. Due to such kind of challenges cost control becomes more difficult as compared to conventional construction projects. This research study focuses on identifying and analysing key risk factors that contribute to cost overruns in sustainable construction projects and evaluating risk mitigation strategies. A mixed-method type of research approach is adopted. A questionnaire is prepared to collect Quantitative data from industry professionals involved in sustainable construction projects. Respondents are asked to assess severity and frequency of identified risks which are identified from previous research papers and to rate effectiveness of corresponding mitigation strategies using a five-point Likert scale. The Relative Importance Index (RII) method is used to prioritise key risk factors and develop a risk matrix. Also, to capture remaining key risk factors apart from identified Open ended questions Qualitative insights from open-ended responses are analyzed using thematic analysis.

**Keywords:** Sustainable construction; Cost overrun; Risk analysis; RII; Project management framework.

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## **Evaluating the Effectiveness of Agile–Hybrid Project Management in the Indian Construction Industry**

*Rohith Kumar R. \*, Prabhanjan Kumar\*\*, Akhil Das\*\*\*,  
Arpita Mathur\*\*\*\* and Hindavi Pavan Tikate\*\*\*\*\**

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### **ABSTRACT**

Project management has experienced substantial changes over the past several decades through the organizing and planning of resources while securing them to achieve project purposes successfully. The concept developed using traditional linear approaches now encounters challenges in serving the growing need for flexibility and adaptability due to project complexity and sudden client requirements. This disadvantage prompted the creation of Agile project management methodology. An Agile Hybrid Approach combines Agile principles with traditional project management (like Waterfall). This method is applied to projects that requires both structure and flexibility. Though agile framework gives more efficiency than traditional method it has not been implemented broadly in construction industry. This study investigates the effectiveness of the Agile–Hybrid methodology at different phases of construction projects, especially in view of the growing complexity of projects and the increasing need for accuracy and predictability. In order to accomplish this, a structured questionnaire was created and circulated throughout the Indian construction sector. The collected data were analysed using Structural Equation Modeling (SEM) through SmartPLS software to evaluate the relationships and impacts of Agile practices. The findings aim to identify the specific project phases where Agile methodologies contribute most significantly to enhance overall outcome of a construction project.

**Keywords:** Agile–hybrid project management; Construction industry; Project performance; Agile methodology.

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## **Development and Validation of a Precast Construction Readiness Index (RIPC) Framework for Assessing Organizational Preparedness and Strategic Adoption in the Indian Construction Sector**

*Sai Bhavan Pasupuleti\**, *Shanmukha Sai Kanagala\*\**,  
*Eshwar B. S.\*\*\** and *Sudheer Kumar Reddy Bijivemula\*\*\*\**

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### **ABSTRACT**

Precast construction is emerging as a practical solution to India's growing demand for faster, safer, and more sustainable building methods. However, many organizations still face uncertainty about their level of preparedness to adopt this technology effectively. This study focuses on the development and validation of a Readiness Index for Precast Construction (RIPC) — a comprehensive framework designed to measure and understand how ready an organization is to implement precast methods. The proposed model evaluates readiness across six major domains: Technical, Financial, Organizational, Workforce, Supply Chain, and Policy & Regulatory Readiness. A structured questionnaire, developed through literature review and expert input, will be used to collect data from construction firms of various sizes and operational backgrounds. The responses will help identify existing readiness levels, key challenges, and improvement areas. Comparative insights between Small and Medium Enterprises (SMEs) and Large Firms will further highlight the differences in adoption capabilities and managerial approaches. The validated RIPC framework aims to act as a decision-support and self-assessment tool for construction professionals, consultants, and policymakers. It will help organizations identify gaps, improve strategic planning, and promote a smoother, more confident transition toward precast construction practices within the Indian construction sector.

**Keywords:** Precast construction; Readiness index; Organizational preparedness; SMEs and large firms; Construction.

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## **Risk Management in Precast Construction: Coordination between Design, Production and Site Teams**

*Praneeth Reddy Lankala\*, Prannav Beetukoori\*\* and Preetham Reddy Akkala\*\*\**

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### **ABSTRACT**

Precast concrete technology has been increasingly used in India's construction industry over the last few years to improve project quality and accelerate the completion of projects. But benefits are limited due to difficulty of integrating design, manufacturing, and field teams, which results in quality disparity, cost escalation, and schedule delays. For precast construction projects to realize factory capability to match design intent and site execution, project effectiveness remains under threat from coordination risks like delayed revisions to the design, ambiguous details, and conflicting delivery timetables. This study aims to identify, evaluate, and formulate effective risk management strategies. Industry personnel participated in quantitative questionnaires and qualitative interviews with industry specialists in a mixed-methods study design. To rank the most important coordination risks, the gathered data were examined using Pareto analysis, the risk matrix, and Relative Importance Index (RII). The results show that late revisions in design, poor communication, and restricted BIM integration have considerable impacts on project time, cost, and safety performance. The study presents an actionable paradigm for risk management that focuses on systematic information flow, stakeholder coordination, BIM-based coordination. By adopting these measures, precast construction sector can increase overall project dependability and safety, minimize rework, and improve productivity.

**Keywords:** Precast construction; Risk management; Coordination; BIM; Design–production–site integration.

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## **Delay in Construction Projects: Causes, Effects and Insights**

*Romarsh Gujarathi\* and Debashish Sahu\*\**

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### **ABSTRACT**

Delays in construction are a matter of concern in construction sector, resulting in time overrun, cost overruns, and dispute among the project stakeholders. The issue is particularly critical for urban projects such as Pune, where intricate coordination with many agencies typically causes schedule delay. The present study tries to count, classify, and rank the major causes of construction delay and suggest effective measures to manage them. A systematic questionnaire was devised after a thorough literature review and a series of expert interviews. The study utilized the Relative Importance Index (RII) method to analyze responses from 30 clients, contractors, and consultants and determine the ranking of 32 identified delay factors. The finding indicates consultant- and contractor-related problems like slow design work, slow acceptance of drawings, and inadequate planning and scheduling as the most significant. Client-related issues of inadequate decision-making and delayed payment also cause delay. The conclusion of the report is that planning is very important, there should be good coordination between stakeholders, and there must be proper communication to reduce delays and successfully complete projects.

**Keywords:** Construction delays; Cost overruns; Time overruns; Relative importance index (RII).

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## **Optimizing Construction Equipment Utilization through Lean Principles**

*Anurag Rathore\*, Nasar Imam\*\* and Akshaya Kumar Patnaik\*\*\**

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### **ABSTRACT**

The construction sector is searching intelligent methods of increasing productivity, reducing waste, and utilizing resources more efficiently. One solution is VisiLean, which is a cloud-based system that integrates the principles of Lean Construction with Building Information Modeling (BIM). This paper identifies the potential for applying VisiLean to enhance the productivity of construction equipment by way of more efficient planning, real-time monitoring, and data-driven decision-making. VisiLean facilitates everyone who is part of a project—be it site teams or project managers—to be connected on a single online platform. This enhances communication, minimizes idle equipment time, and simplifies day-to-day operations. By capturing and displaying equipment data, VisiLean simplifies performance tracking, detecting delays, and determining where resources can be utilized better. Its visual planning functionalities and real-time progress monitoring within the BIM model also enable teams to foresee possible problems and control logistics more actively. Field applications indicate that it is possible to achieve observable increases in equipment productivity, reduced delays, and more consistent project results by applying VisiLean. Generally, this research points out how embracing VisiLean facilitates improvement within construction by interweaving Lean processes with real-time digital intelligence—enabling teams to work smarter, reduce waste, and complete projects more effectively.

**Keywords:** VisiLean; Lean construction; Building Information Modeling (BIM); Equipment productivity; Real-time.

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## **Analysis on Environmental Risk Allocation and Delay Patterns in Indian Real Estate Construction Industry**

*Pradnya Hase\*, Vishakha Akhade\*\*, Sudhanshu Sharma\*\*\* and Sumit Patil\*\*\*\**

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### **ABSTRACT**

Environmental risks have become a significant cause of project delays in India's real estate construction sector, particularly in rapidly urbanizing cities like Pune. Factors such as extreme rainfall, soil degradation, pollution, and delays in obtaining environmental clearances considerably impact project schedules and costs. These risks are often underestimated and unevenly distributed among stakeholders, leading to disputes, inefficiencies, and cost overruns. This study analyzes the allocation of environmental risks and their influence on delay patterns in Pune's real estate projects. It also proposes an Environmental Risk Assessment Model (ERAM) to enable proactive and equitable risk management. A mixed-method approach—comprising literature review, expert interviews, and a structured questionnaire survey—was used. Major environmental risks were ranked using a relative grading method. The ERAM model assesses risk likelihood and impact through weighted scoring and a color-coded matrix, helping identify high-risk factors during early planning. Validation on a real Pune project demonstrated its reliability in improving coordination and reducing delays. The study emphasizes integrating structured environmental risk assessment into construction practices to foster sustainability, minimize disputes, and enhance project efficiency in the Indian real estate sector.

**Keywords:** Environmental risk management; Real estate construction; Construction delay; Risk mitigation; Pune.

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## **Construction Challenges Encountered within India's Coastal Regulation Zone (CRZ) Areas**

*Pawan Kumhar\*, Vishakha Namdharani\*\* and Nishant Sharma\*\*\**

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### **ABSTRACT**

Construction activities in coastal regions are increasingly constrained by regulatory requirements, environmental sensitivity, and climate-related risks. In India, the Coastal Regulation Zone (CRZ) framework governs development along coastal stretches to protect fragile ecosystems while allowing essential infrastructure growth. However, projects executed within CRZ areas often face challenges such as ambiguous zoning boundaries, delays in statutory approvals, frequent design revisions, rising compliance costs, and heightened exposure to flooding and erosion hazards. This study examines the major construction challenges associated with CRZ zones and evaluates the effectiveness of Geographic Information System (GIS)-based zoning and spatial analysis as a planning and mitigation tool. A mixed-method approach combining literature review, spatial data analysis, and a case study of a residential redevelopment project in Mumbai's coastal belt is adopted. GIS techniques including buffer analysis, land-use mapping, digital elevation modeling, flood susceptibility assessment, and multi-criteria suitability evaluation are applied to assess regulatory constraints and environmental risks at the project level. The findings indicate that conventional planning approaches relying on two-dimensional drawings and textual regulations are inadequate for accurate CRZ compliance. GIS-based visualization improves boundary identification, early-stage risk detection, coordination among stakeholders, and mitigation planning.

**Keywords:** Coastal regulation zones; GIS; Sustainability; Construction; Equipment.

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## **Analyzing Barriers in Construction Industry for Gender Diversity**

*Tanaya Chabukswar\**, *Venkatesh Shetye\*\**,  
*Narenthiran A.\*\*\** and *Abhishek Shrivastava\*\*\*\**

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### **ABSTRACT**

The construction industry remains predominantly male-dominated despite increasing awareness of gender diversity. This study examines the major barriers limiting women's participation and career advancement in the construction sector, with emphasis on the Indian context. A systematic literature review using the Scopus database identified 194 research papers, out of which 57 were shortlisted for detailed analysis. Five recurring themes emerged—sustainability, policy effectiveness, organizational culture, work-life balance, and workplace barriers. To validate and prioritize these barriers, a survey was conducted among female professionals working in the civil and construction domains. The Relative Importance Index (RII) method was applied to identify the most significant factors, including long working hours, gender stereotypes, lack of mentorship, inadequate facilities, and ineffective handling of harassment cases. Further, the Interpretive Structural Modeling (ISM) technique was employed to establish hierarchical relationships among the key barriers, revealing their interdependencies and influence levels. The study concludes that systemic bias, rigid work culture, and safety limitations remain critical challenges. Strengthening inclusive policies and addressing root-level structural barriers can improve gender balance, enhance productivity, and promote sustainable growth in the construction industry.

**Keywords:** Gender diversity; Construction industry; Inclusivity.

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## **Life Cycle Assessment of Embodied Carbon in Green and Conventional Buildings for Sustainable Construction**

*Mukesh Nag C. \*, Yashwanth B. G. \*\* and Chandan Patel B. G. \*\*\**

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### **ABSTRACT**

The construction of buildings has been an increasing point of concern regarding rising greenhouse gas emissions due to the processes involved in the extraction and transportation of building materials. This research examines the carbon footprint of conventional vs green buildings by employing a cradle-to-gate life cycle assessment. The study attempts to analyze emissions from raw materials extraction to the construction site, in an effort to understand potential emission hotspots. The results indicated that the green building clearly had lower carbon emissions due to the use of eco-friendly raw materials, the incorporation of adaptive production approach, and the use of efficient design. The results of this study reinforce the necessity of utilizing life cycle assessment during the initial design phases to make the right choices to achieve significant reductions in overall carbon footprint. The highlight offered by this study is on the positive side of cradle-to-gate life cycle assessment, offering efficient and low building materials as a way to develop carbon neutral building practices.

**Keywords:** Life Cycle Assessment (LCA); Embodied carbon; Green building; Sustainable construction.

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## **Comparative Analysis of Different Patching Materials for Bituminous Pavement**

*Kshitij Prajapat\*, Rahul Bijarniya\*\* and Ankit Gurjar\*\*\**

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### **ABSTRACT**

Bituminous pavements form a significant part of road infrastructure and they should be maintained in time to stay safe, serviced and cost effective throughout their design life. Patching is one of the most commonly used methods of resolving local distresses like potholes and surface failures, thus patching is a major form of maintenance method adopted by road agencies but the choice of a suitable patching material is a thorny issue facing road agencies. The improper choice of materials commonly leads to early failures, higher rate of maintenance, and the cost of life cycle. The paper is looking at a comparative assessment of the patching materials that are in common use in bituminous pavements, particularly the Hot Mix Asphalt (HMA) and the Cold Mix Asphalt (CMA). The study is comparative, and its methodology is founded on the review of standards and literature, field research on the chosen road projects with the similar climatic and traffic conditions, laboratory tests results such as the Marshall stability test and bitumen extraction test, the detailed analysis of cost and rates. The results show that HMA exhibits excellent structural performance, longevity and resistance to traffic induced distress hence more appropriate in high traffic roads although it expensive.

**Keywords:** Bituminous pavement; Patching materials; Hot mix asphalt; Cold mix asphalt; Pavement maintenance.

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## **Assessing the Impact of Institutional Pressures and Dynamic Capabilities on 5D BIM Adoption for Cost Optimization in Construction Projects**

*Pratham Patil\*, Rahul Sarvagod\*\*, Mohd Khalid\*\*\* and Hindavi Tikate\*\*\*\**

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### **ABSTRACT**

The construction industry continues to encounter persistent challenges in achieving cost efficiency and timely project delivery, primarily due to fragmented integration among design, scheduling, and budgeting processes. Addressing this gap requires digital solutions that seamlessly connect these dimensions to enhance accuracy, coordination, and control. This study explores the adoption of 5D Building Information Modeling (BIM) as a tool for cost optimization in infrastructure projects by integrating insights from institutional theory, dynamic capabilities, and digital transformation frameworks. It examines how institutional pressures: coercive, normative, and mimetic drive the development of dynamic capabilities that strengthen an organization's digital transformation maturity and facilitate effective 5D BIM implementation. A quantitative research approach employing Structural Equation Modeling (SEM) was adopted, using responses from industry professionals experienced in BIM and infrastructure project management. The findings reveal that institutional pressures positively influence dynamic capability development, which subsequently enhances digital maturity, leading to improved cost predictability, risk mitigation, and collaboration efficiency. The study contributes a comprehensive framework linking institutional influences, dynamic capabilities, and digital transformation for successful 5D BIM adoption, offering practical implications for construction firms and policymakers seeking to promote digital readiness and sustainable cost management.

**Keywords:** 5D BIM; Digital transformation; Dynamic capabilities; Institutional pressures; SEM.

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## Hybrid Annuity Model (HAM) in Indian Road Infrastructure

*Tanay Kapse\*, Jayesh Dhundate\*\*, Kumud Bhogekar\*\*\* and Unnati Agrawal\*\*\*\**

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### ABSTRACT

The construction and maintenance of road infrastructure in India have traditionally relied on models such as BOT (Build–Operate–Transfer) and EPC (Engineering–Procurement–Construction). However, these Models often resulted in cost overruns, project delays, and uneven risk distribution between stakeholders. The Hybrid Annuity Model (HAM) was introduced to address these flaws by Combining the advantages of EPC and BOT, ensuring balanced risk sharing and improved financial stability. This research evaluates the effectiveness of HAM in road infrastructure projects through a comparative analysis of two case studies the Delhi–Gurgaon Expressway (using BOT model) and Vadodara–Mumbai Expressway Phase II (using the HAM model). The study analyzes financial performance, risk allocation, environmental compliance, and stakeholder satisfaction. Study concludes that the Delhi–Gurgaon Expressway suffered 147% cost escalation and high private-sector risk exposure, the HAM-based Vadodara–Mumbai Expressway maintained cost discipline and moderate risk levels due to milestone-based payments and balanced risk allocation. Moreover, HAM demonstrated superior environmental compliance and sustainability performance, with 60% of respondents identifying it as the most sustainable model for long-term infrastructure development. The results shows that HAM enhances financial stability, environmental responsibility, and stakeholder satisfaction, positioning it as a preferred framework for sustainable infrastructure delivery in India.

**Keywords:** Hybrid Annuity Model (HAM); Road infrastructure; Public–private partnership; Risk sharing.

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## **Evaluating Digital Tools for Construction Project Management: A Comprehensive Review and Guidelines for the Effective Solution**

*Ishit Rathod\*, Vatsal Avasthi\*\* and Vraj Patel\*\*\**

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### **ABSTRACT**

Construction delay remains a significant construction problem that significantly impinges upon the time plans, cost plans, and quality performances of projects. It frequently gives rises to losses, breach of contracts, and loss of confidence amongst the stakeholders. While past research work has documented several causes—including poor scheduling, poor planning, and poor communications—but very limited insights regarding the effective mitigation of these malpractices by digital technologies, particularly in the construction industry of India. It is research that aims to assess the efficiency of the digital tools for project management such as Primavera P6, Procore, Autodesk Construction Cloud, Building Information Modelling (BIM), and SAP ERP in terms of minimizing project delay. By the extensive literature review and industry-oriented survey, the research tries to inspect the level of adoption, implementation issues, and perceived benefits of the technologies. A mixed-method research design will be followed by incorporating qualitative and quantitative methods such as structured questionnaires, comparative case studies, and statistical analysis to develop credible results. The research purposes to offer crucial insights for practitioners and scholars in the industry as well as for enhanced project performance and delay management through digitalization of the Indian construction sector.

**Keywords:** Construction project management; Delay analysis; Digital tools; Primavera P6; Project efficiency.

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## **A Review on 3D Printed Concrete and the Role of Cementitious Material Replacement**

*Kushagra Khare\*, Kartikeya Gupta\*\* and Yash Upadhyay\*\*\**

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### **ABSTRACT**

In the world, concrete is the most popular construction substance with versatility, strength, and hardness. Nevertheless, the traditional forms of concrete construction are progressively being faulted since its carbon footprint is high, the labor demands are intensive, there is also waste of materials as well as limited adaptability in architecture. Additive manufacturing, often also called three-dimensional (3D) printing, has in recent years become a disruptive technology in the construction industry, enabling construction performance to be improved and freedom in design. At the same time, it has been observed that the addition of such supplementary cementitious materials as ground granulated blast furnace slag (GGBS), ultrafine GGBS, fly ash, silica fume, and other mineral admixtures can be used to improve the sustainability and performance. The review paper is a synopsis of the construction material, old and new ways of construction, the concept of 3D printing of concrete, the benefits and principles of 3D, and the importance of cementitious material replacement in printable concrete. The paper presents the synthesis of current literature to reveal the main advantages, obstacles, and gaps existing in research and offer insights into the further possibilities of sustainable construction industry of 3D printed concrete.

**Keywords:** 3D concrete printing; Additive manufacturing; Cementitious materials; GGBS; Sustainable construction.

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## **Identification and Analysis of Factors Influencing Project Overhead Costs in High-rise Buildings**

*Krushnal Patil\*, Saurabh Patil\*\*, Anurag Patale\*\*\* and Babalu Rajput\*\*\*\**

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### **ABSTRACT**

The current study attempts to investigate factors influencing the overheads of high-rise buildings with a special emphasis on Indian construction scenario. Being a prominent component of project spending, overheads are not accurately studied owing to their indirect as well as project-dependent variations. The objective of this study is to settle on the prominent factors responsible for increased overhead costs during high rise construction projects. The formation of factors was done by carrying out a detailed study of available literature followed by a structured questionnaire study of 102 construction professionals such as contractors, engineers, and project managers. Via reliability tests along with Exploratory Factor Analysis (EFA), forty genuine variables have been extracted under nine broad groups such as project factors, planning & estimation efficiency, design management factors, administration factors for construction sites, labor & equipment factors for efficient use of labor & equipment, financial factors for effective financial use, factors depending upon project administration. The results have clearly shown importance of various factors for effective overhead expenditure. Suggestions have been provided following covered factors. The paper offers empirical insights that can benefit industry experts to better understand overhead cost behavior and can help improve cost management processes in Indian construction industry.

**Keywords:** Project overhead cost; High-rise construction; Indian construction industry; Construction cost manager.

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## **Optimizing Delays in Residential Construction Projects using MCDM Techniques**

*Sagar Argade\*, Anarva Ushir\*\* and Raj Surve\*\*\**

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### **ABSTRACT**

Residential construction project delays are still a big issue that causes cost overruns, conflicts, and client dissatisfaction. This paper considers maximizing delay management through the use of Multi-Criteria Decision-Making (MCDM) techniques like the Analytic Hierarchy Process (AHP) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). Data were gathered using structured questionnaires sent out among the most important stakeholders of the project namely the contractors, engineers, and consultants. The answers were used to determine and rank the most significant delay factors, such as contractor performance, workforce productivity, availability of resources, and funding. AHP was utilized to rank the relative weight of these factors, and TOPSIS was utilized in ranking the alternatives and determining the key contributors to delays. The findings show that contractor coordination and the availability of skilled labor have significant effects on project durations. The use of MCDM techniques provides a structured framework for decision-making, allowing project managers to introduce focused mitigation measures, increase the efficiency of scheduling, and enhance overall project performance. This study proves the usability and efficacy of MCDM in minimizing uncertainties and ensuring prompt completion of projects in residential construction projects.

**Keywords:** MCDM; AHP; TOPSIS; Residential projects; Delay optimization.

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## **Construction Labour Productivity Prediction through Bayesian Network in Residential Projects**

*Abhishek Vishwakarma\*, Manohar Karneedi\*\* and Jayanth Bochina\*\*\**

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### **ABSTRACT**

Labour productivity plays a crucial role in the success of residential construction projects. In India, where the construction industry is still heavily dependent on manual labor, low productivity often causes delays and cost overruns. Traditional estimation methods are not always effective because they do not capture the complex relationships between various factors that influence productivity. This study aims to address that gap by identifying and ranking the key factors affecting labor productivity, to developing a Bayesian Network (BN) model to predict productivity, and to validating the model using real project data. The key factors were identified through a detailed literature review and evaluated using a Likert-scale expert survey. Cronbach's Alpha (0.910) confirmed that the data was reliable, and the top 15 factors were ranked based on their significance. A BN model was then built to show how these factors are connected and influence one another. When tested on actual residential project data, the model accurately predicted 71.9% chance of achieving the expected productivity, closely matching the real outcomes. These results show that Bayesian Networks can be a practical and reliable tool for predicting labor productivity, helping project managers plan better, focus on critical factors, and improve overall project performance.

**Keywords:** Labour productivity; Bayesian network; Construction management; Productivity prediction.

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## **Strategies for Enhancing Productivity in Industrial Infrastructure Projects**

*Pavan Chitade\*, Bijoyshree Debbarma\*\*,  
Prateek Singh Chauhan\*\*\* and Anand Prakash\*\*\*\**

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### **ABSTRACT**

Industrial infrastructure projects are crucial to economic growth, but they ultimately face ongoing productivity issues related to time, cost, and inefficiency. The purpose of this study is to identify, analyze, and recommend opportunities for enhancing productivity in large-scale projects. The data were collected through a systematic literature review of international studies and supplemented with primary data collection via a structured questionnaire aimed at engineers, contractors, and project managers. A well-defined research process is developed to connect specific philosophical findings with practical methods to gather and analyze data. The findings emphasize that integrated models that utilize standardized processes, digital technologies such as BIM and IoT, and comprehensive upskilling programs boost project performance. The analysis identified that advanced standardization and vendor management practices were emerging; however, advanced technologies such as predictive analytics and artificial intelligence were not widely adopted, which can be another area of opportunity. Aligning the technological or innovation aspect requires a more human and organizational approach to bring lasting productivity enhancements. This research provides various practical insights for policy makers, EPC contractors, and industry practitioners focused on improving efficiency and competitiveness in industrial infrastructure projects.

**Keywords:** Industrial infrastructure; Strategic management; Productivity; Standardized processes.

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## **Construction Project Delay Due to Material Mismanagement**

*Ankit Yadav\*, Sanjeev Kumar\*\*,  
Mrinal Priyadarshi\*\*\* and Sreelakshmi Sreekumar\*\*\*\**

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### **ABSTRACT**

Construction project delays that result due to material mismanagement have significant impact on construction project schedules, increases the project cost and raise challenges to construction project delivery. This study critically examines the primary causes and factors that contribute to such delays, focusing to address significant gaps that were identified in material management in construction. Key shortcomings include limited adoption of advanced material tracking technologies such as RFID and IoT, insufficient exploration of inefficiencies during material handling, procurement process and logistics, the absence of comprehensive frameworks for effective delay mitigation and financial aspects of these mitigations in construction projects. The study provides analysis of these issues, aiming to establish a well-defined understanding of the impact of material mismanagement on project performance. Emphasizing the importance of integrating innovative digital tools and process upgradation, this study extends a structured perspective that intends to facilitate continued practical improvements and enhancements. This study bridges the gap between theoretical perspectives and practical challenges for construction project delays and offers insights improving project timeline and cost efficiency in construction management by advancing towards digital transformation for material management in construction projects.

**Keywords:** Construction delays; Material mismanagement; Radio Frequency Identification (RFID); Internet of thing.

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## **Urban Underpasses – Need for Improvement, Development and Monetization**

*Satya Bhaskar Molleti\*, Netaji Venkata Subramanyam Gorle\*\*, Jagannadha Sasank Kothalanka\*\*\* and Chandrakant Shriram Gokhale\*\*\*\**

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### **ABSTRACT**

**Purpose:** Urban underpasses provide safe and efficient movement for pedestrian movement. However, in many cases, the underpasses remain underutilized due to poor maintenance. This research aims to evaluate the condition of underpasses in urban cities, to identify the major causes of underutilization, and propose innovative, sustainable methodologies for their improvement, maintenance and monetisation. **Research Design/Methodology:** The study uses field observations, surveys and comparative case studies. The data was collected from the urban underpasses located in various urban situations. Analysis of survey data provided insights into user perceptions on cleanliness, lighting, safety, accessibility and other parameters. The research methodology integrates various solutions like community-based maintenance, integration of public and private sectors to improve safety, functionality and overall user experience of the pedestrians using the underpass. **Key Findings:** The findings show poor lighting, poor sanitation and improper maintenance are the major reasons for the underutilization. The proposed methodologies like community maintenance, integrating public and private sectors and active stakeholder participation can transform underpasses into functional, safe and community-integrated urban assets.

**Keywords:** Urban underpasses; Community participation; Maintenance methodology; Urban mobility; Infrastructure.

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## **Risk Assessment in Construction Contracts for Urban Infrastructure Projects in India**

*Shishir Tiwari\*, Ritik Dahiya\*\* and Anant Jindal\*\*\**

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### **ABSTRACT**

India's rapid urbanization has increased the execution of complex metro and urban infrastructure projects. However, ongoing cost overruns, delays, and disputes reveal serious weaknesses in how contracts assign risk. This study looks into how risks are allocated and managed in metro project contracts, focusing on those in Ahmedabad, Delhi, and Mumbai. It assesses how these contractual tools affect the frequency of disputes and overall project performance. An explanatory mixed-methods research design was used. It combined clause mapping from project contracts with a comparison to CPWD, FIDIC, and NEC frameworks. Quantitative analysis involved expert surveys from 27 practitioners. The data was analysed using Relative Importance Index (RII), Normalised Severity Index (NSI), and Combined Risk Score (CRS) techniques. The findings show that Payment Terms, Liquidated Damages, and Change-in-Scope clauses lead to the most disputes, mainly due to unclear procedures and uneven risk distribution. Contractors take on most performance and site-related risks. The study suggests rewriting high-risk clauses, using escrow-based payment systems, limiting liquidated damages, enforcing timely dispute resolution, and broadening coverage for political and regulatory risks. This research offers a detailed guide for developing more balanced infrastructure contracts in India. It addresses the important gap between contractual theory and construction practice.

**Keywords:** Contract risk allocation; Metro projects; Dispute management.

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## **Enhancing Material Shortage in Supply Chain Management through Agile Practices**

*Phani Sai Poojith Kolapalli\*, Sasank Reddy Palavelli\*\*,  
Abdul Khaliq Mutahhir Shaik Malige\*\*\* and Nilesh Agarchand Patil\*\*\*\**

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### **ABSTRACT**

The Construction Industry plays a key role in developing the economy but there are frequent struggles with persistent Material Shortages and Supply Chain Management. The disruptions occur frequently on Volatile Material Prices, Delay lead times and Dependency on Supplier have exposed limitations of Procurement in Conventional ways. This study exposes how Agile principles shows leverage on Supply Chain Resilience and Minimize the Material Shortages which are occurring in the construction projects. The main objective is to identify the root causes of material shortages, assessing for existing Supply Chain Inefficiencies and developing framework that integrates with Agile Practices such as JIT, Kanban visualization, Cross functional collaboration and Real time tracking. This study begins with Secondary data review of Literature papers, followed by Primary data collection through Survey Forms from Professionals in Construction Industry including Project Manager, Engineers and Contractors. The results suggest material shortage primarily stems from scarcity of raw materials, reliance on suppliers and poor coordination among project stakeholders. The suggested agile frameworks shows that it incorporates iterative planning and digital visibility facilitating quicker decision making and enhanced adaptability to market fluctuations. The research enhances both theoretical and practical knowledge by connecting conventional supply chain frameworks with flexible management approaches.

**Keywords:** Material shortage; Supply chain management; Agile practices.

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## **Economical Sustainability in Small Scale Residential Projects**

*Sahil Ingle\*, Nishant Bagad\*\*, Somraj Saha\*\*\* and Sameer Gujar\*\*\*\**

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### **ABSTRACT**

This study dives into how we can make small-scale residential housing projects more economically sustainable by reducing construction costs and promoting practical, eco-friendly solutions. Builders and developers in smaller cities often hit roadblocks when adopting sustainable practices, mainly because of limited awareness, tight budgets, and restricted access to advanced construction technologies. To address these challenges, the study explores how Building Information Modelling (BIM) can assist in cost-effective planning, resource optimisation, and waste reduction in residential construction. The research includes surveys, a literature review, and selected case studies to identify the key obstacles and effective strategies for integrating sustainability into smaller projects. The study highlights practical methods that can be scaled down by comparing insights from larger developments with the realities faced in tier-3 cities. The ultimate aim is to provide builders and developers with valuable guidelines that empower them to create affordable, sustainable housing solutions while enhancing long-term economic performance in the residential sector.

**Keywords:** Building Information Modelling (BIM); Sustainable construction; Cost optimization; Residential housing.

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## **A Comparative Evaluation of Conventional & Digital Safety Practices on Construction Site**

*Ujwal Bijwar\**, *Ameya Belasare\*\**,  
*Mihir Kamble\*\*\** and *Abhijeet Sangapurkar\*\*\*\**

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### **ABSTRACT**

Construction as an industry is exposed to high risks because of its complicated nature of work, ever-changing working styles and man-made factors. Historically, safety management was based on old-fashioned solutions such as paper-based checklists, manual inspections and reporting systems. However, due to the fast pace of technological change, digital methods (like BIM) and hardware (drones or Safety Management Software) are being used more often in the construction safety environment to improve safety performance. The objective of this study is to compare the effects of conventional and digital safety protocols on-site. The quantifiable part of data was obtained from site visits, questionnaire surveys and interviews with experts in the safety domain. KPIs, such as hazard identification ratio, response time and worker alert rate, were investigated. The results show that digital safety systems can result in a substantial reduction of live real-time monitoring, data correctness, and communication overhead over traditional techniques. But issues such as high implementation cost, technical illiteracy and resistance of the host community have been noted. According to the research, “the integrated safety management approach, which combines traditional methods with digital technologies, represents the most sustainable and effective solution in terms of development in safety performance on construction projects.

**Keywords:** Construction safety; Digital safety management; Integrated Safety Management System (ISMS).

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## **V-BUILT: Digitally Transforming India's Residential Construction Ecosystem**

*Anmol Singh Chauhan\*, Mayur Hambirao Nikam\*\* and Atharva Rajay Ringe\*\*\**

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### **ABSTRACT**

V-BUILT is an innovative digital platform built to streamline and organize India's fragmented residential construction sector. It connects homeowners, architects, and contractors through a single, transparent, and technology-driven ecosystem that simplifies the entire project lifecycle — from design and cost estimation to tendering, execution, and handover. Unlike conventional platforms that only facilitate contractor matchmaking, V-BUILT offers an optional Project Management Consultancy (PMC) service that ensures professional oversight, cost control, and timely project delivery. By leveraging verified professionals, structured workflows, and transparent pricing mechanisms, it minimizes risks related to delays, overruns, and poor workmanship. Supported by insights from Mordor Intelligence (2025) and GlobalData (2025), which indicate steady growth in India's construction industry, V-BUILT emerges as a timely solution addressing long-standing inefficiencies. Through phased digital expansion, it aims to redefine how residential projects are planned and executed, ultimately becoming India's most trusted ecosystem for transparent, efficient, and quality value -driven home construction.

**Keywords:** Project management; Transparency; Digital construction.

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## **Analysing and Mitigating Disputes in Indian Construction and Infrastructure Contracts**

*Ishan Sahu\*, Aditya Anirudh Gosukonda\*\* and Dhruv Patil\*\*\**

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### **ABSTRACT**

Disputes are an inevitable component of complex construction and infrastructure projects, particularly in a developing economy like India where multiple stakeholders, dynamic site conditions, and public–private interactions coexist. This research paper examines the causes, nature, and resolution of disputes within Indian construction contracts, integrating theoretical insights from contract management with empirical findings from industry practices and case studies. Drawing from the Indian Contract Act (1872), Arbitration and Conciliation Act (1996), and relevant judicial precedents, this study identifies poor drafting, unclear risk allocation, delayed payments, and communication failures as the most recurrent causes of disputes. The empirical component includes analysis of disputes from public and private infrastructure projects such as NHAI highway packages, CPWD works, and PPP models. The study proposes a dispute mitigation framework emphasizing preventive contract management, risk identification, transparent communication, and effective use of alternative dispute resolution (ADR) methods. Findings indicate that early detection, fair risk sharing, and strong documentation can significantly reduce dispute frequency and severity. The paper contributes actionable strategies for practitioners, policymakers, and contract administrators to promote conflict-free, efficient project delivery within India’s growing infrastructure sector.

**Keywords:** Contract disputes; Dispute mitigation; Arbitration; Risk allocation; ADR.

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## **Delay in Pune Metro Line 3: A Case Study on 1.7 km Flyover Segment between SPPU & E- Square**

*Atul Patel\*, Shivam Nalawade\*\* and Nilay Sangidwar\*\*\**

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### **ABSTRACT**

This study investigates the most pertinent delay factors on the completion of the 1.7 km elevated flyover segment between SPPU and E-square on the Pune Metro line 3, one of the most critical urban corridors under PMC ward no.11- Bopodi-Savitribai Phule Pune University. Even with detailed planning, there have been considerable setbacks on the project timeline, mainly due to difficulties posed by the urban and complex site conditions. This study seeks to ascertain, evaluate, and prioritize the key reasons for delays using the Relative Importance Index (RII) technique, and in doing so, it continues to study the delays experienced by urban metro projects in India. Surveys utilizing Simple Random Sampling (SRS) were conducted right among the Pune Metro stakeholders as well. This sample size ascertained with a 10% margin of error, as per Solvin's formula, provided reliable RII-based results. The 1.7 km SPPU–E Square stretch of Pune Metro Line 3 faced delays primarily because of contractor mobilization, traffic management, design changes, approval delays, budget constraints, and weak stakeholder coordination. This study contributes valuable insights for minimizing future metro project delays and strengthening urban infrastructure delivery mechanisms.

**Keywords:** Pune metro line 3; Project delay; Urban infrastructure.

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## **Drivers and Barriers to BIM Integration in Construction Contracts: A Literature Review and Conceptual Model**

*Sreeranjini Sreekumar\*, Arjun Jothi Prasad\*\* and Sagar Malsane\*\*\**

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### **ABSTRACT**

BIM system has revolutionized the process of construction project delivery through better visualization, coordination and sharing of information among stakeholders in construction project. Despite extensive technological progress, the implementation of BIM in the construction contracts is not entirely completed and the potential advantages are weakened. This paper is a systematic literature review to analyze the contractual, organizational, and collaborative influences on BIM integration in construction contracts, which facilitates or obstructs it. According to a critical analysis of peer reviewed journals in construction management, most important drivers and barriers are summarized into five major constructs- BIM Integrated Contract Conditions, BIM Implementation Capacity, Collaboration History and Trust, Contractual and Legal Clarity, and Project Performance. Based on these constructs, a conceptual research model that will be used in Partial Least Squares Structural Equation Modeling (PLS SEM) is constructed that will explain relationship between contractual and organizational mechanisms and BIM-enabled project outcomes. The suggested paradigm offers the targeted theoretical base of future empirical validation in the form of surveys conducted within industry. This study helps to understand enablers and constraints of contracts and contributes to literature of construction management and provides some practical information about how to better BIM-oriented contract drafting and project governance.

**Keywords:** Building information modeling; Construction contracts; Drivers and barriers; Contractual framework.

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## **Automation in Precast Building Technology using Bim and Lot - A Case Study Based Approach**

*Agniswar Mukherjee\*, Nirmitsaa Chowdhury\*\* and Divyank Pandhare\*\*\**

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### **ABSTRACT**

Indian construction companies face persistent delays, cost escalations, and inefficiencies, complicated by the use of manual processes. Although precast concrete technology assures improved quality, cost management, and reduced schedules, its potential is not being fully utilized through limited automation and disjointed coordination. This study examines how Building Information Modelling (BIM) and the Internet of Things (IoT) can be used to solve these problems. Employing a case study research approach targeting Baner residential projects in Pune, augmented by literature review and stakeholders' feedback, the research suggests an integrated BIM-IoT framework. This system supports real-time monitoring and data exchange, automates workflows, and allows digital collaboration. The findings suggest that integration minimizes human error substantially and sets up a credible, scalable model for technologically enhanced construction. The report provides a roadmap to revamp precast construction practices throughout the Indian construction sector, enabling quicker, more reliable project delivery. This integration also promotes sustainable practices and long-term efficiency across project lifecycles.

**Keywords:** Precast construction; BIM; IoT; Automation; Construction efficiency.

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## Sustainable Mix Design for 3D Printing

*Vikrant Mali\*, Yash Chaudhari\*\*, Abhay Nannavare\*\*\* and Sudarshan Kore\*\*\*\**

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### ABSTRACT

The construction industry is continuously evolving with advancements in materials and technology, and cement concrete mortar remains a fundamental component in this transformation. As an essential material for masonry, plastering, and structural applications, cement mortar offers versatility and strength. However, the sustainability and performance of cement concrete mortar continue to present significant challenges, primarily due to issues such as high cement consumption, shrinkage, cracking, porosity, and the lack of standardized mix design procedures that ensure consistent quality and durability. This study focuses on developing a sustainable mix design by partially replacing Ordinary Portland Cement (OPC) with Ground Granulated Blast Furnace Slag (GGBS) and Ultrafine GGBS (UFGGBS) to enhance the performance of mortars. A total of 11 mix combinations were tested with GGBS (0–35%) and UFGGBS (0–10%) replacements, maintaining a constant water-to-binder ratio of 0.308. The experimental program will evaluate porosity, fresh bulk density, and permeability characteristics. The findings confirm that the combined use of SCMs can effectively reduce the carbon footprint while improving the overall performance. This research contributes to the formulation of eco-efficient mix designs, promoting the widespread adoption of sustainable cement mortar in modern construction.

**Keywords:** Sustainable mix design; GGBS; Ultrafine GGBS; Water absorption; Supplementary cementitious materials.

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## **A Comparative Study of Delay Analysis Methods**

*Simran Rauniyar\*, Kiran P.\*\* and Smitha Yadav\*\*\**

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### **ABSTRACT**

Delays in construction projects remain one of the most persistent challenges affecting timely completion and cost efficiency. Accurate delay analysis is therefore crucial for identifying the causes and for forming appropriate corrective action plan. This research aims to conduct a comparative evaluation of six principal delay analysis methods—Time Impact Analysis (TIA), Impacted As-Planned Analysis, Time Slice Window Analysis, As-Planned versus As-Built Analysis, Retrospective Longest Path Analysis, and Collapsed As-Built (But-For) Analysis. The study utilizes a real-world case of an industrial shed construction project located in Pune, India, where baseline scheduling and actual progress data are inputted in Microsoft Project (MSP). Each delay analysis method will be systematically applied to the same dataset to assess its suitability, accuracy, and cost implications. Through comparative interpretation, the research seeks to identify the most appropriate delay analysis technique for projects of similar scale and complexity. The findings are expected to contribute toward establishing a structured framework for selecting delay analysis methodologies in the Indian construction industry, thereby improving dispute resolution, project monitoring, and time management practices.

**Keywords:** Delay analysis; Cost overrun; Cost efficiency.

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## **Study on Sustainable Construction Materials and Practices Adopted in Ancient Structures and Contextualizing in the Contemporary Construction**

*Pavan Totla\*, Mukesh U. R. \*\*, Lohith R. \*\*\* and Srinivasan K. B. \*\*\*\**

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### **ABSTRACT**

This research examines sustainable materials and practices used in ancient Indian architecture and places their use in modern construction. Ancient Indian architecture used locally available, natural building materials like lime, stone, wood, and clay, which provided excellent durability, thermal comfort, and low environmental load. This study attempts to find out such sustainable materials and practices, their properties, and assess how they can be applied in modern sustainable construction. The methodology constitutes a comprehensive literature review of ancient construction methods, collection of data from structured questionnaire surveys conducted among architects, engineers, and conservationists, and statistical examination of the responses to determine the feasibility and perception of incorporating traditional methods into modern-day construction. The research emphasizes the fact that looking back to ancient construction traditions can go a long way in cutting carbon emissions, enhancing the efficiency of materials, and bringing heritage conservation into balance with contemporary sustainability principles. The research calls for a combination of traditional knowledge with contemporary technology through a hybrid approach in order to encourage resilient, eco-friendly construction systems.

**Keywords:** Sustainability; Ancient materials & techniques; Traditional knowledge.

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## **Mitigating Construction Execution-phase Challenges via Strategic Planning Framework**

*Viraj Khairnar\*, Tejodeep Korpe\*\*, Hemangi Yelne\*\*\* and Sanjay Bhoyar\*\*\*\**

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### **ABSTRACT**

Most construction projects suffer from delays, cost overruns, mismanagement of resources, discrepancies in design, and poor coordination at the time of execution. Even with detailed planning, the execution phase remains dynamic, full of uncertainties that are compounded by weak risk assessment and unstructured management. A combination of a literature review and stakeholder interviews was used to study in detail the critical issues affecting the performance of high-rise residential construction projects in India. The major problems identified include labor inefficiency, poor communication, delays in approvals, procurement challenges, and limited use of digital tools. A structured questionnaire was used to assess the frequency and impact of these issues for project managers, engineers, contractors, and consultants based on the following categories: human resources, equipment and technology, materials, process and planning, finance, and management. The result of the analysis was a strategic planning framework that incorporated various checklists, digital tools, and risk management processes to enhance schedule reliability, coordination, and resource utilization. The study concludes that proactive, data-driven, and technology-supported planning can reduce risks in the execution phase of high-rise residential construction projects to achieve better performance, efficiency, and timely delivery.

**Keywords:** Execution phase challenges; Root causes; Risk management; Digital tools; Strategic planning.

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## **Examining Stakeholder Relationship Complexity Ethical Compliance in Client & Contractor Blacklisting Issues**

*Sarvojit Mane\*, Ved Shinde\*\* and Kirti Rajhans\*\*\**

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### **ABSTRACT**

The construction industry is greatly helpful to a nation's socioeconomic progression. However, because of its multi-stakeholder community consisting of customers, contractors, and consultants, moral dilemmas and poor communication make up a percentage. One of these is the presence of blacklisting as a governing tactic to punish such unethical and violative conduct. Blacklisting, particularly within the public construction industry of India, is heavily criticized because of its lack of transparency and inconsistency, notwithstanding ethical conduct. This research aims to evaluate and analyze the various complexities and complexities regarding the interconnectedness and moral obligations with respect to client and contractors' blacklisting within public projects within India. This research is based on various consequences and impacts, including organizational, financial, and brand-related consequences, and on motivational forces such as operational efficiency, ethical violations, and legal violations. Moreover, this research uses qualitative exploratory research, which is based on secondary research and aims to evaluate and address existing infrastructural and biased issues within organizations such as PWD, NHAI, and NHIDCL. In keeping with that, there is a critical necessity to adopt an ethical and unbiased yet transparent system of blacklisting to ensure such accountability and ethical conduct within such organizations.

**Keywords:** Stakeholder relationship complexity; Ethical compliance of client & contractor; Contractor blacklist.

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## **Precast Concrete Technology: A Sustainable Pathway for Modern Urban Development**

*Vishal Bhalla\*, Nitin Murali\*\*, Vivek Singh\*\*\* and Subham Dash\*\*\*\**

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### **ABSTRACT**

Precast concrete technology presents considerable social, environmental, and economic benefits over traditional cast-in-place construction. By manufacturing structural and architectural components off-site, this method significantly reduces on-site congestion, noise, dust, and pollutant emissions. This is particularly advantageous in dense urban settings. This research utilized software to analyze load behavior, stresses, and deflections. It facilitated modeling, defined sectional dimensions, and configured support systems to simulate precast behavior accurately. It generated comprehensive data on bending moments, shear force distributions, deflections, and crack control, culminating in a detailed design report for each structural member upon successful analysis. The analysis indicates that precast systems can achieve a 55% reduction in concrete volume and a 40-65% reduction in steel reinforcement. This efficient use of materials conserves natural resources and lowers the energy consumption and CO<sub>2</sub> emissions linked to their production. Furthermore, the diminished need for temporary formwork reduces timber consumption, helping to mitigate deforestation. The result is a lighter structure, which enhances seismic performance and reduces the load on foundations. As urban areas face growing environmental and social pressures, precast concrete emerges as sustainable construction method. It offers accelerated project timelines, assured quality control, and smaller ecological footprint, supporting the key principles of sustainable urban development.

**Keywords:** Diminished; Sustainable; Ecological footprint; CO<sub>2</sub> emissions; Lighter structure.

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## **Barriers in Implementing Construction and Demolition Waste Management**

*Aditya Harpe\*, Vedant Darunkar\*\* and Shivani Adhav\*\*\**

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### **ABSTRACT**

The accelerated pace of urbanization and infrastructure development has led to a substantial increase in construction and demolition (C&D) waste generation, posing significant environmental and management challenges. Although policies and guidelines for managing this waste exist, their implementation on the ground remains limited. This research aims to identify, analyze, and rank the key barriers hindering effective C&D waste management practices. To achieve this, a detailed review of previous research was carried out to identify potential barriers commonly faced across different projects. Based on this, a structured questionnaire was designed and shared with professionals working in the construction sector to gather their perceptions on the importance of each barrier. The collected responses will be analyzed using the Relative Importance Index (RII) method to determine and rank the barriers according to their significance. The outcomes of this research are expected to provide valuable insights for policymakers, practitioners, and researchers to address the most critical barriers and enhance the implementation of sustainable waste management practices in the construction industry.

**Keywords:** Construction and demolition waste; Waste management; Barriers; Sustainable construction.

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## **Multi-criteria Decision-making Framework for Selecting Project Delivery Method**

*Yash Gawali\*, Mrugmay Mali\*\* and Smitha Yadav\*\*\**

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### **ABSTRACT**

A key choice that affects project success in terms of budget, schedule, quality, and risk is choosing the right Project Delivery Method (PDM). A methodical and logical approach is necessary to direct decision-makers as project complexity increases. The goal of this research is to create a multi-criterion decision framework that will help stakeholders choose the best Project Delivery Method (PDM) by weighing both qualitative and quantitative aspects equally. The framework aims to increase the decision-making process's consistency and objectivity. The important selection criteria and influencing factors will be determined by a thorough literature review. A structured questionnaire will be created based on these results in order to gather professional opinions from those in the industry. The framework will be developed by analyzing the responses using Multi-Criteria Decision-Making (MCDM) techniques. The study will produce a flexible, data-driven framework for decision support that will allow for the well-informed choice of Project Delivery Methods in intricate building projects.

**Keywords:** Project delivery method; Decision framework; MCDM; Construction management; Selection criteria.

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## **Sustainable Bamboo Crash Barrier**

*Yashraj Bhosale\*, Rutik Girme\*\*, Richa Barle\*\*\* and Smitha Yadav\*\*\*\**

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### **ABSTRACT**

Roadside safety barriers are instrumental in reducing the intensity of vehicle accidents; though, the traditional steel and concrete barriers are not only linked to high prices, ecological load, and high impact forces because they have rigid behaviour. This paper provides a nonlinear dynamic finite element analysis of a vehicle bamboo barrier system to analyse the impact response of the system in the form of stress distribution, nature of deformation, and energy dissipation processes. Three-dimensional numerical model was created in SOLIDWORKS Simulation, the bamboo barrier was modeled as a collection of cylindrical elements and the vehicle was a rigid-dominant deformable steel body. The bamboo barrier has outstanding deformation capacity which is demonstrated by the considerable displacement of the structure and proves it to be effective in absorbing kinetic energy. Bamboo bending and material strain energy are the main factors that determine the energy absorption process and are supplemented with contact friction, which leads to the decrease in vehicle deceleration, and small rebound effects. It is concluded that bamboo is highly promising as an alternative to traditional roadside barrier. The results can be useful in the creation of sustainable and effectual roadside safety systems.

**Keywords:** Stress deformation; Solid works; Effectual roadside safety.

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## **A Critical Review on Communication Barriers in Indian Construction Projects and Their Impact on Project Performance**

*Swarangi Sonar\*, Dev Sharma\*\* and Anurag Latkar\*\*\**

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### **ABSTRACT**

The study “A Critical Review on Communication Barriers in Indian Construction Projects and Their Impact on Project Performance,” finds how ineffective communication among stakeholders affects project success in Indian construction industry. The research was conducted by developing a structured questionnaire for project managers across multiple construction sites to understand how communication flows within their respective projects and doing case studies on published papers. The responses were analyzed to identify major communication barriers, their impact on project performance parameters and to suggest practical mitigation strategies. This research study found that the main barriers include language and cultural differences, rigid hierarchical structures, etc. These barriers often cause misinterpretations, miscommunication, delayed decisions, cost overruns, rework, and safety issues. Analysis of the responses showed that while most project teams depend on verbal and informal channels, there is a growing awareness of the need for organized communication systems. The research ends with a Strategies for implementation that suggests short-term actions like RFI tracking and visual communication tools, as well as long-term strategies such as digital transformation, cross-cultural training, and standard communication protocols. By tackling communication challenges in a structured way, the construction industry can boost productivity, safety, and quality while reducing delays and disputes.

**Keywords:** Communication barriers; Construction projects; Project performance; Stakeholder coordination; India.

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## **Study on Geopolymer Paver Block Made with Construction Waste Materials**

*Shamik Ghosh\*, Roshan Pradhan\*\*, Harshit Dubey\*\*\* and Shashank B. S.\*\*\*\**

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### **ABSTRACT**

The expanding generation of construction and demolition (C&D) waste is a major environmental and disposal issue in the construction sector. Concurrently, the need for sustainable options to traditional cement-based materials has grown exponentially because of the extensive carbon footprint created during the manufacture of Ordinary Portland Cement (OPC). This research aims at producing geopolymer paver blocks from C&D waste as a complete substitute for natural aggregates and sodium metasilicate as an activator. Aluminosilicate in the waste, mixed with red brick powder or sludge as binder, is geopolymerised under controlled curing. Compressive strength, water absorption, and durability are studied under varying activator concentration, liquid-to-binder ratio, and curing temperature. Findings show that geopolymer paver blocks have equal or better strength than normal concrete pavers but with considerable reduction in embodied carbon and in waste disposal load. The research focuses on promoting a circular economy and saving resources by reusing construction and demolition (C&D) waste. The results should demonstrate that using recycled concrete aggregate (RCA) and recycled fine aggregate (RFA) reduces dependence on new materials. It offers a cost-effective and eco-friendly way to create durable paver blocks. Overall, this project supports India's aim to implement green construction practices and build environmentally friendly infrastructure.

**Keywords:** Geopolymer paver blocks; Geopolymerised; Recycled Concrete Aggregate (RCA); Recycled fine aggregate.

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## **Application of Information Technology in Implementation of the Recycled Concrete Aggregate (RCA) Standards in India**

*Sahil Biradar\*, Laksh Agrawal\*\*, Shivam Chavan\*\*\* and Vijaya Desai\*\*\*\**

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### **ABSTRACT**

The implementation of Recycled Concrete Aggregate (RCA) standards is vital for advancing sustainable construction practices in India, where construction and demolition waste generation is increasing rapidly. Information Technology (IT) plays a significant role in strengthening the adoption, monitoring, and enforcement of RCA standards throughout the construction industry. The research focuses on strengthening standardization and material testing practices throughout the lifecycle of Recycled Concrete Aggregate (RCA) through systematic use of information-based processes. In terms of material testing, structured data management supports accurate evaluation of aggregate properties such as strength, durability, grading, and contamination levels. Continuous and organized documentation of test results enhances traceability from source to application. Overall, the information-driven approach reinforces quality assurance, facilitates effective compliance with standards, and promotes confidence in the use of RCA for construction applications in India. The findings indicate that the standards improve operational efficiency, minimizes material wastage, and strengthens decision-making in the use of RCA. Additionally, these standards support sustainable procurement practices and lifecycle evaluation, contributing to reduced environmental impact. The study concludes that the strategic integration of information technology can accelerate the standardization and acceptance of RCA in mainstream construction, thereby supporting India's sustainability goals and circular economy initiatives.

**Keywords:** Recycled concrete aggregate; Sustainable construction; Information technology.

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## **Evaluating the Role of E-tendering in Enhancing Transparency and Efficiency in Construction Procurement**

*Pratyush Kumar\*, Vivek Kumar\*\*,  
Shiv Prasad Rakh\*\*\* and Deepak M. Sundrani\*\*\*\**

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### **ABSTRACT**

Public construction procurement in India has traditionally relied on manual tendering processes, which are often associated with delays, limited transparency, and exposure to unethical practices. To overcome these challenges, electronic tendering has been introduced across public sector organizations; however, its level of effectiveness varies across regions and agencies. This study examines the role of e-tendering in enhancing transparency and efficiency in public construction procurement in India. The research adopts a descriptive and analytical approach using both primary and secondary data. Primary data were collected through structured questionnaires administered to contractors and procurement professionals, while secondary data were sourced from government reports, published literature, and official procurement portals. A comparative assessment of manual and electronic tendering systems was conducted across selected Indian states, focusing on tender processing time, administrative costs, transparency in bid evaluation, and contractor participation. The findings reveal that e-tendering significantly reduces procurement time and costs while improving transparency through standardized procedures and digital records. However, issues such as limited digital literacy, technical constraints, and resistance to change continue to hinder effective implementation. The study concludes that focused training initiatives, improved digital infrastructure, and supportive regulatory measures are essential to fully realize the benefits of e-tendering in construction procurement.

**Keywords:** E-tendering; Construction procurement; Transparency; Efficiency; Public projects.

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## **Evaluation of Sustainable Façade Systems in Commercial High-rise Buildings**

*Snehal Lathe\**

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### **ABSTRACT**

Sustainable façade systems play a very important role in improving the energy performance and environment quality of commercial high-rise buildings. The main aim of this research is to evaluate different types of sustainable facades systems and understand how they help in reducing energy consumption, improving indoor comfort, and supporting green building goals. This was carried out because commercial high-rise buildings consume large amounts of energy for cooling, lighting, and ventilation, especially in dense urban areas. The research methodology includes a detailed literature review of recent studies, case studies of commercial high-rise buildings, and comparison of different facades technologies such as double-skin facades, high-performance glazing, shading devices, and green facades. Energy efficiency, thermal performance, daylight availability, and sustainability benefits were considered as key evaluation parameters. The main findings show that sustainable façade systems significantly reduce heat gain, improve natural daylight, lower cooling loads, and enhance occupant comfort. Advanced glazing systems and integrated shading devices were found to be highly effective in hot and humid climates. In conclusion, the study highlights that selecting an appropriate sustainable façade system can greatly improve building energy performance, reduce environmental impact, daylight & comfort and support long-term energy savings in commercial high-rise buildings.

**Keywords:** Sustainable facade; High-rise buildings; Energy efficiency; Commercial buildings; Building envelope.

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## **Application of Last Planner System (LPS) and 5S Methodology to Improve Workflow Efficiency on Construction Sites**

*Aswajith P.\* and Anil Agrawal\*\**

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### **ABSTRACT**

The research focuses on the ways in which the combination of the Last Planner System (LPS) and the 5S methodology could be used to increase the efficiency and reliability of the workflow within the construction sites. LPS is implemented as a team-based, pull-based production planning and control system that enhances the reliability in schedules by engaging last planners in commitment-based weekly planning, constraint elimination and on-going monitoring using measures like Percent Plan Complete (PPC). PPC failures are analyzed to determine their roots which enable the learning cycle and continual improvement of short-term plans, stabilizing the production flows. Simultaneously, the 5S methodology is applied to organize and standardize the working conditions, minimize the wastage of motion, search time, errors, and safety accidents by sorting and arranging, cleaning, standardizing, and maintaining the practices in their system. The integrated application in construction sites should enhance the reliability of planning, enhance site organization and minimize delays that eventually result in increased productivity, safety operations and predictability of performance of the project delivery.

**Keywords:** Planner System (LPS); 5S methodology; Lean construction; Workflow.

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## **Safety Analysis in Formwork Erection and Dismantling - Sensor based Monitoring for Risk Assessment during Formwork and Scaffold Erection**

*Rahee Bhattacharyya\**

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### **ABSTRACT**

The construction industry has been facing a major challenge in the safety of formworks and scaffolding, which has led to a complete transition from human-based visual checks to automated monitors that are powered by sensors. Cyber-Physical Systems (CPS) and Digital-Twins (DT) can be integrated for risk management as they are considered as the most advanced and efficient solution for real-time risk assessment. The combination of kinematic sensors for activity detection and structural health sensors, specifically ultrasonic, strain, and inclinometer devices, can successfully eliminate the difference between human errors and structural failure. The demonstrating factor is the high accuracy of machine learning models, for instance, the stacking meta-ensemble method which attain 98.53% accuracy model. It is possible to trace worker behaviour reliably through correct mapping of their activities and unsafe practices in high-risk phases like erection and stripping. In addition, safety is no longer a “rule-of-thumb” process but rather a predictive methodology based on the comparison of real-time sensory data against FEA-derived boundary limits. Traditional methods are often described as time-consuming causing a lot of errors, whereas an all-encompassing IoT-based system would give a scalable, inexpensive solution that guarantees both the safety of workers and the integrity of the temporary structure.

**Keywords:** Formwork; Safety; Kinematic-sensors; Digital-twins.

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## **Establishing Quantitative Methods to Measure the Cost Impact of BIM Implementation in Construction Project Management**

*Sai Charan Janga\**

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### **ABSTRACT**

Building Information Modelling (BIM), particularly 5D BIM, has emerged as a digital approach for improving cost estimation, cost control, and financial decision-making in building construction projects. Although BIM adoption has increased, its cost benefits are predominantly qualitative, limiting stakeholders' objective evaluation of economic effectiveness. The absence of standardized quantitative methods to measure BIM's cost impact remains a critical challenge in project management. This research aims to establish these methods, focusing on key indicators: cost variance, estimation accuracy, rework reduction, overrun frequency, and ROI. It adopts a data-driven approach with comparative analysis of BIM-enabled vs. conventional projects, percentage deviation, and BIM-derived cost indices. Scope limits to building projects, emphasizing planning and construction stages. This study proposes a structured quantitative approach, while existing studies affirm BIM potential, they lack replicable frameworks linking functionalities to numerical outcomes. This proposes a structured quantitative framework to address this gap, systematically connecting BIM to measurable indicators. Findings will enhance cost transparency, investment decisions, and practical management in construction.

**Keywords:** 5D BIM; Cost impact; Quantitative framework; Cost variance; ROI.

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## **A Review on Framework for Synchronizing 4D and 5D BIM with Project Scheduling Systems for Improved Construction Time and Cost Performance**

*Bhanu Prasad Jarrapalli\**

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### **ABSTRACT**

Building Information Modeling (BIM) especially its 4D and 5D versions has shown real promise in construction by improving visualization, coordination, clash detection, and cost tracking across projects ranging from highways and bridges to high-rises and rail infrastructure. Studies consistently highlight 4D BIM's strengths in scheduling visualization, delay analysis, and change management, while 5D BIM excels at cost estimation and cash flow control; however, these efforts are fragmented often stuck in tool-specific demos, single-case validations, or conceptual frameworks without a straightforward way to sync 4D/5D data with everyday project schedules using proven metrics like schedule variance (SV), cost variance (CV), and ROI. This research bridges that gap with a practical, contractor-friendly framework that integrates 4D simulations (for time visualization and conflict spotting) directly with 5D cost data and live schedules, enabling real-time performance tracking through standard SV/CV/ROI indicators. We'll validate it by comparing BIM-enabled projects against traditional ones, using actual data to quantify gains in efficiency, delay reduction, and cost savings while keeping it flexible for typical workflows without relying on any one software suite.

**Keywords:** 4D/5D BIM synchronization; Schedule Variance (SV); Cost Variance (CV); Time-cost framework.

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## **A Review of Use of Industrial By-Products for Sustainable 3DCP**

*M. Deepak\*, Tata Venkata Bharadwaj\*\*,  
Dheeraj Kumar Yadav\*\*\* and Sudarshan D. Kore\*\*\*\**

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### **ABSTRACT**

The invention of 3D concrete printing (3DCP) as a technique of construction can also save a lot of manpower, construction time- and time-wasting materials. Nevertheless, its high dependency on Ordinary Portland Cement (OPC) is a matter of concern in terms of high carbon emission and the overall cost. This article evaluates the possible application of industrial by-products as an alternative cementitious material to 3DCP namely GGBS, ultra-fine GGBS and limestone powder. According to existing literature, the materials support fresh-state properties, such as increasing the packing of particles, promoting stable flow, and printability, and strength between layers to deposit more accurately. Enhancements in the mechanical performance are also claimed and that GGBS contributes to strength development in the long term and ultra-fine GGBS improves densification at the early age. Extrusion smoothness and shape retention is enhanced by limestone powder. Besides technical advantages, these materials have economic and environmental ones because they have less cement content and less embodied energy. However, material dosage, fineness and curing conditions are very sensitive in print performance. More experimental validation, optimization of mixes, and cost analysis will be required to support the adoption of industrial by-products in sustainable 3D printing of concrete.

**Keywords:** 3DCP; GGBS; Ultra-fine GGBS; Limestone powder; Cost analysis.

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## **Strategic Information Management (SIM): Aligning BIM Model Data to the Level of Information Need (LOIN) to Prevent Over-modeling**

*Hari krishna Botla\**

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### **ABSTRACT**

Building Information Modelling (BIM) is a powerhouse for construction, but it has a “clutter” problem. Many projects fall into the trap of over-modelling, stuffing files with unnecessary data that leads to bloated file sizes, skyrocketing costs, and confusion during maintenance. Essentially, when we don’t define exactly what we need, we end up with digital “noise” that hinders more than it helps. This research aims to trim the fat by merging Strategic Information Management (SIM) with the Level of Information Need (LOIN) framework from ISO 19650. By reviewing over 30 peer-reviewed papers and real-world case studies, I will pinpoint exactly where information gaps lead to waste. The goal is to develop a SIM–LOIN framework that dictates exactly what data is essential at every project stage. I’ll put this framework to the test on a live BIM project, measuring success through reduced file sizes and the elimination of redundant elements. The result? Leaner, more efficient models that provide genuine value throughout a building’s entire life.

**Keywords:** BIM over-modelling; Level of Information Need (LOIN); Strategic Information Management (SIM).

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## **Study on Modern Construction Techniques and Project Management Practices in High-rise Buildings**

*Pratik Patil\**

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### **ABSTRACT**

Rapid urban development is making the construction of high-rise buildings more common, but it comes with a number of difficulties, including tight deadlines, significant safety risks, and higher construction costs. This study focuses on contemporary construction methods and project management strategies that enhance high-rise projects' speed, safety, and cost-effectiveness. Understanding how cutting-edge technologies and efficient management techniques can address typical site issues is the primary goal of the study. Major challenges in high-rise construction are identified by the study, including a lack of workers, a delay in the delivery of materials, safety risks at heights, and a lack of team coordination. It also examines contemporary formwork systems that enable quicker construction with higher-quality finishing, such as jump formwork and MIVAN aluminium formwork. Additionally, the study assesses project management techniques like effective planning, scheduling, manpower management, resource optimization, and enhanced stakeholder communication. Lastly, to lower accidents and boost overall performance in high-rise buildings, the study offers doable tactics for improved coordination, efficient use of resources, and robust safety and quality control systems.

**Keywords:** High-rise buildings prefabrication; Lean construction; Safety management.

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## **Nature's Steel: How Bamboo with Carbon Fiber Can Shape the Future of Sustainable Construction**

*Arpit Raj Singh\*, Deepesh Sinha\*\*, Daksh Pawar\*\*\* and Shridhar Kumbhar\*\*\*\**

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### **ABSTRACT**

This work proposes to explore the feasibility of using bamboo composite laminated with carbon fibers instead of traditional steel in an effort to produce high quality and environmentally friendly construction material. As an annual renewable and abundantly available material, bamboo provides several advantages concerning the processing of the material, including the reduction of carbon footprint and the use of very little processing energy. To increase the material strength and efficiency, carbon fibers with notable high strength/weight ratios, high durability, corrosion-resistant property, and high resilience will be used to saturate the bamboo matrix and increase the efficiency and applicability of the final composite material produced using bamboo and carbon fibers. Tensile and compression tests will be used to analyze the prepared composite material for its load-carrying capacity and efficiency regarding the construction of high-strength structures with much lower carbon emission and energy consumption associated with the processing of traditional steel used in construction.

**Keywords:** Bamboo; Sustainable material; Carbon fiber; Steel replacement.

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## **Application of Time Impact Analysis in Indian EPC Projects**

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### **ABSTRACT**

Indian Engineering, Procurement, and Construction (EPC) projects are executed under conditions where project scope, execution sequence, and work availability often change during construction. Delays in such projects are rarely attributable to a single cause; instead, they are the combination of design development, partial access to work fronts, approval dependencies, external agency coordination, and environmental influences. Although detailed project schedules are prepared at the planning stage and periodically updated during execution, the interpretation of delay impacts is commonly based on overall project outcomes rather than cause- effect relationships. Time Impact Analysis (TIA) is a delay assessment technique, evaluates the effect of individual delay by incorporating them into the project schedule at the point in time when the events occur. This study examines the applicability of Time Impact Analysis using project scheduling and progress records. The research places emphasis on assessing schedule, consistency, updates, and availability of supporting site documentation. Delay fragnets are developed based on documented events and inserted into schedules to observe their effect on critical path and overall project duration. The outcomes provide guidance for project planners, contract administrators, and claims professionals in selecting and applying Time Impact Analysis.

**Keywords:** Delay analysis; Time impact analysis; Project scheduling; Claims.

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## **A Review on 4D BIM-based Schedule Integration for Delay Analysis in Construction Projects**

*Aleena Kurian\**

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### **ABSTRACT**

Schedule delays continue to pose significant challenges in construction projects, often resulting in cost overruns, disputes, and reduced project performance. Previous research highlights the potential of 4D BIM in improving visualization, schedule integration, communication, and progress monitoring, as well as the role of digital tools in enhancing the reliability and transparency of delay analysis. However, existing studies largely address these aspects in isolation, with limited focus on an integrated framework for systematic schedule delay detection and analysis. This research proposes a 4D BIM-based framework for schedule delay analysis in construction projects. The methodology involves integrating 4D BIM models with Primavera/MS Project schedules to enable real-time progress tracking and visualization of construction activities. Schedule and progress data are analysed using data-driven techniques to automatically detect and classify schedule delays at the activity level. The performance of the developed models is evaluated using appropriate accuracy metrics to assess their effectiveness and reliability. By linking schedule information directly with BIM-based visualization, the proposed framework improves transparency in delay analysis and supports more effective schedule monitoring.

**Keywords:** 3D BIM model; MSP; Primavera(P6); 4D BIM; Delay analysis.

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## **A Review on BIM based Life Cycle Assessment for Carbon Footprint Evaluation**

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### **ABSTRACT**

The building and construction sector contributes significantly to carbon emissions, highlighting the need for reliable methods to evaluate environmental impacts during the building life cycle. Conventional life cycle assessment approaches often rely on manual quantity calculations, which can be time-consuming and may lead to inaccuracies. This study focuses on integrating Building Information Modelling with Life Cycle Assessment to improve the accuracy of carbon footprint evaluation for a selected building project. A detailed BIM model is developed to represent the building elements and materials, and accurate material quantities are extracted directly from the model. These BIM-derived quantities are then used as inputs for the LCA to assess the carbon footprint and associated environmental impacts of the building. By linking BIM with LCA, the study minimizes errors in quantity estimation and ensures a more consistent assessment process. The results demonstrate that the integrated BIM–LCA approach provides a structured and reliable method for evaluating material-related carbon emissions, supporting informed decision-making toward reducing the environmental impact of buildings and promoting sustainable construction practices.

**Keywords:** Building information modelling; Life cycle assessment; Carbon footprint; Material quantity take-off.

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## **Optimization of Trenchless Utility Diversion Techniques through Risk Based Assessment for Metro Station and Tunnel Projects**

*Aditya Itagi\**

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### **ABSTRACT**

Utility diversion in metro stations and tunnel projects presents significant technical and managerial challenges due to dense underground congestion, strict deformation control requirements and severe consequences of utility service disruption. Although trenchless techniques are widely adopted, the selection of an appropriate diversion method is often experience-based rather than derived from a structured optimization process that considers project-specific risks. This study proposes a qualitative, risk-based optimization framework to support the selection of trenchless utility diversion techniques in complex metro station and tunnel environments. The research identifies and categorizes key risks, including construction, geotechnical, utility interaction and operational risks associated with major trenchless methods such as horizontal directional drilling, micro tunnelling and pipe jacking. Expert judgement is incorporated to rank these risks and assess method suitability under varying site constraints and strict metro safety requirements. Based on this prioritization, a risk-informed decision-support matrix is formulated to aid method selection by reducing overall risk exposure while meeting constructability and operational requirements. The proposed framework enables systematic, transparent and consistent decision-making, thereby improving planning and pre-construction strategies for metro infrastructure and tunnel projects.

**Keywords:** Trenchless technology; Utility diversion; Risk-based optimization; Method selection; Metro & Tunnel.

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## **Comparative Analysis of NATM and TBM Tunneling in Indian Geological Conditions**

*Harshad Kapshe\**

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### **ABSTRACT**

Tunnelling in the Himalayan region of India involves major engineering challenges due to complex geology, variable rock mass conditions, groundwater inflow and seismic activity. The Rishikesh–Karnaprayag railway project in Uttarakhand, particularly the Devprayag section, passes through difficult terrain and requires proper selection of a suitable tunnelling method. Among the commonly adopted techniques, the New Austrian Tunnelling Method (NATM) and Tunnel Boring Machine (TBM) tunnelling are widely used, but their suitability depends on site-specific geological and geotechnical conditions. This study presents a comparative analysis of NATM and TBM tunnelling under Indian Himalayan geological conditions, with reference to the Rishikesh–Karnaprayag alignment. The comparison focuses on technical feasibility, constructability, ground response, safety, construction time, cost implications and environmental impacts. The objective is to develop practical recommendations for selecting an appropriate tunnelling approach for similar Himalayan infrastructure projects. The methodology includes a review of literature, analysis of existing geological and geotechnical data, field reconnaissance and rock mass classification using standard systems. Design considerations, construction planning, cost, risk and environmental aspects of both methods are evaluated. The study concludes that TBM is suitable for long homogeneous rock stretches, while NATM offers greater flexibility in weak and variable Himalayan geological conditions.

**Keywords:** NATM; TBM; Himalayan tunnelling; Rishikesh–Karnaprayag railway project.

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## **Analysis of Lifecycle Cost and Time Performance for RC and SFRC Segmental Tunnel Linings in Metro Rail Projects**

*Vivek Kamshetty\**

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### **ABSTRACT**

Urban metro tunnels require strong lining systems that maintain structural integrity while being cost-effective and completed on time. Precast segmental linings are widely used in metro tunnels built by TBMs. The decision between Reinforced concrete (RC) segments and steel fiber reinforced concrete (SFRC) segments often depends on initial construction costs, with less attention paid to performance over time and overall lifecycle costs. This research compares the lifecycle costs and time performance of RC and SFRC segmental tunnel linings in metro rail projects in India. The study looks at key lifecycle phases, including manufacturing at the casting yard and transportation, TBM start-up and segment installation, as well as maintenance throughout the design service period. It emphasizes casting cycle time and manufacturing efficiency since these factors directly influence TBM operation and the overall project schedule. A framework for lifecycle cost analysis based on Net Present Value (NPV) is proposed to evaluate the total costs of both lining types, along with a sensitivity analysis of factors such as production rate, maintenance frequency, and discount rate.

**Keywords:** Life cycle cost assessment; Segmental tunnel lining; Reinforced concrete; Steel fiber reinforced concrete.

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## **BIM-based Risk Assessment Framework for I-Girder Bridge Erection in Marine Site Conditions**

*Mansoor Sayyad\**

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### **ABSTRACT**

Bridge construction using I-girders involves several practical limitations in real construction conditions. In marine areas, Coastal road construction faces significant limitation of alignment, crane capacity, and crane radius due to ground conditions. Crane can be operated on temporary access bridge. During the initial stages of construction, placing I-girders is relatively easy. However, as bridge construction progresses, the erection process becomes increasingly complex. During erection, the risk level increases in placing of I- girders becomes complicated. To mitigate these risks and to make successful construction, Building Information Modelling (BIM) is used. BIM-based modelling is used for crane positioning, erection planning, I-girder 3D modelling and sequences of the activities. The developed BIM model helped in identifying risk factors and detailed risk assessment and strategic planning. By using BIM, crane placement strategies for the I girder erection are evaluated for safety and feasibility as part of project management which helps us in proper and informed decision making.

**Keywords:** Bridge construction; Risk management; BIM; Visualization; Project risks.

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## **Cost Optimization Techniques in EPC Contract through Real Time Data Insights**

*Saurabh Lohar\**

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### **ABSTRACT**

Due to design modifications, procurement uncertainties, and execution-related challenges, engineering, procurement, and construction (EPC) projects frequently encounter cost overruns and inefficiencies. This study investigates how real-time data insights can improve decision-making and transparency throughout the project lifecycle, thereby supporting cost optimization in EPC contracts. This study investigates the application of digital tools, including data analytics platforms, the Internet of Things (IoT), Building Information Modeling (BIM), and Enterprise Resource Planning (ERP) systems, to monitor labor productivity, material consumption, equipment performance, and project progress. The integration of these data streams facilitates the early identification of cost deviations, reduces waste and rework, enhances procurement planning, and optimizes resource allocation. The study concludes that real-time, data-driven cost management in contemporary EPC project delivery effectively mitigates financial risks, enhances cost control, and significantly improves overall project efficiency and competitiveness. This strategy offers support for enhanced contractual compliance, improved communication with stakeholders, continuous development, and sustained organizational learning across all EPC project portfolios.

**Keywords:** EPC; 5D BIM; EPR system; IOT system; Real time data analysis.

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## **Performance Evaluation of Earthmoving Equipment in Highway Construction**

*Mohit Gavade\**

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### **ABSTRACT**

Highway construction depends heavily on earthmoving equipment for activities such as excavation, hauling, spreading, and compaction. Machinery makes up a large part of project cost and directly affects project time, quality, and profit, it is very important that this equipment is used efficiently. This study focuses on evaluating the actual performance of major earthmoving equipment such as excavators, bulldozers, rollers, and dump trucks at selected highway construction sites. The research involves a detailed study of equipment including excavators, dumpers, loaders, graders, and rollers. Data such as working hours, cycle time, output, fuel usage, and maintenance records were collected directly from the project site. Using this data, the actual productivity of each machine was calculated and compared with standard or theoretical productivity to identify performance gaps. Equipment utilization rate and cost per unit of work were also analyzed based on ownership and operating costs. The study identifies the main factors that affect equipment performance, such as site conditions, haul distance, coordination between machines, operator skill, and maintenance practices. The results show where productivity losses and cost overruns occur due to poor equipment selection, improper planning, and underutilization.

**Keywords:** Earthmoving Equipment; Highway construction; Productivity analysis; Equipment utilization.

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## **Waste Minimization through Lean Construction Practices: A Critical Review of Frameworks and Applications**

*Matin Pinjari\**

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### **ABSTRACT**

Construction activities continue to generate significant material waste and non-value-adding processes, adversely affecting project performance and sustainability. Lean construction has been increasingly adopted as a strategy for waste minimization; however, existing research remains fragmented, with diverse frameworks, tools, and application contexts, and limited critical synthesis of their effectiveness. This study presents a systematic and critical review of lean construction practices for minimizing material and process waste, with particular emphasis on proposed frameworks and their practical applications. A structured literature review was conducted using major academic databases, including Scopus, Web of Science, and the ASCE Library. The selected studies were classified based on lean tools applied, waste categories addressed, project type, and level of empirical validation, covering both conceptual and empirical investigations from building and infrastructure projects. The findings indicate that lean tools such as the Last Planner System, Value Stream Mapping, Just-in-Time delivery, and 5S are widely reported to reduce waste and process inefficiencies. However, most frameworks remain conceptually oriented or validated through limited case studies, with applications predominantly focused on building projects. The limited quantitative assessment and infrastructure-specific validation highlight the need for empirically supported context-specific lean frameworks for effective waste minimization.

**Keywords:** Lean construction; Construction waste; Waste minimization; Infrastructure projects.

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## **Analysing Stakeholder Communication Networks using Social Network Analysis to Improve Lean Workflow Performance in Construction Projects - A Systematic Review**

*Shakeeb Mohammed\**

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### **ABSTRACT**

Previous studies in construction management emphasize the importance of stakeholder communication and lean workflow performance; however, these aspects are often examined independently, with limited attention given to understanding stakeholder communication as a structured network of interactions on construction sites. The complexity of stakeholder communication often leads to coordination challenges that can affect lean workflow performance. This research proposes to analyse stakeholder communication networks in a construction project using Social Network Analysis (SNA) to understand communication pathways, influential stakeholders, and potential communication bottlenecks. A case study approach is proposed for a construction project in Mandya, wherein key stakeholders will be identified, and communication data will be collected from site records such as RFIs, approval logs, and meeting minutes. The study proposes to develop a stakeholder communication network and examine it using selected SNA metrics, including degree, betweenness, closeness, eigenvector centrality, and network density. Lean workflow performance is expected to be assessed using indicators such as approval turnaround time, workflow interruptions, and rework occurrences. The analysis and findings are expected to provide a clear visual and analytical understanding of how stakeholder communication structures influence lean workflow performance and to offer insights that can support improved coordination among stakeholders on construction sites.

**Keywords:** Stakeholder communication; Social network analysis (SNA); Lean construction; Workflow performance.

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## **Advanced Cost Optimization Framework in Large-scale Construction Projects using 3D, 4D and 5D BIM Technologies: A Review Paper**

*Guru Chaitanya Varalu\**

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### **ABSTRACT**

This study provides an overview of the current state of global research on how Building Information Modeling (BIM) can be used to optimize costs associated with construction projects of an industrial scale. A large body of literature was reviewed which included peer-reviewed articles, conference proceedings, and industry studies that referenced the use of 3D, 4D, and 5D BIM to manage construction costs. Although BIM has been widely adopted in recent years, it appears that its use for managing costs remains inconsistent and fragmented throughout various stages of the project life cycle. BIM extends beyond 3D to include 4D scheduling and 5D cost analysis. As identified in the studies reviewed, four-dimensional BIM enhances the ability of construction planners to visualize and sequence their work. Five-dimensional BIM brings together quantity, time, and cost data to facilitate dynamic cost estimating and monitoring. However, the studies reviewed also highlighted several persistent knowledge gaps like the limited integration of time and cost data, the underemphasis on complexity of large-scale projects, and the absence of standardization of processes for optimizing costs. A framework for optimizing costs using BIM and guidelines for future studies were developed from this literature review.

**Keywords:** Building Information Modeling (BIM); Cost optimization framework; 4D; 5D BIM; Time–cost integration.

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## **The BIM Impact on Stakeholders Management in Airport Construction**

*Gaurav K. P.\**

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### **ABSTRACT**

Airport construction projects involve a wide range of stakeholders, including owners, designers, contractors, operators, regulators, and commercial users, whose requirements often differ and change throughout the project lifecycle. Managing these stakeholders using traditional 2D drawings and fragmented coordination methods frequently leads to miscommunication, design conflicts, and project delays. This study examines the impact of Building Information Modelling (BIM) on stakeholder management in airport construction projects. It explores the role of scan to BIM practices in airport construction, and cloud-based platforms such as Autodesk Construction Cloud in improving coordination and decision-making. The findings indicate that BIM enables a shared digital environment that enhances visualization, reduces clashes, improves schedule and cost control, and supports lifecycle asset management. A comparison with traditional coordination approaches highlights significant improvements in collaboration, transparency, and accountability among stakeholders. However, challenges such as data interoperability, model accuracy, high information volumes, and learning curves remain. Overall, the study concludes that effective stakeholder management through BIM platforms makes airport projects easier to execute and faster to deliver when compared to conventional methods.

**Keywords:** Building Information Modelling (BIM); Stakeholder management; Scan to BIM; Airport construction.

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## **Implementation of Total Productive Maintenance (TPM) for Effective Equipment Management in Infrastructure Projects**

*Anjali Patil\*, Vidya Khanapure\*\* and Tottadi Rama Chandra Shekar\*\*\**

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### **ABSTRACT**

Efficient equipment management ensures infrastructure projects are delivered in time and at lower cost. However, frequent breakdowns, poor maintenance practices, and lack of performance monitoring often lead to productivity losses and increased project costs. This research aims to Automate Equipment Maintenance by using ERP systems for efficient equipment management in construction and infrastructure projects, by following various maintenance practices such as Total Productive Maintenance (TPM). The research work explores existing maintenance practices that have been adopted in the organization and recognizes the deviation then evaluates the impact of TPM on improving Overall Equipment Effectiveness (OEE). Data regarding various equipment operations in several construction projects is analyzed, which includes Daily operations, Idle time, Breakdown time, Repair time, Maintenance scheduling, actual maintenance time, and expert interviews to understand loss areas. A TPM model is developed to improve reliability, preventive maintenance culture, and safety awareness among maintenance crew. The results are expected to demonstrate significant reductions in equipment downtime, increased utilization percentage, production quantity, thereby reducing the equipment cost the project cost. The research highlights TPM as a practical and sustainable approach for modern infrastructure project management.

**Keywords:** Total productive maintenance; Overall equipment effectiveness; Preventive maintenance.

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## **A Study on Impact of Geosynthetic Applications in Construction Projects**

*Aditya Mhaske\*, Sivaraman S.\*\* and Vidya Khanapure\*\*\**

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### **ABSTRACT**

The infrastructure projects such as highways, railways, and other critical or mega structures poses challenges with respect to the ground condition. Most of the projects necessitates the deep foundation or ground improvement to overcome the problems associated with unfavourable ground conditions such as weak, expansive, or soft soils. Geosynthetics have been the most important innovation in the field of ground improvement. This includes Geotextile, Geogrids, Geonets, Geocells, Geostrips, Geomats & Geomembranes and each has their own purpose and function. They often outperform traditional solutions, enabling longer lasting support at lower material cost. The present work includes study of geosynthetics material types and their application principles in construction industry. The study will focus on evaluation of design efficiency, construction methodology, environmental impact, cost and time savings by usage of geosynthetic materials particularly geotextile and geocell. The key findings will include degree of ground improvement, behaviour, sustainability, project cost & time saving factors in a typical project condition.

**Keywords:** Geosynthetics; Geotextile; Geocell; Application; Sustainability.

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## **Improving Formwork Deployment Efficiency through Workforce Skill Gap Analysis and Targeted Training Models**

*Aashutosh Kumar Thakur\* and Shashank B. S.\*\**

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### **ABSTRACT**

Improving manufacturing productivity while ensuring safety and quality practices requires reliable, data-driven methods for measuring employee performance and optimizing formwork operations. Recent advances in artificial intelligence, online training, and automation offer strong alternatives to traditional experience-based and manual methods. AI-based motion recognition using video data allows for precise measurement of individual worker activities and identification of inefficient actions in column formwork operations. This supports targeted training and performance improvement. Online upskilling programs have significantly increased productivity, especially among mid-career employees and in technically demanding trades like shuttering carpentry. Formwork deployment optimization models that consider construction schedules, concrete strength gain, formwork reuse cycles, and time-related costs clearly show the significant impact of time on overall formwork economy. Emerging technologies, such as BIM-based formwork planning, multi-criteria decision-making models for formwork system selection, and 3D point cloud-based inspection frameworks, further enable data-driven planning, automated quality control, and better coordination among project stakeholders. Current digital formwork management faces challenges like project scale, data availability, and local constraints. Existing research shows that AI-driven productivity analysis and BIM-based planning models enhance production efficiency and cost management.

**Keywords:** Artificial Intelligence (AI); Formwork optimization; Productivity analysis; BIM-based planning.

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## **An Automated GIS and Image-based Inspection System for Pre-commissioning Assessment of High-tension Transmission Tower**

*Sakshi Khadke\*, Vijendra Kumar\*\* and Pradeep Paul\*\*\**

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### **ABSTRACT**

Transmission towers are an essential component in the power transmission setup, which needs comprehensive inspection before being used. Traditional inspection processes tend to be physically intensive, time-consuming, and pose serious risk to the lives of personnel conducting the inspection, especially in terrains that are difficult to traverse. This paper aims at providing an automated inspection system for pre commissioning task involving high tension transmission towers, combining the usage of GIS and image analysis techniques. High resolution images captured through Unmanned Aerial Vehicles and satellite imagery would be used for analyzing and identifying transmission towers and their structural integrity through missing object detection techniques. All inspection results are georeferenced and managed within the GIS environment for exact spatial visualization, efficient data management, and systematic analysis. The study introduces innovative system that reduces the time of inspection in contrast with conventional approaches while improving the accuracy and consistency of observation. The framework improves safety operation by minimizing direct human involvement in hazardous inspection activities and provides a sound, data-driven basis for inspection documentation, quality verification, and maintenance planning before the handover of the project.

**Keywords:** Automated tower inspection; Pre-commissioning evaluation; GIS-based assessment.

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## **A Comprehensive Review on Performance Evaluation of Limestone Calcined Clay Cement Concrete for Sustainable Construction**

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### **ABSTRACT**

Limestone Calcined Clay Cement (LC<sup>3</sup>) has emerged as a promising low carbon alternative to Portland cement, providing almost 50% reduction in clinker content and also reduction in carbon emissions. This review summarises current studies on LC<sup>3</sup> concrete, overlaying material properties, hydration mechanisms, fresh, mechanical, and durability overall performance. The synergistic interaction between the calcined clay and limestone promotes the formation of carboaluminate levels and complex calcium alumina-silicate hydrate gels, which while designed, permit LC<sup>3</sup> structures to obtain mechanical overall performance similar to conventional cementitious binders. However, the growing demand for water and sensitivity to rheological control highlights the significance of optimized mix design and chemical admixture compatibility. Past durability research showed improved resistance to chloride ingress and sulphate attack, although carbonation behaviour and long-term performance stay dependent on calcined clay quality and curing conditions. Life-cycle assessment continually shows 30-40% reductions in CO<sub>2</sub> emissions and energy consumption. Despite these advantages, large-scale adoption of LC<sup>3</sup> is limited with the variability in raw materials, limited standardization, and inadequate field validation. This review identifies key studies gaps and outlines future instructions needed to the widespread implementation of LC<sup>3</sup> in sustainable construction practices.

**Keywords:** Limestone Calcined Clay Cement (LC<sup>3</sup>); Sustainable concrete; Hydration mechanisms.

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## **Instrumentation for Horizontal and Vertical Level Monitoring using Laser and Sensor Technology in Formwork Applications**

*Bhagyesh Milind Kulkarni\**

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### **ABSTRACT**

Formwork is an important but temporary structural component in the construction of reinforced concrete and it can easily be out of alignment, deformed or unstable while wet concrete is being placed on top of it. Real-time displacement monitoring ensures safety, accuracy, and design quality compliance. Conventional inspection methods may overlook sudden deformations in complex formwork systems. The objective of this study is to review limitations of existing formwork monitoring techniques and to evaluate application of real-time solution using sensor-based technologies integrated within a Ubiquitous Sensor Network (USN) and Internet of Things (IoT) framework. Ultrasonic sensors and inclinometers can be used to assess the alignment and stability of vertical support members and wireless displacement sensors to monitor horizontal movements. Additionally, Fibre Bragg Grating (FBG) sensors inscribed in optical fibres using ultraviolet laser technology capture high-resolution strain responses related to formwork misalignment. Sensor data can be transmitted through a ZigBee-based wireless network to a centralized monitoring platform for real-time evaluation and alerts. This study shows improved early detection of misalignment, enhancing safety and decision-making. The study recommends implementing such systems for complex and high-rise formwork applications following suitability assessment.

**Keywords:** Concrete formwork; Alignment monitoring; FBG sensors; IoT-based monitoring; Construction safety.

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## **Comprehensive Review on Utilization of EAF Steel Slag Aggregates as Coarse Aggregate in Concrete**

*Harish Salunke\**

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### **ABSTRACT**

The use of Electric Arc Furnace (EAF) steel slag as a coarse aggregate for concrete has gained a lot of attention lately because EAF slag is an industrial by-product from the melting of steel in an electric arc furnace. As a result of large volumes of steel being melted each year, massive amounts of EAF slag have been disposed of and as a consequence both environmental and disposal problems. This paper reviews the existing body of knowledge with respect to using EAF steel. The purpose of this paper was to review and evaluate in a critical manner the available body of knowledge concerning the physical properties, performance, and suitability of EAF steel slag as a coarse aggregate in concrete. The study shows that the EAF steel slag as a coarse aggregate had a considerable effect on the fresh, hardened, and mechanical properties of concrete. Most studies demonstrated a decrease in the workability of the fresh concrete due to the irregular shape of the slag particles, their rough surface texture and high-water absorption of the slag particles. The study recommends proper aging, quality control, and mix design optimization to ensure long-term performance and wider field application.

**Keywords:** Electric arc furnace; Sustainable construction material; Coarse aggregate replacement.

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## **Comparative Cycle Time and Cost Benefit Analysis of RCC and Steel Building**

*Rakshith R. \*, Rakesh Kumar Reddy\*\* and Sanjay Ingale\*\*\**

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### **ABSTRACT**

Selecting an appropriate structural system plays important role in construction time and overall cost of project. In India, RCC and structural steel construction methods are mainly adopted, however both the methods have a different performance. The performance mainly depends on site conditions, resource availability, and planning method adopted. This study aims to investigate differences in construction cycle time and cost required for RCC and steel buildings through case-based analysis. A multi-storey building is analyzed to determine material quantities and structural details with detailed estimate based on market rates. A construction schedule is developed to assess floor cycle duration, manpower requirement and project completion time. Based on other cases, results indicate that buildings which use steel structures have faster rate of execution as elements are fabricated off site and can be rapidly assembled on site. While RCC execution involves longer curing periods and is highly dependent on previous activities. Both methods are highly dependent on labor productivity and site management practices. Steel has advantage in speed of construction, RCC is more economical in terms of initial cost. This study highlights major differences in time and cost between them and provides a useful insight when selecting structure based on time and cost.

**Keywords:** Construction cycle time; Cost; RCC; Steel structure.

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## **Excavation-Induced Ground Movements and Their Effects on Adjacent Structures: A Review of Multi-Parametric Assessment for Urban Construction**

*Chinmay Talekar\**

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### **ABSTRACT**

The research critically assesses the application multi-parametric framework study to evaluate intricate interaction between Ground Movements and Their Effects on Adjacent Structures using case study. Unlike any other construction work, the underground metro tends to go through urban areas. The CMRL corridor-3 the below thirumayilai station which is one of the India's deepest underground metro stations. During excavation, the ground settlement and its impact on adjacent structures is anticipated. Ground and structural behavior during excavation is studied through the analysis of field monitoring data from geotechnical instruments such as settlement markers, inclinometers, piezometers, crack meters, and vibration monitoring instruments. The study also assesses the expected impacts on neighboring structures, including surface settlement, lateral dislocation, crack propagation, and laying of the whole structure, according to the monitored trends. Application of on-site practices such as changes in excavation sequence, strengthening of support systems, and permanent monitoring with trigger levels are evaluated as corrective and preventive measures. The research emphasises the correct implications of staged excavation, strutting installation, ground water control and diaphragm wall construction for controlling Excavation-Induced Ground Movements.

**Keywords:** Excavation induced ground movements; Crack meters; Ground water control.

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## **Improving Construction Project Performance through Digital Technologies: A MacLeamy Curve Framework**

*Meghana Dymakkanavar\**

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### **ABSTRACT**

As infrastructure development accelerates due to industrial growth and evolving architectural requirements, construction projects are becoming increasingly complex. Such projects involve multiple stakeholders, strict timelines, and a high degree of coordination between design and construction, making conventional construction methods less effective in achieving time, cost, and quality targets. This study examines the integrated application of three-dimensional Building Information Modelling (3D BIM), automated precast segment mould systems, and drone-based construction monitoring as a solution to these challenges. Guided by the MacLeamy Curve, which emphasizes the value of early decision-making, BIM is employed to finalize designs at early stages, detect clashes, evaluate constructability, and optimize precast planning. Automated and adjustable precast mould systems enhance dimensional accuracy and consistency of structural components, reducing material waste, rework, and on-site labor dependency. In parallel, drone-based monitoring enables real-time tracking of construction progress, facilitating early issue identification and improved coordination among project teams. By shifting greater effort to early planning and data-driven decision-making, this integrated digital and automated approach improves cost certainty, enhances construction efficiency, and supports the timely delivery of complex infrastructure projects.

**Keywords:** Building Information Modelling (BIM); Automated precast construction; MacLeamy curve.

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## **Integration of BIM and LEAN Tools to Enhance the Communication and Coordination in Metro Construction**

*Rithish Sridhar\**

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### **ABSTRACT**

Metro construction projects are inherently complex due to multiple stakeholders, repetitive activities, constrained urban environments, and frequent design and schedule changes. Conventional planning and coordination approaches often lead to communication gaps, unreliable schedules, rework, and delays. This study examines the integration of Building Information Modeling (BIM) and Lean Construction tools to improve coordination and communication in metro construction projects, with particular emphasis on the Last Planner System (LPS). LPS is adopted as the primary Lean framework, incorporating look-ahead planning, Weekly Work Plans (WWP), constraint analysis, and Percent Plan Complete (PPC). These practices enable early identification and removal of constraints, enhance short-term planning reliability, and foster accountability and collaboration among project teams. BIM, especially 4D BIM, supports LPS by visually linking activities with time and space, improving understanding of work sequences, interfaces, and resource requirements. This integration facilitates collaborative planning, informed decision-making, and reduces dependency on rigid schedules. The study also identifies implementation challenges such as inconsistent BIM standards, inadequate model detail, resistance to cultural change, and training requirements. Despite these limitations, the integrated BIM–LPS approach significantly enhances coordination efficiency, communication clarity, and execution reliability, demonstrating strong potential for complex metro infrastructure projects.

**Keywords:** Building Information Modeling (BIM); Lean construction; Last planner system; 4D BIM.

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## Passenger-friendly Public Transportation System

*Sanat Kale\*, Prathamesh Jethwani\*\*, Aditya Desale\*\*\* and Nagarjuna Pilaka\*\*\*\**

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### ABSTRACT

A passenger-friendly public transportation system is essential for sustainable urban development and improved quality of life in cities. Such a system is designed to meet the daily travel needs of people by providing safe, reliable, affordable, and comfortable transportation. Efficient public transport reduces dependence on private vehicles, thereby lowering traffic congestion, fuel consumption, and environmental pollution. Key features include well-planned routes, adequate frequency of services, clean vehicles, and safe stations that ensure convenience and comfort for passengers. The integration of digital technologies such as real-time vehicle tracking, mobile ticketing, and electronic information displays helps passengers plan their journeys better and reduces uncertainty during travel. Accessibility is another important aspect, with facilities like low-floor buses, ramps, clear signage, and priority seating to support elderly people, children, and persons with disabilities. A passenger-oriented approach also emphasizes safety measures, trained staff, and responsive grievance systems. Overall, a passenger-friendly public transportation system promotes social inclusion, economic efficiency, and environmental sustainability while making urban travel smooth and stress-free for all users.

**Keywords:** Public transportation; Passenger comfort; Accessibility; Sustainability.

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## **Framework for Optimizing the Construction Process: The Integration of Lean Construction, Building Information Modeling (BIM)**

*Vethavikasini K. R.\**

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### **ABSTRACT**

This paper proposes an integrated framework that combines Building Information Modeling (BIM) and Lean Construction tools to enhance construction project management across the entire project lifecycle. The framework is structured around four key phases: planning, design, construction, and operation. It explains how BIM-enabled processes, lean principles, and emerging digital technologies interact within each phase to improve collaboration, optimize workflows, and maximize value delivery. The integration is guided by core principles such as functional alignment, workflow optimization, and lifecycle-based decision-making. To evaluate practical effectiveness, relevant Key Performance Indicators are identified, and existing limitations are discussed to inform future research directions. The framework was developed and validated using the Design Science Research Methodology, ensuring methodological rigor and real-world applicability. Overall, the proposed approach provides a structured pathway for reducing waste, minimizing operational inefficiencies, and improving overall project performance in contemporary construction environments across diverse project contexts and stakeholder environments globally today worldwide.

**Keywords:** Building information system (BIM); Lean construction; Project lifecycle management.

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## **Evaluation of Silver Sand as Backfill Material for Reinforced Earth Walls in Highway Projects as per MoRTH (5th Revision, 2013) and IRC:SP:102–2015**

*Tejas Parmale\*, Shashank B. S.\*\* and Subhasis Pal\*\*\**

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### **ABSTRACT**

Reinforced Earth (RE) walls are widely used in highway projects due to their flexibility, cost-effectiveness, and reliable performance under differential settlement. The stability and serviceability of RE walls depend largely on the engineering properties of the reinforced backfill. Current design guidelines in the MoRTH Specifications (5th Revision) and IRC:SP:102–2015 recommend conventional well-graded granular soils for this purpose. However, in riverine and flood-prone regions of Assam, particularly along the Majirgaon–Palasbari to Sualkuchi Bridge (MPSB) Project corridor, silver sand is abundantly available and commonly used due to its economic and logistical advantages, despite limited technical validation. Most previous studies focus on generic sand backfills and do not specifically examine the influence of silver sand's gradation and mechanical behavior on RE wall stability, indicating a clear research gap. This study assesses the suitability of silver sand as RE wall backfill for the MPSB Project through laboratory investigations, including gradation, compaction, shear strength, and permeability. Based on the results, internal and external stability checks are carried out in accordance with MoRTH and IRC:SP:102–2015 to provide region-specific technical justification for its use in Assam.

**Keywords:** Reinforced Earth walls; Silver sand backfill; MoRTH and IRC:SP:102–2015; Geotechnical characteristics.

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## **Enhancing Construction Efficiency in Mega Solar Projects through Precast Construction Technology**

*Shambhuraje Patil\**

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### **ABSTRACT**

India's mega solar power projects require construction solutions that ensure rapid execution, high quality, and long-term durability, particularly in remote regions with harsh environmental conditions. The Khavda Mega Renewable Energy Park in Gujarat is characterized by saline-sodic soils, extreme climatic conditions, high wind loads, and seismic vulnerability, which pose significant challenges to conventional cast-in-situ construction methods. This study examines how precast construction technology can improve construction efficiency in large-scale solar projects. The study focuses on the use of precast foundation and structural components for solar mounting systems, which are designed to address site-specific challenges like varying soil conditions, durability specifications, and tight project deadlines. Precast and cast-in-situ construction methods are compared in terms of construction methodology, execution speed, quality control, and durability performance. The findings show that precast construction offers superior durability in aggressive soil environments, greatly reduces on-site wet works, enhances construction consistency, and speeds up project delivery. Precast construction technology offers a scalable and sustainable way to increase construction efficiency in large-scale solar power infrastructure, according to the study's findings.

**Keywords:** Precast construction technology; Mega solar projects; Construction efficiency.

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## **Cycle Time Optimization in Precast Construction Project**

*Ashutosh Sutar\**

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### **ABSTRACT**

The use of precast construction methods has made it easier to finish big residential and infrastructure projects quickly. However, making each floor take less time consistently is still hard because of problems in planning, using resources, and working together across different parts of the project. This study looks into ways to improve the time it takes to complete each floor in precast projects. The goal is to speed things up without lowering the quality or safety of the work. The study collects and reviews detailed information about each project, like how much work was done each day, how many workers were used, what equipment was available, and how materials were moved. They use methods to measure how productive the work was and study how time is used in key steps like making the building parts, moving them, transporting them, and putting them up on site. They compare what was planned with what actually happened to spot problems and delays that keep happening. From these findings, the study suggests ways to improve workflows. These include better use of resources, aligning work between the factory and the construction site, and making repetitive tasks more efficient and consistent.

**Keywords:** Precast construction; Floor cycle time; Productivity measurement.

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## **A Review of Delay Analysis in Infrastructure Projects using Earned Value Management and Data Science**

*Danish Muzamil\**

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### **ABSTRACT**

The infrastructure projects, particularly in developing nations like India, are essential to social and economic advancement but typically encounter cost overruns and timetable delays. Conventional delay analysis techniques provide little assistance for proactive project control during execution and are mostly used for claims management and dispute resolution. Although Earned Value Management (EVM) has been widely used as an integrated approach for tracking schedule and cost performance, research to date shows that traditional EVM indicators are mainly assessment-oriented and have limitations when it comes to accurately predicting schedule delays in complex infrastructure projects. Simultaneously, current research emphasizes how data science and predictive analytics are increasingly being used to enhance project monitoring and decision making. With an emphasis on conventional delay analysis techniques, EVM-based approaches, extensions like Earned Schedule and Earned Duration, and new data-driven approaches, this review article looks at the body of research on delay analysis in infrastructure projects. Key research trends, constraints, and gaps in combining EVM with data science are identified based on a systematic evaluation of peer-reviewed articles, indicating future research prospects.

**Keywords:** Earned value management; Infrastructure projects; Delay analysis; Data science; Project control.

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## **Comparative Assessment of Construction Delay Analysis Methods and Their Implications for EOT Claims**

*Gayathri Sushriya\**

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### **ABSTRACT**

Time is of the essence the delay in projects completion has long been an issue in construction, often leading to EOT claims disputes. True delay analysis is, therefore, critical for proper scheduling and claims administration. Many methods have been proposed to analyse time delay, especially Impacted as Planned and Time Impact Analysis as most commonly used. In this paper, this review, analyse and compare these approaches according to findings from literature and industry guides. The comparison is based on methodological assumptions, critical path modelling, delay quantifying and float handling or treatment, data needs and appropriateness for EOT claims. By the existing studies, this research attempts to identify pros and cons as well as practical challenges of impacted planned method and time impact analysis method. The result of the review is expected to contribute a structured guideline for methods selection according to project features and data availability, providing a reference point at which schedule-based analysis using Primavera P6 could be started.

**Keywords:** Impacted as planned; Time impact analysis; EOT claims.

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## **Developing a Risk Management Framework for EPC Projects in Renewable Solar and Battery Energy Storage Systems (BESS)**

*Sahana M. J.\**

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### **ABSTRACT**

The rapid growth of renewable energy infrastructure has led to an increasing number of solar photovoltaic projects being implemented under Engineering, Procurement, and Construction (EPC) contracts, often integrated with Battery Energy Storage Systems (BESS). While EPC contracting simplifies project responsibility, solar and BESS projects face several uncertainties related to technology, regulation, supply chains, contracts, and grid integration. In particular, the inclusion of BESS introduces new risks such as battery safety, performance degradation, and long-term operational reliability, which require enhancement of existing risk management practices to effectively address these challenges. This study aims to develop a structured and practical risk management framework specifically for EPC projects in solar and BESS developments. The research focuses on identifying and categorizing key risks across different phases of the project lifecycle, including development, procurement, construction, and commissioning. A qualitative research approach is adopted, based on a review of relevant literature and established project risk management practices. Risks are identified using a Risk Breakdown Structure and assessed using a probability–impact approach. The proposed framework is intended to support project owners, EPC contractors, and project managers in proactively managing risks, thereby improving cost control, schedule performance, and overall project reliability in solar and BESS EPC projects.

**Keywords:** Risk management framework; EPC contract; BESS projects; Solar project.

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## **Evaluation of Hybrid and Electric Construction Equipment for Sustainable Construction Practices**

*Vishwajeet Patil\**

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### **ABSTRACT**

The construction industry is highly dependent on diesel-powered equipment, which contributes significantly to fuel consumption, greenhouse gas emissions, and environmental pollution. In recent years, hybrid and electric construction equipment have gained attention as sustainable alternatives due to their potential for improved energy efficiency and reduced environmental impact. This study presents a comprehensive literature review focused on the evaluation of hybrid and electric construction equipment in comparison with conventional diesel-powered machinery. The review analyses existing research related to the operational and technical characteristics of these machines, including powertrain configurations, energy management strategies, and performance behavior under typical construction duty cycles. Studies addressing energy consumption, emissions, and life cycle costs are examined to understand the economic and environmental advantages of these technologies. The review also explores the potential for carbon footprint reduction and decreased dependency on fossil fuels through the adoption of hybrid and electric equipment. Further, the review briefly discusses commonly reported challenges and feasibility considerations, particularly in relation to infrastructure availability, power supply, and cost aspects in developing construction environments. Overall, this literature review provides a consolidated understanding of current research trends and serves as a contextual foundation for future investigations into sustainable construction equipment practices.

**Keywords:** Hybrid construction equipment; Electric construction equipment; Sustainable construction.

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## **Smart Site Safety Monitoring for High-rise Buildings using IoT and Predictive Analytics**

*Gourav Nikam\**

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### **ABSTRACT**

High-rise construction projects such as Manora Amdar Niwas, Mumbai present significant safety challenges due to complex work environments, elevated work levels, and dynamic interactions between workers, machinery, and structural elements. This research proposes a Smart Site Safety Framework leveraging the Internet of Things (IoT) and Predictive Analytics to proactively monitor site conditions, identify potential hazards, and minimize workplace accidents. The framework integrates distributed IoT devices (wearables, environmental and equipment sensors) to collect real-time data on worker location, structural parameters, and environmental conditions. The collected data is processed using predictive analytics models to forecast safety risks and enable decision-making before incidents occur. A review of existing research demonstrates that IoT systems significantly improve safety outcomes by enhancing hazard detection, predictive maintenance of equipment, and real-time monitoring capabilities. The proposed approach emphasizes data connectivity, machine learning-based risk modeling, and automated alert systems to transform traditional reactive safety practices into proactive safety management, specifically addressing the operational risks of high-rise building sites. Preliminary validation indicates improved safety compliance and reduced near-miss incident rates, highlighting the effectiveness of smart safety interventions in modern construction environments.

**Keywords:** IoT; High-rise construction safety; Predictive risk analysis.

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## **A Framework for Measurement and Improvement of Nominated Subcontractor Performance and Interface in Mixed Use Development Project**

*Ashitosh Mhase\**

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### **ABSTRACT**

A key component of construction supply chain management, the general contractor subcontractor relationship has a significant impact on project outcomes. According to research, up to 90% of construction sector projects are subcontracted. Therefore, it's critical to figure out how to measure performance and reward subcontractors that do better. Performance management indicators had to be customized to each organization's unique demands to monitor performance. This study develops a useful and methodical framework for measuring performance, based on the key performance indicators (KPIs) model, to assess subcontractors' managerial proficiency. To determine important metrics for evaluating subcontractors including time, cost, quality, safety, resources, satisfaction, and leadership. The study starts with a thorough analysis of the literature and expert consultations. KPIs would be created to assess the performance index (PI), which measures subcontractor's performance at several levels, ranging from excellent to poor. This method reduces evaluation bias by offering general contractors a more open and impartial assessment procedure.

**Keywords:** Subcontractors; Key performance indicators; Evaluating; Performance index.

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## **Optimising Value Stream Mapping by using AI in Infrastructure Projects**

*Tushar Gatal\**

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### **ABSTRACT**

Waste reduction and workflow optimization are critical challenges in infrastructure development, yet conventional value stream analysis in construction is largely manual and static, providing limited ability to handle dynamic site conditions, uncertainty, and the interdependent use of manpower, materials, and equipment. Earlier research has primarily focused on manufacturing environments, leaving practical construction-based applications insufficiently explored. This study presents AI-driven framework that enhances value stream evaluation for infrastructure projects by utilizing real-time operational data obtained from active sites. The proposed methodology integrates process mining to actual execution sequences, machine learning techniques to assess productivity patterns and resource utilization, predictive analytics to anticipate potential schedule deviations, and anomaly detection methods to identify inefficient or abnormal site behavior. By enabling continuous, data-driven analysis, the approach supports faster and more accurate identification of non-value-adding activities and early recognition of bottlenecks. Validation through real project datasets, simulations, and case studies demonstrates that the intelligent framework achieves superior performance in terms of analysis speed, accuracy, and schedule and cost control when compared with traditional practices. The findings highlight the potential of AI-enhanced value stream techniques to support engineers and managers in improving efficiency, optimizing resources, and delivering infrastructure projects in a more reliable and controlled manner.

**Keywords:** VSM; AI; ML; Process mining.

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## Precast Geopolymer Lightweight Concrete

*Mohit Sarvaiya\**

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### ABSTRACT

Precast geopolymer lightweight concrete (PGLWC) emerges as a sustainable construction material, use of industrial waste which reduces the CO<sub>2</sub> emissions by up to 80% compared to Portland cement concrete and reduces material expenses by 20-30% via waste utilization, while enabling faster factory production and accelerates onsite assembly by 50%. Integrating geopolymer binders, lightweight aggregates, and precast methods it reduced weight, good at thermal insulation (lowering energy use in buildings), and enhanced seismic resilience through ductility and lower mass in earthquake-prone zones. This review paper summarizes experimental and analytical studies related to precast geopolymer lightweight concrete. It discusses different geopolymer binder systems, different types of lightweight aggregates, precast manufacturing and curing methods, and the mechanical and durability performance of the material. Attention is given to precast-specific requirements such as early-age strength development, stability during handling and transportation, and long-term durability. The review identifies important research gaps, including the lack of standard mix design and curing methods, limited analytical models for structural design, insufficient long-term durability data and inadequate life-cycle studies. further research is required to support the large-scale practical use of precast geopolymer lightweight concrete in sustainable construction.

**Keywords:** Precast geopolymer concrete; Lightweight concrete; Sustainable construction; Geopolymer binders.

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## **Assessment of Reservoir Sedimentation in Reservoir, Madhya Pradesh using Remote Sensing and GIS**

*Uttej Sakharle\* and Vijendra Kumar\*\**

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### **ABSTRACT**

Sedimentation has a significant negative impact on lifespan of reservoirs by reducing storage capacity and deteriorating water quality. This study focuses on Parwati Phase I, II project region, micro-irrigation scheme aimed at supplying water to approximately one lakh hectares of agricultural land. The required water lifted from Indira Sagar Reservoir using pump-based systems. Sediment deposition in Indira Sagar Reservoir adversely affects Parwati Phase I, II project by reducing pump storage capacity, shortening the service life of project components, and causing damage to pumping machinery. Therefore, effective monitoring and control of sedimentation are essential for ensuring reliable project operation. Remote sensing techniques provide an efficient and time-saving approach for assessing and monitoring sedimentation, enabling the generation of reliable spatial information. concentrate on covering sedimentation trends in Parwati I & II design Satellite images obtained from Google Earth Pro and ArcGIS were used to identify and delineate Parwati Phase I & II project boundaries. Analysis primarily focuses on Pump House-1, where land and water boundaries were manually digitized and compared with historical imagery. This approach enables identification of sediment accumulation zones and temporal changes in reservoir. Effective monitoring using remote sensing tools supports improved operation and maintenance of the project infrastructure.

**Keywords:** Reservoir sedimentation; Indira Sagar reservoir; Parwati phase I & II project; Remote sensing; GIS.

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## **AI based Computer Vision for Automated Crack Detection in Concrete Structures: A Deep Learning Approach**

*Himanshi\*, Mehar Fatima Sayed\*\* and Muskaan Haneefa Shaik\*\*\**

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### **ABSTRACT**

Modern infrastructure depends heavily on concrete structures, but cracking due to subsequent loading, exposure to environmental conditions, and material age affects the long-term performance of such structures. Timely and precise identification of cracks is critical to the structural safety and proper maintenance strategy. This paper introduces a computer vision application that uses AI to identify and classify cracks in concrete walls, which is used to overcome the shortcomings of the traditional manual system of inspection. The proposed methodology utilizes deep learning-related models of object detection- YOLO versions and RF-DETR, with the help of the organized image-processing pipeline to enhance durability in the context of different surface texture and lighting conditions. Standard measures like precision, recall, and mean average precision (mAP) have been used to calculate model performance. Comparative analysis suggests that YOLO-based models have a higher sensitivity in detection especially thin cracks, hairline cracks and hence can be applied in both real-time and large-scale inspections. By comparison, RF-DETR offers a more reliable and precise localization based on transformer-based global context modeling that are effective in structural and settlement cracks. Overall, YOLOv12 represents a trade-off solution, which is efficient in terms of detection sensitivity, accuracy, as well as computation efficiency.

**Keywords:** Crack detection; Convolutional Neural Networks (CNNs); YOLOv11; YOLOv12; RF-DETR.

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## **BIM Enabled Construction Management in Nuclear Projects**

*Vinuth M. Gonnagar\**

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### **ABSTRACT**

Construction management in nuclear infrastructure projects is highly challenging due to strict safety regulations, complex design interfaces, and the collaboration of various disciplines occurring simultaneously. These difficulties are intensified by limited digital connectivity and constrained real-time communication typically found at high-security project sites. In such cases, poor coordination during the planning phase often results in spatial conflicts, sequencing issues, and rework during the construction process. This project explores the application of Building Information Modeling (BIM) as a valuable tool for supporting construction management, focusing particularly on clash detection and 4D construction sequencing. A pilot BIM model is created to represent a standard nuclear facility design, incorporating architectural, structural, and MEP components. BIM-based clash detection is performed to identify possible conflicts during the planning phase, while the construction schedule is linked to the model to generate a 4D simulation that visualizes construction sequences over time. The research demonstrates how BIM-based visualization and simulation can enhance planning precision, improve coordination among multiple disciplines, and minimize the chances of rework, even under limited digital conditions. The findings highlight the suitability of BIM as an effective and scalable construction management approach for nuclear infrastructure projects.

**Keywords:** BIM; Nuclear infrastructure; Clash detection; Visualization; 4D simulation.

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**TRACK 2**

**REAL ESTATE AND  
FACILITY MANAGEMENT**

## **Economic Impacts of Transit-Oriented Development (TOD) in PCMC**

*Shrutik Banginwar\*, Vidhan Maheshwari\*\* and Sarthak Sajjanwar\*\*\**

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### **ABSTRACT**

Transit-Oriented Development (TOD) integrates urban land use and public transport to concentrate activity around high-quality transit stations. This study assesses TOD's economic feasibility through a primary survey of the Pimpri Chinchwad (PCMC) corridor in India, examining its influence on land value, employment, and policy instruments for equitable implementation. The research is based on literature review survey of six diverse transit nodes taken into consideration. Findings reveal pronounced land value premiums, with over 82% of stakeholders confirming a proportional increase in property values near transit. TOD also significantly boosts employment access, as over 82% reported reduced commute times enhancing job opportunities, and 85% noted increased customer accessibility for local businesses. However, these gains are coupled with significant affordability pressures, with nearly 80% of respondents citing challenges for lower-income households and first-time homebuyers. The study evaluates financing tools like Land Value Capture (LVC) and concludes with actionable recommendations for policymakers including mandating inclusionary housing and ring-fencing LVC revenues to harness TOD's economic benefits while safeguarding equity in rapidly urbanizing Indian contexts.

**Keywords:** Land value dynamics; Employment effects; Policy pathways for Indian cities.

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## Strategic Responses of Real Estate Developers to Economic Crises

*Sumit Kumar Behera\**, *Sharvari Pawar\*\**,  
*Sarthak Arun Bankar\*\*\** and *Milind T. Phadtare\*\*\*\**

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### ABSTRACT

The real estate sector is one of the foundational pillars of the India's economy, encompassing residential, commercial, industrial, and infrastructure development. It plays a vital role in the economic development of nations, acting as both a driver of growth and a barometer for economic stability. Economic crises—whether global or regional—often lead to declining property demand, reduced investor confidence, tighter credit conditions, and increased uncertainty, all of which pose significant challenges to real estate developers. This study, “Strategic Responses of Real Estate Developers to Economic Crises,” examines how leading Indian developers have responded to such challenges. It focuses on the various strategies used by different developers during the COVID-19 pandemic. Through a thorough review of existing literature and a comparative analysis of six major firms—DLF Ltd., Godrej Properties, Oberoi Realty, Mahindra Lifespaces, Sobha Realty, and Prestige Estate Projects—this research identifies various key aspects of resilience such as: financial prudence, operational flexibility, digital transformation, market diversification, and human-resource management, etc. The findings show that developers with strong balance sheets, a proactive mindset towards digital adoption, and adaptable business models were able to recover more quickly and even spot new opportunities during the downturn and suggests a comprehensive framework for strategic responsiveness.

**Keywords:** Strategic responses; Real estate developers; Economic crises.

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## **Quality Management Practices in Real Estate Sector**

*Sambasivam V. \*, Antony Kuruvila George\*\*,  
Charan R. A. \*\*\* and Avinash Bagul\*\*\*\**

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### **ABSTRACT**

The study investigates quality management practices within the real estate sector, which plays a pivotal role in providing infrastructure, housing, and employment. Despite rapid advancements, the sector continues to encounter persistent challenges in terms of quality, primarily due to ineffective quality control mechanisms. The objective of this research is to identify prevailing quality management practices and propose data-driven strategies for improving overall quality in the real estate projects. A descriptive and exploratory research design this is employed, utilizing primary data collected through structured questionnaires administered to project managers, engineers and quality professionals from real estate firms. The survey evaluates twenty-eight critical Total Quality Management (TQM) factors encompassing leadership, employee involvement, customer satisfaction, training, and supplier management, assessed using a five-point Likert scale. This data is analysed to find Root Causes of quality issues. The expected outcomes include the identification of key success factors influencing quality performance, recognition of implementation barriers, and formulation of actionable recommendations to strengthen quality management practices within the real estate industry.

**Keywords:** Quality management practices; Real estate sector; Total Quality Management (TQM); Root cause analysis.

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## **Implementation of Circular Economy in Affordable Housing: Business Model and Material Reuse and Strategies**

*Himanshu Terde\*, Shivam Dhage\*\* and Om Bulbule\*\*\**

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### **ABSTRACT**

This thesis studies how Circular Economy (CE) principles can be used to improve affordable housing in India. It reviews research showing that CE can help save resources, reduce waste, and make housing more eco-friendly by reusing materials and planning for the full life of buildings. The papers also say teamwork between governments, builders, and communities is important. Case studies in Pune and Mumbai, like Indradhanushya Centre, Magarpatta City, and Dharavi, show that big projects and formal housing can use CE ideas more easily. Small developers and informal settlements, however, often lack money, skills, and government support, making it hard for them to follow CE. Interviews with developers, such as Rohan Builders in Pune, reveal that some are starting to use new technologies like tunnel formwork which helps to build homes faster and with less waste. But small developers still face problems getting access to such technology and funding. The research also finds that CE has strong potential to make affordable housing better, but success depends on local conditions, project size, and willingness to try new ideas. The thesis suggests more support for small builders and sharing modern technology to help more projects use Circular Economy.

**Keywords:** Circular economy; Affordable housing; Resource efficiency; Technology adoption.

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## **Urban Slum Rehabilitation: A Critical Analysis of Their Impacts on Urban Sustainability and Human Rights**

*Radhika Agarwal\*, Atharva Desai\*\* and Snusha Ghase\*\*\**

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### **ABSTRACT**

Rapid urbanization in India has accelerated the growth of informal settlements, making urban slum rehabilitation essential for achieving sustainable and inclusive urban development. This study critically analyses the environmental, social, economic, legal, and human rights dimensions of slum rehabilitation, focusing on Mumbai's Dharavi Redevelopment Project (DRP) as a representative case. It examines major policies such as the Maharashtra Slum Areas (Improvement, Clearance and Redevelopment) Act, 1971, Development Control Regulation (DCR) 33(10), and the Pradhan Mantri Awas Yojana (PMAY) to identify challenges including land tenure disputes, policy overlaps, bureaucratic inefficiencies, and forced displacement. Employing a mixed methodological approach—combining policy analysis, stakeholder perspectives, and field observations—the research finds that while rehabilitation initiatives improve physical infrastructure and tenure security, they often lead to livelihood loss, social fragmentation, and environmental degradation. Dharavi's informal economy, valued between ₹5,000–₹7,000 crore annually, represents a resilient urban ecosystem at risk of destabilization through top-down redevelopment. The study concludes that India's existing model remains infrastructure-centric and insufficiently participatory. It advocates a shift toward inclusive, community-driven, and environmentally resilient rehabilitation frameworks that balance physical redevelopment with social justice and long-term sustainability.

**Keywords:** Urban slum rehabilitation; Dharavi redevelopment project; Sustainable development.

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## **Barriers of Fractional Ownership in Real Estate**

*Dhruvil Kale\*, Jash Shah\*\* and Chinmay Vyas\*\*\**

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### **ABSTRACT**

The project scrutinizes the innovative investment model of fractional ownership, which the research attributes as a “new investment fad,” especially in the Indian real estate market. Rather than just reporting the model’s features, the study gets into the root causes that hold back its large-scale acceptance and flourishing. The aims of the research are transparent and sufficiently lofty for a project of this kind: 1. To pinpoint the obstacles to Real estate Fractional Ownership. 2. To uncover the interconnections among the diverse barriers. The intention of carrying out a systemic analysis has led to the use of a very strong modelling technique such as Interpretive Structural Modelling (ISM), which is the centre of their methodology. Purpose-The goal of this research is to pinpoint the major barriers that prevent the practice of fractional ownership from becoming widespread in the Indian real estate industry. The main goals are to list the barriers and create a model that not only demonstrates the complicated connections between them but also uncovers their underlying relationships as a result.

**Keywords:** Fractional ownership; MICMAC analysis; ISM.

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## **Developing Applications of AI-based Agent Systems for Property Dealing**

*Chinmay Sohony\*, Shreeyash Kharat\*\*, Prajwal N.\*\*\* and Anand Prakash\*\*\*\**

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### **ABSTRACT**

This research explores the importance and functioning of AI-based agents in the real estate transaction process of buying, selling, and leasing to optimise efficiency and customer satisfaction. The study examines the simulated real estate transaction process in the context of the case study using inquiry-and-response procedures produced by AI-based agents through multi-casing. The findings have been collected using within-case and cross-case analyses, indicating the difference in the specifications of adaptability, coordination, and consistency. The findings indicate the major contribution of AI-based agents in real estate transactions to reduce the necessity of direct human involvement and decision-making based on authentic data. The addition of these AI-based agents to a multi-agent system encounters technological complexities due to the difficulty of establishing the dependency of the agents within the multi-agent system architecture. The study remains applicable within the context of simulation at the stage of the prototype study and does not require any real-time or large-scale interaction with the customer, thus providing opportunities to expand the study. In this study, the use of AI-based agents within the real estate sector has been examined to develop a conceptual framework that automates the real estate property transaction process with the transparency of manual customer intervention.

**Keywords:** AI-based system; Property dealing; Real estate.

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## To Assess the Growth Potential of Warehousing as an Asset Class

*Soumya Mohandas\**, *Greeshma H. M.\*\**,  
*Adhiraj Misal\*\*\** and *Poulomee Ghosh\*\*\*\**

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### ABSTRACT

India's warehousing sector has emerged as a strategic asset class within the logistics and real estate ecosystem, owing to rapid urbanization, industrial expansion, and the exponential growth of e-commerce. Policy interventions such as the Goods and Services Tax (GST) and the Make in India initiative have further increased the demand for large, digitally enabled, and strategically located warehousing facilities. Despite this momentum, limited academic attention has been given to understanding the spatial and regional disparities in warehousing development across India. This research aims to assess the characteristics of existing warehousing stock and analyze whether the current supply is consistent with the growing demand generated by e-commerce and industrial growth. Employing a mixed-method approach, the study integrates literature review, secondary data analysis, and ongoing primary data collection across Pune's major industrial clusters—such as Chakan, Talegaon, and Hinjewadi—to document attributes such as grade, size, location, proximity to the city center, occupancy, rent, and accessibility. The study seeks to identify spatial trends, infrastructural dependencies, and demand-supply imbalances shaping the sector. The outcomes will contribute to developing evidence-based policy recommendations and real estate models for sustainable and regionally balanced warehousing growth in India.

**Keywords:** Warehousing; Logistics real estate; E-commerce; Regional disparities; Supply-demand dynamics.

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## **The Impact of Social Media Marketing on the Sales and Brand Visibility of Real Estate Businesses**

*Somesh Mane\*, Ankit Bhudhar\*\*, Yash Paidlewar\*\*\* and Arpita Mathur\*\*\*\**

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### **ABSTRACT**

In the rapidly evolving digital landscape, social media has emerged as a vital tool for marketing across industries, particularly in real estate. This study explores how platforms such as Facebook, Instagram, LinkedIn, and YouTube influence the sales performance and brand visibility of real estate businesses. Adopting a descriptive and analytical research design, the study combines primary data—collected through surveys, interviews, and case studies—with secondary data from market reports and social media analytics. The findings reveal that social media marketing significantly enhances customer engagement, brand trust, and property inquiries. Interactive content formats like videos, virtual tours, and influencer collaborations are found to be especially effective in driving buyer interest and conversion rates. However, challenges such as platform management, content consistency, and advertising costs remain key barriers. The research concludes that strategic investment in creative content and targeted social media management can substantially boost visibility and sales in the real estate sector.

**Keywords:** Social media; Real estate; Sales performances; Digital marketing.

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## **Application of Virtual Reality in Real Estate Marketing**

*Nishant Dahake\*, Rushikesh Bhujbatkar\*\* and Shivin Tomar\*\*\**

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### **ABSTRACT**

The integration of Virtual Reality (VR) technology in real estate marketing has revolutionized the way properties are showcased and experienced by potential buyers. This paper explores the transformative impact of VR on enhancing customer engagement, improving visualization accuracy, and accelerating decision-making processes within the real estate sector. By enabling immersive virtual tours and interactive walkthroughs, VR mitigates geographical constraints and reduces the need for physical site visits, thereby optimizing marketing efficiency and expanding market reach. The study also examines the technological advancements driving VR adoption, evaluates its benefits in terms of user experience and sales conversion, and addresses the challenges related to implementation costs and technological accessibility. Findings suggest that VR serves as a powerful tool for real estate professionals to differentiate offerings in a competitive market, ultimately fostering a more informed and confident buyer base. This research underscores the strategic importance of VR as an innovative marketing approach, highlighting its potential to reshape traditional real estate practices in alignment with evolving consumer expectations.

**Keywords:** Real estate marketing; Virtual reality; Customer experience.

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## **An Integrated Framework to Assess Financial Viability of Redevelopment Projects**

*Ravindrakumar Kshirsagar\*, Lochan Charde\*\*,  
Purushottam Bhangе\*\*\* and Tushar Ghute\*\*\*\**

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### **ABSTRACT**

**Purpose** Cost-benefit analysis is a widely used method to assess the financial viability of redevelopment projects. However, there is limited use of real-time financial data to forecast profits and risks, particularly in slum, brownfield, and heritage redevelopment projects. Without dynamic models, developers and planners often make investment decisions with restricted financial visibility. This paper proposes a theoretical model that enables assessment of the financial viability of redevelopment projects on a real-time basis, integrating key cost, revenue, and risk parameters from the developer's perspective. **Study Design/Methodology** The study uses secondary data to analyse the major financial components influencing redevelopment feasibility, including construction costs, FSI/TDR utilization, rent compensation, and expected returns. Insights from developer surveys further support the development of a financial viability assessment tool. **Findings** The study presents a real-time financial viability assessment framework that improves transparency and supports data-driven decision-making for developers. It helps forecast profitability and risk exposure more effectively in the dynamic context of urban redevelopment projects.

**Keywords:** Redevelopment projects; Financial viability; Profitability analysis; Urban renewal; Real estate.

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## **Social Media Marketing Strategies and Their Effectiveness in Real Estate Consumer Engagement**

*Nagesh Vardam\*, Sumaiyah Shaik\*\* and Utpal Saikhedkar\*\*\**

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### **ABSTRACT**

This research analyzed responses participants, primarily real estate home buyer and real estate professionals who seller in pan India liked metro cities, Delhi, Mumbai, Pune, Hyderabad, Bengaluru (Bangalore), Nagpur, Chennai, Kochi, Kolkata, and many more cities involved. The rapid digitalization of the consumer behavior has fundamentally transformed real estate marketing strategies, with social media platform merging as a primary channel for different steps. This study finds that digital and social media platforms are the primary channel for real estate research and marketing in the region. For the primary data collections involved structured surveys of multiple responses across Pune, Mumbai, Hyderabad, and Bengaluru (Bangalore) metropolitan resign, compressing perspective home buyer's and real estate professionals' sellers, younger professionals aged 22-40 years. This research establishes that strategies social media development purposeful in measurable improvements in lead quality and conversion, rate with real estate firms' allocation marketing budget to digital channels, demonstrating superior ROI compared to traditionally advertising methods. Implementation of AI-enabled chatbots and immersive an AR/AV technology represents emerging's opportunities. This study contributes to academic understanding of digital marketing effectiveness in high-involvement punches contexts whiles providing actionable strategic framework for real estate professionals seeking to optimizing social media engagement.

**Keywords:** Real estate; Marketing; Consumer surveys.

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## **Mobilizing Basic Industry Enablers: Transforming Tier 3 City to Tier 1 City**

*Shubhecha Barapatre\*, Akshay Kalje\*\* and Aryan Dandgal\*\*\**

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### **ABSTRACT**

India's urbanization is rapidly transforming its economic landscape, with industrial and infrastructural growth primarily concentrated in Tier-1 cities like Pune, Hyderabad, and Ahmedabad. In contrast, Tier-2 and Tier-3 cities such as Solapur continue to face systemic challenges—poor infrastructure, weak governance, and limited policy support—that hinder industrialization. This study explores how the key enablers of industrial growth in Tier-1 cities can be adapted to catalyze transformation in emerging urban centers. Using a comparative analytical framework based on three pillars—Governance and Policy, Economic and Industrial Ecosystem, and Urban Infrastructure—the research benchmarks Solapur against major Tier-1 cities. A scoring matrix of 19 indicators reveals deficits in digital governance, PPP participation, and logistics readiness, while recognizing strengths in textile heritage and agro-industrial potential. To address these gaps, the study proposes Integrated Textile and Agro-Industrial Parks with Skill Development Centres, supported through public–private partnerships and central/state schemes such as PM MITRA and PMKSY. This model aims to enhance value addition, employment, and sustainable industrial ecosystems, driving Solapur's transition toward Tier-2 status. The research contributes a replicable, data-driven framework for balanced regional industrialization, with future validation through expert and stakeholder assessments.

**Keywords:** Tier-3 cities; Industrial enablers; Urban transformation; Infrastructure; Solapur.

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## **Kaushal Rojgaar Saathi: A Digital Platform for the Construction Industry Labour Market**

*Vishal Mishra\* and Pritam Ghosh\*\**

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### **ABSTRACT**

**Objectives:** This study targets the development of a useful and technology-based model that can easily link skilled and semi-skilled workers to employers in the construction and related industries. The purpose is to eliminate the long-standing gap in the informal labour market of India by creating a transparent and inclusive platform that will guarantee fair access to employment opportunities for all workers. **Methods:** The research adopted a mixed method, using secondary data about labour market trends together with personal interactions with contractors, developers, and workers. Existing digital platforms were compared in order to gain insights that would assist in designing a practical B2B2C model that incorporates digital profiles, validated worker information, and employers having direct access. **Findings:** Throughout the research conducted, the major challenges were identified, such as not being able to see the workforce, having to rely on middlemen, and getting limited access to verified information. The suggested model can facilitate hiring, eliminate exploitation, and build trust through digital inclusion. **Implications:** Kaushal rojgaar saathi, in collaboration with Skill India and digital Bharat, fosters the form of an unorganised sector, which equips workers with necessary skills.

**Keywords:** Skill development; Employment linkage; Digital workforce; Labour market; Inclusive growth.

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## **Risk Management Strategies in Project Scheduling: Real Estate Project**

*Shivam Kenjale\*, Soham Jadhav\*\* and Vaishnav Kenjale\*\*\**

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### **ABSTRACT**

The complexity of real estate developments requires strong risk management strategies in project scheduling. This study looks at how systematic Project Risk Management, outlined in PMBOK framework, can reduce uncertainties that affect project timelines, costs, and delivery effectiveness. Real estate projects often face delays from issues like resource limits, regulatory approvals, supply chain problems, and labor shortages, leading to time and cost overruns. Research uses methodical approach that includes risk identification, both qualitative and quantitative analysis, risk response planning, and ongoing monitoring. Tools such as Monte Carlo Simulation, Line-of Balance scheduling, and Fuzzy Decision-Making models help measure delay risks and improve resource allocation under uncertainty using Resource Constrained Project Scheduling models. The findings show that proactive risk identification and integrated response strategies greatly improve project reliability, stakeholder trust, and schedule compliance. Study points out increasing importance of Offsite Construction and Importance-Performance Analysis in handling modular project risks, providing modern view on new construction methods. The paper concludes that structured risk management plan not only reduces disruptions and inefficiencies but also enhances overall project sustainability and profitability in unpredictable real estate market. Recommendations suggest creating flexible scheduling frameworks that use predictive analytics and contingency planning to improve decision-making and project results.

**Keywords:** Project risk management; Project scheduling; Monte Carlo simulation; Resource-constrained project Scheduling models.

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## **The Impact of Proximity to Metro Stations on Housing Prices: A Case Study of the Pune Metro**

*Pranav Pilankar\*, Satyajeet Ghogare\*\*,  
Aditya Wasani\*\*\* and Shruti Vaishampayan\*\*\*\**

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### **ABSTRACT**

This study investigates the relationship between the infrastructure of the metro rail system and the residential real estate values along the corridor that will be developed by the upcoming Metro Line 3 in Pune, with a specific emphasis on the Balewadi neighbourhood. The purpose of this study is to investigate the impact that proximity to metro stations, which will be classified as 0–500 metres, 500–1000 metres, and beyond 1000 metres, has on property prices between the years 2020 and 2025. The research design that has been chosen is a mixed-method research design. This design incorporates quantitative data from online real estate platforms such as 99acres and MagicBricks, as well as qualitative insights from local brokers and agents through structured interviews. It is anticipated that the study will shed light on the ways in which enhanced accessibility, regulatory incentives, such as enhanced floor space indexes (FSIs), and neighbourhood amenities all contribute to variations in property values across different areas. The findings aim to assist policymakers, developers, and urban planners in integrating transit-orientated development principles within Pune’s evolving urban landscape.

**Keywords:** Metro rail; Real estate prices; Transit-orientated development; Balewadi; Property price increase.

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## **Digital Marketing by Real Estate Firms using Companies Websites**

*Avinash Purandare\*, Sourabh Dhamanekar\*\*,  
Kashinath Sawant\*\*\* and Anup Rane\*\*\*\**

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### **ABSTRACT**

The proposed thesis explores how real estate firms in India utilizes their company website as a strategic tool for digital marketing. The study aims to analyse the effectiveness of website in promoting projects, generating leads and enhancing brand credibility in highly competitive market. Key objectives include evaluating the digital marketing components used by the real estate firms such as SEO, content marketing, virtual tours and customer engagement tools also accessing the impact on consumer behaviour and purchase decision. The research will also examine how these digital initiatives influence overall sales performance and brand perception. Data will be collected from selected companies' websites and supported through user survey and expert interview and secondary research. The expected output is to identify best practices and recommended strategies for optimising digital marketing through corporate websites to strengthen customer reach and trust within the real estate sector. The findings of this study are expected to contribute to a deeper understanding of how digital platforms can be strategically leveraged to enhance marketing efficiency and competitive advantage in the real estate industry.

**Keywords:** Digital marketing; Real estate; Company websites; Customer engagement; Online branding.

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## **Real Estate Regulation Act (RERA): A Study of Its Implementation with Specific Reference to Maha RERA**

*Ramakrishna Nallathiga\*, Sarath Sajeer\*\*, Govind Nair\*\*\* and Nishank N. V.\*\*\*\**

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### **ABSTRACT**

The Real Estate (Regulation and Development) Act, 2016 was a major regulatory step in changing how regulatory bodies handle the real estate sector in India, and the Maharashtra Real Estate Regulatory Authority (MahaRERA) is one of the most ambitious state regulatory bodies. This study discusses the MahaRERA's effects in Maharashtra, particularly the enforcement of the regulation by orders, judgments, and circulars of the Authority. Based on secondary data from MahaRERA annual reports and a methodological review of the individual project-related orders issued by the Authority and Adjudicating Officers, the study assesses the effects of enforcement mechanisms on promoter behaviour, project compliance, and consumer protection. It has been shown that the large application of speaking orders, penal actions, awards of interest and compensation and clarificatory circulars by MahaRERA has been essential in promoting transparency, enhanced accountability and institutionalisation of regulatory discipline in the industry. The paper also highlights the changing jurisprudence of MahaRERA, which shows how interpretive consistency and judicial administrative circulars have created less ambiguity and increased adherence. Although the results related to enforcement have been mostly favourable, issues of prolonged project completion and order-related performance remain.

**Keywords:** RERA; MahaRERA; Real estate regulation; Transparency.

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## **Impact of Green Building Certifications on Market Price for Residential Building in Urban Real Estate**

*Anusha Malagi\*, Shanu Soni\*\*, Shreeraj Mavale\*\*\* and Manas Marathe\*\*\*\**

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### **ABSTRACT**

This paper explores how green building certifications influence the market price, buyer perception, and investor confidence in residential real estate, focusing on urban Pune. With rising environmental concerns rapid urbanization, sustainable construction practices have become key differentiator in the housing market. Certifications such as IGBC, GRIHA, and LEED serve as benchmarks for energy efficiency, eco-performance, & long-term value. Through a mix of primary data (buyers, investors, and developers) and secondary data (government records, property portals), study compares certified and non-certified residential projects across areas like Hinjewadi, Kharadi, Baner, and Balewadi. The results reveal that green-certified properties command an average 7% price premium and achieve 20–25% lower energy costs, contributing to higher buyer satisfaction and faster market absorption. Awareness and perception remain influential factors—while 92.9% of buyers recognize the long-term benefits of certified homes gaps persist in understanding rating systems and maintenance requirements. Developers affirm that the premium value offsets additional certification costs through operational savings and enhanced asset liquidity. Overall, the study demonstrates that green building certification is not only an environmental commitment but also a strategic economic advantage, and greater awareness, incentives, and streamlined certification processes could further drive sustainable housing adoption in India’s urban real estate sector.

**Keywords:** Green building; Sustainability; Real estate; Property valuation; Buyer perception.

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## **Enhancing ESG Integration in Real Estate Projects: Gap Analysis and Framework Recommendations**

*Aditi Zilpe\*, Archita Rane\*\* and Prachi Rathore\*\*\**

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### **ABSTRACT**

Sustainability and social responsibility are on the rise and gaining importance, especially in the construction sector. Integration of ESG practices in the field, not only meet the regulatory demands but also increase the competitiveness and profitability of projects. This paper talks about the current scenario of ESG practices in the Real Estate sector in India, discusses the challenges in its implementation and aims to develop a framework to integrate ESG practices in Real Estate Development. The study is made using a mixed-method approach involving literature review, stakeholder surveys and interviews, policy analysis, and a comparative review of global ESG standards. The data collected through surveys and interviews will help identify the gaps and the lack of a structured framework in ESG implementation in India, highlighting the elements or areas with scope for standardization to enhance ESG integration across the project life cycle. The analysis will focus and develop the framework based on the opportunities and emerging trends and the ways in which they can be optimized with context to the Real Estate Sector in India.

**Keywords:** ESG; Real estate; Indian construction sector; Framework development.

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## **Comparative Financial Feasibility Analysis of Single-use and Mixed-use Hotel Developments**

*Janhavi Nitnaware\*, Gourav Pooniya\*\* and Aniket Sharma\*\*\**

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### **ABSTRACT**

This research examines the comparative financial feasibility of single-use hotel developments and mixed-use hotel-retail projects within the Indian real estate context. As the hospitality sector evolves alongside urban growth, developers increasingly consider integrated developments to optimize land use, diversify income, and mitigate risks. The study applies a comparative, quantitative methodology using a discounted cash flow (DCF) model to evaluate both single-use and mixed-use cases. Financial indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, and Profitability Index are computed under standardized assumptions for construction cost, operational expenditure, and market demand. Sensitivity analyses assess the impact of variations in occupancy, retail rent, and construction cost on financial returns. Findings indicate that the mixed-use model, with its additional retail component, enhances cash flow stability and overall project viability by leveraging revenue diversification and synergy benefits. The study concludes that, while single-use hotels may suit specific market conditions, mixed-use developments generally provide higher financial resilience and return potential. Recommendations are provided for developers and urban planners to adopt integrated design and financial planning strategies for sustainable hospitality-led mixed-use projects.

**Keywords:** Financial feasibility; Mixed-use development; Real estate investment.

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## **Effective Stakeholder Management Strategies for Re-development Project**

*Pratik Landge\*, Avishkar Shinde\*\* and Prathamesh Suryawanshi\*\*\**

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### **ABSTRACT**

Redevelopment projects are crucial for renewing old parts of the city, but they often encounter various challenges due to the involvement of multiple stakeholders. This research aims to identify stakeholder management issues in residential redevelopment projects through a literature review, questionnaire survey, and expert interviews, and to provide an effective framework for stakeholder management. The primary goal is to understand the roles, interests, and influence of many stakeholders, including residents and developers. According to the research, project delays and cost overruns can result from poor coordination, communication breakdown, and disagreements between stakeholders. The study suggests that early stakeholder involvement, good communication, and cooperation can enhance project progress. The report concludes with recommendations for improving stakeholder management in redevelopment projects that are transparent, timely, and sustainable. The target is to identify the problems causing stakeholder management issues in redevelopment, so that in the future, developers can proceed with effective stakeholder management and avoid uncertain outcomes.

**Keywords:** Stakeholder management; Redevelopment challenges; Communication and coordination.

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## **Consumer Demand Analysis towards Green Building**

*Tejaswini Malshette\*, Madhura Karad\*\* and Shruti Vaishampayan\*\*\**

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### **ABSTRACT**

India's rapid urbanization has intensified the need for sustainable housing solutions to mitigate rising energy consumptions. Green buildings, designed for resource efficiency and minimal environmental impact, offer a viable solution by lowering long-term energy, water, and maintenance costs. However, their adoption is hindered by the perception of a high initial "green premium"—an upfront cost 5–12% greater than conventional construction—and a significant lack of empirical, region-specific data on their lifecycle savings within the Indian context. Much of the existing evidence on savings is derived from theoretical models or foreign studies, which are less reliable for India's diverse climatic and economic conditions. This research aims to analyze consumer demand through a comprehensive literature review, by identifying key parameters influencing consumer behavior, including awareness, willingness to pay, and perceptions of comfort and cost-benefits. By using statistical analysis, this study will evaluate actual savings and occupant satisfaction to provide data-driven insights. The findings will be used to recommend effective strategies for enhancing green building demand, thereby helping to debunk cost-prohibitive perceptions and promote broader adoption of sustainable construction in India.

**Keywords:** Green building; Sustainable real estate; Pune's residential property demand.

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## **An Analysis of the Peer-to-peer Lending System in India**

*Shourya Kesari\* and Anusha Verma\*\**

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### **ABSTRACT**

The infrastructure and real estate sectors are crucial for fueling India's economic growth, creating jobs, and building capital. However, their growth heavily relies on the availability and movement of institutional credit. This study takes a closer look at how bank credit to these sectors impacts India's construction output from 2005 to 2025, using secondary data gathered solely from the Reserve Bank of India's Database on Indian Economy (data.rbi.org.in). The research aims to explore how changes in credit flow to these sectors affect construction activities, investment trends, and the overall economic landscape. By utilizing time-series econometric methods—like correlation analysis, cointegration tests, and Vector Error Correction Models (VECM)—the study seeks to find out if shifts in bank credit to infrastructure and real estate have a significant and lasting impact on construction output. P2P lending is a platform for trading excess money, flexibility and choice of lending and borrowing among all lenders & borrowers respectively, whereas lending is the most important source of finance for SME's. Online P2P lending companies like LenDenClub, Faircent, Finzy-bridge fintech, India P2P, etc., work as the marketplaces that brings individual borrowers & lenders together for loan transactions without the interference of traditional financial institutions such as Banks & NBFC's.

**Keywords:** Real estate; Credit schemes; Construction.

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## **Developing Strategic Framework for BIM Implementation in High-rise Construction**

*Mayank Jitekar\*, Adityraj Shinde\*\*, Hemant Bhoir\*\*\* and Hindavi Gavali\*\*\*\**

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### **ABSTRACT**

Building Information Modelling (BIM) has emerged as a transformative approach in the construction industry, yet its adoption in high-rise and building projects in India remains limited, with most organizations operating at lower BIM maturity levels. This study aims to develop a strategic framework for enhancing BIM implementation by assessing the current and desired maturity levels across six key dimensions: technology, process, people, policy, collaboration, and innovation. A quantitative, survey-based research design was adopted using a structured questionnaire comprising 20 items rated on a 0 -3 scale. The questionnaire was floated among industry professionals, and ten preliminary responses were received. The data from these responses are being analyzed using Importance Performance Analysis (IPA) and gap analysis to identify critical areas requiring strategic attention. The preliminary findings indicate that while awareness and perceived importance of BIM are high, actual implementation and integration across lifecycle stages remain at basic levels. The outcomes of this study will guide the formulation of a strategic roadmap to transition organizations from their current maturity levels toward collaborative and integrated BIM practices.

**Keywords:** BIM maturity; Strategic framework; BIM adoption; Gap analysis; Digital transformation.

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## Marketing Strategies for Township Projects in Pune City

*Ashish Gupta\**, *Rathan R.\*\** and *Rajarakshit Udupudi\*\*\**

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### ABSTRACT

Pune is rapidly transforming its real estate landscape through large-scale township developments that integrate housing, offices, and recreational spaces within a single area. As the market grows increasingly competitive and consumers become more tech-savvy, developers must adopt innovative marketing methods to attract and convert buyers. This paper examines the effectiveness of various marketing strategies adopted by township builders in Pune, both online and offline. It explores the role of social media advertising, property portals, influencer collaborations, virtual tours, and search engine optimization (SEO) in shaping buyer preferences and decision-making. A mixed-method approach involving surveys of homebuyers and residents, along with interviews of real estate professionals, was used to assess the impact of each marketing channel. Findings reveal a strong shift toward data-driven, multi-channel strategies targeting digitally literate consumers. Social media campaigns, influencer partnerships, and virtual tours emerged as the most effective tools for lead generation and conversion. The study concludes that blending traditional marketing approaches with modern digital strategies can enhance visibility, trust, and brand establishment in Pune's dynamic township development sector.

**Keywords:** Township development; Real estate marketing; Digital marketing; Social media advertising.

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## **Impact of Metro on Real Estate Property Markets: A Case Study of Hyderabad Metro**

*Sai Durga Prasad Chunchu\**, *Pechetty Kesavan\*\**,  
*Satyabrat Swain\*\*\** and *Rama Krishna Nallathiga\*\*\*\**

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### **ABSTRACT**

India is undergoing rapid urbanization and mass urban transport plays an important role to support it. Metro rail projects have emerged as important mass urban transit projects in India. Such metro projects can also affect the urban land development, use and values. In this context, this study investigates the impact of the Hyderabad Metro Rail (HMR) project on real estate land prices in Hyderabad city, with a particular focus on the changes in land values around metro corridors. The primary objective is to analyze how the development of HMR project has influenced urban land markets by improving connectivity, reducing travel time and costs, and altering patterns of accessibility. The research aims to identify significant market trends in metro-accessible areas and understand changes in land use and zoning regulations prompted by transit-oriented development. Through a comparative analysis of real estate conditions before and after the HMR project implementation, the study also explores the metro's role in traffic congestion. Drawing from a comprehensive literature review, the research synthesizes findings from Indian contexts, including comparative case studies from cities such as Bangalore, Chennai, and Delhi.

**Keywords:** HMR; Rail corridors; Land values; Real estate development; Land use change.

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## **Evaluation of Heritage Conservation and Urban Growth: A Comparative Study of Real Estate Influence in Hyderabad City**

*Geetha Kiran Goli\**, *Gyanesh Dhangathi\*\**,  
*Gowtham Krishna Jonnalagadda\*\*\** and *Priyanka Gayen\*\*\*\**

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### **ABSTRACT**

Rapid urbanization in Indian metropolitan regions has heightened the struggle between preserving heritage and accommodating real estate growth. An issue has changed how cities grow, how they are managed, and how people live and work in them the research defines how Hyderabad's urban expansion has transformed its spatial and cultural landscape, comparing the heritage-rich Old City with the technology driven corridor of Cyberabad. The defines how real estate development has influenced urban identity, infrastructure distribution, and policy priorities. A mixed-method approach was adopted, combining quantitative and qualitative analyses. Primary data is used from residents, planners, and developers reflect perceptions of livability, infrastructure quality, and cultural conservation. The research indicates that while real estate expansion contributes to economic dynamism, it risks eroding cultural identity. A comparative assessment between traditional and modern zones reveals spatial inequities, differential investment patterns, and evolving community perceptions. It emphasizes the need for an integrated urban policy that aligns development goals with heritage preservation for sustainable urban growth.

**Keywords:** Heritage conservation; Urban growth; Real estate development; Urban policy.

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## **Land Price Dynamics: Comparative Study of Areas within and Beyond ORR**

*Satya Sai Aneesh Dhanekula\*, Ajay Babu Jujjuvarapu\*\*,  
Shubham Indrajit Gosavi\*\*\* and Ramakrishna Nallathiga\*\*\*\**

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### **ABSTRACT**

The rapid growth of Indian cities has made infrastructure a key factor in determining urban land values. In Vijayawada, the construction of the Outer Ring Road (ORR) represents a significant change that will likely affect real estate dynamics in urban and surrounding areas. This study looks at how closeness to the ORR impacts land price trends, appreciation rates, and investment choices from 2015 to 2025. Using spatial mapping, hedonic regression modeling, and transaction data over several years, the research compares land value behavior across three areas: the Inner Zone (within the ORR), the Ring Zone (within a 1 km buffer), and the Outer Zone (beyond the ORR). Early findings show noticeable differences in appreciation rates. The Ring Zone displays increased speculative activity and changing investor interests. The study provides insights for urban planners, emphasizing the importance of careful zoning, development that matches infrastructure needs, and fair land use regulation. By placing Vijayawada's growth within the larger context of urbanization, the research helps to better understand how major transport infrastructure can reshape land markets in rapidly growing Tier-II Indian cities.

**Keywords:** Infrastructure-led urban development; Land value dynamics; Outer ring road; Spatial analysis.

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## Co-living Models for Urban Cities

*Deekshii S.\* and Poulomee Ghosh\*\**

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### ABSTRACT

The rental housing industry in India has been facing a gradual entry by organised players in recent years. It is a reaction to the growing need of collective accommodation, instigated by the accelerated urbanisation, the growth of migration to the large urban centres, the changes of work patterns due to the cultures of co-living. At the same time, the persistent lack of special-purpose student housing has created broad opportunities in the segment of shared living. Co-living has emerged as a new form of asset in the real estate industry, where the goal is to address the issue of urban housing shortages, providing professional management, location-specific and relatively affordable rentals at a scale that focuses more on flexibility, convenience, and a service-oriented lifestyle. The given model is particularly attractive to students and novice professionals. The paper provides a conceptual discussion of co-living as an emerging real estate asset category in the Indian context, consolidating the scholarly literature and industry perspectives to assess its key drivers, features of operations, and structural features, which contributes to better understanding of its changing position in the Indian urban rental housing ecosystem.

**Keywords:** Co-living; Operational business models; Alternative real estate asset class.

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## **The Role of Digital Collaboration Tools in Stakeholder Communication for Mega Projects**

*Vedant Somalkar\**, *Atharva Desai\*\**,  
*Gurman Singh Kohli\*\*\** and *Kirti Rajhans\*\*\*\**

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### **ABSTRACT**

**Abstract:** Mega projects are large, complex, and involve multiple stakeholders, making effective communication crucial for success. Traditional methods such as meetings and emails often fail to meet the needs of geographically dispersed and interdisciplinary teams. This study explores how digital collaboration tools enhance communication, coordination, and decision-making in mega projects. **Research Design/Methodology:** A mixed-method approach was used, including a literature review, quantitative surveys, and qualitative insights from project professionals across sectors such as infrastructure, energy, and technology. The study evaluated project management software, cloud-based file-sharing systems, and virtual meeting platforms through statistical and thematic analysis to assess their impact on communication and collaboration. **Key Findings:** The research found that digital collaboration tools significantly improve stakeholder communication, coordination, and decision-making efficiency. Their use led to reduced delays, improved real-time information flow, and increased transparency in mega projects. However, barriers such as stakeholder resistance, technical issues, and data security concerns persist. The study concludes that effective adoption requires proper training, leadership support, and a strong digital communication strategy to fully leverage these tools.

**Keywords:** Digital collaboration tools; Stakeholder communication; Real-time decision-making; Efficiency.

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## **Critical Evaluation of MAHA RERA: Loopholes, Developer Leverage Affecting Homebuyers**

*Nikhil Chavan\*, Atharva Soygaonkar\*\* and Dhaval Gahiwad\*\*\**

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### **ABSTRACT**

The Real Estate Regulatory Authority (Regulation and Development) Act, 2016 (RERA) has been introduced for making the realty business in India more transparent, accountable, and fair, in the direction of securing the interest of the homemakers. This research assesses the effectiveness of MAHARERA in securing homemakers under the RERA Act of 2016. The act aimed to create transparency and accountability, habitual project delay, ambiguous procedure for extensions of approvals, and inadequate implementation mechanisms favor the developers. A mixed-methods data collection design was employed, comprising a qualitative survey of homebuyers and a qualitative interview of homebuyers, respectively, which revealed that every homebuyer experienced at least a single extension of their respective project by witnessings its average delay of 33 months; additionally, 95% of them were subjected to a non-transparent experience and 67% were compensated nothing. The analysis indicates the finger of suspicion towards three key areas of vulnerability—procedural, financial, and informational—that create holes in the system for exploitation by developers. The research examines the fallibilities of RERA and makes suggestions that are directed towards strengthening consumer rights in India's real estate market and bringing a semblance of accountability.

**Keywords:** MAHARERA; Homebuyer protection; Project delay.

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## **Assessing the Macroeconomics Impacts on Green Growth in Real Estate**

*Jaya Chandra Sai Prakash Yerra\**, *Akshat Jain\*\**,  
*Akarsh Grandhi\*\*\**, *Debanjali Saha\*\*\*\** and *Chetna Rathee\*\*\*\*\**

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### **ABSTRACT**

India's economy and real estate industry are changing as a result of its shift to sustainable growth. The research looks at how important macroeconomic indicators like GDP growth, inflation, interest rates, and foreign direct investment (FDI) are influenced by green growth metrics like green bond issuance and the ESG index. These indicators then have an impact on real estate metrics in India. The research uses econometric analysis to examine data from 2010 to 2024. Stationarity and long-term relationships are established using the unit root and cointegration tests. Models of regression and impact analysis tells how macroeconomic and green growth factors directly affect real estate outcomes like housing prices, investment flows, and REIT performance. Then the Robustness of econometric model is checked with alternative assumptions. Results show that green investments enhance the long-term relationship between real estate performance and economic growth, and that these effects are amplified by supportive policies. The research ends with useful advice for investors, developers, and legislators, highlighting the significance of targeted regulations and sustainable finance.

**Keywords:** Macroeconomic indicators; Green growth metrics; Green bond issuance; Econometric model.

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## **Study of Residential Redevelopment Firms as a New Business Category in the Real Estate Sector: Insights from Pune**

*Sarvagnee Navdhare\*, Rohit Patel\*\* and Shruti Vaishampayan\*\*\**

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### **ABSTRACT**

The real estate sector in India is witnessing a new trend as redevelopment is picking up momentum in major cities like Mumbai, Pune, Bengaluru and Surat. Pune, being one of India's fastest-growing cities, tops urban growth chart with 332%. This rapid growth, combined with limited space in prime central locations, makes redevelopment an increasingly attractive option for developers. With significance on how small and mid-sized businesses are transforming the market through distinctive business mechanisms and geographic specialization, the study aims to explore redevelopment as a new business category within Pune's real estate industry and how firms identify opportunities in these projects aligning with incentives and regulatory support. Redevelopment has emerged as an alternative sector to greenfield projects due to land scarcity and the growing need for urban regeneration-particularly in older neighborhoods like Kothrud, Erandwane, and Deccan. It uses a qualitative case study approach. Data collection involves site visits, document analysis, and interviews with pertinent stakeholders. Significant topics of research include understanding project ideas and selection, stakeholder negotiation, financial analysis, and understanding associated risks with the projects. The results can potentially help identify redevelopment as a unique and developing business sector in Pune's urban real estate market, highlighting its entrepreneurial dimensions.

**Keywords:** Redevelopment; Businesses; Regeneration; Incentives.

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## **Challenges and Prospects of Colive Contract in Indian Context**

*Priyanshu Singh\**, *Prashant Shukla\*\**,  
*Shreeshail Amol Ganore\*\*\* and Smitha R. Yadav\*\*\*\**

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### **ABSTRACT**

The rapid growth of urban populations, particularly in developing countries like India, has led to a heightened demand for residential space in metropolitan centers. Traditionally propelled by the expansion of sectors such as information technology, finance, and corporate enterprises, the real estate market faced considerable disruption during the COVID-19 pandemic, when the widespread adoption of remote work altered housing preferences and slowed market activity. In the subsequent recovery period, a distinct shift has been observed toward flexible and community-based living arrangements. Co-living—characterized by shared, amenity-rich accommodations—has emerged as a compelling alternative, particularly for young professionals seeking affordability, convenience, and ease of relocation over conventional home ownership or standard rentals. This study explores the primary challenges and opportunities associated with co-living contracts in India, analyzing the key legal, regulatory, and socio-economic factors that influence the appeal and uptake of co-living spaces. The research aims to provide actionable insights for policymakers, real estate developers, and stakeholders to enhance the viability and attractiveness of co-living as a sustainable model for urban housing in a post-pandemic world.

**Keywords:** Contractual challenges; Co-living; Future housing solutions; Rental market.

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## **A Digital Marketplace Approach to Property Valuation in India: Tackling Operational Inefficiencies in Tier-2 and Tier-3 Cities**

*Ankit Patel\*, Sameer Jain\*\*, Vivek Upadhye\*\*\* and Arpit Singh\*\*\*\**

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### **ABSTRACT**

The study explores the development of a Digital Marketplace for Property Valuation in India, focusing on challenges in second and third-tier cities. It highlights the inefficiencies of traditional valuation methods, which rely on manual processes, disconnected services, and limited automation, particularly in underserved areas. The research proposes a hybrid AI-human valuation model as a solution to improve accuracy, compliance, and turnaround times. This digital platform aims not only to provide reliable valuers but also to enhance regulatory approval and expedite the property valuation process. Additionally, the study assesses the readiness of stakeholders to adopt the digital platform and evaluates its commercial and operational feasibility. The findings reveal that while digital solutions offer significant potential, challenges such as trust, compliance, and regional market fragmentation must be addressed before successful implementation. Ultimately, the research outlines a practical approach to digitizing property valuation in underserved markets, with AI applications extending into the real estate sector as a key outcome.

**Keywords:** Property valuation; Digital marketplace; Hybrid AI model; Compliance automation; Real estate.

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## **Land as an Influence in Real Estate**

*Rohit Manthole\*, Parth Shewale\*\* and Ayush Raut\*\*\**

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### **ABSTRACT**

Land serves as the cornerstone of all real estate activity, forming the foundation for residential, commercial, and industrial development. Unlike other resources, land is immovable, scarce, and permanent qualities that make it both valuable and limited. Its characteristics and location determine not only what can be constructed but also a project's economic viability, market appeal, and long-term investment potential. The attributes of land—such as topography, soil quality, accessibility, and proximity to infrastructure—directly influence Purpose: This study examines the multidimensional relationship between land and real estate, highlighting how physical, regulatory, and economic parameters collectively shape market behavior. It identifies the major determinants of land valuation, including zoning and land-use regulations, title clarity, infrastructure readiness, and access to social amenities. Methodology: The research is based on an extensive literature review and conceptual analysis to explore the interdependence between land and real estate markets. It further discusses the transformative role of digital tools such as Geographic Information Systems (GIS) in land evaluation, facilitating spatial insights into zoning compliance, The results indicate that land and real estate markets are tightly interconnected fluctuations in one affect the other. Increasing housing demand escalates land values, while zoning and fragmented ownership can hinder supply and inflate property prices.

**Keywords:** Land assessment; Land valuation; Real estate market; Zoning; GIS.

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## **A Study on the Influence of Asset Efficiency and Key Financial Indicators on the Performance of NIFTY Realty Firms**

*Taran Tiwari\*, Rohit Narayankar\*\*, Prem Chavan\*\*\* and Dipayan Roy\*\*\*\**

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### **ABSTRACT**

The Indian real estate sector has witnessed remarkable transformation since the implementation of the Real Estate (Regulation and Development) Act (RERA) in 2016, which enhanced transparency and accountability. This study analyzes the impact of key financial ratios on the performance of NIFTY Realty firms during the post-RERA period (2017–2024). A balanced panel of ten listed firms, comprising 80 firm-year observations, was developed using data from CMIE Prowess and company reports. Return on Assets (ROA) serves as the dependent variable, while the explanatory variables include Asset Turnover Ratio, Net Sales, Net Profit Margin, Interest Coverage Ratio, Debt-to-Equity Ratio, Current Ratio, and Quick Ratio—representing efficiency, profitability, leverage, and liquidity dimensions. A Fixed Effects panel regression model was employed to capture firm-specific variations. The findings indicate that Asset Turnover Ratio, Net Sales, Net Profit Margin, and Interest Coverage Ratio have a significant positive impact on ROA, suggesting that operational efficiency, revenue growth, and debt-servicing ability enhance firm performance. Conversely, Debt-to-Equity, Current, and Quick Ratios are insignificant. The within  $R^2$  value of 0.867 confirms the model's strong explanatory power, highlighting efficiency and profitability as key performance drivers.

**Keywords:** Asset efficiency; Financial performance; NIFTY realty firms; Impact.

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## **Analyzing the Influence of Aircraft Noise on Property Prices in Airport-adjacent Urban Zones: A Case Study of Pune Airport**

*Sayali Kedare\*, Aishwarya M. Bettin\*\* and Manas Marathe\*\*\**

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### **ABSTRACT**

As cities continue to expand, the airports too are rigorously growing their infrastructure to accommodate more passengers and freight. As a result, the airport operations are also becoming more significant, affecting the surrounding communities as well as the prices of properties. One of the major environmental concerns associated with airports is the aircraft noise. This study analyses the airport of Pune, which is one of the most rapidly developing airports in India to understand how the aircraft noise affects the prices of residential properties in the surrounding areas. The findings indicate that the properties located within higher noise zones tend to have low price, emphasizing the importance of effective land use planning and coordination between aviation department and urban development authorities. The research aims to provide insights to developers, builders and planners which would help them better choices with respect to location and design for economically viable development around airports.

**Keywords:** Aircraft noise; Property prices; Airport proximity; Land use planning.

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## Project Cost Management for Redevelopment Projects

*Bhakti Kanade\*, Aishwarya Narvekar\*\*,  
Sampada Mahulkar\*\*\* and Tushar Jadhav\*\*\*\**

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### ABSTRACT

The Real estate sector in Maharashtra, India is witnessing a dynamic shift where redevelopment is emerging as a key driver of Urban Transformation. Rapid urbanization, aging infrastructure, the need for optimized land use and the potential for high returns, have established redevelopment as an essential component of sustainable city growth. Cost overruns are a persistent challenge in redevelopment projects, impacting profitability, timelines, and stakeholder satisfaction. This highlights the importance of effective Project Cost Management to navigate complexities such as regulatory challenges, stakeholder coordination, and financial viability. This research delves into the critical aspects of project cost management for redevelopment projects focusing on identifying project phase wise major cost drivers, analyzing industry pain points and formulating cost-optimization strategies to enhance project efficiency. Through an extensive literature review and semi-structured interviews with industry experts, the research examines challenges at various project phases leading to cost overruns and/or delays. The findings of this study will help the stakeholders associated with real estate redevelopment projects.

**Keywords:** Real estate; Redevelopment; Project cost management; Cost drivers.

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## **Indian REITs: Growth, Governance and Global Lessons**

*Gitanjali V.\**, *Vetri Selvan J.\*\**,  
*Sai Sri Lasya Priya Chamarthi\*\*\** and *K. T. Vigneswara Rao\*\*\*\**

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### **ABSTRACT**

The study investigates the evolution of Real Estate Investment Trust (REIT) framework in India's Real Estate Sector, highlighting the facilitation of investments in an income-generating asset through a highly transparent and regulated structure. This explores the growth prospects, performance trends, and challenges of Indian REITs. It also compares their regulatory framework with those of the United States and Singapore to identify effective global practices. The research analyses the financial performance of selected Indian REITs, including Embassy Office Parks REIT, Mindspace Business Parks REIT, and Brookfield India REIT and uses performance measures like Sharpe, Treynor, Jensen's Alpha, and  $M^2$  to compare returns with alternative investments. The study also explores the rise of Small and Medium REITs (SM REITs) and the scope of REITs in alternative real estate sectors like warehousing, logistics, and data centres. The developments of REITs in the Indian Market signal an emergence of a new investment landscape with enhanced accessibility, transparency and diversification.

**Keywords:** Real estate investment trust; Income-generating assets; Alternative investments; Performance measure.

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## **Vertical Solutions for Urban Landscape: Assessing the Impact of Emerging Technologies on Housing Affordability**

*Murali krishna Botta\*, Rohan Hore\*\* and Chetan More\*\*\**

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### **ABSTRACT**

This research examines the practicality and performance of prefabricated two-dimensional (2D) panel systems and modular three-dimensional (3D) volumetric construction methods amid the growing demand for sustainable and efficient high-rise development. Using insights from India's six Lighthouse Projects (LHPs) implemented under the Global Housing Technology Challenge (GHTC), the study evaluates planning, execution, and management challenges along with the time and cost performance of each technology. Findings indicate that 3D modular systems, as demonstrated in the Ranchi project, can reduce construction time by 40–50% and overall costs by nearly 20% due to factory-controlled precision and simultaneous on-site activities. The Chennai and Indore projects employing 2D prefabricated steel and sandwich panel assemblies achieved faster construction, better seismic resistance, and improved thermal insulation. Both technologies contribute to reduced material waste, lower carbon emissions, and safer working conditions, supporting sustainability goals. However, challenges remain in transportation logistics, skilled labor availability, and high initial capital costs. The study concludes that while 2D and 3D prefabricated systems are promising solutions for sustainable urban housing, effective implementation requires supportive government policies, capacity building, and infrastructure development.

**Keywords:** Prefabrication; Modular construction; Construction efficiency; LHP; Urban housing.

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## **The Role of New Age Media and Collaborative Strategies in Stakeholder Management for the Real Estate Sector in India**

*Pranav Shinde\*, Jaykumar Khutale\*\* and Chaitanya Bembade\*\*\**

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### **ABSTRACT**

The Indian real estate sector is shaped by complex industry dynamics, multiple stakeholder involvement, evolving regulatory frameworks, and a rising demand for transparency and effective two-way communication. These factors have accelerated the adoption of digital technologies and collaborative platforms for stakeholder management. This study examines the impact of digital tools on stakeholders' perspectives, intentions, and behaviors in the Indian real estate market. A quantitative research methodology was employed, and data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The analytical framework integrates the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), focusing on key industry stakeholders. The results identify user attitude, social influence, and performance expectancy as the main determinants of user intention to adopt digital technologies. User intention also plays a mediating role by positively influencing actual technology usage and stakeholder engagement. Conversely, effort expectancy, facilitating conditions, and trust factors show minimal or no impact on user intention. The findings indicate that real estate stakeholders primarily adopt digital technologies due to perceived benefits and social influence rather than technological complexity. Overall, digital technologies enhance collaboration, transparency, and performance efficiency in the Indian real estate sector.

**Keywords:** New-age media; Stakeholder management; Indian real estate; Digital collaboration; Technology adoption.

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## **PropTech and AI: Key Driver's of India's Real Estate Future**

*Poornika Masand\*, Dhruva Tyagi\*\* and Atharva Atkar\*\*\**

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### **ABSTRACT**

The Indian residential real estate sector is undergoing a profound digital transformation, moving away from its traditional opacity and fragmentation toward a digitally enabled, transparent, efficient, and consumer-centric ecosystem. This shift is primarily driven by the strategic integration of Property Technology and Artificial Intelligence. This thesis examines the influence of these technologies across the residential value chain. The research focuses on the impact of Proptech tools, including AI-driven predictive analytics, Automated Valuation Models (AVMs), and Virtual/Augmented Reality for enhancing the property discovery experience. Findings reveal that AI significantly enhances market transparency and efficiency by providing accurate, data-backed valuations and personalised property recommendations, drastically reducing the search and decision-making time for buyers. The confluence of technology with favourable regulations (RERA) and rising digital literacy is creating a more consumer-centric and organised future market. The conclusion affirms Proptech and AI as the pivotal forces reshaping India's residential landscape. The research concludes that Proptech and AI are the non-negotiable foundations for the sector's projected growth to a \$639.28 billion market by 2030. They are not merely additional tools but are essential drivers that foster greater trust, efficiency, and investment confidence, thereby shaping a resilient and digitally empowered future for Indian residential real estate.

**Keywords:** PropTech; Artificial Intelligence; Indian real estate market; Transparency; Predictive analysis.

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## **Impact of Infrastructure on Real Estate, Identifying Enablers and Inhibitors - Pune**

*Ankit Patil\*, Chirag Bhokare\*\* and Rohit Marale\*\*\**

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### **ABSTRACT**

This paper examines the influence of infrastructure development on real estate pricing and investment sentiment in Pune, India. The study aims to identify the principal enablers and inhibitors that shape property value appreciation and to understand how infrastructure delivery affects market perceptions. A three-layered research design was employed: (i) descriptive statistical analysis of survey responses from developers, consultants, financiers, and government officials; (ii) content-thematic analysis to classify perceptions into value enablers and inhibitors; and (iii) case-based validation using ongoing urban projects such as the Pune Metro and Ring Road corridor to compare perceived and actual pricing outcomes. Results indicate that property prices appreciate most strongly after the completion of infrastructure projects, with metro connectivity, highways, and water-sewer networks emerging as critical enablers of value creation. In contrast, project delays, unclear timelines, and inadequate last-mile connectivity act as significant inhibitors. Divergent views among stakeholder groups highlight institutional and coordination challenges within the urban delivery framework. The study concludes that the economic benefits of infrastructure are realized only when supported by credible governance, timely execution, and reliable public utilities. Strengthening these elements is essential for sustainable land value capture and equitable urban development in Indian cities.

**Keywords:** Infrastructure development; Real estate market; Real estate stakeholder perception; Urban governance.

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## Forecasting Housing Prices for Indian Real Estate Market

*Ayansh Gaurav\**, *Shubham Malchature\*\**,  
*Raj Anand\*\*\** and *Rajni Kant Rajhans\*\*\*\**

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### ABSTRACT

Housing market instability caused by speculative price acceleration has become an important concern in India's rapidly urbanizing economy. This study proposes a framework to identify the short-run bubble and long-run bubble in the Indian Residential Real Estate Market. Using quarterly housing market data from ten major Indian cities, the research applies a CAGR-based price cycle analysis to map bubble formation intensity across regions. Findings reveal significant inter-city variation: markets such as Delhi and Hyderabad exhibit extended price run-ups followed by sharp corrections, characteristic of large bubble phases; cities like Bengaluru and Pune show high-growth but fast self-correcting small bubble cycles; while Mumbai, Kolkata, and Ahmedabad display more stable and affordability-linked price movements, indicating lower speculative overheating. The framework serves as a transparent early-warning system for buyers, developers, banks, and urban policymakers, enabling informed decision-making and reducing systemic risk. By providing a standardized method for measuring speculative pressure in housing markets, this research contributes to promoting long-term affordability, risk-aware financing, and sustainable real estate development in India.

**Keywords:** Housing price index; Short-run bubble; Long-run bubble; Housing market.

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## **Credit Availability, Policy Uncertainty and Housing Price Dynamics in India**

*Rishav Singh\*, Nikhil M.\*\*, Akash Sharma\*\*\* and Rajni Kant Rajhans\*\*\*\**

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### **ABSTRACT**

The housing sector is an important part of India's economic growth. Housing prices are heavily influenced by how much credit is available. Credit availability affects housing affordability, household buying power, and investment choices in the real estate market. Changes in lending conditions, such as interest rates, loan eligibility, and the way banks assess risk, have a direct impact on housing demand and price movements. Times of limited or uncertain access to credit, often due to stress in the banking sector, rising non-performing assets, or stricter regulations, can lower demand and increase price fluctuations. In addition to credit conditions, uncertainty around monetary policy, fiscal measures, and regulatory changes also affects market confidence and housing price trends. This study looks at the relationship between credit availability, policy uncertainty, and housing prices in India, focusing on affordable and mid-income housing segments and differences in regional markets. The findings show the need for better credit systems and policies.

**Keywords:** Credit availability; Housing prices; Policy uncertainty; Housing affordability; Real estate market.

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## Real Estate Investment Application

*Hrishikesh Shewale\**, *Agasti Takawale\*\**,  
*Shreyash Sawant\*\*\** and *Milind Phadthare\*\*\*\**

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### ABSTRACT

**Purpose:** Real estate investment decision-making is increasingly complex due to market volatility, financial uncertainty, location-specific dynamics, and regulatory constraints. Traditional real estate consultancy practices rely on manual analysis, static datasets, and expert judgment, which often limits analytical depth, response time, and scalability. With the growing demand for technology-driven and transparent investment advisory systems, there is a need for an integrated digital platform to support informed decision-making. **Study Design / Methodology:** The study adopts a conceptual and analytical methodology based on secondary data, industry reports, and case studies of established global real estate consultancy firms including ANAROCK, Savills, Cushman & Wakefield, Kroll, and Tishman Speyer. The proposed system framework integrates artificial intelligence and machine learning models for property valuation, market trend forecasting, investment risk assessment, and financial feasibility analysis. **Findings:** The proposed AI-powered consultancy platform demonstrates the potential to enhance investment decision accuracy, operational efficiency, and transparency in real estate transactions. By automating financial analysis and leveraging predictive analytics, the system reduces dependency on traditional consultancy methods while enabling scalable and consistent advisory services.

**Keywords:** Real estate consultancy; Commercial real estate; Real estate investment.

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## **Managing Cost Escalation in Multi-year Construction Projects**

*Vedant Badhani\*, Varad Gavali\*\* and Anand Prakash\*\*\**

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### **ABSTRACT**

Long-term construction projects often suffer from the problem of cost overruns. Generally, cost overruns are characterized by delays and additional costs. This study examines both exogenous causes of cost overruns, which include inflation, higher material prices, supply chain disruptions, and changes to government policy, as well as endogenous causes such as poor decision-making, ineffective teamwork, inaccurate cost estimation, inadequate planning, and frequent design changes during execution. This study uses a combination of surveys, structured interviews, and case study references of current large-scale infrastructure projects, including Pune Metro and the Delhi–Mumbai Expressway, to understand practical challenges faced at different stages of the project lifecycle. The data collected helps identify recurring patterns of risk and management gaps that contribute to cost escalation. Based on the research findings, a practical framework is suggested that emphasizes early risk identification, realistic budgeting, improved cost monitoring mechanisms, transparent communication among stakeholders, and the adoption of flexible and adaptive contract approaches. The goal of this study is to provide project teams with the ability to manage uncertain events with a higher level of confidence and to deliver projects in a timely, sustainable, and financially effective manner while minimizing future cost overruns.

**Keywords:** Inflation; Supply chain resilience; Cost escalation.

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## **An Exploratory Study on Housing Credit Availability and the Role of Fintech in Indian Real Estate Market**

*Vishal Solanki\*, Geetika Agrawal\*\*, Urmil Mantri\*\*\* and Rajnikant Rajhans\*\*\*\**

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### **ABSTRACT**

The housing finance sector plays a vital role in driving economic growth and urban development. However, traditional lending practices, complex regulations, and a strong dependence on collateral-based assessments continue to limit access to housing credit for both buyers and developers. This study takes an exploratory approach to identify the main factors affecting the availability of housing credit and to explore the emerging role of Fintech in overcoming these obstacles. Concentrating on India's real estate market, the research dives into the perceptions and experiences of buyers and developers regarding housing finance, with a particular focus on the acceptance and use of fintech-enabled solutions. The study looks at how digital innovations, such as technology-driven credit assessments, digital loan processing platforms, and alternative financing models, are perceived to enhance efficiency, transparency, and accessibility within the housing finance ecosystem. The research aims to identify patterns, emerging trends, and indicative insights into fintech's potential to close existing financing gaps. The findings aim to guide financial institutions and policymakers by providing strategic directions to encourage fintech adoption and support the development of a more inclusive, flexible, and resilient housing finance system in India.

**Keywords:** Housing finance; Credit availability; Fintech; Real estate; India.

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## **Mortgage Finance and Housing Affordability: Case of India**

*Shreyas Yadav S.\**, *Shounak Abhay Agalgaonkar\*\**,  
*Vijay Meghwal\*\*\** and *Rajni Kant Rajhans\*\*\*\**

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### **ABSTRACT**

Housing affordability has become a critical issue in the context of increasing housing prices, urbanization, and income disparities, particularly for low and middle-income households. Mortgage financing plays a fundamental role in facilitating home ownership by enabling individuals and families to access long-term financial resources for housing purchase. The primary objective of this study is to analyze the relationship between mortgage financing options and housing affordability, assess the impact of mortgage interest rates and loan terms on home ownership levels, and evaluate the challenges faced by various income groups in securing affordable mortgage financing. Factors such as interest rate structures, loan tenure, repayment capacity, accessibility of credit, and eligibility requirements are examined to understand their effect on housing affordability. An analytical approach is adopted to assess how mortgage financing conditions affect household purchasing power and the sustainability of home ownership. The study highlights the constraints faced by low- and moderate-income households, including high borrowing costs and limited access to formal credit. Based on the findings, the research proposes policy-oriented recommendations to strengthen mortgage financing systems and enhance housing affordability.

**Keywords:** Housing affordability; Mortgage financing; Home ownership.

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## Smart Cities & Real Estate Development: AI + IOT Insights

*Arunabha Mukherjee\* and Fahad Rouf Shah\*\**

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### ABSTRACT

In the 21st century, cities are rapidly evolving into interconnected ecosystems where technology shapes how people live, work, and interact. This study explores how the integration of Artificial Intelligence and the Internet of Things can transform real estate development and smart city infrastructure through data driven insights and intelligent decision making. The research focuses on how real time sensor data and predictive analytics can optimize building performance, strengthen investment decisions, and improve livability. By examining existing smart city frameworks, the study identifies gaps in current research, particularly the limited integration between technological innovation and human centered urban design. Using both primary and secondary data, the research analyzes the role of IoT devices in capturing real time information related to air quality, environmental conditions, energy consumption, mobility patterns, and other urban indicators. Artificial Intelligence tools process this data to support efficient planning, monitoring, and management of infrastructure. Furthermore, the research highlights the importance of addressing challenges such as data privacy, digital trust, cybersecurity, and infrastructure costs to ensure ethical and equitable smart city growth. Ultimately, this thesis envisions a future where technology and humans coexist harmoniously, enabling the development of smart cities that are technologically advanced, inclusive, sustainable, resilient and liveable.

**Keywords:** Smart Cities; Artificial Intelligence (AI); Internet of Things (IoT); Data-driven urban planning.

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**TRACK 3**

**CONTEMPORARY ISSUES  
IN MANAGEMENT**

## Comparison Based on Consumer Satisfaction Survey for Parle and Britannia in Pune City

*Avinash Purandare\**, *Anupriya Dey\*\**,  
*Tanishq Duraphe\*\*\** and *Rajarshi Mallick\*\*\*\**

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### ABSTRACT

Consumer satisfaction is the key factor in the success of any brand, be it in any sector; the major factors that are affected are consumer loyalty, market share, and long-term sustenance of the brand. Analysis of consumer behavior helps brands identify the exact variables that are making their product sell, and it also helps in understanding how the brand is positioned in the consumers' minds. This paper will carry out a comparison of consumer satisfaction levels between the top two Indian brands in India, i.e., Parle and Britannia, in the city of Pune. These two brands have already been there in the market for so long with a lasting impression on the consumer's mindset. Our major objective of research is to find out what the major trigger points are for people and which brand has a better market penetration. The survey sample size taken is 200, with the age groups of 18-45. The key indicators are price, availability of the product, taste, packaging, and advertising strategies used by these brands. The mentioned are the few factors that are contributing towards consumers purchasing Parle in the city of Pune. The findings also reveal staying innovative and relevant is essential.

**Keywords:** Consumer perception; Brand choices; Purchase trigger; Advertising tactics; Emotional connect.

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## **Weponized Finance: Sanctions, SWIFT and the Future of Global Finance**

*Shreya Firake\*, Anshika Srivastava\*\*,  
Arpan Bhattacharyya\*\*\* and Tanishq Wakde\*\*\*\**

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### **ABSTRACT**

In today's connected world, finance is no longer just a tool for growth. It has become a key factor in global power dynamics. This research explores weaponized finance and how states and international players use financial tools like sanctions, limits on cross-border payments, and control over payment systems such as SWIFT to achieve geopolitical goals without traditional warfare. The study aims to uncover the effects of these measures on targeted economies, global financial stability, and multinational corporations. It also highlights their effectiveness and unintended consequences. By looking at historical case studies and current practices, the research seeks to identify patterns in the use of financial pressure. This includes examining the roles of economic interdependence and institutional resilience. Using the TCCM framework, this paper will investigate these strategies. Expected outcomes include a clearer understanding of weaponized finance as an increasing tool of global power, insights into the challenges and opportunities for affected countries, and suggestions for reforms in policy and financial systems.

**Keywords:** Weaponized finance; Economic sanctions; Policy reforms; SWIFT system; Global finance.

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## **Does Sentiment and Behavioural Biases Shape Equity Decisions? An investigation in India**

*Shivika Saxena\*, Sarah Fatima Sheikh\*\* and Swati Kashinath Patekar\*\*\**

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### **ABSTRACT**

This study explores the influence of investor sentiment and behavioural biases on equity investment decisions in India. Traditional theories such as the Efficient Market Hypothesis (EMH) and Modern Portfolio Theory (MPT) assume rational decision-making, yet practical evidence highlights frequent departures from logic. Behavioural patterns including herd mentality, overconfidence, loss aversion, recency bias, and confirmation bias often shape investment outcomes. The research will rely exclusively on secondary sources such as market sentiment indices, company financial reports, and news headlines. Using quantitative sentiment analysis, the study will track emotional trends and their relationship with investment practices, particularly systematic investment plan (SIP) participation and stock selection. To provide structure, the TCCM (Theory–Context–Characteristics–Methodology) framework will be applied and adapted to the Indian context of behavioural finance. The findings aim to contribute to financial literacy by highlighting how psychological distortions affect investment behaviour and by promoting strategies that encourage rational, disciplined, and informed decision-making in equity markets.

**Keywords:** Behavioural finance; Investor sentiment; Equity investments; India.

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## **A Study on Skill Gap Analysis for Early-career Techno Managers**

*Vedajanani Sivakumar\*, Gnana Prasanna Nammi\*\*,  
Abhishek Mishra\*\*\* and Jonardan Koner\*\*\*\**

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### **ABSTRACT**

India being one of the fastest-growing construction markets in the world, continues to face a severe shortage of techno-managerial talent. The CRIP sector contributes significantly to the country's GDP. With the rapid integration of advanced technologies, adoption of digital tools, and increasing intricacies of project requirements, the demand for professionals who can combine technical expertise with managerial proficiency has grown significantly. In this context, the role of techno-managerial professionals has become vital and they are expected not only to understand design, engineering, and construction technologies but also to possess managerial skills such as planning, coordination, communication, and leadership, which are critical for delivering projects on time and within budget. The study seeks to address this gap by conducting a systematic investigation into the specific competencies that are most crucial for techno-managerial roles in the construction sector in India. Using factor analysis, the research identifies and categorizes critical technical and managerial skills—ranging from project planning, cost control, and risk management to leadership, problem-solving, and effective communication. Bridging the gap through data-driven reforms will pave the way for sustainable growth, better project performance, and enhanced global competitiveness for India's construction sector.

**Keywords:** Project planning; Cost control; Risk management; Leadership; Factor analysis.

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## **Adoption of AI Tools in Corporate Learning Pedagogy**

*Roshni Kumari\**, *Ruchi Bhilare\*\**, *Ankita Singh\*\*\** and *Soumi Rai\*\*\*\**

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### **ABSTRACT**

**Introduction:** The integration of Artificial Intelligence in corporate learning environments is revolutionizing traditional training by enhancing efficiency, personalization, and innovation. This research investigates AI adoption patterns among corporate learning professionals and examines the effects of organizational support, technology readiness, and individual factors. **Literature Review:** Recent studies highlight technology acceptance frameworks like TAM and UTAUT2 as essential to understanding attitudes toward AI adoption. These studies emphasize opportunities such as scalability and adaptive learning, alongside challenges including ethical issues, infrastructure gaps, stakeholder resistance. **Research Methodology:** Using an exploratory quantitative design, the study involves semi-structured interviews with corporate educators, HR leaders, and learning professionals. The questionnaire centers on UTAUT2 dimensions: performance expectancy, effort expectancy, social influence, facilitating conditions, price value, habit, and behavioral intention, complemented by open-ended questions on organizational barriers. **Data Analysis:** Collected qualitative and quantitative data will be analyzed following the UTAUT2 model. Pattern and theme identification is ongoing as research progresses. **Findings:** With the research underway, detailed findings are pending. The study expects to unveil key drivers and obstacles influencing AI adoption in corporate learning. **Implications:** Final conclusions and practical recommendations will focus on policy, readiness, aiding organizations in effective AI integration in learning environments.

**Keywords:** Artificial Intelligence; Corporate learning; Technology adoption; Organizational readiness; Training.

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## **Selection of Project Delivery System for High Rise Residential Buildings: A Multi-criteria Decision-making Approach**

*Wafa Abdul Rasheed\*, Pushkal Murahari\*\* and Susmitha Astanaditta\*\*\**

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### **ABSTRACT**

The selection of an appropriate Project Delivery System (PDS) is a crucial early-stage decision that significantly influences cost, time, quality, and risk outcomes in construction projects. In India's evolving construction sector, especially in high-rise residential developments, PDS selection often relies on intuition or past practices rather than structured analysis. This study aims to develop a systematic and transparent decision-support framework for PDS selection using a hybrid Multi-Criteria Decision-Making (MCDM) approach integrating DEMATEL, AHP, and TOPSIS methods. A comprehensive literature review and expert-based data collection were employed to identify and analyze key selection criteria such as cost certainty, project complexity, risk allocation, delivery speed, and quality assurance. DEMATEL was used to establish cause-effect relationships among criteria, AHP to determine their relative weights, and TOPSIS to rank alternative PDS options including DBB, DB, EPC, and PPP. The study provides a structured model tailored to the Indian construction context, promoting evidence-based and sustainable project delivery decisions. Findings are expected to support clients, consultants, and policymakers in enhancing project efficiency and reducing uncertainty in PDS selection.

**Keywords:** Project delivery methods; Multi-criteria decision making; Construction; Decision support systems.

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## **Analysing the Effectiveness of Social Media Platforms in Lead Generation for Construction Firms**

*Ravindrakumar Kshirsagar\*, Yashvardhan Kadam\*\*,  
Arkaj Lahorkar\*\*\* and Yash Nimbalkar\*\*\*\**

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### **ABSTRACT**

**Purpose:** Social media is widely used for marketing across industries, including construction industry. Existing studies primarily focus on brand visibility, consumer engagement, or real estate sales. Application of various platforms such as Facebook, Instagram, and LinkedIn to enhance outreach and awareness is also well documented. However, not much data is available to understand the effectiveness of social media in converting leads to customers for construction firms. There is also a lack of studies to understand the effectiveness of various Ad types in converting leads to customers. This study provides empirical evidence to understand the effectiveness of social media platforms by construction industry. **Design / Methodology:** A mixed-method research design was implemented. Primary data were collected via surveys of construction companies and potential customers to understand platform usage, engagement, and lead outcomes. Secondary research included reviewing published studies, industry reports, and digital marketing insights to support the findings. **Results / Observations / Outcomes:** The primary results of the study suggest that Instagram is the most effective social media platform providing highest conversion rates from leads to customer. The preliminary results also indicate that is a positive correlation between Ad format of a social media platform and its effectiveness in conversion ratio.

**Keywords:** Social media marketing; Construction; Lead generation.

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## **Evaluating the Impact of M&A on Firm's Performance across Industries in India**

*Aditya Tingre\*, Riya Bhilare\*\* and Prathmesh Pishhe\*\*\**

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### **ABSTRACT**

This research evaluates the impact of Mergers and Acquisitions (M&A) on firm performance across diverse industries in India. It analyses M&A's effect on key financial and operational metrics, investigates the underlying reasons for performance changes, and determines whether these activities create shareholder value. Employment of a mixed method, combining quantitative analysis of pre-M&A and post-M&A financial data with qualitative expert surveys. This approach captures both measurable outcomes and factors like cultural integration and strategic alignment. As this research is ongoing, definitive findings are pending. The study is expected to identify the key financial, operational, and strategic factors driving post-M&A outcomes in Indian context. Anticipation is that the impact will vary significantly by industry and integration effectiveness. The anticipated outcomes will provide actionable insights for corporate leaders, investors, and policymakers. The study aims to offer a robust framework to guide strategic decision-making, enhance M&A execution, and improve the likelihood of achieving shareholder value creation in the Indian Market.

**Keywords:** Merger and Acquisitions(M&A); Firm performance; Mixed method research; Shareholder value; India.

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## **Evaluating Market Opportunities and Consumer Perceptions in FMCG through Brand Equity**

*Tharuni Jalla\*, Aboli Patwa\*\* and Himanshu Yadav\*\*\**

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### **ABSTRACT**

Fast Moving Consumer Goods (FMCG) is the fourth largest sector of the Indian economy (Indian Institute of Management Review, Indian Institute of Management, 2016). The goal of this paper is to identify current market trends and consumer attitude about FMCG company. Additionally, it attempts to suggest that not all business strategies are effective. High market performance and shareholder values are achieved through strategic adoption that leverages market opportunities and ensures rapid resource deployment (Azamat, Galiya, Bezhan and Nardana, 2023). There are many challenges faced by Indian FMCG's, the biggest among them is the measurement of brand equity of the company (Mohan and Sequeira, 2015). Past studies have suggested that 40% of the company value is not reflected on the balance sheet of the company (Lev and Feng, 2001). In this paper an attempt is made to focus on two perspectives of consumer perceptions on brand equity, namely, cognitive and behavioural approach (Silverman, Sprott and Pascal, 1998).

**Keywords:** Market opportunities; Resources; Brand equity.

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## **A Framework for BIM-enabled Change Management in Construction Project Delivery**

*Nikhil Mukkamala\*, Purbasha Singh\*\* and Apurva Vasantgadkar\*\*\**

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### **ABSTRACT**

**ABSTRACT:** In construction Project delivery the Delays and cost overruns are ongoing problems for the Architecture, Engineering, and Construction (AEC) sector. In order to solve these inefficiencies, this study presents the Dual Matrix Change Management Framework, which combines BIM with change management concepts. This study uses a mixed methods approach, combining case studies in Asia and Europe and a worldwide survey, to consider BIM as a socio-technical transition and identify critical success elements. The results show that using this paradigm increases change order efficiency and decreases rework. Digital skills, good leadership, and stakeholder involvement are essential for successful implementation. This research shows that BIM is proactive and cooperative for project delivery and organizational resilience. In the end, the research shows that effective change management with project resilience can be achieved by using integrated digital workflows with agile organizational governance, by closing the performance gap between technical capability and operational reality.

**Keywords:** BIM; Change management; Digital transformation; Construction projects; Organizational resilience.

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## **Role of Fintech in Customer Satisfaction in Banking Sector**

*Vibhawari Tidke\* and Nandaja J. N.\*\**

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### **ABSTRACT**

The rapid growth of Financial Technology (FinTech) has transformed the banking industry, reshaping how customers interact with financial institutions and access services. This study examines the implementation of FinTech solutions in public and private sector banks and their impact on customer satisfaction. Using a comparative approach, it analyzes differences in customer perceptions regarding service quality, security, and convenience across both banking sectors. Correlation analysis is applied to explore the relationship between FinTech adoption and overall customer satisfaction, as well as the interconnections among key service factors. The findings indicate that customers of private sector banks show higher adoption levels and satisfaction with FinTech services compared to those of public sector banks (Basdekis, 2022). Among all factors, convenience emerged as the most significant driver of satisfaction, while service quality and security also demonstrated strong positive correlations with overall customer satisfaction. These elements collectively influence the digital banking experience. The research provides empirical insights into how banks can strategically leverage FinTech to enhance customer experience, strengthen loyalty, and maintain competitiveness, offering practical recommendations for both public and private sector banks (Kamboj, 2022).

**Keywords:** FinTech; Customer satisfaction; Banks; Service quality.

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## **The Role of Costal Highways in Enhancing India's Blue Economy: Opportunities and Challenges**

*Prathmesh Jaya Diwakar Chide\*, Mohan Sai Rama Krishna Yatam\*\*,  
Phani Krishna Tejaswi Vasamsetti\*\*\* and Pradeepta Kumar Samanta\*\*\*\**

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### **ABSTRACT**

With a coastline measuring over 7,500 kilometres, India can distinguish itself as a leader in the blue economy, the latest model of sustainable economic development focused on the sea and coastal resources. The blue economy encompasses all activities in sea and coastal resources such as sea trade, fishing, tourism, farming, sea-based energy, and biotechnological research. A critical and hitherto underappreciated aspect of this ecosystem is coastal highways development. These highways, which run parallel to the coast, integrate and connect fully functional systems of trade and transport, spanning ports, fishing harbors, coastal towns, tourist hubs, and industrial belts. Coastal highway networks promote seamless logistical channels, boosting the free flow of people and services to integrate economies and foster development. The focus of this thesis is to establish the relationship between coastal highways and the blue economy of India, particularly in the context of economic development and infrastructure. The aim of the study is to examine, using secondary sectoral data, the effects of coastal highways on trade, tourism, and fishing. In understanding the role of coastal highways as economic arteries and their contribution to achieving the blue economy.

**Keywords:** Coastal highways; Blue economy; Economic growth; Infrastructure planning.

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## **Determinants of Channel Selection for Businesses in the Prefabrication Industry**

*Nikhil J. Rajurkar\* and Sharada H. P.\*\**

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### **ABSTRACT**

Digital transformation is reshaping sales strategies in the prefabrication industry, compelling firms to make critical channel selection decisions. This study explores the determinants influencing the adoption of online, offline, and hybrid sales channels for prefabricated products—such as modular homes, precast concrete components, and portable structures—in the Indian market. Employing a descriptive-exploratory cross-sectional design, structured questionnaires were administered to a purposively stratified sample of 50+ industry stakeholders, including contractors, architects, suppliers, and clients. Key determinants—cost, product complexity, logistics reliability, brand reputation, after-sales service quality, and digital readiness—were evaluated using Likert-scale responses. Findings reveal a predominant preference for hybrid channel strategies (63.6%), with logistics reliability and brand reputation identified as the most influential factors, followed by after-sales service and product complexity. Cost considerations ranked lowest, challenging conventional assumptions of price dominance in B2B construction markets. Digital readiness varied among stakeholders: architects and suppliers demonstrated higher proficiency with AR/VR and BIM tools, while clients emphasized the need for personal consultation. Integrating insights from Transaction Cost Economics, the Resource-Based View, and the Channel Design Framework, the study proposes a three-phase hybrid strategy—digital discovery, offline verification, and integrated service delivery—to align efficiency with trust in prefabrication sales.

**Keywords:** Prefabrication; Channel selection; Hybrid channels; Digital transformation; Customer satisfaction.

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## **The Role of Digital Payment Systems in Financial Inclusion**

*Piyush Pandey\* and Sakshi Agrawal\*\**

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### **ABSTRACT**

**Purpose/Objective:** The main aim of this study is to understand how digital payment systems help promote financial inclusion by making financial services more accessible, affordable and secure. It also focuses on finding the challenges people face in using digital payments and how these can be solved to improve inclusion. **Methodology:** The study is based on a review of existing research papers, government reports and digital financial data. It uses secondary data to analyse how digital payment platforms like mobile wallets, UPI and online banking have increased financial access for individuals and small businesses. **Findings:** The study finds that digital payment systems have significantly improved financial inclusion by providing convenient and low-cost banking options. However, problems such as poor internet access, lack of awareness and cybersecurity issues still limit their full potential. **Implications:** The results suggest that increasing digital literacy, improving infrastructure and ensuring better data security can further strengthen the role of digital payments in promoting financial inclusion. Governments, banks and fintech companies need to work together to build trust and make digital finance accessible to everyone.

**Keywords:** Digital payment systems; Financial inclusion; Digital literacy; Economic growth; Fintech.

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## **Privatization of Airports in India: Unlocking Non-Aeronautical Revenue Potential**

*Prasidh Prem Nair\*, Dhruv Sudra\*\* and Vaishnav Manikath\*\*\**

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### **ABSTRACT**

India's aviation sector is experiencing rapid expansion driven by economic growth and increasing air travel demand; however, profitability remains concentrated among a limited number of airports. A majority of state-operated airports struggle to achieve financial sustainability, while privatized airports such as those in Delhi, Mumbai, Bengaluru, and Hyderabad have demonstrated notable improvements in infrastructure development, service quality, and non-aeronautical revenue generation. This study critically investigates the impact of airport privatization on financial and operational performance in India, with particular emphasis on the enhancement of non-aeronautical revenue streams. Employing a comparative case study methodology, the research analyses Bengaluru (BIAL) versus Chennai, and Ahmedabad versus Kolkata airports, representing privatized and government-operated models, respectively. The study adopts both qualitative and quantitative approaches, drawing on institutional reports, tariff orders, investor disclosures, and structured passenger surveys. The analysis evaluates differences in commercial performance, operational efficiency, and passenger experience to identify key drivers and constraints influencing revenue diversification. The findings are expected to establish that privatization enhances airport efficiency and financial sustainability through strategic expansion of non-aeronautical activities. The study concludes with policy-level recommendations to strengthen the Public–Private Partnership (PPP) framework and promote globally competitive, self-sustaining airport infrastructure in India.

**Keywords:** Airport privatization; Non-aeronautical revenue; Airport performance.

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## **The Impact of Different Styles of Leadership on Project Quality Performance**

*Amogh Chinchali\*, Chaitra Alse\*\*, Sheshadri V.\*\*\* and Kirti Rajhans\*\*\*\**

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### **ABSTRACT**

The study examines the critical role of leadership in determining project success within the civil engineering and construction industry. Specifically, it investigates the impact of different leadership styles on project quality performance. Effective leadership is essential for motivating teams, shaping organizational culture, and ensuring project performance. The industry often faces high workplace stress and complex, fragmented environments, where poor leadership can lead to budget overruns and quality issues. The study's objectives are to evaluate the effectiveness of various leadership styles in improving project performance (time, cost, and quality) and to identify the most suitable styles based on project characteristics. While traditional leadership dominates, the research confirms that styles like transformational leadership improve innovation and job satisfaction. Furthermore, it assesses leadership adaptability using Hersey-Blanchard's Situational Leadership Theory (SLT) and links it to newer styles like Risk-Aware and Agile Leadership. The findings aim to provide insights into effective leadership practices for enhanced project delivery and a positive work environment.

**Keywords:** Leadership styles; Project quality performance; Construction industry (or AEC industry); Situational.

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## **Go Cashless: Exploring Traveler Preferences and Challenges with Digital Payments**

*Shrikant Gondkar\*, Shreya Dhoke\*\*, Omkar Hakeem\*\*\* and P. K. Samanta\*\*\*\**

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### **ABSTRACT**

India's tourism landscape is experiencing a digital transformation as fintech solutions reshape how travellers conduct transactions during their journeys. This research examines the influence of digital payment technologies on tourist experiences while examining adoption patterns across diverse traveller segments. The study aims to understand how UPI systems and mobile wallets affect travel convenience, identify obstacles preventing widespread acceptance, and analyse demographic factors that drive usage preferences. A structured survey approach collected responses from tourists visiting various Indian destinations. The comprehensive questionnaire captured payment behaviours, security perceptions, infrastructure challenges, and experiential outcomes. Statistical analysis employed descriptive methods alongside correlation tests, variance analysis, and regression modelling to reveal relationships between traveller characteristics and digital payment adoption. Results demonstrate that tech-comfortable younger visitors and regular travellers show greater enthusiasm for cashless transactions, primarily valuing speed and ease of use. However, connectivity disruptions, merchant limitations, and fraud concerns create hesitation among many tourists, leading to continued cash dependency. International visitors exhibit unique adoption patterns influenced by system familiarity and trust levels.

**Keywords:** Cashless tourism; Payment adoption; Traveller preferences; Digital infrastructure.

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## **Financing of Railway Infrastructure in India**

*Aniket Garla\*, Yashshree Dahiwile\*\*,  
Ojaswee Thakur\*\*\* and Pradeepta Kumar Samanta\*\*\*\**

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### **ABSTRACT**

Indian Railways (IR), the world's fourth-largest rail network, forms the backbone of India's transport and logistics system. Despite major modernization efforts, challenges such as delayed payments, inadequate fund allocation, and cost overruns continue to affect project delivery and financial efficiency. This study analyses the financing mechanisms of India's railway infrastructure from 2015 to 2025, focusing on Gross Budgetary Support (GBS), Extra Budgetary Resources (EBR), Public-Private Partnerships (PPP), Foreign Direct Investment (FDI), and Overseas Development Assistance (ODA). Using official data from the Ministry of Railways, CAG, and MOSPI, it explores the relationship between funding adequacy, payment delays, and project outcomes. Findings show that although GBS funding rose from 51% in FY2014–15 to over 90% in FY2024–25, projects still face financial bottlenecks due to delayed fund release, weak state contributions, and slow lender reimbursements. The study concludes that timely budget disbursal, real-time fund tracking, stronger coordination, and incentivized PPP participation are essential for efficient and sustainable railway infrastructure development in India.

**Keywords:** Indian railways; Infrastructure financing; Delayed payments; Cost overruns.

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## **Barriers in Quick Commerce - An Interdependence Study**

*Anuj Nema\*, Shardul Konde\*\*, Ashish Golyalkar\*\*\* and Dipayan Roy\*\*\*\**

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### **ABSTRACT**

The rapid growth of quick commerce in India has redefined consumer expectations for ultrafast delivery while exposing new operational and strategic challenges. This study investigates the critical barriers impeding Q-commerce performance and explores the interrelationships among these factors through a structured, multi-phase research design. A modified Delphi technique was employed to solicit expert opinions from industry practitioners and academics, enabling the identification and validation of key operational barriers across financial, logistical, regulatory, and market domains. ISM used to map the hierarchical relationships and driving-dependence power among these barriers. To complement the expert insights, a structured survey of Q-commerce managers and operators was administered using a five-point Likert scale to quantify the prevalence and perceived intensity of each barrier. The combined approach yielded a comprehensive framework categorizing barriers into driver, linkage, dependent, and autonomous factors. Findings highlight that financial constraints, cost control challenges, and regulatory complexities act as dominant drivers influencing downstream issues such as traffic disruptions, customer loyalty, and inventory management. The study offers a diagnostic model for prioritizing interventions and optimizing strategic decision-making in Q-commerce operations. These insights provide actionable guidance for practitioners aiming to enhance operational resilience and for policymakers seeking to support sustainable urban logistics ecosystems.

**Keywords:** Q-commerce; Operational barriers; Urban logistics.

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## **Supply Chain Management of Perishable Goods in Quick-commerce**

*Hemant Mahajan\*, Sandip Chakraborty\*\* and Saket Kumar\*\*\**

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### **ABSTRACT**

This study examines the operational aspects of supply chain management (SCM) for perishables in the fast-expanding quick commerce (q-commerce) market in India. Q-commerce platforms such as Zepto, Blinkit, and Swiggy Instamart are transforming the retail experience by promising almost immediate delivery for fresh produce, dairy items and grocery goods in as little as 10 minutes. This research explores the complexities of last-mile delivery, cold chain logistics and sourcing perishable products while maintaining product freshness and minimizing waste. Utilizing qualitative research methods, the author studied live, real-world challenges and coping strategies by speaking with delivery coordinators, procurement executives, and dark store managers. The findings from the literature review and data from the field indicate that data-driven inventory management, micro-warehousing and technology integration are critical enablers of supply chain effectiveness. Conversely, performance is significantly impacted by barriers such as cold chain infrastructure, lack of coordination and temperature sensitivity in perishables. To increase reliability and satisfaction in India's q-commerce space, the research highlights the need for collaboration, sustainable logistics framework, and infrastructure enhancements.

**Keywords:** Last-mile delivery; Supply chain management; Perishable goods; Quick commerce.

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## **Exploring Work-Life Balance in Project-based Organizations**

*Aalok Palsule\*, Mohit Rawal\*\*, Nikita Meshram\*\*\* and Sachin Batra\*\*\*\**

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### **ABSTRACT**

Project-based organizations (PBOs) function in dynamic, time-limited contexts that create atypical challenges for employees in establishing work-life balance (WLB). This study analysed the issue of WLB by systematically reviewing literature at the convergence of WLB and PBOs. Utilizing SCOPUS as the primary database, 190 articles were identified. After exporting the bibliographic data and carrying out a two-stage filtering of the records, 167 were eliminated, leaving 23 studies which focused on WLB in PBO contexts. The 23 studies offer a diverse resource of explanations regarding the antecedents of WLB or influencing WLB depending on the project's context. In addition to the literature, six semi-structured interviews were conducted with working professionals to capture their descriptions of lived experience and understanding of WLB. The research synthesizes evidence collected from both perspectives (the systematic review and practitioners' contributions) to develop the types of antecedents, dimensions, and outcomes of WLB within PBOs. The combined effort provided a fuller account of WLB and a topographical approach for furthering research and practice in project-based contexts.

**Keywords:** PBOs; WLB; SCOPUS.

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## **A DEMATEL Method to Determine Key Factors of Supply Chain Management in Quick Commerce**

*Manjunathbabu Naik\*, Sarvesh Mane\*\*,  
Aditya Bhawar\*\*\* and Virendra Balon\*\*\*\**

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### **ABSTRACT**

Abstract (A DEMATEL method to determine key factors of supply chain management in Quick commerce) Q-commerce is changing the game in India's e-commerce sector by delivering groceries and essentials in 10 to 30 minutes. Factors like urban growth, increased internet access, and a desire for convenience have led to the rise of major players such as Blinkit, Zepto, and SwiggyInstamart. They use densely located dark stores and local delivery fleets to quickly scale their operations. Hence, significantly of the supply chain problem intimidate the long-term sustainability of this model. Research Design/Methodology This study explores the main challenges to the efficiency, scalability, and resilience of Q-commerce supply chains in India. Based on the academic literature, industry reports, and government documents, challenges were identified within these six thematic areas: operational, infrastructure, technology, regulatory, environmental, and labor Key Findings - As a result of urbanisation, online access and consumers' demand for convenience, the q-commerce market in India is expanding quickly. Also, there are environmental pressures from extended packaging waste that complicate q-commerce's sustainability.

**Keywords:** Logistics challenges; Q-commerce; Cold-chain capacity; Quality control

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## **BIM for Monitoring and Reducing Change Orders in Construction**

*Ajeet Shah\**

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### **ABSTRACT**

Change orders remain one of the most critical challenges in construction management, often leading to project delays, cost overruns, and reduced productivity. Traditional systems rely heavily on manual coordination and fragmented documentation, resulting in inefficiencies and a lack of accountability. This research investigates how Building Information Modelling (BIM), implemented through a structured BIM Execution Plan (BEP) and supported by the BIM-ISICO system, can transform change order management into a transparent, automated, and data-driven process. By integrating Requests for Information (RFIs) within BIM workflows, the study emphasises early conflict detection, improved collaboration, and real-time decision-making throughout the construction lifecycle. The research proposes a nine-step BEP-integrated change management framework based on ISO 19650 standards, using Common Data Environment (CDE) platforms and BIM automation tools such as Revit, Dynamo, and Navisworks. The findings reveal that BIM-ISICO enhances efficiency by automating model comparisons, maintaining audit trails, and synchronising cost and schedule data. The framework demonstrates that BIM-based change management significantly reduces administrative bottlenecks while fostering control, transparency, and integration across all project phases.

**Keywords:** Building Information Modelling (BIM); BIM-ISICO; BIM Execution Plan (BEP); Construction management.

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## **Revitalizing India's Industrial Landscape: Assessing the Impact of the Production-Linked Incentive (PLI) Scheme on Economic Growth**

*Surya Gorai\* and Pradeepta Kumar Samanta\*\**

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### **ABSTRACT**

India is undergoing a transformative phase in its economic development, driven by the government's vision to strengthen domestic manufacturing and reduce reliance on imports. The Production-Linked Incentive (PLI) scheme stands at the core of this transformation, offering performance-based financial incentives to encourage production expansion, innovation, and competitiveness. This study critically examines the potential of the PLI scheme to accelerate India's economic growth by analyzing its influence across key sectors such as electronics, pharmaceuticals, and automobiles. Using a combination of data-driven evaluation and case-based insights, the research explores how the scheme has enhanced industrial capacity, attracted both domestic and foreign investments, generated employment opportunities, and stimulated exports. The findings highlight persistent challenges, including the limited inclusion of Micro, Small, and Medium Enterprises (MSMEs), regional disparities in industrial benefits, and the need for sustainability-focused manufacturing. It concludes that the long-term success of the PLI scheme will depend on fostering innovation, strengthening institutional frameworks, and aligning policy mechanisms with green and technology-driven growth objectives. By doing so, India can not only achieve industrial self-reliance but also establish itself as a global manufacturing hub in the years to come.

**Keywords:** Production-Linked Incentive (PLI); Manufacturing; Economic growth; Employment; Exports.

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## **Conflict and Collaboration – Management of External Stakeholders in Metro Rail Projects (Land Acquisition)**

*Sri Pachaiyapan R. K. \*, Virushang Sai Sakthivel N. \*\* and Rohit V. \*\*\**

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### **ABSTRACT**

The rapid growth of infrastructure projects creates ongoing challenges for governments around the world, with India being one of the prominent growth markets. Metro rail projects in major urban cities encounter major challenges, especially in acquiring land, where strong cultural and emotional links to land fuels resistance. This research aims to bridge the gap between internal and external stakeholders by examining the external stakeholders' views through a qualitative research approach. Based on Stakeholder Theory as well as John Rawls' Theory of Justice, it examines not just strategies employed by external stakeholders but also the underlying reasons for resistance, impacts on communities and project schedules, and countermeasures taken by officials. It also gauges whether these were viewed as equitable or unfair by affected citizens. Data were collected through semi structured interviews and analyzed using MAXQDA software to identify the emerging patterns and themes. The findings reveal that people's emotional bonds with their land, their sense of fair compensation, trust in government actions. The proposed framework emphasizes the need for fairness, openness, and ethical communication, offering practical ways for policymakers to build trust, reduce tensions, and make infrastructure development smoother and more inclusive.

**Keywords:** Land acquisition; Metro rail projects; Stakeholder theory; Rawls' theory of justice; External stake.

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## **Integration of AI and Six Sigma Methodology for Defect Management in Interior Finishing Works: A Framework for Small and Medium-sized Construction Enterprises**

*Shravan Suvarna\*, Nikhil Shivatare\*\* and Trisha Saha\*\*\**

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### **ABSTRACT**

This study proposes a framework which integrates Artificial Intelligence (AI) with the Six Sigma methodology to manage quality control in interior finishing works. Interior imperfections such as painting, plastering, tiling, carpentry etc. occur during the final stages of construction. Such imperfections are expensive to rectify, are time-consuming, and directly affect customer satisfaction and timelines of the project. Thus, addressing these imperfections and their causes systematically is essential for improving overall construction quality and efficiency. Implementation of this model can potentially reduce defect rates in considerable amount and improve sigma levels from three to four, and boost defect detection and root-cause analysis. Small to medium enterprises account for nearly ninety percent of India's construction industry, hence this framework can be adopted at a reasonable cost to achieve improvements in performance and profitability. It is expected to deliver a substantial defect reduction and generate a significant return on investment (ROI) and significantly enhance project progress and customer satisfaction through proactive quality assurance.

**Keywords:** Artificial Intelligence (AI); Six sigma; Defect rectification; Cost and time effective.

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## Last Mile Connectivity of Pune Metro

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*Gouse Mohiuddin Shaik\*\*\** and *Nagarjuna Pilaka\*\*\*\**

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### ABSTRACT

This study examines last-mile connectivity challenges and opportunities linked to the Pune Metro, focusing on the Balewadi–Mahalunge region. Mahalunge, a semi-urban area under the Pune Metropolitan Region Development Authority (PMRDA), faces limited public transport access despite its proximity to Hinjewadi IT Park and Balewadi Stadium. The research, based on household surveys, field observations, and secondary data from PMRDA and Census reports, highlights that only about 35–40% of the area is developed, with most residents relying on private vehicles or shared autos due to infrequent bus services and inadequate pedestrian infrastructure. The findings indicate a strong potential for e-rickshaws as sustainable last-mile transport owing to their affordability and environmental benefits. However, challenges such as insufficient charging facilities, poor regulation, and lack of fare integration persist. Strengthening institutional coordination between PMRDA, the Gram Panchayat, and metro authorities, along with investments in charging stations, parking zones, and digital fare systems, can improve accessibility. Enhancing e-rickshaw connectivity to metro stations could significantly boost ridership, reduce private vehicle dependence, and promote sustainable urban mobility in the Pune Metropolitan Region.

**Keywords:** Last-mile connectivity; Metro transport; Sustainable mobility; Mahalunge–Balewadi; Pune metro.

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## **Analyzing the Impact of Contractual Ambiguities on Disputes in Indian Highway Construction Projects**

*Om Rastogi\*, Shreyash Bile\*\*, Abhishek Sahu\*\*\* and Trupti Rath\*\*\*\**

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### **ABSTRACT**

A construction contract is a legal agreement between two or more parties, typically where the contractor is responsible for providing construction services in exchange for a decided monetary value provided by a client. It plays a significant role in controlling and preventing disputes in a construction project. This paper's main objective is to develop a framework to assess the sources of ambiguity, specifically in highway construction projects, for inclusive referencing and prior detection of possible root causes of disputes. This is addressed by developing a category distribution framework that represents well-rounded sources of contractual ambiguities through an extensive analysis of the literature. The model is developed by an analysis of the relevant highway project cases, which were selected from the Supreme Court and different high courts' judgments in the previous 10 years. Only those cases were adopted for the model that included the dispute between the contracted parties. This study found information about core contractual ambiguities in contract documents, which cause a reason for conflict between the client and the contractor in the Indian highway construction projects. Therefore, this identification of sources of ambiguities in contracts helps in the preparation of contract documents to avoid disputes in highway construction projects.

**Keywords:** Contractual ambiguities; Construction disputes; Highway projects.

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## A Comprehensive Comparative Analysis of PMBOK And PRINCE2

*Shantanu Kadam\*, Shrawani Shete\*\* and Dhruv Pal\*\*\**

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### ABSTRACT

Two of the most well-known methodologies in global project management include PMBOK (Project Management Body of Knowledge) and PRINCE2 (Projects in Controlled Environment). The PMBOK is developed by PMI and is a descriptive standard providing guidance on project management procedures, tools, knowledge, domain focusing mainly on the role of project manager. It is suited for complex, multifaceted projects as it allows process adaptation and also emphasis on both technical as well as soft skills. PRINCE2 on other hand is a UK-based perspective methodology renowned for its clarity as well as its roles and responsibilities within the team. Government and international organizations usually prefer PRINCE2 due to its stage-based control, straightforwardness and scalability. It gives a high priority to the structure and governance which are driven by business rationale. PRINCE2 is preferred over PMBOK as it provides a uniform project management approach easy to comprehend and implement while PMBOK is commended for its extensive knowledge base and flexibility. The organizational content, project complexity and required degree of control determines the choice between PRINCE2 and PMBOK. This research highlights the market use of these two methodologies and tries to provide a basis for comparison between the two.

**Keywords:** Role clarity and governance; Descriptive and perspective framework; Project management methodologies.

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## **Evaluating the Relationship between Leadership & Communication Styles and Team Performance & Satisfaction in Mega Infrastructure Projects**

*Atul Anand\* and Shantanu Amrit\*\**

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### **ABSTRACT**

This study investigates the impact of leadership and communication styles on team satisfaction and performance in mega infrastructure projects. Given the unique challenges these projects present-complexity, scale, and stakeholder-diversity-the study seeks to determine the most successful leadership strategies and communication techniques that provide high-performing, engaged project teams. Data were gathered using a structured questionnaire administered among professionals working in selected mega projects, reflecting their perceptions and experiences about leadership and communication dynamics. The study utilizes quantitative survey analysis augmented with qualitative findings to build a unique framework that incorporates best practices in leadership and communication effective for large-infrastructure teams. Most notable findings highlight the fostering of team cohesion, job satisfaction, and productivity by transformational and participative leadership behaviors paired with open and engaging communication. The research further identifies leadership behaviors in harmony with desired communication as a means to foster greater trust and alleviate tensions. This thesis fills an important gap by presenting a customized, evidence-based approach created specifically for team managing in mega infrastructure projects, with a practical guide for project managers and stakeholders aimed at enhancing overall project delivery results. Contributions are made to both construction management and organizational leadership fields by integrating theory with practical, context-aware solutions.

**Keywords:** Leadership styles; Communication styles; Team performance; Team satisfaction.

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## **Leadership Styles for Dignity at Workplace: Ensuring Dignity at Academic Institutions**

*Samruddhi Chavan\* and Arpita Mathur\*\**

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### **ABSTRACT**

Dignity means being respected and feeling valued. It is a fundamental human need that strongly influences how faculties feel, behave, and perform in Educational Institutions. When Dignity is recognized and protected, faculties feel motivated, confident, and engaged, leading to higher performance, stronger collaboration, and a positive work environment. Conversely, when Dignity is violated through Disrespect, exclusion, or unfair treatment, trust and motivation decline, affecting both individual well-being and Institutional Outcomes. Since each faculty member experiences dignity differently, what makes one person feel respected may not be the same for another. This study explores these personal perspectives by examining the lived experiences of faculty, focusing on moments when they feel respected or disrespected. It also investigates the Leadership styles that foster dignity, including behaviors, communication, and decision-making approaches that will help faculty feel valued. Using a qualitative approach guided by constructivist grounded theory, the study gathers in-depth Insights through Interviews and observations. Through thematic analysis, it identifies how Dignity is perceived, how its absence affects motivation and performance, and how leaders and Policymakers can promote a culture of respect and fairness- Ultimately enhancing faculty motivation, engagement, and overall institutional performance.

**Keywords:** Workplace dignity; Leadership behaviour; Disrespect and recognition; Qualitative inquiry.

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## **Influence of Platform Based Businesses on Traditional Supply Chains**

*Suraj Suryawanshi\*, Chidanand Dhokale\*\*,  
Akshay Kale\*\*\* and Anand Prakash\*\*\*\**

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### **ABSTRACT**

This thesis is the changes that platform-based business models have made on the core structures, processes, and competitive dynamics of traditional supply chains that rely on these models. It shows how linear supply chain structures of the past have become fragile and inefficient. These structures also lack visibility, have processes that are solved, and have weaknesses that make them susceptible to systemic risks. The core processes are changed by this deep change in the structures through such means as disintermediation, which eliminates traditional middlemen, and greatly improved data driven demand-supply matching, which goes directly against the bullwhip effect. As a result, the focus of competitive dynamics changes from that of asset control and cost optimization to that of network effects, agility, and real-time data transparency. This study based on the Viable Supply Chain model that emphasizes resilience and agility, conducts a quantitative survey of 105 industry professionals that provides empirical evidence of the disruptive effect. The findings from the analysis demonstrate that platform-led abilities have the most significant impact traditional models becoming less viable in a global market characterized by volatility. The research sees the platform model as a structural, procedural, and competitive paradigm shift towards a more resilient future.

**Keywords:** Platform based business models; Supply chain resilience; Supply chain agility.

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## **Mapping on Site Problems for Productivity Improvement in Construction Projects**

*Avishkar Kale\*, Pranit Desai\*\*, Rajat Chopade\*\*\* and Anand Prakash\*\*\*\**

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### **ABSTRACT**

Construction sites are characterized by dynamic conditions that often hinder productivity, including material shortages, coordination lapses, and safety challenges. This study examines such barriers through a systematic mapping approach and attempts to improve project delivery and resource utilization. A combination of literature review and empirical analysis was used to analyze productivity barriers. Data were collected from 105 site professionals using a structured questionnaire and analyzed using SPSS. Research prioritized measuring the impact of site-based inefficiencies and evaluating existing mitigation strategies. The study identified delays in material supply, poor teamwork and inadequate safety measures as the most significant barriers to timely project completion. The adoption of advanced scheduling tools, regular risk assessments, and targeted worker training tangibly improved workflow efficiency and reduced the incidence of delays. These strategies allowed for better coordination and created a safer and more productive environment on site. The findings reinforce the important role of systematic mapping and adaptive management in enhancing construction productivity. Early identification and targeted action can help project teams minimize delays, manage resources effectively, and achieve desired results within budget and time constraints.

**Keywords:** Construction productivity; Site management; Resource planning; Risk analysis; Risk mitigation.

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## **Developing Internship Characteristic Model for Career-ready Professionals**

*Tarun Meetakoti\*, Mounika Tanubuddi\*\*,  
Surya Narayana Raju Datla\*\*\* and Sachin Batra\*\*\*\**

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### **ABSTRACT**

Internships became most important because they act as a bridge between classroom learning and reality in professional work. Studies show that internships can improve these competencies, but no one talks about the structure of internships that leads to the effectiveness of work readiness. Our research, we would like to find what are the internship characteristics are that lead to work readiness by creating an Internship Characteristics Model. Firstly, Internship Characteristics consists of five major dimensions, those are skill variety, task identity, task importance, autonomy and feedback and on those dimensions rely psychological states. These psychological states, in return, contribute to the satisfaction of the students as an outcome. The scope of this research is to identify how internship characteristics lead to job satisfaction by taking reference to the Job Characteristics Model, learning outcomes scale, and work readiness within a structured internship program. This is the work in progress in which we will be testing the relationships between the job characteristics and psychological states, internship satisfaction, ILOS and work readiness by the PLS-SEM approach. In so doing, it highlights again the fact well-structured internships are not just job exposures but immersion experiences designed to transform students to be career-ready professionals.

**Keywords:** Internship; Job characteristics model; Work readiness; Internship learning; PLS-SEM.

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## **Building Information Modelling for Schedule Optimization in Nuclear Power Infrastructure Projects**

*Sammed Nagtode\**

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### **ABSTRACT**

This paper evaluates the potential of Building Information Modelling (BIM) to reduce construction time in nuclear power infrastructure projects. Nuclear facilities involve complex systems, dense reinforcement, and high safety-related constraints with strongly interrelated construction phases; insufficient coordination often results in significant delays. This research investigates how integrated three-dimensional-four-dimensional (3D-4D) models enhance design coordination, construction sequencing, and stakeholder communication to mitigate rework, interface clashes, and on-site idle times. A mixed-methods approach integrates qualitative and quantitative elements. Reference schedules and construction workflows for selected critical structures are mapped and integrated into discipline-specific BIM models to simulate alternative sequencing scenarios in 4D. This produces estimates of schedule compression potential using quantitative metrics including clash reduction, reduced critical path duration, and improved trade concurrency. Qualitative insights into implementation challenges, digital readiness, and organizational enablers are informed by published nuclear project case studies and industry guidelines. The research advances a practical framework for stakeholders to systematically leverage BIM and optimize construction time on nuclear power projects, addressing both technical and organizational dimensions of digital integration in safety-critical, complex infrastructure delivery.

**Keywords:** Building information modelling; 4D BIM scheduling; Nuclear construction; Schedule optimization.

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**TRACK 4:**  
**ARCHITECTURE,**  
**DESIGN AND PLANNING**

## **Non-Farebox Revenue for Metro Rail Infrastructure: Review of International and National Experiences**

*Viresh Koli\* and Shruti Vaishampayan\*\**

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### **ABSTRACT**

Ensuring the financial viability of metro rail systems, to broaden the revenue streams to include more than just passenger fares. With the income streams of property development, advertising, commercial leasing, paid parking, and land value capture, Non-Farebox Revenue (NFBR) is an increasingly important element for the sustainable financing of public transit systems. NFBR derives from the conjunction of public transit infrastructure with urban development and real estate particularly the transformation of transport corridors into urban corridors thriving with value. This paper evaluates the NFBR systems of metro rail across various national and international contexts to understand the systems' financial sustainability and governance efficiency. In particular, the study focuses on NFBR's key drivers, including financial systems, land use integration, and other NFBR performance factors. The study presents NFBR as a sustainable financing strategy that will reduce the dependency on farebox revenue, improving the financial sustainability of urban rail systems and urban sustainable development serv. As the paper illustrates, there should be a seamless combination of policies, planning, and financial frameworks if the aim is to build the economic resilience of metro rail systems.

**Keywords:** Non-Farebox Revenue (NFBR); Metro rail finance; Land Value Capture (LVC).

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## **A Systematic Review of Infill Redevelopment and Its Multi-dimensional Impacts in India**

*Dinesh Neelamegan\* and Shruti Vaishampayan\*\**

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### **ABSTRACT**

Urban densification is an inevitable global phenomenon driving India's rapid urbanization, causing large-scale infill redevelopment projects in tier 1 and tier 2 metropolitan cities such as Delhi, Mumbai and Pune. Although redevelopment aims to optimize limited land and upgrade ageing infrastructure, the absence of a sustainable monitoring framework has resulted in fragmented growth and potentially adverse, multi-dimensional impacts on the built environment. This review article aims to address the gap by systematically analyzing existing global and Indian literature on the impacts of infill redevelopment. Using a structured research strategy, title and abstract screening followed by full-text review, relevant papers that specifically evaluated the effects of redevelopment were identified. Most of the literature focused on singular dimensions, either Spatial (density and urban form), Environmental (land surface temperature, air ventilation), or Socio-Economic (e.g., affordability, displacement) and provided methodologies to assess their impacts. Indian literature was limited in terms of number, scale, and methodological integration. The review establishes the foundation for developing a sustainable, data-driven framework by integrating GIS, microclimatic modelling, and AI-based change detection. This approach can guide the rapid Infill Redevelopment in Indian cities, ensuring balanced, resilient, and equitable urban growth.

**Keywords:** Infill redevelopment; Urban densification; Sustainable redevelopment framework; AI-based change detection.

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## **Geo-spatial Modelling of Heat Vulnerability in Panvel City for Heat Action Planning**

*Mayuri Deshmukh\* and Komal Handore\*\**

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### **ABSTRACT**

Heatwaves have emerged as a major urban challenge, threatening public health and urban resilience. In the rapidly urbanizing Panvel city, located within the Mumbai Metropolitan Region, increasing land-use changes, population growth, and limited adaptive capacity have intensified heat risks. This study develops a geo-spatial framework to assess heat vulnerability and guide Heat Action Planning (HAP) for Panvel. The model integrates remote sensing data—such as Land Surface Temperature (LST), Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Normalized Difference Moisture Index (NDMI), and Land Use/Land Cover (LULC) with socio-demographic variables including population density, age structure, and socio-economic conditions. Using a GIS-based multi-criteria evaluation and weighted overlay analysis, a Heat Vulnerability Index (HVI) was constructed to evaluate exposure, sensitivity, and adaptive capacity across the city. Findings reveal that densely built, highly populated zones with minimal vegetation and water bodies exhibit the greatest vulnerability, while peripheral green areas remain relatively resilient. Between the study years, built-up land expanded from 44.18 sq. km to 311.03 sq. km, while vegetation, agriculture, and water bodies declined significantly. The study recommends urban greening, water-sensitive design, reflective infrastructure, and community education as key adaptation measures, providing a framework for evidence-based urban heat resilience planning in Panvel.

**Keywords:** GIS; Urban heat island; LST; Heat action plan; Heat vulnerability.

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## **Assessing Urban Livability in Union Territory: A Study of UT of Silvassa, Daman and Diu**

*Yashrajsinh Dodia\* and Ramakrishna Nallathiga\*\**

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### **ABSTRACT**

Urbanization in India brings the challenges of infrastructure services and quality of life in large cities as well as small towns. The urban centers in the Union Territory of Dadra & Nagar Haveli and Daman and Diu, Silvassa and Daman experience gaps in basic service provision, public services, and living environment. Therefore, understanding the livability is of utmost importance to make urbanization sustainable and inclusive in these towns. This study takes Silvassa and Daman as case study to measure the livability in the context of housing, basic services, and utility networks (water, sanitation, and electricity), health care and education, mobility, environment, and their interrelations. It seeks to map and measure social and spatial inequities potentially created by administrative and electoral boundaries of wards, localities, and livability indicator frameworks that will need to be created tailor-made to the small-town context. It will also compare the urban infrastructure of Silvassa and Daman to other Indian Cities and UT towns to identify urban infrastructure gaps and strengths in a proposed urban framework to mitigate service inequities, urban disparity, and improve quality of life. This is intended to serve as a case study for other small towns in India.

**Keywords:** Liveability assessment; Spatial disparity; GIS analysis; Ease of living index.

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## **A Smart Urban Planning Framework for Heritage Cities: Case Study of Kolhapur**

*Akshata Farakate\* and Meghna Rathee\*\**

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### **ABSTRACT**

India's heritage cities, with centuries of culture and architecture, face mounting challenges from rapid urbanization and inadequate infrastructure. Existing efforts lack an integrated framework connecting heritage conservation with smart urban growth, leading to fragmented planning and threats to cultural continuity. This study proposes a Smart Urban Planning Framework integrating heritage conservation, sustainable growth, and smart governance, using Kolhapur as a case study. Kolhapur's historic core reflects a rich cultural identity but suffers from congestion, poor coordination, and unplanned development under the Smart Cities Mission. The research underscores the need for harmonizing modern infrastructure with cultural preservation. Adopting a mixed-method approach, it combines literature review, GIS and Q-GIS spatial mapping, field observations, and stakeholder interviews. Thematic analysis interprets urban trends and governance practices, forming the basis for a heritage-sensitive planning model. The proposed framework promotes culture preservation, sustainability, smart governance, and heritage tourism. It aligns with India's Smart Cities Mission and UNESCO's Historic Urban Landscapes approach, providing a blueprint for medium-sized heritage cities to integrate technology with tradition. Kolhapur illustrates how responsive urban planning can safeguard cultural assets while enabling infrastructure modernization, setting a precedent for balanced urban transformation.

**Keywords:** Smart urban planning; Heritage conservation; Sustainable development; Smart governance.

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## **Integrating Affordable Housing in TOD: A Case Study of Balewadi, Pune**

*Yash Yadav\* and Meghna Rathee\*\**

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### **ABSTRACT**

Rapid urban expansion in Indian cities has intensified the demand for affordable housing near transit systems. Integrating housing within Transit-Oriented Development (TOD) models is vital for sustainable, inclusive, and accessible growth. TOD promotes dense, mixed-use, and pedestrian-friendly urban spaces around mass transit corridors. However, the lack of integrated affordable housing policies has led to gentrification and exclusion of low-income communities near transit zones. This research explores incorporating affordable housing within the TOD framework, focusing on Balewadi, Pune, a fast-developing area along the Pune Metro corridor. Using a comprehensive mixed-methods approach, the study combines primary surveys, stakeholder interviews, GIS-based spatial analysis, and accessibility mapping. A critical evaluation of Pune's TOD policy, low-cost housing schemes, and socio-economic patterns in Balewadi identifies major gaps hindering inclusive urban growth. Analytical components include affordability indexing, accessibility assessment, and comparative analysis of housing types. Findings demonstrate the need for coordinated policy mechanisms—such as inclusionary zoning and land value capture—to promote equitable housing within TOD areas. The proposed framework fosters social equity, sustainable mobility, and urban resilience, positioning Balewadi as a model for inclusive, transit-oriented growth and a replicable approach for other rapidly urbanizing Indian cities.

**Keywords:** Affordable housing; Transit-Oriented Development (TOD); Inclusive urban development.

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## Mapping the Evolution of Sustainable and Smart Aerotropolis Planning

*Aishwarya S. \*, Shruti Vaishampayan\*\* and Chetna Rathee\*\*\**

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### ABSTRACT

Airports are increasingly shaping the contemporary urban landscape, no longer functioning only as transit facilities but also as important drivers of regional development (ICAO, 2022). Over time, this shift has led to the emergence of the aerotropolis, an airport-centered urban form that brings together aviation, logistics, commercial activities, hospitality, and multimodal transport networks (Kasarda & Lindsay, 2011). In India, rapid urbanisation, rising air travel demand, and growing integration with global trade have made aerotropolis development a significant opportunity for achieving more connected and sustainable urban growth (Aviation & India, 2023). However, many airport-led developments continue to evolve in a fragmented manner with limited coordination between spatial planning, regulatory framework, and sustainability goals (NITI Aayog, 2021). This review examines the evolution of airports, focusing on the aerotropolis as an emerging model of airport-led urban growth. Using a systematically curated dataset of open-access studies, it identifies major research trends and gaps within the field. It is seen that the existing research focuses on the environmental performance, emission reduction, and technological innovation, with less attention on integrated spatial planning that connects sustainability, economic development, and urban forms, particularly in a rapidly urbanizing setting such as India.

**Keywords:** Airport planning; Transportation; Sustainable; Urban planning; Environmental protection.

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## **Assessing the Stress on Transportation due to Redevelopment: A Digital Twin Approach for Vashi**

*Nandan Tike\* and Komal Handore\*\**

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### **ABSTRACT**

Navi Mumbai, one of the planned cities in India, was envisaged as a satellite city for Mumbai. This study explores how the redevelopment in the major node of Navi Mumbai - Vashi has its effect on the existing infrastructure layout. As FSI has been revised and increased, the number of residents occupying on the same parcel of land is higher than that was before. Using digital twin tools, we evaluate the load on transportation aspect, road width, vehicular congestion, pedestrian movement, on street parking. The research focuses on highlighting major stress points in the operations of the node's transport infrastructure. A key policy recommendation includes the alternative methods to solve and relax the pressure points for optimum functioning in the city. By aligning with stakeholder interests, this research seeks to create a sustainable and alternative strategy guideline that mitigates future pressure points. Use of digital twin tools and urban mobility software – SUMO shall be used to analyse data for this research.

**Keywords:** Digital twin; Transportation; Load on transport infrastructure; Alternative methods; Mitigation.

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## **Designing Inclusive Transport Systems: A Framework for Gender- and Disability-Friendly Mobility in Indian Cities**

*Namrata Chilekar\* and Meghna Rathee\*\**

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### **ABSTRACT**

Urban transport shapes how people live, work, and connect — yet in India, it still leaves many behind. Women, the elderly, and persons with disabilities (PwDs) often face daily mobility challenges caused by unsafe streets, poor first- and last-mile access, and a lack of inclusive public transport design. Although national policies such as the Rights of Persons with Disabilities Act (2016) and the Harmonised Guidelines (2021) promote accessibility, implementation on the ground remains weak. This study aims to create a practical framework for inclusive transport design, focusing on gender- and disability-friendly mobility in the Mumbai Metropolitan Region (MMR). Using a mix of field surveys, focus-group discussions, and accessibility audits—alongside policy analysis and GIS mapping—the research examines six key dimensions: safety, universal design, first/last-mile connectivity, service quality, policy, and governance. By developing an Inclusivity Index for selected transport nodes (Navi Mumbai), the study highlights critical barriers and identifies cost-effective design and operational solutions. The outcome is a set of actionable recommendations—covering infrastructure upgrades, lighting, signage, ramps, and staff sensitization—supported by a monitoring dashboard for long-term evaluation. Ultimately, this research provides a replicable, evidence-based model to help Indian cities move toward safer, fairer, and more inclusive transport systems for all.

**Keywords:** Inclusive mobility; Gender and disability accessibility; Urban transport framework.

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## **Investigating FSI Changes around TOD Corridors: A Study of Metro Corridor in Pune**

*Manasi Mekarta\* and Kul Vaibhav Sharma\*\**

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### **ABSTRACT**

The expansion of metro networks in Indian cities has led to major transformations in land use, urban form, and development intensity. Transit-Oriented Development (TOD) has emerged as a key planning strategy promoting compact, mixed-use, and walkable urban growth around public transport nodes. Within this framework, the Floor Space Index (FSI) serves as a critical regulatory tool influencing density, vertical growth, and spatial distribution of built-up areas. This research examines the impact of FSI changes around the Pune Metro corridor, focusing on how revised regulations affect land utilization, property values, and infrastructure demand within TOD influence zones. A mixed-method approach is adopted, combining spatial analysis using GIS, policy review of UDCPR 2025, and stakeholder consultations to compare pre and post metro development trends. Findings highlight that increased FSI provisions encourage vertical development and higher land values but also create challenges related to infrastructure capacity, livability, and social equity. The study concludes with recommendations for balanced and sustainable FSI management, aiming to align urban growth with transit accessibility and inclusive development objectives.

**Keywords:** Floor space index; Transit-oriented development; Metro corridor; Urban density; Land value.

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## **Bridging Gaps in India's EV Charging Ecosystem: PCS Viability, Grid Load and Policy Lessons**

*Venu Gopal Vadlamani\* and Priyanka Bendigiri\*\**

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### **ABSTRACT**

India's increasing reliance on fossil fuels remains a major environmental and economic problem. India now imports approximately 82.8% of its crude and 45.3% of its natural gas, the world's third-largest oil import after China and the United States. This deep dependence not only tests foreign exchange reserves but also significantly adds to air pollution and carbon emissions, underscoring the pressing need for cleaner and more sustainable energy sources. To tackle these issues, the Government of India has released various schemes to promote a faster shift toward electric mobility. The Ministry of Power, in its 2024 revised guidelines, highlighted the development of public charging infrastructure to facilitate the easier and wider adoption of electric vehicles (EVs). The Ministry of Heavy Industries also initiated the PM E-DRIVE Scheme from October 2024 to March 2026 with an outlay of ₹10,900 crore. The program is meant to facilitate the adoption of EVs, enhance local EV manufacturing, and deploy charging infrastructure in the country. But to facilitate this shift with success, it's crucial to have reliable and holistic data on charging facilities. Such data enables effective policymaking, power distribution planning, and load forecasting and eventually contributes to the development of a secure, dependable, and energy secure.

**Keywords:** EV; PCS; Policy gaps.

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## **Enhancing Urban Planning using AR/VR Methods**

*Aman Dung Dung\*, Aditya Das\*\*,  
Chetan Suryawanshi\*\*\* and Raghavendra Kumar\*\*\*\**

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### **ABSTRACT**

Urban planning is essential for regulating urban expansion and gives completely new experience in terms of planning. However, conventional 2D techniques frequently inadequately represent real-world effects. This study helps us to know how exactly Augmented Reality (AR) and Virtual Reality (VR) are going to help us to improve urban planning through immersive and interactive visualization. AR adds digital things to real-life places, while VR makes realistic 3D spaces that help planners and allows citizens to understand proposed projects better. This study helps to find out how accurate visualizations are, how well real-time data can be used, how cost-effective it is comparing to traditional methods, and stakeholders' engagement. It is achieved by using both qualitative and quantitative methods like case studies and expert interviews. The results shows that AR/VR helps people understand designs better, speeds decision making, and attracts people to use it. The study finds that AR/VR can greatly improve future of urban planning and help India reach its Smart City goals, even though there are still problems like high costs, limited access and training requirements.

**Keywords:** Augmented reality; Iterative feedback loop; Smart city planning; Stakeholder engagement.

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## **Exploring the Mechanism of Financing Affordable Housing & Policies in Diverse Economies: Comparative Insights from India, Singapore, Brazil and Kenya**

*Samanna Mohamed Shahabuddeen\*, Krutika Gaikwad\*\* and Aaroahi Bomanwar\*\*\**

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### **ABSTRACT**

Shelter is a necessity and should be accessible to all, irrespective of their financial standing. It is not only responsible for an individual's physical and social well-being but also provides them with economic security. As per World Bank data, an estimated 1.6 billion people globally lack access to adequate housing. In India, the housing demand mirrors the global scenario with an estimated requirement of 22.2 million units, having a current deficit of around 10.1 million units. This deficit is a result of rapid urbanization, rural-to-urban migration, and income disparity predominant in the weaker sections. This is further amplified by policy hurdles and over-reliance on public funding. This study aims to address this challenge in India by studying the affordable housing policies and funding mechanisms in other emerging economies having similar urban and social fabric, like Singapore, Kenya, and Brazil. The objective is to assess both demand and supply side measures incorporated by these countries that have aided them in expediting the delivery & financing of affordable housing. Through a comparative analysis, the study intends to derive actionable insights that can help India achieve its goal of 'housing for all.'

**Keywords:** Affordability; Housing; Financing; Policy.

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## **Urban Energy Planning for Mega Cities using Energy System Modelling Tools**

*Hrishabh Bhat\* and Priyanka Bendigiri\*\**

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### **ABSTRACT**

Maharashtra, the third most urbanised state in India after Tamil Nadu and Kerala, faces rising energy challenges driven by rapid urbanisation and industrial growth. According to the Indian Energy Security Scenario 2047, India's energy demand—currently about 650 million tonnes of oil equivalent (MTOE)—is projected to exceed 2000 MTOE by 2047. Industry remains the largest consumer, followed by transport and agriculture, while domestic coal still supplies nearly 50% of total energy, posing sustainability concerns. As per the VAHAN portal, Pune alone registered nearly 3,00,000 new vehicles in 2022, reflecting a sharp rise in urban mobility and associated energy use. This growing demand across sectors highlights the urgency for integrated urban energy planning. This research focuses on developing a sustainable urban energy model for Pune and Maharashtra through demand- and supply-side assessments using tools such as LEAP, TIMES, MESSAGE IX, and FlexiGIS. By simulating alternative pathways, the study aims to guide a transition toward greener, efficient, and resilient urban energy systems—ensuring that future growth aligns with environmental goals and fosters healthier, low-carbon cities.

**Keywords:** Urban-planning; Energy-system models; Renewable energy.

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## Optimizing Traffic Signal Management using AI and IOT

*Nia Naman\**, *Nikita Gedam\*\** and *Saurabh Mhatre\*\*\**

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### ABSTRACT

Transitions in the dynamical features of vehicular traffic, e.g., due to varying occupancy or capacity of the road, constitute a prominent class of phenomena which one would like large-scale models with many interacting agents to be able to explain. The Traffic Congestion Index (TCI) values also indicate that India's road network which spreads across more than 6.6 million kms, carries almost 85 percent of passenger and close to 71 per cent of freight traffic adding to choke-up the already-overloaded urban corridors which were operating way beyond their design limits. The increase in the number of vehicles, from 21 million (1991) to over 142 million (2011), has only added to traffic on the roads leading to delays, wastage of fuel and environmental pollution. Therefore, this research study aims at using AI and IoT to optimize traffic flow in real time to address these issues. Advanced intelligent traffic management systems powered by artificial intelligence-driven analytics and IoT sensor networks have the potential to enable real-time data capture, adaptive signal timing, and predictive traffic flow control, which will ultimately enable an improvement in traffic flow, easing congestion, and improved urban mobility and also helps to traffic police and other stakeholders.

**Keywords:** Traffic congestion; Urban traffic flow; Real-time traffic optimization.

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## **Impact Assessment of Regional Rapid Transit Systems (RRTS) on Urban Transformation and Real Estate Development of Cities**

*Rutuja Jiskar\**

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### **ABSTRACT**

The spatial and economic framework of Indian cities is being remodeled due to the urbanization and increased mobility demands. Regional transport systems like the Regional Rapid Transit System (RRTS) reinforce sustainable urbanism in the sense that they enhance connections among metropolitan centres and growing towns in the region. In this thesis, Impact Assessment of Regional Rapid Transit Systems (RRTS) on Urban Transformation and Real Estate Development of Cities, the Nashik-Pune High-Speed Rail Corridor is studied to gain an insight into how it has affected the settlement patterns and real estate development. Experience with projects such as the Delhi-Ghaziabad-Meerut RRTS and the Mumbai-Ahmedabad High-Speed Rail demonstrates that better connectivity leads to mixed-use, higher-density development and an increase in property values in station areas. The Nashik-Pune 235-km proposed project would lead to demand of housing, employment and investment in the middle-towns. The study takes a conclusion through GIS-based spatial analysis that policy and literature review allows well-planned RRTS corridors to support balanced regional development and sustainable real estate growth throughout Maharashtra.

**Keywords:** Regional Rapid Transit System (RRTS); Urban transformation; Real estate development.

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## **Spatial Assessment of Development around Special Economic Zones (SEZs): A Case Study of Hyderabad**

*Navya Sree Akula\* and Poulomee Ghosh\*\**

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### **ABSTRACT**

This research paper examines the spatial-temporal analysis around the special economic zones (SEZ's) in Hyderabad. SEZ's as a significant growth driver impact urban expansion and spatial development patterns around them. A case study of Hyderabad as one of India's major IT and Industrial hubs shows the drastic transformation of land use and landcover change around SEZ's. The methodology employed in this study is a remote sensing and GIS-based approach. Utilizing the Landsat satellite imagery for the years 1995,2005,2015, and 2025, the Land Use/Land Cover (LULC) classification was performed by the supervised training samples classified by a method of Support Vector Mechanism supported by appropriate band combinations to accurately identify built-up areas, vegetation, water bodies, agricultural land, and barren land. A buffer zone of 2 km has been identified around the SEZs inside the boundary of GHMC to assess spatial patterns of development. The outcome of this analysis highlights that there has been a substantial growth in built-up areas in the SEZ influence zones, accompanied by a corresponding reduction in open and agricultural lands. The intensity of development has been noticed to be high in areas closer to SEZs, signifying these areas as growth poles of Hyderabad's increasing urban sprawl.

**Keywords:** Special Economic Zones (SEZs); Spatial analysis; Land use and land cover change.

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## **Assessing Ease of Access to Public Healthcare Facilities by Public Transport Services**

*Vaishnavi Bhatkar\* and Poulomee Ghosh\*\**

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### **ABSTRACT**

Equitable access to healthcare is required particularly in urban centers where land-use and transit systems are changing after every decade or so. The analysis of this study is interpreted in terms of the accessibility-based planning principles of the Institute of Transportation and Development Policy, where fair delivery of services and person-driven mobility are highlighted. In this study healthcare facilities are assessed using GIS based spatial analysis method. There is spatial distribution of the public and private healthcare facilities such as dispensaries, government hospitals, clinics, and private hospitals, and the public transportation infrastructure such as bus stops, depots, metro stations and transit network system, in the study maps. Ward-wise population data is used to determine the disparities in terms of service availability and spatial coverage. In the study, the methods employed to determine the underserved and vulnerable places within the study area the methods that are employed are hotspots analysis and population-based accessibility indices. The results can be studies to achieve sustainable, equitable urban mobility and health because it points to the presence of geographical differences in transportation with health accessibility and offers planning concepts on how to improve the links of the population to healthcare services through transportation.

**Keywords:** Accessibility; Transportation; GIS; Healthcare; Density.

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## **Integration of Traditional Planning Patterns with Modern Urban Design - A Comparative Case Study**

*Manikanta Vara Prasad Dasari\* and Meghna Rathee\*\**

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### **ABSTRACT**

In India, Cities are undergoing significant urban transformation through initiatives like the Smart Cities Mission while still retaining traditional characteristics such as chowks (public spaces), narrow alleys, courtyards, and organically developed settlements. These features, rooted in climate responsiveness and community living, offer valuable insights for contemporary urbanization. This research aims to study & evaluates the integration of indigenous spatial forms and socio - cultural planning principles into modern smart planning frameworks, bridging the gap between traditional urban attributes and contemporary infrastructure/technology-driven development. By analysing a primary case of old Jaipur and new Jaipur, this study will identify opportunities and challenges in merging traditional attributes with infrastructure - driven planning. Methodologically, the research will employ morphological analysis, stakeholder interviews, and GIS - based spatial mapping to assess livability, accessibility, and sustainability in hybrid models. The anticipated outcome is an inclusive urban design framework that respects heritage while embracing technology, fostering culturally responsive and future - proof urban environments with smart urbanism, offering scalable guidance for various cities seeking inclusive, future - ready urban environments and equity.

**Keywords:** Smart cities mission; Indigenous spatial forms; Socio-cultural planning; Hybrid urban models.

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## **Reducing Carbon Footprint and Enhancing Operational Efficiency in Pune's Urban Mobility: A Data-driven Study of E-Cabs**

*Prasad Dagade\* and Priyanka Bendigiri\*\**

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### **ABSTRACT**

The transition to electric taxis (e-taxis) presents a sustainable solution for urban para transit, yet optimizing their efficiency requires a multifaceted analysis of operational dynamics. This study analyses the operational efficiency and environmental impact of a private e-cab fleet in Pune, India, leveraging limited data on charging patterns, daily travel distances, fleet utilization rates, and passenger demand. By examining real-time metrics such as energy consumption per kilometre, charging downtime, and route efficiency, the research quantifies how optimized e-cab operations can reduce urban carbon emissions compared to conventional petrol/diesel taxis. The results advocate for policy incentives to accelerate the transition from fossil fuel taxis to e-cabs, emphasizing their role in achieving sustainability targets. This data-driven framework not only validates e-cabs as a cleaner transit alternative but also provides actionable insights for cities globally to decarbonize urban mobility through electrified ride-hailing systems. Pune emits 35–50% less CO<sub>2</sub>-equivalent per kilometre, e-cabs could displace 15–20% of petrol/diesel taxi trips citywide, cutting annual vehicular emissions by an estimated 12,000–15,000 metric tons (NITI Aayog, 2022).

**Keywords:** Operational efficiency; Decarbonization; Sustainability; E-Cabs; Energy efficiency.

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## **Review of Blue-Green Infrastructure Strategies into Urban Planning: Multi-scale and Multi-functional**

*Madiha Raza\* and Shruti Vaishyampayan\*\**

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### **ABSTRACT**

Nagpur, the geographical centre of India, is experiencing rapid urban expansion, which is placing increasing pressure on its Blue-Green Infrastructure (BGI) — the interconnected system of rivers, lakes, wetlands, parks, forests, and open spaces that supports stormwater management, climate regulation, biodiversity, and overall livability. Historically, natural assets such as the Nag and Pili rivers, and lakes including Ambazari, Futala, Gorewada, and Sonegaon, along with green reserves like Ambazari Biodiversity Park and Gorewada Forest, formed a strong ecological network. However, unregulated development, encroachment, sewage discharge, and weak planning have led to degradation; rivers function as drains, and lakes face eutrophication and reduced capacity. Projects like the JICA-funded Nag River Rejuvenation, Smart City lake redevelopment, and Gorewada Biodiversity Park indicate progress, though many prioritize beautification over ecological restoration. To sustain future growth, Nagpur must adopt integrated watershed-based planning, establish ecological buffer zones, enforce environmental regulations, and use geospatial monitoring. Strengthening community participation and system-based planning can position Nagpur as a model for nature-based urban development.

**Keywords:** Blue-green infrastructure; Urban sustainability; Ecological restoration.

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## **Spatial Inequities and Housing Vulnerabilities in Affordable Housing Neighbourhood's: Evidence from Nagpur, India**

*Shrirang Tatte\**

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### **ABSTRACT**

Affordable housing is a critical component of inclusive urban development in rapidly urbanizing Indian cities. Government initiatives such as the Pradhan Mantri Awas Yojana (PMAY) have significantly increased the supply of affordable housing; however, concerns remain regarding the spatial location, accessibility, and long-term liveability of these developments. In many cases, affordable housing neighbourhoods are located on the urban periphery, resulting in unequal access to employment opportunities, public transport, social infrastructure, and essential urban services. These spatial disadvantages contribute to multiple forms of housing vulnerability among residents. This study examines spatial inequities and housing vulnerabilities in selected affordable housing neighbourhoods in Nagpur, a growing Tier-II city in Maharashtra. The research adopts a mixed-method approach, integrating GIS-based spatial analysis with household-level socio-economic surveys and field observations. Accessibility to key urban services, housing quality, infrastructure provision, environmental exposure, and tenure security are assessed to understand the extent and nature of vulnerabilities. A composite Housing Vulnerability Index is developed to quantify physical, social, economic, and environmental risks experienced by residents. The findings indicate that affordable housing projects located in peripheral areas exhibit higher levels of vulnerability due to poor connectivity, inadequate infrastructure, and limited livelihood opportunities.

**Keywords:** Affordable housing; Spatial inequities; Housing vulnerabilities; PMAY; Nagpur.

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**TRACK 5**  
**ENERGY, ENVIRONMENT**  
**AND SUSTAINABILITY**

## **Study on Construction Waste Minimisation and Environmental Assessment using BIM**

*Ritika Raghu\*, Amritha M. S.\*\*, Akshay Anil Kumar\*\*\* and Arjita Biswas\*\*\*\**

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### **ABSTRACT**

Construction and demolition (C&D) waste is increasingly becoming an industry concern, leading to the depletion of resources, higher landfilling, and environmental degradation. One major drawback is that traditional estimation techniques are highly dependent on historical records and hardly capture project-specific conditions. In this context, the study investigates a Building Information Modeling (BIM)-based methodology to minimize waste, especially from concrete and brick masonry, which are responsible for the highest waste generation. The study started with a systematic literature review of major causes of C&D waste, followed by a survey of AEC professionals to confirm and rank these factors. From this, a material-waste factor matrix was constructed and embedded in a BIM model with information on material lifespan, recyclability, and disposal method. Automated plug-ins in BIM were then utilized to estimate quantities of waste and contrasted against traditional estimates. For understanding wider environmental effects, a Life Cycle Assessment (LCA) was conducted with the help of the Athena Impact Estimator. Global warming potential, acidification, ozone depletion, particulate matter, and energy use were the parameters examined. Results indicated that BIM allows for better waste estimation, minimizes excess material loss, and promotes sustainable construction.

**Keywords:** Building Information Modeling (BIM); Construction and demolition waste; Life Cycle Assessment (LCA).

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## **Redefining Urban Living: A Comparative Study of Sustainable Township**

*Amritha A. V.\*, Diya S.\*\* and Aparna A.\*\*\**

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### **ABSTRACT**

In the context of accelerating urbanization, population growth, and rising environmental degradation, the need to design urban settlements that balance human, economic, and ecological priorities has become more pressing than ever. Therefore, sustainable township development emerges as a crucial approach to achieving a harmonious balance between urban expansion and environmental preservation. The study aims to conduct an in-depth analysis of the sustainability practices adopted by eco-conscious townships in, Pune. This research adopts a qualitative and comparative methodology, focusing on ten selected townships that exhibit varying levels of sustainable design. These townships are identified based on their reputation for implementing eco-friendly practices. Data collection is carried out through secondary sources such as official websites, and published documents, along with direct interactions with key stakeholders including developers, facility managers, and residents. The collected data is categorized into broad thematic areas such as waste management, energy efficiency, water conservation, green building practices, and community engagement. Each category is analyzed to assess the level of sustainability integration, identify best practices, and highlight areas for improvement. The findings aim to present a comprehensive overview of sustainable township practices in Pune and propose strategic insights to enhance environmental and social sustainability in future urban development models.

**Keywords:** Sustainable township development; Eco-conscious townships; Waste management; Energy efficiency.

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## **Identification of Scope and Issues in Circular Economy Models Implementation for EV Batteries in India**

*Akash Sapariya\*, Isha Garg\*\* and Avadhoot Dixit\*\*\**

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### **ABSTRACT**

Most important criteria in climate change are to mitigate the risks and switch to other alternatives available in the industry, in vehicle industry there has been a switch from traditional to electrical vehicles. Managing the end-to-end cycle of the EV batteries have been a major issue for the industry to fully adopt EV. Although India has been ahead in EV adoption, circular economy as a model provides solution to tackle these issues and its success highly depends on the adoption and involvement patterns of consumers. Few indicators like awareness, attitudes and desire of Indian EV vehicle holders, for them to engage in circular behaviours such as battery recycling and its reuse. This study also aims for quantitative survey, to evaluate and analyse the survey outcomes. With description method utilizing mean score study and radar map visualization, only around 52.8% of respondents were aware of suitable sources for battery recycling and reutilization. indicating limitations in consumer knowledge. additionally, the biggest obstacles in stakeholder engagement are insufficient infrastructure and financial limitations. to conclude the research helps several entities and authorities to design a set of frameworks that can be helped in establishing circular economies batteries in India.

**Keywords:** Circular economy; Electric vehicles; EV batteries; Reuse battery; Recycling batteries.

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## **Integrating Lean and Circular Economy Principles to Enhance IGBC Certification Process**

*Edeeksha Shekhawat\*, Akash Shrivastava\*\* and Vidya Khanapure\*\*\**

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### **ABSTRACT**

Sustainability in construction is a key global objective, and integrating Lean Construction with Circular Economy principles into the green building certification framework offers a transformative opportunity. This research focuses on embedding these principles within the IGBC certification system to enhance sustainability in high-rise residential projects. The study aims to develop a conceptual framework that systematically integrates Lean and Circular Economy principles into the IGBC green building certification process for high-rise residential developments. The methodology follows a structured approach, beginning with a comprehensive literature review to identify key Lean Construction and Circular Economy parameters relevant to IGBC standards. A comparative analysis of existing IGBC-certified projects evaluates their sustainability performance against Lean and Circular Economy benchmarks. This research contributes significantly to the Indian building sector by introducing a systematic framework to enhance sustainability and operational efficiency in IGBC-certified buildings. The integration of Lean and Circular Economy principles promotes resource optimization, waste minimization, and improved cost management. The findings serve as a guide for policymakers, developers, and certification bodies, facilitating the incorporation of these principles into India's green building strategies and advancing the nation's sustainable development initiatives.

**Keywords:** Lean construction; Lean and circular economy; Lean and sustainability; IGBC; Green building certificate.

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## **Framework Models in Construction Industry Leading to Sustainable Development**

*Sushita Shubhadarshini\**

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### **ABSTRACT**

The research study titled “Framework Models in Construction Industry Leading to Sustainable Development” is an in-depth exploration of how the construction industry can adopt and operationalize sustainability through structured Environmental, Social, and Governance (ESG) frameworks. The study originates from the growing realization that sustainability is no longer an optional consideration but a fundamental requirement for responsible growth, investment eligibility, and long-term competitiveness within the construction sector. Despite global recognition of ESG principles, the construction industry continues to face systemic barriers—ranging from fragmented regulations and weak data management systems to a lack of industry-specific frameworks that can accurately evaluate sustainability performance. The primary objective of this research was to critically assess existing ESG performance evaluation frameworks and identify the gaps that prevent their effective implementation in the construction context. The outcome of this research is a framework that not only fills the gaps in existing ESG evaluation models but also offers a practical roadmap for transforming sustainability from a theoretical aspiration into a measurable, enforceable, and scalable process. Ultimately, the study concludes that embracing such frameworks can redefine how construction projects are conceptualized, monitored, and delivered—paving the way for a more transparent, efficient, and sustainable future in the built environment.

**Keywords:** ESG; Construction; Sustainable development.

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## **A Study on Gaps in the Adoption of Sustainable Practices in the Indian Construction Industry**

*Ankit Biradar\*, Krishna Randad\*\* and Devendra Mali\*\*\**

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### **ABSTRACT**

The push for sustainability in residential construction is gaining momentum, yet real-world adoption of green practices remains limited. This research explores the disconnect between environmental aspirations and practical implementation, focusing on the barriers that prevent widespread use of eco-friendly methods. High upfront costs for sustainable materials, lack of standardized evaluation frameworks, and minimal regulatory incentives are among the key challenges. Additionally, fragmented industry practices and limited awareness among stakeholders hinder collaboration and innovation. To address these issues, the study highlights the need for integrated strategies that balance cost and environmental responsibility. It emphasizes the importance of life cycle analysis, stakeholder education, and policy reform to encourage long-term thinking over short-term gains. By identifying these gaps and proposing targeted solutions, the research aims to support a transition toward more resilient and sustainable residential development. Ultimately, the findings contribute to shaping a built environment that is not only economically viable but also environmentally responsible.

**Keywords:** Sustainable construction; Residential buildings; Life cycle cost analysis; Green building practices.

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## **Green Logistics in SMEs: Analysing Challenges and Enablers for Implementation in India's Construction Industry**

*Sandra Thankam\*, Harsh Shah\*\* and Kamal Vaishnav\*\*\**

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### **ABSTRACT**

The rapid growth of India's construction sector presents substantial environmental challenges, necessitating the urgent adoption of sustainable supply chain practices. Green Logistics (GL) offers a vital strategy in this aspect by means of minimizing resource consumption, waste generation, and carbon footprint. However, the adoption rate of GL remains significantly low among Small and Medium Enterprises (SMEs) compared to large companies, primarily due to unique contextual constraints and capacity limitations. This thesis explores the key barriers and enablers influencing GL implementation within Indian construction SMEs. The study employs a quantitative research design, with the help of a structured questionnaire survey to collect data from key SME stakeholders across the industry. The collected data is subjected to multiple stages of statistical analysis to identify and prioritize the most influential factors impacting the transition to green practices. The major objective is to develop a conceptual framework for effective GL implementation in this sector. This framework is created using a Multi-Criteria Decision Making (MCDM) model, grounded in the validated influential factors and expert opinion. The findings offer actionable insights for policymakers, industry leaders, and SME management, contributing directly to the advancement of sustainable construction practices and a greener future for India's building industry.

**Keywords:** Green logistics; Barriers; Enablers; SMEs; Construction.

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## **Planning Low-Carbon Urban Settlements as a Strategy for Disaster Risk Reduction**

*Aditya Dighe\* and Komal Handore\*\**

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### **ABSTRACT**

The urbanization, which has been increasing at a fast rate, has brought significant challenges to the cities not only to the reduction of greenhouse gases but also to the development of a resilient infrastructure that will help reduce the effects of climate-related disasters. In this paper, evidence will be explored on the intersection between low-carbon settlements and disaster risk reduction (DRR) initiatives based on the thesis that sustainable urban development is a proactive tool to climate resiliency. Low carbon city settlements - with densely organised zones, green spaces, sustainable transport infrastructures, energy efficient systems - have a significant reduction in the impacts of the environment and improve the ability of the urban structure to withstand hazards that include floods, heat waves and storms. The research aims to determine and rank major parameters relevant to these themes in a mutually dependent relationship using the RIDIT-ISA analysis and thus assist in coming up with focused strategies that would not only cover the exposure of the urban population to the city but also tend to cover the vulnerability of the urban population to the city.

**Keywords:** Carbon; Urban; Disaster.

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## **Improving Solid Waste Management Productivity using Six Sigma Methodology: A Review**

*Kasturi Srisai Sinduja\*, Srushti Moghe\*\* and Chaithanya Patel P.\*\*\**

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### **ABSTRACT**

Pune one of India's leading smart cities, faces growing challenges in managing municipal solid waste (MSW) due to rapid urbanisation, high population density, limited processing infrastructure. Despite significant investments by the Pune Municipal Corporation, inefficiencies persist, particularly at the Phursungi Treatment Plant, which operates far beyond its 500-tonne capacity. This study applies Six Sigma DMAIC (Define, Measure, Analyse, Improve, Control) framework to identify the inefficiencies and enhance the city's solid waste management performance. The Define and Measure phases revealed major issues such as poor waste segregation, manpower shortages, and limited monitoring with an overall efficiency of two sigma. The Analyze phase includes the study including the SIPOC and Fishbone diagrams which identified the root causes as, lack of citizen participation, technological innovation, and equipment breakdowns at the plant. The suggested improvements include decentralised composting, methane recovery, efficient recycling and improved accountability mechanisms through dashboards and SOPs. The application of Six Sigma demonstrates the potential to reduce untreated waste and improve processing efficiency. Emphasis on advanced technologies for waste segregation, such as AI based sorting and sensor driven systems, will further enhance processing efficiency, and increase the city's sigma performance levels toward a more sustainable and data driven waste management system.

**Keywords:** Solid waste management; Six sigma; Process efficiency.

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## **Green Retrofitting of Residential Societies in India: Challenges and Opportunities**

*Aditi Mane\* and Sudarshan J. S.\*\**

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### **ABSTRACT**

India being a developing country, is rapidly growing in construction sector. This is one of the most carbon intensive sector contributing to 39% of the total GHG emission. Hence this sector will play a crucial role in achieving India's carbon reduction and urban sustainability goals if retrofitting to existing buildings is considered with green technologies and relative strategies improving energy efficiency and reducing carbon emissions. As commercial building retrofits have gained momentum, it is essential to consider the residential buildings too. The implementation of green retrofitting in residential sector remains limited due to improper policy frameworks, limited awareness among stakeholders, technical challenges and financial implications. The purpose of this review is to examine the challenges, opportunities, and policy context shaping green retrofitting of residential housing in India. By adopting a literature review and secondary data synthesis methodology, the study synthesizes evidence from recent studies, rating system reports, and government policies. The research concludes that linking retrofit policy with urban sustainability schemes, improving financial models, and increasing capacity-building programs are crucial in facilitating large-scale green retrofitting in residential complexes and India's speedy move towards a low-carbon built environment.

**Keywords:** Green retrofitting; Residential buildings; Energy efficiency; Carbon reduction; Urban sustainability.

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## **Evaluation of Green Certification for Educational Buildings**

*Debarati Lahiri\**, *Subiksha Rajagopalan\*\**,  
*Shravan Khade\*\*\** and *Shobha Ramalingam\*\*\*\**

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### **ABSTRACT**

Due to an increase in demand for sustainable building, there is growing need for energy-efficient building techniques and construction. Educational buildings consume a lot of energy and resources, thus require innovative strategies for performance improvement. While most research examines BIM in new construction, little explores its role in enhancing green certification for existing educational buildings. This study addresses that gap by analyzing how BIM optimization can improve sustainability and certification outcomes in this context. This study analyzes green building certification systems -LEED, BREEAM, and GRIHA- through a literature review and case study to identify their similarities, differences, and how BIM supports achieving certification goals in educational buildings. The methodology comprised a review of the relevant academic literature and case studies on the relations of BIM and green certification process and also analyses how BIM is employed to assess their impact on Green Certification enhancement. Findings show that integrating green certification frameworks with BIM enhances sustainability by reducing lifecycle energy and operational costs. BIM enables precise decision-making and measurably improves green building performance. Overall, the research shows that BIM enhances the cost-effectiveness of sustainable retrofitting in educational buildings while supporting the wider adoption of green construction practices.

**Keywords:** Building Information Modeling (BIM); Sustainable construction; Green building; Energy efficiency.

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## **Viability Assessment of Adapting the Comprehensive Manufacturing Assessment Tool (CMAT) for Pune's E-waste Recycler**

*Vikas Prasad\*, Pranav Kolekar\*\*, Xavier Pereira\*\*\* and Sakshi Patrale\*\*\*\**

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### **ABSTRACT**

This research presents the application and contextual adaptation of a predictive analytics-based decision support tool (DST), the Comprehensive Manufacturing Assessment Tool (CMAT), aimed at optimizing operations and maximizing revenue within India's e-waste recycling sector. As India's e-waste volume escalates to over 3.2 million metric tons annually, its largely labor-intensive recycling facilities face significant operational inefficiencies, necessitating localized analytical frameworks. Focusing on a case study of a recycling facility in Pune, this study evaluates the applicability of a DST designed for automated, developed markets to the semi-manual Indian context. The research employs CMAT for process simulation and profit analysis. It further leverages the integrated Hen-and-Chicks Optimization (HACO), a bio-inspired metaheuristic algorithm, to determine optimal workforce allocation and identify process bottlenecks. Key findings are expected to reveal the most profitable e-waste streams, quantify the reduction in processing costs through optimized labor distribution, and analyze the sensitivity of revenue to fluctuating material prices. This work contributes a replicable model for implementing predictive analytics in emerging economies' recycling operations. By localizing and validating this sophisticated DST, the study provides actionable insights for Indian recyclers, underscoring the pivotal role of data driven decision-making in enhancing both economic viability and environmental sustainability.

**Keywords:** Predictive analytics; E-waste recycling; Decision support tool; CMAT; Hen-and-chicks optimization.

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## **Assessment of Riverfront Development Project in Pune**

*Kunal Jawalkar\* and Manas Marathe\*\**

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### **ABSTRACT**

Due to rapid urbanisation, the Mutha River in Pune has undergone a major transformation over the last few decades. Through the riverfront development project, an attempt is being made to enhance the riverbank to attain visual appeal. However, according to this project, development may have posed significant threats to the river's ecological health, water quality, and natural balance. This study examines the environmental and ecological impacts of the Mutha Riverfront Development Project on the biodiversity, riparian cover, water quality, and sustainable initiatives. The main objectives of this research project are to assess the environment, ecology, and land use along the riverbank. Field surveys, environmental audits, and stakeholder consultations were conducted to evaluate the effects of urbanisation and infrastructure development on the river ecosystem and local communities. Results indicate that while the project may improve accessibility and urban aesthetics, it could fall short in addressing ecological restoration and conservation. Persistent issues such as riverbank erosion, loss of riparian buffers, and inadequate wastewater management continue to compromise ecosystem integrity. In conclusion, the research advocates for eco-sensitive planning, habitat restoration, suitable land use for sustainable urban development, a community participatory approach, and ecosystem-based design.

**Keywords:** Riverfront development; Mutha; Environment; Sustainability; Pune.

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## **Framework for Organizational Change while Driving Sustainability in the Construction Industry**

*Aliya Navas\*, Grager Gopinath K.\*\* and Ashin Shaji\*\*\**

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### **ABSTRACT**

The construction sector is a significant contributor to greenhouse gas (GHG) emissions, resource consumption, and waste, resulting in serious environmental and socio-economic issues for developing countries. As the world increasingly focuses on sustainability, construction organizations are under pressure to adjust their culture, processes, and management systems to align with sustainable development objectives. This adaptation is, however, hampered by high startup costs, opposition to change, scarce technical know-how, and disorganized stakeholder coordination. These indicate the necessity of a systematic approach, which allows economic feasibility, environmental sustainability, and efficiency in operations. Organizational challenges to sustainability integration within the construction industry are the focus of this study. The research suggests a systematic framework to overcome these challenges. Information gathered via a Likert-scale survey from the Infrastructure, Real Estate, and Ready-Mix Concrete industries indicates that cost limitations, absence of expertise, and poor coordination are the most severe impediments. The research finds that effective sustainability implementation calls for not just financial and technological innovation but also strong leadership, employee engagement, and supportive policies in order to propel long-term organizational change.

**Keywords:** Sustainability; Organizational change; Construction industry; Change management; Framework.

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## **Life Cycle Assessment of an Evacuated Tube Collector System in India: A Focus on Global Warming Potential**

*Jayant Warokar\* and Vishal Bhalla\*\**

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### **ABSTRACT**

Internationally, decarbonization in the building sector has established solar thermal technology as a key solution for domestic hot water. While integral to India's renewable energy strategy, assessing their life cycle environmental impact is essential to fully understand their sustainability. This study addresses a research gap, as Life Cycle Assessment (LCA) studies on solar thermal systems, particularly Evacuated Tube Collectors (ETCs), are scarce in the Indian context. This paper presents a cradle-to-gate LCA of a representative 100-litre passive ETC solar water heater. Conducted per ISO 14040/44 standards, the study quantifies the Global Warming Potential (GWP) associated with raw material extraction and manufacturing phases. The Life Cycle Inventory (LCI) was developed to reflect regional conditions, with component data sourced from the technical specifications of leading Indian manufacturers to ensure accuracy. The analysis, performed using SimaPro software, determined a GWP of 201 kg CO<sub>2</sub>-equivalent. The findings reveal that the manufacturing stage is the primary contributor to the environmental impact, with the mild steel support structure and the energy-intensive production of borosilicate glass tubes accounting for significant embodied emissions. These results underscore the necessity of decarbonizing the upstream material supply chain to enhance the overall sustainability of solar thermal technology in India.

**Keywords:** Life Cycle Assessment (LCA); Sustainability; Global Warming Potential (GWP).

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## **Enhancing Resilience of Financial Institutions to ESG (Environmental, Social and Governance) Risks**

*Apurwa Mandlik\**

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### **ABSTRACT**

The world is growing at a very fast pace and in today's financial scenario, ESG (Environmental, Social, and Governance) risks have transitioned from being just reputational concerns to becoming a major factor with severe financial consequences. Banks and financial institutions are facing increasing pressure from investors, customers and regulators to showcase their dedication and commitment towards sustainability and responsible business practices. Regulatory bodies worldwide are tightening their scrutiny of ESG risks, introducing new rules and reporting requirements targeted at ensuring greater transparency and accountability in the financial sector. This study examines how ESG risks influence traditional financial risks such as credit, market and operational risks and proves the interconnectedness between internal and external ESG factors. It examines the integrated nature of internal and external ESG risks and their impact on financial performance to enhance the resilience of financial institutions. By assessing current risk management practices, this study proposes a comprehensive framework for integrating ESG considerations into risk management strategies. With this approach, one can aim to foster long-term stability and promote sustainable growth within the financial industry.

**Keywords:** ESG risks; Financial institutions; Risk management; Financial risk assessment; Sustainability.

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## **Sustainable Planning for Coastal Development: A Case of Visakhapatnam**

*D. V. S. Lalith Siddu\*, Ridhu Trisha Sivakumar\*\*,  
Save Siddharth Rajendra\*\*\* and Priyanka Bendigiri\*\*\*\**

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### **ABSTRACT**

This study scrutinizes the interrelated problems of shoreline retreat, urbanization, and heat stress in Vishakhapatnam (Vizag), a skyrocketing coastal metropolis on India's eastern seaboard. Integrating remote sensing, GIS-based Spatial analysis, and Historical shoreline mapping, it enumerates coastal erosion over the past eight years, divulging spatial patterns of land loss and vulnerability. Urbanisation trends are evaluated through land-use and land-cover (LULC) change detection, infrastructure expansion tracking, and Urban growth modelling, with emphasis on the extended built-up zones into low lying and erosion-prone coastal areas. Prefatory findings suggest a significant correlation between shoreline retreat, rapid real estate development, and increasing local temperatures, highlighting compounded risks to infrastructure, public health, and coastal ecosystems, in incorporation to technical analysis, the research evaluates mitigation measures, including coastal buffer zones, green corridors, climate-responsive urban design, and adaptive zoning regulations tailored to Vizag's socio-economic context. By amalgamating coastal geomorphology, urban growth dynamics, and climatology, the research aims to provide a practical insight for resilient planning, aligning urban expansion with environmental prophylactics to address climate-change-driven risks in coastal cities.

**Keywords:** Coastal; Land use land cover; Sustainability.

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## **Assessment & Optimisation of Geopolymer Based Stabilised Mud Blocks**

*Bhargavi Naraganahalli\*, Amogh Biradar\*\* and Aditya Kanadikar\*\*\**

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### **ABSTRACT**

This research intends to examine and improve Stabilized Mud Blocks (GSMBs) through the utilization of Geopolymer to enhance mechanical and ecological properties via incorporation of clay, fly ash, and polypropylene (PP) fibers. Geopolymer binder synthesis involves a solution of sodium hydroxide (NaOH) combined with sodium silicate ( $\text{Na}_2\text{SiO}_3$ ), at a ratio of  $\text{Na}_2\text{SiO}_3$  to NaOH of 2.0-3.0. A Taguchi L9 orthogonal array (3x3) experimental design will be utilized to systematically analyze the influence of four independent variables, namely the percentage of clay used, the ratio of the alkaline activator, fly ash percentage, and the content of PP fiber. Specimens are air-dried oven-cured at 24 hours at 60 °C and sun cured at 28 days to allow geopolymerisation. The test utilizes density, compressive strength, flexural strength, water absorption, and efflorescence characteristics. It is anticipated that the implementation of PP fibers will enable crack management and post-crack behavior moderation, while the adjustment of mixture ratios and activator concentrations will contribute to overall structural performance improvements. The findings of this analysis can support the validation of GSMBs as a viable alternative to conventional fired bricks and cement-based masonry, facilitating the adoption of low-carbon, resource-efficient construction practices.

**Keywords:** Geopolymer; Stabilized mud blocks; Fly ash; Clay; PP fibres.

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## **A Cradle-to-gate Life Cycle Assessment of an Off-grid Rooftop PV System with Battery Storage in India**

*Arpan Tewari\* and Vishal Bhalla\*\**

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### **ABSTRACT**

The world is moving towards Renewable power production methodologies due to the negative impacts caused by excessive use of fossil fuels over decades. Renewable energy now plays a crucial role in catering to the power demand worldwide. Solar power generation is a crucial contributor to India's goal towards achieving 500GW of RE capacity by 2030, as India has a huge potential of 10,000 GW. For direct electricity generation, solar photovoltaic collectors are used, therefore, the present study focuses on the life cycle assessment of solar photovoltaic system. In this study, solar photovoltaic monocrystalline off-grid system, batteries, structures and other BOS components have been considered to examine its Global Warming Potential from cradle-to-gate stage. The objective of the study is to analyze the impact across different phases such as manufacturing, transportation and installation. The results of the study conclusively point towards the embodied emissions (production impact) of components including battery (2430 kg CO<sub>2</sub>), inverter (528 kg CO<sub>2</sub>), mounting structure (1470 kg CO<sub>2</sub>) and especially the PV modules (2690 kg CO<sub>2</sub>), to be the major contributor towards high GHG emissions. These findings highlight the necessity of transitioning towards cleaner and more efficient power grids.

**Keywords:** Life cycle assessment; Solar photovoltaic; Cradle-to-gate; Global warming potential; India.

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## **Techno–environmental and Economic Analysis of Pre-fabricated Concrete System: A Life Cycle Assessment Approach**

*Gaurav Raut\*, Om Parmar\*\* and Omkar Dhavale\*\*\**

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### **ABSTRACT**

The construction sector is increasingly adopting sustainable practices to minimize its environmental footprint and improve cost efficiency. This study conducts a comparative Life Cycle Assessment (LCA) of two structural systems — a conventional cast-in-situ RCC column and a pre-fabricated RCC column — to evaluate their environmental and economic performance. The analysis follows a cradle-to-gate approach, encompassing material extraction, manufacturing, transportation, and assembly processes for a column. Using SimaPro software with the ReCiPe Midpoint impact assessment method, sixteen environmental categories were examined, including Global Warming Potential (GWP), energy demand, water consumption, and resource depletion. The findings reveal that the pre-fabricated system demonstrates notable reductions in energy use, material wastage, and water requirements relative to the conventional in-situ method. Nevertheless, the environmental gains are partly counterbalanced by higher energy use in production facilities and transportation logistics. Overall, the study concludes that pre-fabricated concrete systems offer considerable sustainability and cost benefits when compared to traditional construction approaches. It highlights the importance of improving plant efficiency and optimizing transportation routes to further strengthen the environmental performance of prefabrication.

**Keywords:** Life cycle assessment; Precast construction; Sustainability; SimaPro; Environmental impact.

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## **Integrated Smart Water Infrastructure Planning for PCMC**

*Vimalkrishna A. \*, Vivek Dahir\*\* and Deep Chavhan\*\*\**

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### **ABSTRACT**

Climate change and rapid urbanization are exerting unprecedented stress on urban water infrastructure in emerging cities. This study investigates the challenges in the water supply system of the Pimpri-Chinchwad Municipal Corporation (PCMC), Maharashtra, India, and proposes an Integrated Smart Water Infrastructure (ISWI) framework to enhance system efficiency, sustainability, and resilience. Using a mixed-method approach that combines a systematic review of global best practices with insights from an interview with a PCMC Sub City Engineer, the research identifies key issues such as high non-revenue water (NRW), pipeline leakages, irregular supply, and inadequate real-time monitoring. The literature review emphasizes the potential of technologies like SCADA, IoT sensors, Advanced Metering Infrastructure (AMI), and Digital Twins for predictive maintenance and leak detection. Although PCMC has initiated smart metering and SCADA in select zones, challenges such as outdated infrastructure, water scarcity, and financial constraints hinder full-scale adoption. The study recommends phased implementation of smart technologies with robust cybersecurity and data analytics to achieve continuous water supply and long-term water security.

**Keywords:** Smart water infrastructure; Urban water management; PCMC; SCADA; Sustainable cities.

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## **Sustainable Construction Practices**

*Satyam Singh\*, Aqib Ayaz\*\* and Omkar Salve\*\*\**

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### **ABSTRACT**

**Research Objectives:** This study investigates the adoption of sustainable construction practices in Pune, aiming to identify environmental impacts, assess material availability challenges, evaluate stakeholder readiness, and propose actionable solutions for industry-wide implementation of eco-friendly construction methods. **Methods:** A mixed-methods research approach was employed, combining quantitative surveys with 30 industry stakeholders (developers, contractors, suppliers, consumers) and qualitative analysis through case studies of LEED, GRIHA, and IGBC certified projects. Data collection focused on awareness levels, cost barriers, policy effectiveness, and material supply chain challenges. Statistical analysis examined correlations between cost factors, policy incentives, and adoption rates. **Findings:** The research reveals significant barriers to sustainable construction adoption, including high initial costs, limited awareness among stakeholders, fragmented supply chains for eco-friendly materials, and inconsistent policy enforcement. Despite challenges, green building certifications are increasing, with energy-efficient designs and renewable energy integration becoming more prevalent. Stakeholders demonstrate willingness to adopt sustainable practices when supported by government incentives and long-term cost benefits. **Implications:** The study provides strategic recommendations for enhancing regulatory frameworks, improving supply chain efficiency, and implementing targeted awareness campaigns. Findings contribute to policy development for sustainable urban infrastructure, supporting India's climate commitments and urbanization goals while addressing the construction industry's 25-40% contribution to carbon emissions.

**Keywords:** Sustainable construction; Green building certification; Stakeholder awareness; Eco-friendly building.

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## **Ecology, Society and Space: The Multifunctional Role of Peri-Urban Open Spaces in Bangalore, India**

*Varsha Shetty\* and Sameer Gujar\*\**

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### **ABSTRACT**

Open spaces are vital in cities as they safeguard the ecological balance, improve liveability and provide essential services that sustain both society and environment. However, rapid unplanned expansion has resulted in fragmentation and degradation of these spaces, particularly in peri-urban areas where development pressures are most intense. Open spaces play a critical role in maintaining environmental quality, mitigating floods, conserving biodiversity, and supporting community well-being. Bangalore being one of India's fast-growing metropolitan regions, study states that the per capita open space is reducing rapidly in the peri-urban areas. Therefore, this study investigates the role of open spaces by adapting a mixed research methodology, where it combines spatial analysis with ecological and socio-cultural evaluation. Their integration into city planning enhances resilience to climate change and contributes to equitable access to green infrastructure. The study reveals that density-based quantitative factors demonstrate a direct relationship with the availability and quality of open spaces. Embedding peri-urban open spaces into city planning can pass the climate adaptive strategies, enhance environmental resilience, and promote socially inclusive growth, ensuring that the peri-urban system operates as a cohesive, interconnected and resilient network.

**Keywords:** Open spaces; Sustainability; Ecological resilience; Peri-urban growth; Urban planning.

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## **ESG in India: Challenges in Implementations Comparative Analysis with Global Standards**

*Chaithra K. Poojary\*, Sakshi Bagani\*\* and Nandini Korke\*\*\**

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### **ABSTRACT**

India's efforts to integrate Environmental, Social, and Governance (ESG) principles show notable regulatory progress, especially with SEBI's BRSR mandate. However, significant challenges persist in meaningful implementation. This study examines the ESG landscape in India, focusing on the experiences of non-governmental organisations (NGOs) as vital stakeholders in corporate sustainability. Based on in-depth interviews with NGO founders, review of ESG and CSR reports, analysis of ESG policies reveals that while companies align with global standards like GRI, SASB, and BRSR, there are still major gaps in standardisation, transparency, and effectiveness. Issues shown include regulatory ambiguities, data inconsistencies, and a focus on short-term projects rather than long-term partnerships. The study also notes the limited impact of investor expectations and technology on ESG reporting quality. A comparative analysis with international benchmarks says rapid evolution in India's regulatory framework, but trust deficits and operational barriers remain. The paper concludes with recommendations to enhance ESG strategies through multi-stakeholder engagement, improved verification and reporting, and bridging the gap between policy and practice. Achieving responsible business transformation in India will require both regulatory support and deeper collaboration among corporations, NGOs, and policymakers.

**Keywords:** ESG; Compliance; Reporting; CSR; Sustainability.

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## **Construction Strategies used for Green Building Offices in Pune City**

*Avinash Purandare\*, Aditya More\*\*, Yutika Shah\*\*\* and Pranav Sharma\*\*\*\**

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### **ABSTRACT**

As urbanization speeds up, Pune has emerged as a leader in sustainable production, specifically within the improvement of green workplace houses prioritizing reduced carbon footprints and more potent indoor environmental great on the equal time as adhering to global sustainability necessities which embody IGBC and LEED. This includes improvement strategies hired in Offices in Pune, that specializes the use of eco- exceptional materials, energy-inexperienced HVAC systems, solar electricity integration, rainwater harvesting, passive cooling strategies, and waste manage practices. The intention is to examine the effectiveness of these sustainable techniques in optimizing beneficial aid usage and minimizing environmental effect by using way of assessing the adoption and implementation of inexperienced constructing era considering economic and environmental advantages for town development. The studies method entails facts collection through case research, professional interviews, and analysis of present-day Offices in Pune, electricity intake patterns, fabric overall performance, and sustainability metrics were tested to assess the effect of these strategies. The findings mean that Pune's green workplace homes notably reduce operational prices and environmental degradation even as selling greater healthful workspaces. In end, by looking at Pune's determination to sustainable improvement demonstrates that integrating inexperienced creation techniques effects in lengthy-term financial, sustainable and ecological blessings.

**Keywords:** Green building; Sustainable construction; Energy efficiency; Pune.

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## Environmental Clearance through Lean Management

*Aachal Chakre\**, *Manjiri Vaidya\*\**,  
*Vaishnavi Dohare\*\*\* and B. Sudheer Kumar Reddy\*\*\*\**

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### ABSTRACT

Environmental Clearance is one of the regulatory tools in India to provide sustainable development for all construction and infrastructure projects by alleviating negative environmental effects. Being an essential process, the EC process can be characterized by criticisms of complexity in its procedures, delays, redundancy, and duplications of data. This paper focuses on major barriers to the EC process and assesses the relevance of lean management concepts, make process efficient, transparent. The qualitative research design was used, and by using the design, the primary data was collected through structured interviews with 55 environmental consultants. Thematic analysis showed that there were ten key barriers, including delays in ToR approvals, multiple submissions of EIA, duplication of data, excessive paperwork, communication failures, and inconsistent appraisal practices. In light of this, a correspondence between each identified barrier and appropriate tools from the lean management. The results seem to indicate that a combination of a more efficient process and technology has a large potential for success for inter-agency coordination and post-clearance monitoring. The conclusion drawn from this study is that by adopting an integrative approach involving lean management. It is possible to optimise the EC process to achieve timely, cost-effective, and environmentally sustainable project approval outcomes.

**Keywords:** Environmental clearance; Lean management; Environmental Impact Assessment (EIA).

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## **Comprehensive LCA to Compare the Environmental Impact of Precast and Conventional Construction Methods**

*Devashree Bhave\*, Sahil Acharya\*\*,  
Ajit Shetkar\*\*\* and Sreelakshmi Sreekumar\*\*\*\**

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### **ABSTRACT**

Nearly 40% of global CO<sub>2</sub> emissions and more than 50% of natural resource use are attributed to the construction sector. The need for sustainable and effective building methods is increasing because of India's rapid urban growth. Although traditional cast-in-place systems remain popular due to their flexibility, they consume a significant amount of energy and materials. Precast construction enhances site efficiency, speed, and quality; however, its reliance on carbon-intensive materials like steel and cement is concerning. In this study, we compare buildings with 4 storeys, 12 storeys, and 32 storeys that have been designed and perform their Life Cycle Assessment (LCA). This assessment covers the stages of material extraction, transportation, construction, operation, and end-of-life. We focus on key factors such as Global Warming Potential (GWP), water and material consumption, and transportation. Databases linked to One Click LCA software provide the data. Designs to assess penalization and logistics more accurately. The ongoing analysis aims to help clients make better decisions during construction. This approach seeks to improve efficiency and sustainability by evaluating the scalability and environmental trade-offs of construction systems.

**Keywords:** Life cycle assessment; Precast; Conventional construction; Sustainability.

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## **The Local Carbon Solution: Sustainable Material Sourcing for Indian Construction**

*Arun Joseph\*, Darshan Bhat\*\*, Srivaari Prasad B. M.\*\*\* and Vishal Bhalla\*\*\*\**

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### **ABSTRACT**

The construction sector is a leading contributor to global carbon emissions and resource consumption, underscoring the critical need to integrate sustainable materials and methods. This research evaluates the potential of locally sourced, environmentally performative materials: hempcrete, recycled steel, and AAC blocks. The study employs a multi-faceted methodology. Using One Click LCA software, it quantifies the potential reduction in embodied carbon achieved by substituting conventional materials with these alternatives. ArcGIS Pro is utilized to conduct a spatial analysis, mapping the proximity of material suppliers to a case study location in Pune. This geospatial assessment highlights how localized sourcing can reduce transportation-related emissions and costs. These analyses are supported by a comprehensive literature review to establish the performance characteristics, life-cycle impacts, and global application trends of the materials. Furthermore, the research includes a cost-benefit analysis, comparing the investment of these sustainable materials against conventional options. This evaluation seeks to determine if any premium in upfront cost is offset by long-term environmental and economic advantages. The findings aim to demonstrate that a strategic, locally oriented selection of sustainable materials can diminish the carbon footprint of construction projects without compromising cost-effectiveness. The study ultimately provides a framework for promoting sustainable construction practices within the Indian market.

**Keywords:** Sustainability; One-click LCA; Locally sourced; Cost comparison.

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## **Sustainability in Supply Chain to Minimize Carbon Footprint**

*Sejal Makde\*, Aniket Kumar\*\* and Amal Sreevalsan\*\*\**

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### **ABSTRACT**

This research explores the strategies and challenges involved in implementing sustainable practices across global supply chains to reduce carbon footprints and combat climate change. It analyzes key stages—sourcing, manufacturing, transportation, warehousing, and distribution—to identify major emission sources and assess eco-friendly technologies and policies aimed at minimizing environmental impact. The study employs a mixed-method approach, combining a comprehensive literature review with qualitative insights from expert interviews and field observations. Special emphasis is placed on emerging economies and industries encountering operational and regulatory barriers. Findings reveal that while innovative solutions such as green logistics, renewable energy integration, and digital tracking systems offer promise, obstacles like high initial investment, inconsistent auditing standards, and weak regulatory enforcement hinder progress. The research underscores the need for integrated, scalable frameworks supported by collaboration among governments, corporations, and consumers. Ultimately, it provides actionable guidance for managers and policymakers to accelerate the transition toward net-zero supply chains, fostering a balance between economic growth, environmental protection, and social responsibility.

**Keywords:** Sustainability; Supply chain; Carbon footprint.

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## **Nature-based Solutions for Urban Resilience: Integrating Green Infrastructure and Ecosystem Services into Sustainable City Planning**

*Shivani Ambavane\* and Kul Vaibhav Sharma\*\**

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### **ABSTRACT**

Indian cities have been exposed to socio-ecological issues such as urban flooding, heat island effects, ecological degradation, and social inequities due to rapid urbanization and changes in climate. The present research uses the Mula-Mutha River stretch in Pune, a 15 km long severely polluted and ecologically distressed urban water body as a case study to identify the opportunity of Nature-Based Solutions (NBS) in river rejuvenation and urban resilience. The study acknowledges the importance of river health to the sustainable urban ecology; therefore, it is based on the mixed-method approach that includes literature review, analysis of case studies, interviews, spatial mapping based on GIS. The paper discusses the opportunities to incorporate the NBS interventions like restored wetlands, bioswales, and green corridors along the river. It will create a situation-specific NBS model to deal with climate risks, ecological rebuilding, and societal health. Spatial mapping of ecological resources and vulnerabilities, prototype riverfront interventions, and policy recommendations to institutionalize NBS in Pune. The study assists in environmental improvement and the cost-saving of up to 20 percent, as well as it gives valuable ideas to authors, researchers, policymakers, and all those stakeholders who engage in the process of creating sustainable and resilient urban river systems.

**Keywords:** Nature-based Solutions (NBS); Urban resilience; Climate change adaptation; River rejuvenation.

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## **Breaking the Glass Ceiling of Solar Energy: A Global Analysis of Structural, Financial and Policy Barriers to Adoption**

*Rigved Mathkar\**, *Siddharth Jagtap\*\**,  
*Aryan Chandanan\*\*\* and Virendra Balon\*\*\*\**

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### **ABSTRACT**

Solar energy has become a key driver in the global shift toward clean and sustainable development. While the cost of photovoltaic technology has dropped significantly and governments worldwide have pledged stronger support, adoption rates still vary widely between regions. Structural issues such as limited land availability, weak grid infrastructure, and uneven technological development continue to slow progress. Financial challenges, including high initial costs, restricted access to credit, and reliance on subsidies, make investment in solar power difficult to sustain. Policy-related barriers—such as unclear regulations and inconsistent implementation—further complicate efforts and deepen global inequalities in access to renewable energy. This study explores these structural, financial, and policy obstacles through a comparative global lens, examining both nations with high solar adoption, like Germany, China, and the United States, and regions still lagging, such as India and Sub-Saharan Africa. By linking these dimensions together, the research highlights how systemic challenges interact and provide insights into pathways for accelerating equitable, inclusive solar energy growth worldwide.

**Keywords:** Solar energy; Structural barriers; Financial barriers; Policy frameworks; Sustainability transition.

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## **Feasibility Study and Implementation Plan for Rainwater Harvesting and End-to-end Connection to Recharge Pits and Borewells**

*Sarthak Velani\*, Aaryamit Jain\*\* and Sanskar Rogye\*\*\**

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### **ABSTRACT**

The Government of India has been promoting for rainwater harvesting (RWH) as a sustainable water management, providing both financial incentives and mandating it in several institutions via schemes such as Jal Shakti Abhiyan, Atal Bhujal Yojana, and AMRUT. Most of these schemes are aimed at addressing urban water shortages, declining groundwater levels, and increasing demands for decentralized water systems. Educational institutes have been identified as key spaces for this work, due to the large built-up area, and potential for social commitment and action, making them practical spaces to develop RWH models for impactful sustainable development. To this end, we propose to conduct the feasibility study of rainwater harvesting system in reducing water dependency, promoting sustainability, and enhancing water management in an educational campus setting. Data will be collected through direct involvement in the project and the findings are expected to throw light on assessed requirements based on standards and areas of improvement for existing facility.

**Keywords:** Rainwater harvesting; Borewell recharge pit; Sustainability; Educational Institute; Water management.

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## **Decision Support Framework for Selecting Environmentally Sustainable Building Materials for Concreting Activity**

*Manikandan P. V.\* , Vaishnav G. S.\*\* ,  
Navaneeth Pankaj P. R.\*\*\* and Priya Vivek Deshpande\*\*\*\**

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### **ABSTRACT**

The concrete sector plays a pivotal role in infrastructure development and is increasingly embracing sustainable practices to optimize the consumption of cement, aggregates, and other resource-intensive materials. The growing emphasis on sustainability demands structured and data-driven approaches to material selection that balance performance, cost, and environmental responsibility. This study suggests a Decision Support Framework for selecting environmentally sustainable materials used in concreting activities, which helps in reducing environmental damage. The study begins with a review of sustainable concrete materials, along with their environmental and performance attributes. Key evaluation criteria such as embodied carbon, durability, workability, local availability, cost, and compliance with CPCB and BIS standards are identified through expert surveys and literature analysis. The suggested framework employs MCDA techniques, integrating methods like the AHP and WSM to prioritize alternatives objectively. The suggested framework bridges practical construction need with sustainability objectives by linking verified material databases, environmental certification data, and local availability indicators. The DSF aims to reduce subjectivity in material selection while promoting the use of recycled and low-carbon materials in concrete production. Ultimately, the suggested framework supports decision transparency, CPCB aligned sustainable construction practices, and contributes to the transition toward low-carbon, resource-efficient concreting across India's construction sector.

**Keywords:** Decision Support Framework (DSF); Multi-Criteria Decision Analysis (MCDA); Weighted Sum Model (WSM).

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## **A Lifecycle Cost Analysis – Based Analytical Study of Sustainable Green Building Project**

*Bhairavi Pawar\*, Ishika Saraf\*\* and Sudarshan Kore\*\*\**

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### **ABSTRACT**

As the demand for sustainable building increases, there is a greater need to analyse green buildings based not only on environmental efficiency but also on economic sustainability in the long term. Conventional cost analysis tends to ignore the operational and maintenance cost savings accumulated over the life of a building. This study seeks to create a framework for analysis using Life Cycle Cost Analysis (LCCA) to compare and analyse the total cost performance of green building and traditional building projects. The aim is to examine the impact of sustainable measures on total life cycle cost by combining Building Information Modelling (BIM) and the LCA tool. The framework accounts for initial construction, energy and water consumption, maintenance, replacement, and end-of-life cost. Through a meticulous comparative analysis, the study illustrates that despite the greater initial investments made in green buildings, they yield considerable cost reductions in operational and maintenance stages and achieve long-term cost optimization as well as better sustainability performance. Overall, the proposed framework provides a practical and data-driven tool to support developers, designers, and policymakers in making informed decisions for the economic evaluation and promotion of green building practices in India.

**Keywords:** Life Cycle Cost Analysis (LCCA); Green building; BIM; LCA tool; Sustainable construction.

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## **Evaluating the Obstacles of Green Supply Chain Management in Construction Industry**

*Tarun Kollipara\*, Sai Rajesh Nagireddy\*\* and Karthikeya Chola Kagitha\*\*\**

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### **ABSTRACT**

The construction industry is an important sector of the economy that is a major contributor to environmental effects through excessive consumption of resources and production of waste. Green Supply Chain Management (GSCM) can be seen as a significant strategy toward enhancing environmental performance without reducing operational efficiency. The use of GSCM in the construction industry remains low despite its benefits. This paper aims to determine and discuss the major obstacles to the effective application of GSCM in the construction industry. The Decision-Making Trial and Evaluation Laboratory (DEMATEL) approach was used to examine the cause-and-effect relationships among the identified barriers. Structured questionnaires were used to gather data from fifteen industry experts, and seven critical barriers were evaluated. The findings show that poor access to green materials, high start-up design costs, construction workforce resistance, and complexity of green logistics are significant driving factors influencing other barriers in the system. In contrast, resistance to change among suppliers, supply chain complexity, and limited digitalisation were identified as dependent obstacles. The results indicate that addressing root-level driving barriers can help reduce downstream implementation challenges and support the successful adoption of GSCM practices in the construction sector.

**Keywords:** Green Supply Chain Management (GSCM); Construction industry; DEMATEL; Barriers.

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## Mapping Namami Gange Projects to Sustainable Development Goals

*Spoorthi D. S. \*, Aniruddh Sharma \*\*, Giriraj Patil \*\*\* and Shobha Ramalingam \*\*\*\**

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### ABSTRACT

The Namami Gange Programme (NGP), launched in 2014 under the National Mission for Clean Ganga, is one of India's most comprehensive river rejuvenation initiatives. While it addresses multiple ecological and social challenges, a structured assessment of its alignment with the United Nations Sustainable Development Goals (SDGs) remains limited. This study bridges that gap by mapping NGP interventions to SDG targets through a thematic basketing approach across five domains: sewerage treatment infrastructure, biodiversity conservation, industrial effluent monitoring, public awareness, and Ganga Gram (eco-village development). Using a systematic literature review and case study analysis, the research consolidates existing evidence to identify critical policy, ecological, and social parameters for future field-based assessments. The focus is on developing an SDG-aligned analytical framework that highlights linkages, overlaps, and opportunities within NGP interventions. The anticipated outcome is a policy-relevant foundation that strengthens the strategic alignment of river rejuvenation projects with India's sustainable development commitments, while guiding governance reforms and future research. This study supports the transition from isolated interventions to an integrated, sustainability-driven river basin management model.

**Keywords:** River rejuvenation; Sustainable development goals; Analytical framework; Namami Gange mission.

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## **Sustainable Real Estate in India: Financial Opportunities and Adoption Challenges**

*Deep Shah\*, Nikita Nikam\*\*, Bhargavi Patankar\*\*\*,  
Anil Kashyap\*\*\*\* and Atul Fegade\*\*\*\*\**

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### **ABSTRACT**

The study, “Sustainable Real Estate in India: Financial Opportunities and Adoption Challenges,” examines how developers and consumers can collectively drive sustainable development by recognising and leveraging financial opportunities within the real estate sector. As Indian cities expand rapidly, integrating sustainability into real estate has become essential for balancing economic growth with environmental responsibility. This research examines how green practices—such as energy-efficient construction, eco-friendly materials, and certified building standards—can generate long-term financial value. Developers benefit through reduced operational costs, improved brand credibility, higher asset valuation, and access to green financing. At the same time, consumers gain from lower utility expenses, healthier living environments, and stronger resale potential. Based on surveys and interviews across major urban centres, the study identifies key adoption barriers, including high upfront costs, limited awareness, and insufficient policy incentives. The findings emphasise that aligning financial benefits with sustainable practices can accelerate market adoption and create a more resilient, affordable, and environmentally responsible real estate ecosystem in India.

**Keywords:** Sustainable real estate; Financial instruments; Developer challenges; Consumer perception.

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## **Evaluating Green Building Rating Systems: A Comparative Study and Framework Proposal**

*Meenakshi Pradeep\*, Aiswarya Manikandan\*\* and Elizabeth Rani V. J.\*\*\**

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### **ABSTRACT**

The impacts of construction business have necessitated green building practices as an element in development. The Green Building Rating Systems such as LEED, IGBC, and GRIHA are put forward to evaluate and facilitate the green building aspect, and its efficiency and applicability in India is doubtful. This is a critical review of effective green building rating systems and their flexibility with regard to environmental, social, and economical sustainability standards. A mixed methods design, involving literature study, expert survey based on a questionnaire, Analytic Hierarchy Process (AHP) and a weighted scoring model are used in the study. Seven shortlisted sustainability factors, such as energy efficiency, water conservation, waste management, indoor environment quality, materials and resource use, social aspects, and economic viability were weighted on expert opinions. The results indicate that waste management, water conservation, and energy efficiency are the major concerns in the Indian case. GRIHA has been rated the best with IGBC and LEED rating systems taking the second and third position respectively. However, not all the current rating systems have up to the shortlisted aspects of sustainability. This research proposes a performance based and composite green building rating system that can be applied to the Indian setting.

**Keywords:** Sustainable development; Green Building Rating Systems (GBRSs); Analytical Hierarchy Process (AHP).

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## **Market Potential and Adoption Trends of Geopolymer Materials in the Indian Construction Industry**

*Shreyash Kotwad\* and Sairaj Khade\*\**

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### **ABSTRACT**

This study explores the market potential, challenges, and adoption trends of geopolymer materials in the Indian construction industry, highlighting their growing importance as sustainable alternatives to conventional cement-based products. A mixed-method approach was adopted, combining surveys and interviews with engineers, contractors, and precast manufacturers to capture industry perspectives. The collected data were analyzed using descriptive and inferential methods with the help of JASP software to identify the key factors influencing adoption. Findings reveal that awareness, sustainability benefits, and a strong supply chain are crucial in driving market acceptance of geopolymer materials. However, despite their proven environmental and technical advantages, a lack of standardization, limited awareness, and the absence of clear regulatory guidelines continue to restrict large-scale use. The study suggests that focused awareness campaigns, supportive government policies, and collaboration among industry stakeholders can accelerate adoption. By integrating data-driven insights and modern analytical tools, this research contributes to promoting sustainable construction practices and advancing the transition toward greener materials in India's construction sector.

**Keywords:** Geopolymer materials; Sustainability; Market adoption; Construction industry; JASP Software.

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## AI-powered Energy Efficiency in Smart Buildings

*Akshay Yadav\**, *Soumav Mitra\*\**, *Nikhil Patil\*\*\** and *Sanjay Bhoyar\*\*\*\**

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### ABSTRACT

**Abstract:** The research dives into how artificial intelligence can make buildings energy efficient, with specially focusing on challenges, opportunities in India. Around the world, smart buildings use AI, the IOT, digital twins, and machine learning to monitor energy use and automatically adjust systems like heating, cooling, and lighting. Coming to the aid of the issue of application and adaptation in Indian context, the study will be looking at the world's best examples and outlining a plan for India to bring in flexible and locally adapted smart buildings. The vision is to start small, gradually build local capabilities, initiate testing in diverse Indian climates and slowly scale up the process to the regional level, all with the aid of a reliable policies in place such as the Energy Conservation Building Code and Smart Cities Mission. The thrust here is to ensure that the brand of tech we get is cost-effective and relevant to India's varying needs using technology such as sensors and AI. With the help of policy, experts and scientists, India can grow more efficient, environmentally friendly and better buildings, and this study will serve as an excellent way to bridge the gap in the process.

**Keywords:** Smart buildings; Artificial intelligence; Energy efficiency; Sustainability.

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## **Enablers for Adopting Sustainable Practices in Power Distribution Companies – A Bibliometric Analysis**

*Durga N.\* and Sudhir Ambekar\*\**

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### **ABSTRACT**

Power distribution companies (DISCOMs) in developing countries are critical to the clean energy transition but are challenged by financial instability, high losses, and inefficiencies, contributing significantly to regional greenhouse gas emissions. This study employs VOSviewer-based bibliometric analysis including keyword co-occurrence, co-authorship (countries) and bibliographic coupling (documents), to map the intellectual structure of research on sustainable practices in power DISCOMs and to identify key thematic clusters and enablers. Analysing a dataset of 2956 articles and reviews (1982 and 2026) retrieved from Scopus database reveals five thematic clusters representing key areas namely renewable energy integration & grid optimization, demand-side management & energy efficiency, environmental sustainability & emissions control, rural electrification & energy planning, and emerging low-carbon technologies. By interpreting these clusters, the study infers potential technological, governance, environmental, and socio-economical enablers that support sustainability adoption in power DISCOMs. These enablers help Power DISCOMs in developing a framework for improving their sustainable practices and help in achieving the country's decarbonisation goals.

**Keywords:** Power DISCOMs; Sustainability; Enablers; Bibliometric analysis; VOSviewer.

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## **Production of Compost Rich in NPK & Organic Carbon using Organic Culture and Vermi-composting Technique**

*Ashish Dattu\*, Raj Rathod\*\*, Vikas Phad\*\*\* and Shridhar Kumbhar\*\*\*\**

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### **ABSTRACT**

Soil nutrient depletion and the heavy use of chemical fertilizers have caused reduced soil fertility and raised environmental concerns in Indian agriculture. Sustainable and low-cost alternatives like vermicomposting can turn organic waste into useful biofertilizers. This study aims to produce compost high in nitrogen (N), phosphorus (P), potassium (K), and organic carbon by using kitchen waste as the main ingredient, along with certain microbial cultures and earthworms. The composting process includes nutrient-solubilizing microbial inoculants, such as *Azotobacter*, phosphate-solubilizing bacteria (PSB), and potassium-mobilizing bacteria (KMB), to speed up decomposition and improve nutrient availability. Vermicomposting units are set up using *Eisenia fetida* and *Eudrilus eugeniae* under controlled conditions, keeping moisture levels at 60 to 70% and maintaining an optimal temperature for worm activity. Key composting factors like temperature, pH, and moisture are monitored regularly to track decomposition. The final compost will be tested for NPK content, organic carbon, microbial population, and C:N ratio. This study aims to create a nutrient-rich compost formula and a simple, farmer-friendly guide for sustainable waste management and improving soil fertility. The work supports the goal of reducing reliance on chemical fertilizers and promoting eco-friendly circular agriculture in India.

**Keywords:** Vermicompost; Sustainability; Waste.

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## **Strategies for Achieving Net-Zero Energy Buildings in the Warm and Humid Climatic Zone of India**

*Vinay Reddy\*, Rachit Patil\*\* and Girish Balaji\*\*\**

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### **ABSTRACT**

Buildings play a big role in how much energy we use and how much pollution we create. In India, where the climate changes from region to region, it's important to design buildings that save energy and work efficiently in the Indian climate conditions. The research analyze at various climate zone, where people often rely on cooling systems that increase energy use. The research aim is to understand how building design, materials, and working conditions affect energy consumption and to find effective ways to make buildings more energy efficient. The research examines various net zero buildings and case studies on net zero buildings to see what workings methods to achieve the aim. The result from the research shows that a practical framework is suggested to help designers and engineers create buildings that are more energy efficient, and sustainable in similar climates. Building Design ideas like shading, ventilation, and using natural light can reduce the need for air conditioning, especially when combined with energy-efficient systems and renewable power.

**Keywords:** Net-zero buildings; Energy efficiency; Passive design strategies; Sustainable architecture.

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## **Circular Economy Approaches in Urban Waste Management**

*Sudipa Sardar\*, Yash Kumbalwar\*\* and Atharva Thuse\*\*\**

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### **ABSTRACT**

The rapid growth of cities is creating an urgent need for sustainable development models that can support economic progress while using resources efficiently. Smart Cities, which rely on technological advances, offer a way to improve urban systems. However, their ability to support sustainability can be greatly improved by incorporating principles from the Circular Economy (CE). This study explores how CE ideas can be effectively included in Smart City projects to help achieve sustainable urban development, with a focus on the Indian context. The research uses a qualitative and descriptive approach, including a review of existing literature, interviews with experts, and analysis of successful examples from around the world and within the country. The study highlights the main difficulties, possibilities, and gaps in policies related to implementing CE strategies in areas like urban planning, transportation, energy, water, and waste management. The results are intended to provide useful guidance and policy suggestions to help Indian Smart Cities move toward a more sustainable, resource-efficient, and low-carbon future.

**Keywords:** Smart cities; Circular economy; Sustainable urban development; Resource efficiency; Policy integration.

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## **Assessment of Impact on Air Quality Index from Manufacturing Industries in Gujarat using GIS**

*Nishtha Pokle\* and Sanket Chawke\*\**

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### **ABSTRACT**

In India, the major cause of air pollution is industrial emissions which contribute nearly 17% of the total greenhouse gas emissions and Gujarat alone contributes 16 % of these emissions- a good target considering its 38,445 registered factories and industrial belts. Ankleshwar is a large industrial area estimated to be 1,600 hectares and has more than 1,200 industrial plants. The level of air quality in these areas is AQI register in the orange and red zones quite often, which means that the air quality is dangerous and requires further research into the involved causes and chemicals. This study fills this deficiency by using factory level analysers and GIS mapping to directly measure and analyse major pollutants in the industrial areas of Ankleshwar as well as the major field data collection on the hotspots of emissions, receptor-sensitive areas, and housing districts near large factories. The methodology assimilates spatial digitalization of the industrial wards of Ankleshwar, sampling. Strategic sampling points depending on the direction of wind, and sophisticated volatile organic. real-time gas analysis based on compound (VOC) detection technology. Sources of secondary data such as the Gujarat Pollution Control Board, IMD, complement on-ground measurements to give a supplement. interdisciplinary viewpoint.

**Keywords:** Air Quality Index (AQI); Industrial emissions; GIS mapping; Ankleshwar; Pollution dispersion.

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## **Life Cycle Assessment of Circular Economy Pathways for Calcined Water Treatment Sludge as a Cement Substitute**

*Jyothsna Chakka\**, *Shreeya Shende\*\**,  
*Saatvik Kapur\*\*\** and *Aniket Dahasahastra\*\*\*\**

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### **ABSTRACT**

The construction sector contributes to approximately 37-39% of global carbon emissions. Major sources of these industrial emissions are production of concrete which is largely driven by process of cement manufacturing. This study explores the possibility of re-using calcinated water treatment sludge (WTS) as a partial replacement of cement to produce low-carbon concrete. This research aims to (i) perform a cradle-to-gate life cycle assessment (LCA) comparing conventional concrete with WTS as partial replacement of cement; (ii) assess mechanical and environmental performance across different feasible replacement levels; and (iii) to propose and integrate an innovative parameter, Strength replacement ratio (SRR) as a criteria for production of sludge-derived concrete to showcase trade-offs between structural performances and material substitution. The methodology involves LCA-modelling, experimental information from literature and scenario-based cost-benefit analysis for the annual WTS generation in Pune. There is clear evidence from previous studies that 10% cement replacement with calcined WTS can reduce embodied carbon by around 9% and divert a large amount of waste from landfill. It is expected that the outcomes of this study will showcase the environmental, economic and circular economy gains of using WTS as supplementary cementitious material to provide a scalable route for decarbonisation of the concrete industry.

**Keywords:** Low carbon concrete; Life cycle assessment; Water treatment sludge; Circular economy.

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## **Integrated Sustainable Development in Modern Airports: A Case Study of India**

*Aditya Narwade\*, Saurabh\*\* and Kalpesh Kalkute\*\*\**

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### **ABSTRACT**

This study explores sustainable development strategies for Indian airports, emphasizing innovative, cost-effective solutions. Through extensive literature review and case analyses, the research highlights how modular, scalable infrastructure paired with renewable energy integration can significantly reduce environmental impact. The methodology combines techno-economic analysis, lifecycle carbon assessments, noise contour mapping, and IoT-driven predictive maintenance, creating a comprehensive framework tailored to India's diverse climatic and regional needs. Key findings demonstrate that hybrid renewable systems, such as solar PV with energy storage, can achieve carbon-neutral operations with favorable paybacks within 6–8 years, while modular terminal designs cut construction costs and timelines by up to 30–40%. Incorporating vernacular architecture and passive cooling techniques reduces HVAC loads and embodied carbon by 20–40%. Circular waste management practices further enhance environmental performance, reaching waste diversion rates above 60%. Continuous monitoring of noise and air quality via AI-driven dashboards supports community well-being, demonstrating practical pathways for mitigation. This research fills a vital gap by integrating advanced construction management principles within India-specific contexts, facilitating scalable, resilient, and environmentally responsible airport development. The proposed framework offers policymakers and developers a strategic roadmap to transform Indian airports into sustainable gateways that support regional connectivity and long-term climate goals.

**Keywords:** Sustainable airports; Renewable energy integration; Modular infrastructure; Circular economy; Green.

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## Effect of Built Environment on Thermal Comfort

*Kshitija Mahale\* and Poulomee Ghosh\*\**

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### ABSTRACT

Urban areas are increasingly experiencing intensified heat stress due to the combined effects of the rapid urbanization, climate change, and modifications in the built environment. The cities, due to extensive concretization and dense built fabric, constantly exhibit higher temperature than their surrounding regions which is commonly called as Urban Heat Island effect (UHI), has become a widespread environmental issue globally, which impacts on public health, energy consumption, ecosystems, and social equity. Various factors contribute to this temperature disparity, each of which can be systematically assessed. Past research has proved various methods to measure urban heat, ranging from direct field measurement to advanced Geographic Information systems (GIS) based techniques. So, this research is going to enumerate all these tools and techniques available to capture the urban heat. This could be also used for the further progress on measuring urban heat as well as formulating effective mitigating strategies to measure urban heat.

**Keywords:** Urban heat island effect; Remote sensing monitoring; Geographic Information systems (GIS).

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## **Assessing the Adoption of Recycled C&D Products in Private Construction Projects of Pune**

*Shoaib Sayyad\*, Abdul Nabi Syed\*\* and Raksha Suvarna\*\*\**

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### **ABSTRACT**

The construction sector is one of the principal contributors to pollution as it generates a significant amount of Construction and Demolition (C&D) waste at various stages of a project. Recycling and reusing waste save the environment and reduce new material requirements. Recycled C&D materials are not yet commonly adopted in private building construction, especially in rapidly growing cities such as Pune. Survey was carried out among architects, engineers, contractors, clients and developers to understand their views and challenges in using recycled materials. The responses were statistically analysed to rank the Barriers for adoption of recycled C&D products. The outcomes of this study provide an in-depth understanding of the practical, economic, and perceptual adoption barriers faced by private construction projects of Pune. The findings help in formulating recommendations and policy measures that encourage the use of recycled C&D products, contributing to more sustainable construction practices and effective waste management in the Pune construction industry.

**Keywords:** Construction and Demolition (C&D) waste; Recycled materials; Barriers to adoption; Waste management.

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## **Evaluating the Extent of Sustainability in Construction Processes: Insights from Literature and Proposed Field Study**

*Mustafa Shaikh\*, Siddhesh Redekar\*\* and Samrat Dongare\*\*\**

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### **ABSTRACT**

This study investigates the adoption of sustainable practices in construction across various phases such as design, procurement, and execution. It aims to understand how sustainability is integrated into the entire construction process and to identify areas where improvements can strengthen environmental performance. The research is conducted through an extensive review of existing research papers to extract key insights, trends, and practices currently followed in the Indian construction sector. The study contributes to strengthening sustainable practices by providing a foundation for understanding how different construction firms are adopting environmentally responsible approaches within their projects. In the next phase, a questionnaire will be circulated among various construction companies in India to collect data and gain insights into the extent to which sustainable practices are implemented in real-world scenarios. A Likert-scale survey will be used to gather responses, and the outcomes will help in gauging the level of sustainability adoption within construction firms. The findings will further support the development of strategies to enhance sustainable construction practices across the industry.

**Keywords:** Sustainable construction; Sustainable practices; Construction phases; Sustainability assessment.

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## **Sustainable Integration: Enhancing Construction Productivity & Infrastructure Lifespan**

*Akshay Gokhale\*, Soumik Mohanty\*\*,  
Dhairya Mugal\*\*\* and Pallavi Nimbawar\*\*\*\**

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### **ABSTRACT**

The construction industry plays a major role for building modern infrastructure, but it is also a major contributor in causing various global environmental challenges. Therefore, it is important to include sustainability in construction to balance development and environment. **Research Design /Methodology** This study shows how sustainable construction has evolved over the years. This study uses qualitative and quantitative methods such as literature reviews and questionnaires for analyzing the knowledge and readiness of professionals in the construction industry adopting these sustainable practices. The result of the study shows even though sustainable projects have higher initial costs, they offer long-term benefits such as reduced environmental impact, longer structure lifespan and savings on operational costs. However, there are several barriers that hinder the wider adoption of these practices which includes lack of training, lack of awareness, and inconsistent regulations **Key Findings** The study concludes that achieving sustainability in the building industry needs both a cultural shift and technical improvement.

**Keywords:** Sustainable construction; Infrastructure lifespan; Barriers to adoption.

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## **Impact of ESG Score on Financial Performance of CRIP Sector Companies in India**

*Shubham Sinha\**, *Nikhil Harsola\*\**,  
*Rishabh Singh\*\*\** and *Tulasi Vigneswar Rao Kamarajgadda\*\*\*\**

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### **ABSTRACT**

**Purpose:** The research here investigates the effect of Environmental, Social, and Governance (ESG) performance on the financial performance of Indian CRIP sector firms between 2022 to 2024. It looks at whether increased ESG adoption leads to greater profitability and operational efficiency contributing to sustainable value creation. **Methodology:** We used econometric models of panel data analysis on 80 CRIP companies to capture both time and cross-sectional variations. ROA and ROE were used as dependent variables, and ESG scores and their Environmental, Social and Governance pillars were used as independent variables. Leverage and revenue growth were control factors. The Hausman test supported the Random Effects model with limited endogeneity and unobserved heterogeneity. **Findings:** The results indicate that there is a statistically significant positive correlation between overall ESG performance and both ROA and ROE ( $p < 0.05$ ). One-unit increase in the ESG score raised by approximately 0.16 points in ROA. The Environmental and Social pillars shown stronger positive influence while the Governance pillar has a weaker or negative association likely because of compliance cost. **Implications:** Implementing ESG values improves financial performance and support long-term sustainable growth of CRIP sector companies in India.

**Keywords:** ESG; CRIP sector; Panel data regression; Sustainability; Financial performance.

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## **The Conflict between Construction and Forest Conservation**

*Swetha Krishna B.\**, *Shrikrishna Chavan\*\**,  
*Rajvardhan Pisal\*\*\**, *Arpita Mathur\*\*\*\** and *Yuvraj Patil\*\*\*\*\**

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### **ABSTRACT**

India's rapid infrastructure development has intensified tensions between construction expansion and forest conservation, with over 1.6 lakh hectares of forest land diverted for non-forest use between 2018 and 2023 (MoEFCC, 2023). Major sectors such as roads, power, and mining dominate this change, disrupting ecological balance and affecting over 4.3 crore forest-dependent people (MoTA, 2023). To address these challenges, this research aims to examine comprehensive legal frameworks—including the FCA, FRA, EIA, WLPA, and CAMPA regulations—while identifying critical loopholes and implementation barriers that shape both conservation and construction outcomes. Using a Constructivist Grounded Theory (CGT) approach supported by NVivo software, this study integrates perspectives from forest officials, legal experts, NGOs, contractors, and local community members in the Koyna region of Maharashtra. Semi-structured interviews were thematically coded to explore socio-cultural, ethical, and policy dimensions of forest governance. Through this inclusive and participatory evaluation, the research develops an evidence-based framework that emphasizes local engagement, ethical accountability, and sustainable balance between ecological protection and developmental progress.

**Keywords:** Forest; Conservation; Legal; Development.

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## **Strategic Identification of Enablers and Barriers for Sustainability C&D Waste Practices using DEMATEL and ISM**

*Basavaraj Tattimani\*, Aditi Nyamagoudar\*\*, Abhay Surya\*\*\* and Prachi Ingle\*\*\*\**

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### **ABSTRACT**

The construction industry faces pressure to adopt sustainable C&D waste management practices despite the underdeveloped application of circular economy principles. This study explores current trends, crucial enablers and barriers, visualizes their interrelationships, and suggests a strategic framework to support sustainable sectoral change. The research begins with a Literature Review to compile factors, followed by a Survey to gather primary data from industry experts. The analytical phase uses a combined approach: DEMATEL (Decision-Making Trial and Evaluation Laboratory) identifies cause-effect relationships by computing influence (D) and dependence (R) degrees and determines root cause and effect groups. This input then feeds into ISM (Interpretive Structural Modeling), which arranges factors into a hierarchical framework to visualize structural interdependencies. The anticipated findings will provide a prioritization roadmap of interventions, specifying which enablers (e.g., strong regulatory frameworks) to enhance and which barriers (e.g., linear-economy mindsets, high initial cost) to mitigate first. By explicating causal directions and hierarchical associations, the research offers practical recommendations and a strategic model to enable decision-makers to effectively allocate resources and drive the construction sector toward circular economy objectives.

**Keywords:** Sustainability; C&D waste; DEMATEL; ISM; Circular economy.

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## **India's Urban Dilemma: Land Acquisition and the Threat to Food Sovereignty**

*Vishal Bhalla\* and Soudamini Kalbhor\*\**

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### **ABSTRACT**

India's rapid urban expansion is exerting unprecedented pressure on its agricultural land, as fertile areas are increasingly converted for infrastructure, etc. This research examines the role of land acquisition laws in this dynamic, analysing how existing legal frameworks may inadvertently facilitate, or fail to prevent, the loss of vital agricultural land. Land that once supported rural livelihoods and national food systems is now routinely repurposed through acquisition and pooling mechanisms. Although these conversions signal economic growth, they also risk eroding the foundation of agricultural sustainability. This study investigates the intersection of land acquisition law and agricultural preservation, exploring how policy frameworks might reconcile the competing demands of urban development and food security. The analysis begins with a critical review of India's land acquisition laws, assessing their scope and limitations in protecting farmland from unregulated conversion. It further investigates the long-term risks of agricultural land scarcity, which threaten not only the livelihoods of farmers but also the food security of urban populations reliant on these supply chains. Ultimately, this research argues that unregulated urbanization may jeopardize the very systems it aims to support by undermining the foundations of national food resilience.

**Keywords:** Agriculture preservation; Land acquisition laws; Urban development; Food security.

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## **Sustainable Paving Blocks Incorporating Industrial and Solid Wastes: A Review**

*Vaishnavi Kumbhar\**, *Prajwal Nikam\*\**,  
*Sanika Deshpande\*\*\** and *Sudarsan J. S.\*\*\*\**

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### **ABSTRACT**

The study aims to develop an environmentally friendly paving blocks by integrating Waste Foundry Sand (WFS), Construction and Demolition (C&D) Waste, Plastic Waste, and Fly Ash. Using Life Cycle Assessment (LCA) is compared the environmental performance of these blocks to that of conventional paving blocks. Current studies mostly stress single-waste substitution, highlighting a research gap in the integrated use of multiple waste materials for sustainable block making. Experimental samples were prepared by substituting traditional raw materials with optimized proportions of these wastes and tested for key physical and mechanical properties such as water absorption, compressive strength, and abrasion resistance, flexural test, density test. In addition to quantifying the environmental effects, the cradle-to-gate life cycle assessment (LCA) method will evaluate the economic viability for large-scale suitability. The results expected that combining multiple wastes in paving block production significantly reduces dependency on virgin resources, lowers the embodied energy, greenhouse gas emissions, and maintains or increases mechanical performance of paving blocks. This study identifies the potential of multiple waste integration in encouraging circular construction models and reducing raw material dependency aligned with India's net-zero and sustainability objectives.

**Keywords:** Paving blocks; Waste materials; Carbon footprint; Sustainable construction.

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## **Barriers to Green Bond Finance in India**

*Richa B. George\* and Mohammed Nadeem S.\*\**

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### **ABSTRACT**

**Abstract Objectives:** This paper examines the principal obstacles hindering the advancement of India's green bond market and aims to present a structured model to identify the interdependencies among the barriers. **Methodology:** The research employs a three-phase methodology: (1) a systematic literature review identifying 25 barriers across financial, regulatory, informational, and institutional domains; (2) expert validation and ranking using the Delphi method; and (3) structural analysis through Interpretive Structural Modeling (ISM) and MICMAC to map relationships among the barriers. **Preliminary Findings:** The ten key barriers identified include liquidity risk, knowledge gaps, greenwashing, limited market size, regulatory framework gaps, weak public policy, investors' risk perception, climatic risks, inadequate incentives, and challenges from foreign direct investment (FDI). **Implications:** A clear regulatory framework, stronger policy signals, and standardization of definitions and disclosures are essential to reduce risks, increase investor confidence, and improve market participation. This study offers a systemic, evidence-based framework tailored to India's context, filling a gap in emerging market green finance literature.

**Keywords:** Green bonds; Sustainable finance; Barriers.

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## **Factors Influencing the Adoption of Green Residential Buildings: A Demand and Supply Side Perspective**

*Ramakrishna Nallathiga\*, Anwesha Gogoi\*\* and Rubiana Angom\*\*\**

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### **ABSTRACT**

Sustainability is steadily transforming the real estate landscape as environmental awareness and responsible living gain importance among modern homeowners and developers. This study explores the factors influencing the adoption of green residential buildings in India from both demand and supply perspectives. It focuses on understanding homebuyers' willingness to buy and pay for green homes and developers' willingness to invest in sustainable construction practices. Using a mixed-method approach, the research combines literature review, surveys, and quantitative analysis to gather insights from homeowners, potential buyers, and developers. The findings reveal that financial considerations, awareness levels, and stakeholder priorities significantly affect adoption decisions. While buyers increasingly value energy efficiency, healthier living, and long-term savings, their willingness to pay often decreases due to higher upfront prices. Developers, on the other hand, remain cautious because of uncertain returns and limited market demand. The study aims to examine how perceptions, economic factors, and awareness influence these decisions and to identify opportunities that could enhance the acceptance of sustainable housing. By integrating both perspectives, the research underscores the importance of supportive policies, awareness initiatives, and financial incentives to accelerate green residential development in India.

**Keywords:** Willingness; Perception; Residential; Sustainability.

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## **Evaluating Policy Frameworks and Certification Systems for Net Zero Commercial Buildings: A Case Study Approach**

*Samruddhi Mutake\*, Linda Thomas\*\* and Abhik Dey\*\*\**

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### **ABSTRACT**

India's commercial building sector is developing at a rapid pace, leading to an enormous hike in energy consumption and corresponding greenhouse gas emissions. In order to meet climate commitments and sustainable development goals, the adoption of Net Zero Energy Buildings (NZEBs) has become increasingly essential. This study aims to analyze and review the green building rating systems such as IGBC Net Zero, LEED Zero and GRIHA. To evaluate energy efficiency measures and smart building technologies that enhance operational performance. These certifications have some measurable benchmarks to evaluate energy efficiency, carbon neutrality and sustainable construction. The literature review includes the review of case studies related to existing net-zero commercial buildings. The methodology integrates market research to identify technological innovations and renewable energy solutions including solar rooftop, smart grid solutions, geothermal systems and biomass-based systems. Ultimately, this research highlights the impact of innovation ecosystems, policy coordination, and market preparedness in upscaling net-zero commercial buildings as drivers of a sustainable, low-carbon future.

**Keywords:** Green building rating systems; Renewable energy integration; Sustainable construction.

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## **Optimizing Construction & Demolition Waste Management through Circular Economy Strategies: A Case Study of Trivandrum**

*Meenakshy J. S.\* , Ann Mary Thomas\*\*, Joseph Saijan\*\*\* and Pavan Totla\*\*\*\**

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### **ABSTRACT**

Trivandrum's rapid urbanization process has exacerbated waste levels associated with construction and demolition (C&D), resulting in environmental and public health challenges. In 2016, the introduction of the C&D waste management rules has not improved Trivandrum's C&D waste management performance as it continues to lack infrastructure for collection, recycling and reuse of C&D waste. The inventive objective of this study is to assess opportunities for enhancing management of C&D waste through circular economy principles, associated with reuse, recycling and sustainable design, while lessening reliance on virgin materials. To do this, the study aims to evaluate the current practice and waste management system, identify barriers (policy and operational), and assess Trivandrum cooperatively to a similar tier 2 city that has developed successful C&D waste solutions. A mixed methods approach, including a survey and structured interview, was used to survey builders/contractors and local government officials to better understand informal practice, regulation gaps, and to identify potential circular options. The goal of this research study is to identify and present strategic approaches to help develop appropriate sustainable, resources efficient, and policy relevant management of C&D waste in urban contexts like Trivandrum.

**Keywords:** C&D waste; Circular economy; Sustainability; Waste management policy; Recycling.

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## **Public-Private Partnerships and SDG Compliance: Analyzing Trade-offs in Pune's Infrastructure Development**

*Sabyasachi Mohanty\*, Mrunal Rawade\*\* and Neha Danta\*\*\**

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### **ABSTRACT**

Public-Private Partnerships (PPPs) address India's pressing urban infrastructure challenges in mobility, housing, and waste management. Despite their growing importance, limited empirical research explores how PPP projects simultaneously advance multiple Sustainable Development Goals (SDGs) while balancing economic growth with environmental and social sustainability. This study investigates SDG compliance and trade-offs in Pune's infrastructure PPPs, focusing on the Pune Metro Line 3 and CFLO Pune's construction and demolition (C&D) waste management facility. Using a mixed-methods case study approach, it employs stakeholder mapping, policy review, and SDG performance assessment across Goals 3, 5, 8, 9, 11, 12, 13, and 15. The findings reveal notable progress in SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities), including 95% water recycling efficiency and improved urban mobility access. However, the study identifies conflicts with SDG 13 (Climate Action) due to high embodied emissions and delayed approvals. Governance complexity, fragmented coordination, and inadequate monitoring mechanisms are key implementation barriers. The research contributes a strategic framework for PPP evaluation, integrating sustainability indicators and stakeholder accountability mechanisms. The study offers actionable insights for policymakers and practitioners to design resilient PPP models that align with India's Net Zero and sustainable urbanization goals.

**Keywords:** Public-Private partnerships; Sustainable development goals; Urban infrastructure; Pune metro line 3.

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## **Antecedents of Greenwashing in Indian Construction Industry**

*Kashfiya T. Naikwadi\*, Allahbaksh M. Bagalkot\*\* and Ruthresh J.\*\*\**

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### **ABSTRACT**

Sustainability has become an essential issue in contemporary business processes, but the emphasis on being environmentally responsible has also resulted in the growing popularity of the phenomenon known as greenwashing, the act of falsely claiming activities or products of an organization to be environmentally friendly. In the Indian construction sector, such fraudulent activity constitutes a severe obstacle on the way to real environmental improvement. This paper explores the causal forces behind greenwashing by looking at the internal and external circumstances that make companies distort their sustainability actions. The article uses a systematic literature review based on the Theory, Context, Characteristics, and Methodology (TCCM) framework to review 108 peer-reviewed articles published between 2011 and 2025 to identify 24 important articles with their interest in the antecedents of greenwashing. Basing the study on legitimacy, institutional, agency, and stakeholder theories, the study also points out the role played by leadership behavior, competitive pressure, cost constraints, and poor regulatory systems in promoting symbolic as opposed to substantive sustainability behavior. The results indicate that poor governance and inconsistent regulation enhance false environmental claims. This paper highlights the pressing need to have strong policy frameworks and accountability measures to create true sustainability practices and inform future empirical studies in the Indian construction industry.

**Keywords:** Greenwashing; Construction industry; Sustainability; TCCM framework; Antecedents.

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## **Analyzing Environmental, Social and Governance Performance: A Cross-sectional Study of Construction Firms**

*Amit Shinde\*, Vivek Reddy\*\* and Virendra Balon\*\*\**

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### **ABSTRACT**

This study examines the Environmental, Social, and Governance (ESG) performance of Indian construction firms that respond to the imperative demand for sustainable practice in India's very resource-intensive construction sector. Robust ESG measures aligned with global sustainability norms and India's net-zero commitment must be embraced right away because of the high carbon footprints, energy usage, and social footprint through bulk employment of the construction sector. The research formulates a systematic hierarchical approach to performance assessment by exploring ESG driver interdependencies and implementation barriers through the use of the Interpretive Structural Modeling (ISM) approach. The research determines the primary implementation challenges Indian construction firms encounter while performing a systematic analysis of the role of ESG performance in influencing business outcomes, including profitability and corporate image. The research also fills a key research gap in adoption strategies for ESG, which are limited to whole-of-organization integration strategies. While surmounting challenges such as standard data constraints, varying reporting methodologies, and overdependence on self-disclosure mechanisms, the expected outcomes indicate that strategic ESG implementation has a significant positive impact on long-term firm performance. A ranked model for addressing these challenges and deepening ESG integration through the implementation of international best practices is provided by the ISM analysis.

**Keywords:** ESG frameworks; Construction firms; ISM methodology; Business performance; SEBI BRSR.

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## **Impediments to the Implementation of Sustainable Construction Materials in India**

*Dhanush Lekkala\*, Edin Jijo\*\* and Neethish Kumar S.\*\*\**

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### **ABSTRACT**

The construction sector in India is under severe obstacles that prevent the implementation of sustainable construction materials although they are capable of mitigating environmental effects and enhancing lifecycle performance. This paper examines the regulatory flaws, inefficiencies in procurement, high initial cost, shortage of supply chains and ignorance and technological illiteracy among the stakeholders as significant challenge areas. Results of previous research in India recognize the cost perception, regulatory inconsistency, lack of education/training, supply chain constraint, and the gap between the policy implementation as the common barriers. Indicatively, in Tier-2 cities like Gwalior, the level of awareness is moderate, but the cost, education, and availability of materials limit the implementation (International Journal of Research in Applied Science and Engineering Technology, 2025). On the same note, research on the selection of sustainable building materials also points out high initial cost, lack of knowledge, technical performance issues, and ineffective market supply chains (Sustainability, 2023). The thesis will formulate a strategic framework that will help in a systematic way of dealing with these barriers through policy reform, capacity building, incentive mechanisms, and better supply logistics. The framework will assist the stakeholders, namely the government, industry and academia to boost the sustainability of material uptake.

**Keywords:** Sustainable construction materials; Strategic framework; Regulatory flaws.

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## **Analysing the Urban Future of Mahalunge, Pune: Smart City and Developmental Challenges**

*Venkatesh Govindwar\*, Arya Satone\*\* and Shreyas Naik\*\*\**

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### **ABSTRACT**

The thesis views the context of Mahalunge, Pune, as it is a fast-growing peri-urban area, strategically located near the outskirts of the city and benefiting from its advantageous location and developing infrastructure. The objective of this study will be to identify and highlight the impact on quality of life as well as the changes that have occurred related to urban service delivery. The research design for this study will be a mix of primary research and secondary research. The study has the backing of the qualitative aspects provided by experts in the field of the real estate industry and urban planning. The results obtained point to the fact that the absence of coordination between the planning and the service providers has placed a lot of pressure on the infrastructure, including roads, drainage, water supply, and general amenities. The service provided in the city, in terms of the overall satisfaction of the inhabitants, has been rated moderate to low with respect to the satisfaction with the governance levels. This study provides a fact-backed basis for the deficiencies in the development of Mahalunge and similar development zones located on the outskirts of the city of Pune.

**Keywords:** Urban service delivery; Infrastructure planning; Governance coordination.

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## **Multifaceted Challenges Encountered by Stakeholders in Navigating Environmental Clearance for Residential Projects in Metropolitan Cities**

*Sachin Patil\**, *Brajesh Priyadarshi\*\**,  
*Manoj Deshmukh\*\*\** and *Abhijat Abhyankar\*\*\*\**

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### **ABSTRACT**

Environmental Clearance (EC) serves as an essential regulatory process that ensures residential developments in metropolitan areas comply with environmental sustainability standards. Despite its importance, the EC process is often complicated, lengthy, and presents several challenges for stakeholders such as developers, environmental consultants, and regulatory authorities. This research focuses on understanding the diverse difficulties faced by these stakeholders and analyzing the procedural steps that contribute to delays and inefficiencies. A mixed-methods approach is employed, integrating literature review, case studies, and primary data collected through surveys and interviews to capture stakeholder perspectives and identify key obstacles. The results reveal that stakeholders experience burdensome documentation, ambiguous or inconsistent regulations, inadequate inter-departmental coordination, financial limitations, and prolonged approval timelines. These challenges impact project planning, decision-making, and timely execution. The study proposes actionable measures to simplify EC procedures, enhance collaboration among stakeholders, and improve transparency throughout the process. The findings aim to support the development of a more efficient, structured, and sustainable framework for environmental clearance, facilitating urban residential projects that meet regulatory requirements while promoting environmental conservation.

**Keywords:** Environmental Clearance (EC); Stakeholder challenges; Regulatory process; Urban residential projects.

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## **To Create a Framework to Achieve Netzero Plus Institutional Building: Using a Case of NICMAR University Campus, Pune**

*Sankar Dhyanesh Konduru\**

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### **ABSTRACT**

The advancement toward Net-Zero Plus (NZP) buildings—characterized by the generation of at least 15% surplus renewable energy relative to annual consumption—holds critical importance for climate mitigation and the long-term transformation of India’s construction sector. This study develops a four-phase technical and strategic framework tailored to achieve NZP status for facilities located in composite climate zones, with a primary emphasis on sustainable energy management. The framework incorporates comprehensive passive design interventions, energy efficiency enhancements, and integration of advanced renewable energy systems. The research methodology follows a structured process involving initial performance assessment, simulation-based energy modeling, mapping of renewable energy potential, and comprehensive techno-economic feasibility analysis. The assessment protocol employs comparative Energy Use Intensity benchmarks, on-site system validation, and lifecycle cost analysis to ensure reliable performance and financial justification. Modeling results forecast a renewable energy generation fraction of 120% and significant EUI improvement. The projected capital investment of ₹15–25 crores yield an estimated payback period of 8–12 years via energy cost savings, while supporting educational, environmental, and demonstrative objectives. Accordingly, the framework provides a replicable reference for higher education institutions across India seeking leadership in sustainable, energy-positive campus development.

**Keywords:** Net-Zero plus buildings; Sustainable energy management; Renewable energy integration; Techno-economics.

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## Legal Perspective of Conflict between Environment and Construction

*Neet Patel\* and Aditya Tope\*\**

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### ABSTRACT

Rapid city growth and increased construction projects often lead to conflicts with environmental protection laws. These conflicts occur when projects begin without the necessary approvals, skip Environmental Impact Assessments (EIA), or damage protected natural areas. As a result, many projects experience legal actions, delays, and environmental damage. This study examines these legal conflicts and how the law can help balance development and environmental safety. The research relies on secondary data such as laws, court cases, government reports, and expert studies. It analyzes real examples, including hydropower projects lacking clearance, coastal road projects harming marine life, and smart city projects built on wetlands. This helps to identify the main reasons behind these conflicts. The findings indicate that although India has strong laws like the Environmental Protection Act (1986), Forest Conservation Act (1980), and Wetlands Rules (2017), poor enforcement and lack of coordination among authorities make proper compliance difficult. The study concludes that construction projects should plan early for environmental safety, conduct EIA studies honestly, and engage the public to avoid future disputes.

**Keywords:** Environment; Construction; Legal conflicts; Sustainable development; Law compliance.

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## **NICMAR University Pune's Transformational Journey towards Sustainability: A Case Study about Proposed Implementation of Energy as a Service**

*Pavan Totla\*, Anjum Saeed\*\*, Ayush Singh\*\*\* and Siddharth Deshmukh\*\*\*\**

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### **ABSTRACT**

As the leading university in CRIP sector, NICMAR University Pune, has always strived to further its sustainability agenda by continuous research and development and implementation of state-of-the-art sustainable energy generation models to achieve its campus-wide Net-Zero carbon emission goal and advancing circular economy. To align with India's National Energy and Sustainable Development Goals (SDG-7), the Institution has always scouted for transformative and regenerative options. To implement such advancement strategies into NICMAR University, it conducted market research to identify and determine the best technology, disruptive and smart integrated OEM's available in market assisted with Techno-Economical-Socio Analysis. This market research culminated integration and deployment of advanced EaaS (Energy as a Service) architecture, promising innovative shift from CAPEX and OPEX intensive systems to service oriented energy generation service model (BOOM). Functionally the system transformed the University's food/ horticultural/ sewage into Biogas, supporting carbon mitigation across university by replacing its existing Carbon Intensive System, promoting and driving decarbonization across Scope 1 and 2 GHG's emissions, while advancing waste metabolism and enabling regenerative energy efficient practices across campus. Identification and leveraging enablers for EaaS transition, mapping critical risk factors and providing mitigation strategies to support long term operational viability.

**Keywords:** Energy as a service; Net zero carbon; Service oriented energy generation models.

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## **A Case Study of Moshi Landfill: Addressing Challenges through a Systematic Framework**

*Roshani Salunkhe\*, Vaibhav Suryawanshi\*\*,  
Ashwini Mudawadkar\*\*\* and Chetan More\*\*\*\**

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### **ABSTRACT**

Landfilling is the most prevalent method of waste management globally and is a crucial alternative, especially in low- and middle-income nations, owing to its comparative ease and affordability. Due to budget constraints, numerous landfills do not have sufficient environmental protection measures like effective liners and leachate collection systems, resulting in considerable environmental pollution. Despite having mitigation systems implemented, it is not always possible to ensure the total prevention of pollution. This research offers a case study of Pune's Moshi Dumping Yard, with the goal of performing a systematic evaluation of municipal dumping grounds and sanitary landfills from social, technical, and environmental viewpoints. Information was gathered via site visits, field surveys, and stakeholder engagements to pinpoint the existing challenges in landfill management. The research highlighted crucial problems like the significant amount of waste, byproducts from waste-to-energy facilities, and inadequate internal access routes in the landfill site. In light of these discoveries, a structured framework has been created to tackle the pinpointed issues using efficient planning and management techniques. The suggested framework seeks to minimize environmental and social effects while acting as a blueprint for future sustainable landfill design and administration in India.

**Keywords:** Landfill; Leachate; Environment.

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## **Solar Tracking Systems for Utility Scale Photovoltaic Plants: Performance Optimization, Construction Challenges and Artificial Intelligence Driven Control Strategies**

*Venkat Vishwanath Peri\**

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### **ABSTRACT**

Solar tracking systems have become more and more common in big solar power plants as they produce a lot more energy than fixed-tilt installations. On the one hand, fixed-tilt systems are simpler to operate, but their limitations due to the inability to change orientation and to capture sunlight are significant. Tracking systems can increase the energy output up to 30% depending on the year. Nevertheless, their performance can be compromised by inter-row shading when the sun is low and the unpredictable weather conditions for the operation. Most of the existing plants use tracking algorithms that are based on pre-defined motion profiles derived from past weather data. This practice may cause, during cloudy weather, the unnecessary movement of the actuator and more damage to the machinery. In this paper the authors identify the operational issues and present an adaptive tracking method that combines real-time irradiance sensing, cloud-aware control logic, and better backtracking techniques. The aim of the proposed framework is that it can both reduce shading losses and avoid unnecessary tracker movement during cloudy conditions. The findings from the field observations and simulation indicate that the adaptive strategy can reduce actuator movement by about 40-60% while still producing more energy than fixed-tilt systems.

**Keywords:** Solar tracking systems; Fixed-tilt photovoltaic systems; Adaptive tracking control.

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**TRACK 6**

**ENGINEERING AND  
PROJECT MANAGEMENT**

## **A Study on BIM & Blockchain Integrated Time and Cost Overruns in Construction Projects**

*Zoya Ghayas\*, Sainath Yakathpure\*\*, Ameya Phadke\*\*\* and Jonardan Koner\*\*\*\**

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### **ABSTRACT**

Time and Cost overruns are major challenges in the construction sector, causing project delays, budget escalations and reduced stakeholder confidence. In India, because of bureaucratic constraints, financial limitations and unorganised implementation, the challenges are amplified. The use of digital technologies such as Building Information Modelling (BIM) and Blockchain offers solutions that can improve the effectiveness of projects. BIM can be an efficient tool to coordinate projects and plan with advanced visualisation and accurate scheduling, and Blockchain enables transparent data management and automation through smart contracts, however, the potential of their combination is underexplored. This study empirically examines the combined impact of BIM and Blockchain technology adoption on the performance of construction projects. Data was derived from structured surveys of professionals, supported by literature, and analysed using triangulation framework to establish benchmarks. Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to analyse links between BIM and Blockchain adoption, governance efficiency and time and cost performance. Results show that BIM enhances time performance through improved planning and coordination, while blockchain increases governance efficiency in cost controls. It is concluded that effective mitigation of time and cost deviations requires a methodical approach of combining these technologies with practical relevance.

**Keywords:** Blockchain; Building information modelling; Construction management; Cost and time overruns.

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## **A Risk Management Framework for Hydropower Projects**

*Ravindrakumar Kshirsagar\**, *Chintha Balaji Shyam Dinesh\*\**,  
*Nithish Chandra Mandal\*\*\** and *Anagha Treesa K\*\*\*\**

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### **ABSTRACT**

**Purpose** Hydropower projects, while offering renewable energy and long-term economic benefits, are inherently exposed to multifaceted risks that can hinder their feasibility, efficiency, and sustainability across the project lifecycle. This research undertakes a comprehensive examination of risk management practices tailored to hydropower development. **Research Design/Methodology** The study begins with the identification and classification of diverse risk types—technical, environmental, financial, social, and regulatory—through secondary research. A structured risk matrix is formulated to quantify and rank risks based on calculated risk scores. A prioritization mechanism is subsequently developed to integrate these ranked risks into the project lifecycle, facilitating proactive and timely management interventions. Furthermore, the research engages in a comparative analysis between risks identified via primary data collection and those reported in secondary literature, seeking to discern convergences and divergences in stakeholder perspectives and documented evidence. **Key Findings** The outcomes contribute to a systematic, evidence-based risk management framework that supports project managers, engineers, and policymakers in enhancing the operational reliability, environmental compliance, and long-term sustainability of hydropower projects.

**Keywords:** Hydropower projects; Risk management; Risk management framework.

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## **Ethical Leadership and Its Effect on Behavioural Intention to Fraud in Construction Projects**

*Rushikesh Jadhav\*, Hrishikesh Jaju\*\* and Chinmay Vankar\*\*\**

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### **ABSTRACT**

The construction industry has always been a target for fraudsters mainly due to the complexity of the projects, the distributed nature of management, and the extreme performance expectations. This paper investigates the influence of ethical leadership on fraud prevention measures, trust in leader, Intention to commit fraud, and ultimately project success in the construction industry. The quantitative research design was derived from the ethical leadership and planned behavior theories that provided the theoretical frameworks. A survey was conducted to collect data from the construction industry. The findings of the study confirm that ethical leadership has a very strong impact on fraud prevention techniques, technology-induced learning, and thus the Intention to commit fraud, all of which are very important to the overall success of the projects. The total effect of ethical leadership was rather indirect, but it still turned out to be the main precursor through its influence on people's minds and technology-induced processes. The study highlights the vast deployment of ethical leadership as an informal control strategy in the construction industry to foster an ethical culture, become less fraudulent, and eventually see a positive impact on project completion.

**Keywords:** Ethical leadership; Behavioral intention to fraud; Construction projects; Organizational ethics.

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## **Building Sustainable Smart Cities: A Feasibility Study through Urban Planning Tools**

*Kritika Kusum\*, Shashank Goel\*\* and Raghavendra Kumar\*\*\**

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### **ABSTRACT**

India's rapid urbanization shows significant challenges in smart city development, particularly in environmental sustainability, energy efficiency and safety in building construction. Existing studies in Building Information Modelling (BIM) highlight comprehensive 3D modeling, enabling urban planners to visualize and optimize city layouts before construction. This approach allows simulations of pedestrian and traffic flows and optimal land use, leading to more informed decision-making and efficient urban development. However, critical gaps in the research exist in the comprehensive urban assessments, including environmental impact assessment (EIA), energy consumption analysis, and safety management within infrastructure projects. Without an integrated approach, these issues contribute to inefficient resource utilization, increased carbon emissions, and higher risks in construction activities. This study addresses these gaps by integrating with Geographic Information Systems (GIS) and advanced planning tools for effective safety identification, analysis, management, and control in urban development. The methodology involves a GIS based framework that enables data-driven environmental and energy assessments through geospatial mapping, real-time simulations. The primary goal of this research is to develop a holistic urban planning approach that ensures sustainability, energy efficiency and safety in India's smart cities. By leveraging digital technologies, this study seeks to provide policymakers, urban planners and stakeholders with actionable insights for optimizing city infrastructure, reducing environmental impact and enhancing resilience against urban risks.

**Keywords:** Building Information Modelling (BIM); Geographic Information Systems (GIS); Safety assessment; Urban.

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## **Identifying & Analyzing Critical Clauses in Contract Which are Prone to Disputes**

*Mihir Chavan\*, Ruturaj Nawale\*\*, Kaustubh Shinde\*\*\* and Prahlad R. \*\*\*\**

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### **ABSTRACT**

The construction industry operates through complex contractual frameworks that govern responsibilities, risks, and financial arrangements. However, ambiguities and inconsistencies in certain clauses frequently lead to disputes, schedule delays, and financial overruns. This study focuses on identifying and analyzing critical clauses in construction contracts that are most prone to disputes, aiming to understand their underlying causes and patterns. A mixed-method approach is being employed, combining a systematic literature review, evaluation of arbitration and dispute cases, and industry-wide data collection through surveys and professional interactions with contractors, consultants, and legal practitioners. The research applies the Failure Modes and Effects Analysis (FMEA) technique to assess each clause in terms of frequency, severity, and detectability, thereby prioritizing dispute-prone areas through a Risk Priority Number (RPN) framework. The ongoing analysis is expected to reveal recurring contractual weaknesses and provide insights into high-risk clauses. The outcomes will contribute to developing preventive strategies, Checklist and recommendations for drafting clearer, dispute-resistant contracts and improving contractual risk management practices in the construction industry.

**Keywords:** Construction contracts; Claims and disputes; Dispute-prone clauses; Contract management.

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## **Airport Development in India: Identification of Challenges & a Way Forward**

*Vibhav Chavan\* and Atharva Deshmukh\*\**

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### **ABSTRACT**

Airports in India play a vital role in driving economic growth and enhancing regional connectivity by supporting trade, tourism and business. The aviation sector contributes approximately \$53.6 billion annually which is around 1.5% of India's GDP and supports nearly 7.7 million jobs, directly and indirectly. Airports act as economic catalysts by facilitating the efficient movement of people and goods attracting investment and boosting local enterprises. Developing an airport demands extensive land for runways, terminals, cargo facilities and safety zones like ICAO mandated Runway End Safety Area (RESA). Selecting suitable land requires balancing accessibility, safety and environmental feasibility. However, land acquisition remains a major hurdle, often leading to delays and cost escalations. Research in this area can guide policymakers in designing fair compensation frameworks, streamline administrative processes, and help investors assess risk effectively ensuring sustainable, efficient and socially acceptable airport development across India. This study critically analyses the multifaceted challenges of land acquisition in India's airport development, a primary bottleneck for the nation's aviation growth. Using a mixed methods approach, the research integrates a qualitative analysis from interviews with key informants and stakeholders, with a quantitative review of major airport case studies to navigate challenges, ensuring sustainable and equitable infrastructure development.

**Keywords:** Land acquisition; Airport development; Sustainability.

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## **Early Stakeholder Involvement and its Role in the Success of Real Estate Development Projects**

*Shahbaz Khan\*, Srishti Bais\*\* and Varun Bonkinpallewar\*\*\**

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### **ABSTRACT**

Real estate development projects often face delays, conflicts, and rising costs because of inadequate early stakeholder involvement. This research looks at how early engagement, communication, and cooperation among stakeholders can reduce conflicts and improve project performance. We used a systematic approach based on PRISMA methodology to review existing literature. This was followed by a thematic analysis of field data to find common patterns and insights. The study employed a mixed-method design, collecting survey responses from real estate professionals and analyzing them to understand the link between stakeholder involvement and project results. The findings show that proactive and early engagement of stakeholders builds trust, improves coordination, and lowers project risks. Better collaboration led to timely milestone completion, higher quality results, and greater efficiency. On the other hand, insufficient involvement often caused miscommunication, conflicting interests, and project delays. This research emphasizes that effective stakeholder participation is not just a recommended practice; it is also essential for the successful and timely completion of real estate development projects.

**Keywords:** Stakeholder engagement; Real estate development projects; PRISMA; Thematic analysis; Project success.

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## **Analyzing Critical Success Factors for Successful Contract Management in Greenfield Airport Projects- An MCDM Approach**

*S. Harikrishnan\*, Gokulkumar G. R.\*\* and Pratik Kamdi\*\*\**

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### **ABSTRACT**

The success of contract management in Greenfield airport projects largely depends on accurately identifying and prioritizing critical success factors (CSFs) that affect cost and time performance. This study aims to develop a structured decision-making framework for evaluating and ranking eleven CSFs using a hybrid Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) approach. AHP was employed to determine the relative importance of cost and time criteria through expert pairwise comparisons, ensuring balanced consideration of both dimensions. TOPSIS was then applied to rank the CSFs based on their performance under these weighted criteria. Data were collected through structured questionnaires from industry experts, including project managers, contract administrators, and planners involved in large infrastructure projects. The analysis identified design team expertise, management support, and project planning and management practices as the most influential CSFs driving contract success. The study highlights the need for skilled design teams, strong managerial commitment, and robust planning to enhance cost efficiency and schedule adherence. The proposed AHP–TOPSIS framework provides a practical, transparent, and replicable tool for improving decision-making and contract management in complex infrastructure projects.

**Keywords:** Contract management; Greenfield airport projects; Critical success factors; AHP; TOPSIS.

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## **How Transportation Acts as a Catalyst in Driving Business and Economic Growth**

*Rohan Kar\*, Anurag Dabhadkar\*\* and Nakul Sahare\*\*\**

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### **ABSTRACT**

Transportation infrastructure plays a vital role in shaping economic landscapes and fostering regional development. This study examines how highway connectivity acts as catalyst for business expansion, trade facilitation, and economic transformation in India. The analysis focuses on two major industrial corridors the Delhi–Mumbai Industrial Corridor (DMIC) and the Bengaluru–Mumbai Industrial Corridor (BMIC) along with the proposed Patna–Siliguri–Darjeeling Expressway, a strategic greenfield project enhancing connectivity between Bihar, North Bengal, and the North-East. These corridors aim to strengthen logistics efficiency, promote industrial clustering, and support balanced regional growth. A mixed-method approach was adopted, integrating GIS-based spatial analysis, SWOT and PESTEL assessments, and Multi-Criteria Decision Analysis (MCDA) to evaluate alternative alignments and strategic options. A Cost–Benefit Analysis (CBA) assessed the project’s economic feasibility by comparing capital investments with long-term socio-economic benefits. Data on highway alignment, traffic flow, and logistics performance were sourced from the National Highways Authority of India (NHAI) and the Ministry of Road Transport and Highways (MoRTH). Economic indicators were obtained from NITI Aayog and Open Government Data (OGD) India. The findings reveal a strong correlation between improved transportation accessibility and economic growth. The study concludes that evidence-based transport planning can significantly enhance trade, tourism, and sustainable regional development in India.

**Keywords:** Transportation infrastructure; Regional development; Industrial corridors; Cost Benefit Analysis (CBA).

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## **Assessing the Impact of Stakeholder Management Practices on Project Performance in Construction 5.0 Initiatives**

*James Joseph Daniel\**, *Khem Karan Dewangan\*\** and *Jai Vaishnavi Nukala\*\*\**

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### **ABSTRACT**

The construction industry is evolving from Construction 4.0 to Construction 5.0, marking a shift from purely technology-driven innovation to a more human-centered and sustainable approach. While Construction 4.0 introduced digital tools such as IoT, automation, and robotics to improve efficiency, challenges like poor system integration, limited interoperability, and lack of practical implementation still persist. Construction 5.0 aims to overcome these issues by emphasizing human-centric design, collaboration, and ethical technology use. This study investigates how adoption of construction 4.0 & 5.0 principles, its barriers to adoption and stakeholder management practices influence project performance within this transition. A survey was conducted among construction professionals to assess the level of adoption of Construction 4.0 and 5.0 principles, identify key barriers, and evaluate their effects on stakeholder engagement and project outcomes. The responses were analyzed using PLS-SEM to test the proposed hypothesis. The findings provide practical insights into how effective stakeholder engagement and human-centered innovation can enhance project performance and support the broader adoption of Construction 5.0 in the industry.

**Keywords:** Construction 5.0; Stakeholder management; Project performance; PLS-SEM.

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## **Developing a Pro-active Framework for Sustainable EPC: Using the Combination of ESG Criteria and Risk Management**

*Amaan Mirza\*, Shreya Galkate\*\* and Udyalin Mishra\*\*\**

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### **ABSTRACT**

The Engineering, procurement and Construction (EPC) sector is at a transformative stage, facing increased expectations that not only focus on cost effectiveness but also are environmentally responsible, socially equitable as well as governed ethically. The integration of ESG (Environmental, Social, Governance) principles, however, remains limited within the EPC risk management practices, often viewed as a compliance. This research aims to introduce a dual-model framework, SERVE framework (Sustainability, ESG driven risk, Resilient mechanisms for governance, Visualizing and monitoring tools and Evaluation) and ERIS framework (ESG-Risk integration score) focusing to embed sustainability into the EPC lifecycle in a more structured and a measurable approach. The proposed framework seeks to establish a link of ESG values directly between risk governance and decision-making Procedures. While ERIS offers quantitative tools to evaluate how well the ESG factors are incorporated into project risk management, SERVE offers a managerial approach for integrating sustainability into IPECC. By bridging the gap between risk management practice and ESG theory, the research makes an academic contribution and provides a replicable framework for assessing sustainability maturity in EPC projects. In practice, it offers EPC companies a realistic roadmap for instituting ESG integration, by using this SERVE-ERIS framework.

**Keywords:** Sustainable EPC; ESG integration; Risk governance; SERVE-ERIS framework; Responsible project manage.

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## **A Framework for Sustainable Inventory Procurement Practice Model**

*Ayush Raj Mohanty\*, Himanshi Bharuka\*\* and Manjiri Wadhone\*\*\**

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### **ABSTRACT**

India's biggest road infrastructure projects face existing challenges in handling the cost efficiency, meeting timelines, and certifying environmental sustainability. Traditional methods of procurement and planning often notice sustainability, leading to excess costs, delays, and poor long-term results. This research creates and tests a Sustainable Inventory Procurement Practice Model (SIPP-M) that uses a structured method, MUSIC-3D inventory analysis. By surveying the Odisha Grand Ring Road Project, the research exhibited how prioritizing materials through multi-dimensional methods, systematic scope definition, and probabilistic scheduling can lower procurement risks while assisting Sustainable Development Goals. Gathering primary data through pilot testing with five infrastructure specialist and analyzing a 10.536 km road widening project (₹24.95 crore) reveals significant chances for sustainable material usage. This incorporate options like recycled asphalt pavement (RAP) and low-carbon concrete, which could cut embodied emissions by 15 to 20% without damaging performance. The proposed SIPP-M framework offers an adjustable and practical model for Indian road infrastructure projects, it addresses the prime gap between sustainability goals and genuine implementation in emerging economies.

**Keywords:** Sustainable procurement; MUSIC 3D; Early planning; Risk management.

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## **Techno-administrative Evaluation of Ganga Jal Aapurti Yojana in Bihar: A Policy for Water Transfer from Surplus to Deficit Regions**

*Amitesh Patel\*, Suraj Shende\*\* and Abhishek Kaushik\*\*\**

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### **ABSTRACT**

Water scarcity in Bihar remains a major issue, especially in its southern and central regions, despite the proximity of the Ganga River. This paper evaluates the techno-managerial efficiency of the Ganga Jal Aapurti Yojana (GJAY), a project designed to supply treated Ganga water to deficit areas through modern infrastructure and coordinated governance. The study aims to assess the project's technical design, administrative coordination, social impact, challenges, and pathways for sustainable management. A mixed-method approach was used, combining field visits, interviews with Public Health Engineering Department officials, local surveys, and secondary data from reports and policies. Analytical tools such as SWOT analysis, comparative case studies, and policy alignment matrices provided a holistic evaluation. The findings reveal that GJAY incorporates advanced technologies like diaphragm wall intake structures, high-capacity treatment plants, SCADA-based monitoring, and pressure-reducing valves for efficient water distribution. These innovations have improved water access, quality, and reliability, enhancing public health and socio-economic conditions. However, issues like leakage, limited connectivity, land acquisition, and coordination gaps persist. Overall, GJAY demonstrates how technological integration with effective management can sustainably address water scarcity and inform future inter-basin water transfer projects.

**Keywords:** Water scarcity; Techno-managerial evaluation; Ganga Jal Aapurti Yojana; Inter-basin water transfer.

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## **A Study on Dynamic Resource Allocation for Construction Projects**

*Nikita Nimbalkar\*, Manali Dhakate\*\*, Vaishnavi Rane\*\*\* and Avinash Bagul\*\*\*\**

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### **ABSTRACT**

The construction industry is one of the backbones of national infrastructure that faces major challenges such as labour allocation, fragmented planning and poor utilization of resources. The study aims at improving resource planning for complex residential projects by identifying bottlenecks in operations to minimise schedule delays and cost overruns. Initially, current resource allocation practices were reviewed to assess its impact on the project performance and avenues to improve resource allocation were identified considering technology-based framework. The study adopted case study approach, which combined Primavera P6 for scheduling, resources levelling, and track KPIs with Power BI to help practitioners improve resource allocation. The framework combined hybrid simulation methodology using Discrete Event Simulation (DES) and System Dynamic (SD) approach, to understand workflow interdependencies, determine bottlenecks and improve project performance. Digital tools implementation allowed maintaining and monitoring of the project processes. Results indicated significant increase in the labor usage, improving on time delivery performance of the projects. The suggested model was valuable in terms of creating a replicable, data-driven project delivery mechanism.

**Keywords:** Resource allocation; Process improvement; Hybrid Simulation (DES - SD); Project performance.

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## **Recent Trends on the use of BIM and Digital Twin in Bridge Asset Management**

*Sarveswar Kalluri\*, Sagar Govind Sawant\*\*, Sanath S.\*\*\* and Vikas Prasad\*\*\*\**

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### **ABSTRACT**

The continuous change in how things are done digitally is changing how big construction projects, like bridges, are designed and built. However, the way these projects are operated and kept in good condition is still not as efficient as it could be. Using Building Information Modelling (BIM) along with Digital Twins (DT) can help with real-time tracking, predicting when things might go wrong, and making bridge operations more effective. This paper looks at different examples where people have used tools to monitor the health of bridges. It focuses on the key factors, tools, sensors, and methods used to create Digital Twins and connect them with BIM so that things can be seen and managed in real time. Even though there are some successful examples and ideas that work, making this approach widely used on a bigger scale is still not happening much. Some big problems include a lack of standard rules, not enough trained experts, high costs to start, and worries about keeping data safe and accurate. Fixing these issues is important to make the best use of combining BIM with Digital Twins for managing bridges.

**Keywords:** BIM; Digital twin; Sensors; Parameters; Bridges.

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## **Project Scheduling and Monitoring through VisiLean and Microsoft Project - A Software Comparative Analysis**

*Devesh Pandya\*, Dhaval Thakkar\*\* and Nilesh Patil\*\*\**

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### **ABSTRACT**

This paper provides a comparative analysis of the project monitoring and scheduling features of Microsoft Project (MSP) and VisiLean which are two of the leading softwares in construction industry and project management sectors. The study compares their capabilities, features, collaborative use, and efficiency in managing workflows from planning to execution. The most critical evaluation factors are schedule generation, resource planning, project progress tracking, real-time collaboration features along with their core project management philosophies used by each softwares. Using a combination of qualitative and quantitative (case study based) analysis, the two applications were compared using the same project instances to evaluate their performance in terms of usability, precision, stakeholder's communication, and adaptability to the changing project conditions. The results show MSP's excellence in project scheduling and resource management while VisiLean's proficiency in real-time mobile integration and lean construction abilities. The analysis will help the practitioner choose the ideal tool depending on project size, complexity, and team collaboration requirements. This study will help industry professionals and learners to identify distinct and collaborative use case for both the softwares to improve overall project efficiency and effectiveness.

**Keywords:** Project scheduling; Project monitoring; Microsoft project; VisiLean software; Lean methodology.

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## **Impact of Stakeholder Relationship Management for Successful Delivery of Construction Projects**

*Maithili Deshmukh\*, Chandan M.\*\*, Saurav Aher\*\*\* and Pallavi Nimbalwar\*\*\*\**

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### **ABSTRACT**

This research looks at how Stakeholder Relationship Management (SRM) can help construction projects finish on time and successfully. The construction industry has become more complex, and with that, there are more people involved who may have different interests. This can cause delays, legal issues, and higher costs. Because of this, the research explores how to identify and understand stakeholders, how to communicate with them effectively, and how to build trust and work together better in managing projects. To get a full picture, the study uses both numbers and detailed information. The main way to collect data is through surveys, interviews, and on-site observations. Additional information comes from existing case studies and published materials. The numbers were analyzed using SPSS, and the detailed information was looked at through themes to see how communication, stakeholder satisfaction, and their influence affect how well a project goes. The findings suggest that clear communication, involving stakeholders in decisions, keeping track of their needs, and including ethical practices and social responsibility in SRM can improve how well projects work together. Even though there were some limits, this study offers useful advice for using SRM effectively in construction projects.

**Keywords:** Stakeholder management; Construction projects; Project governance; Sustainability.

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## **Impact of Hybrid Leadership on Managing Contractors in the Construction Industry**

*Adil Ashraf\* and Naga Sri Pavan Rankireddy\*\**

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### **ABSTRACT**

Construction projects are marked by intricate project environments, stringent deadlines, and various stakeholder participation, which highlights the importance of competent contractor management as an indicator of project success. Conventional leadership styles tend to fail in dealing with the dynamic nature of contractor coordination. In this research, the effect of hybrid leadership, a non-rigid style of leadership that incorporates transformational, transactional, and situational leadership, on contractor management in the construction industry is investigated. Quantitative research design using structured questionnaires and purposive sampling of 50–70 experienced contractors. The research explores the impact of hybrid leadership on communication, conflict resolution, motivation, and overall contractor performance. The literature review was focused on the increasing importance of adaptive leadership in distributed teams and complicated workspaces, with context-specific approaches being stressed. Findings seek to fill the research gap by assessing hybrid leadership effectiveness in improving project outcomes like time management, quality control, and team collaboration. The research contributes to leadership theory by providing actionable insights into how construction managers can adapt their leadership styles to suit changing project requirements and contractor expectations, leading to smoother implementation and better project delivery.

**Keywords:** Hybrid leadership; Contractor management; Communication; Adaptive leadership.

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## **Development of Novel Finance Model for Pune - Mumbai Hyperloop Project**

*Adesh Patil\*, Sameeksha Bhandari\*\*,  
Mrugaya Pujare\*\*\* and Nagarjuna Pilaka\*\*\*\**

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### **ABSTRACT**

Pune-Mumbai Hyperloop is a proposed world-class transport system in line with the vacuum tube and magnetic levitation technologies. This project was intended to provide an effective alternative to the current intercity transport system used in the region. This paper conceptualizes an innovative finance plan that uses corporate social responsibility as an alternate method of project finance in major development infrastructure. This paper discusses the estimation of different expenses in the project and its cost feasibility on the principles of benefit-cost analysis. Research was conducted with the aid of proper questionnaires that are required to be filled by the various organizations functioning in and around the region of Pune and Mumbai to determine CSR capacity and preparedness. Secondary research was carried out to determine the overall project cost by understanding different cost components of various research studies. The conclusion of this research reveals that it would be highly expensive to initiate this project; however, by combining public and private funds along with corporate social responsibility, it would be possible to increase overall project finance sustainability.

**Keywords:** Hyperloop; Financial feasibility; Pune–Mumbai corridor; Corporate funding; Public–Private partner.

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## **Studies on Hybrid Project Management Practices in Construction Projects**

*Bhumika Bahalani\**, *Yukta Khurana\*\**,  
*Shantanu Thakar\*\*\** and *Tushar Jadhav\*\*\*\**

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### **ABSTRACT**

This research explores hybrid project management practice in the construction sector where traditional (waterfall) and agile approaches have inherent strengths and weaknesses. The construction industry, defined by its nature of complexity, regulatory requirements and varying needs, is best served with a flexible but organized project management process. Traditional approach provides structured control but with no flexibility while agile method maximize flexibility but tend to find it difficult to handle rigorous large-scale projects. Our research fills this gap by examining how hybrid practices can maximize project performance. From qualitative data analysis, involving semi-structured interviews with project managers, engineers and stakeholders that were supported by extensive literature reviews, the study examines real-world practices, challenges and results. Major findings demonstrate that hybrid project management facilitates higher adaptability, stakeholder involvement, risk handling and cost-time-quality performance but emphasized major challenges such as cultural resistance, integration complexity and deficiency of standardized models. The research offers insightful recommendations for practitioners looking to adapt project management practices in the changing construction environment.

**Keywords:** Hybrid project management; Construction projects; Traditional methodology; Agile methodology.

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## **Strategic Stakeholder Management in Real Estate Projects - Case India**

*Sayan Mukherjee\*, B. Priyajogi\*\*, Sahil Ahmed\*\*\* and Kirti Rajhans\*\*\*\**

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### **ABSTRACT**

Construction projects across India frequently face significant cost overruns and schedule delays, with inadequate stakeholder coordination identified as a major contributing factor. This study aims to examine how ineffective stakeholder management leads to these challenges in Indian real estate projects, identify key factors behind stakeholder misalignment, and evaluate the suitability of existing stakeholder management frameworks across various project types. Conventional governance, based on rigid procedural systems, has been insufficient to manage the complex, evolving relationships among stakeholders. Furthermore, empirical research on adaptive stakeholder management tailored to India's real estate sector remains limited. The study was carried out using a self-structured questionnaire survey. This ongoing study identifies critical success factors including effective and frequent communication with feedback mechanisms, thorough stakeholder identification and understanding of interests, and efficient conflict resolution. Based on these findings, a practical stakeholder management framework is proposed for industry implementation. Preliminary qualitative results indicate improved communication patterns, a 31% reduction in conflict frequency, and increased stakeholder satisfaction across diverse project contexts.

**Keywords:** Stakeholder management; Cost overruns and schedule delays; Adaptive framework.

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## **Bid or No-Bid Analysis using Decision Tree Model**

*Hiba khan\*, Srushti Dadve\*\* and Prahlad R.\*\*\**

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### **ABSTRACT**

The bidding process has a great impact on the success and profitability of construction projects. A strategic “Bid or No-Bid” decision often constitutes a multi-faced process comprising various factors such as client reputational concerns, risk exposure, profitability prospects, competition intensity, and accessible resources. Traditionally, such decisions are significantly dependent on the experience and intuition of the manager that may lead to inconsistency and subjectivity. The present research proposes a data-based bid decision-making framework incorporating a Decision Tree model. A literature review through the PRISMA technique revealed some key influencing factors and research gaps in the bid/no-bid models developed previously. Primary data were collected by administering structured surveys that were inclined towards contractors, consultants, and project managers. The collected responses were analyzed for relative importance of each factor followed by training a Decision Tree classifier for bid decisions prediction. The model determines the most prominent predictors to be client reputation, tender clarity, and risk exposure. The outcomes indicate the possibility of exploiting the machine learning methods towards rational, transparent, and consistent bidding strategies that will enable construction companies to enhance the accuracy of decisions and competitiveness.

**Keywords:** Bid/No-bid decision; Decision tree model; Construction management; Machine learning; Data-driven Dec.

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## **A Technology-driven Framework for Digital Integration for Effective Project Delivery**

*Pranit Neulkar\*, Atharva More\*\*, Sushil Shinde\*\*\* and Sanjay Bhoyar\*\*\*\**

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### **ABSTRACT**

The construction industry continues to face persistent inefficiencies such as fragmented data systems, inconsistent documentation workflows, and delays in decision-making. This research aims to develop a technology-driven framework for digital integration that enhances coordination and improves overall project delivery. The proposed model is built upon a three-tiered approach comprising structured communication channels, centralized data repositories, and interactive project dashboards. Primary data was gathered through structured questionnaire surveys and interviews with professionals from various segments of the construction industry to evaluate the practicality and effectiveness of the framework. The findings indicate that digital integration significantly enhances information accessibility, documentation consistency, and decision-making speed. It also improves data accuracy and operational performance. The study highlights that bridging technological tools with managerial strategies fosters a more cohesive and data-driven project environment. Overall, the research presents a scalable and cost-effective framework that promotes better project control, accountability, and efficiency, positioning digital integration as a key enabler for modern construction project success.

**Keywords:** Digital integration; Construction management; Project delivery; Data-driven framework; Technology Ad.

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## **Comprehensive Financial Risk Assessment of Toll Based PPP Infrastructure Projects**

*Rahul Yadav\* and Mayur Thakare\*\**

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### **ABSTRACT**

Toll-based Public–Private Partnership (PPP) projects have emerged as a critical mechanism for infrastructure development in India, enabling private sector participation to meet rising infrastructure demands amidst limited public funding. However, these projects face substantial financial risks arising from traffic demand fluctuations, revenue shortfalls, debt repayment challenges, and inflationary pressures. The primary objective of this research is to identify and evaluate major financial risks influencing the financial viability of toll-based PPP projects and to develop an advanced analytical framework that integrates Monte Carlo Simulation and NPV-at-Risk (NPV@Risk) techniques for comprehensive financial risk assessment. The study adopts a comparative case study approach, analyzing one financially successful and one unsuccessful PPP toll project using secondary data sourced from government reports, project audits, and published literature. The expected findings suggest that traffic demand volatility and debt servicing risks are likely to be the most significant factors affecting financial sustainability, while the integration of Monte Carlo Simulation and NPV@Risk is anticipated to provide more accurate, dynamic, and decision-oriented risk assessment compared to conventional deterministic approaches. The research is expected to contribute to the development of a practical financial risk assessment framework that will support policymakers, investors, and concessionaires in making informed decisions.

**Keywords:** Public–Private Partnership (PPP); Financial risk assessment; Monte Carlo simulation; NPV-at-risk.

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## **Evaluating and Implementing Agile Project Management Techniques in Construction: Bridging Innovation and Efficiency**

*Akanksha Deshmukh\*, Ronit Dhame\*\* and Pratik Pawar\*\*\**

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### **ABSTRACT**

The construction industry is undergoing a transformation as traditional, linear management approaches struggle to handle today's complex and fast-changing project environments. This Evaluating and Implementing Agile Project Management Techniques in Construction: Bridging Innovation and Efficiency research explores how Agile Project Management (APM) - originally developed for software development - can be adapted to the construction sector to enhance flexibility, collaboration, and efficiency. The study evaluates the practical implementation of Agile frameworks such as Scrum and Kanban, emphasizing iterative planning, team coordination, and stakeholder communication. Through a combination of literature review, comparative analysis, and an internship-based case study, the research identifies both the opportunities and challenges in adopting Agile methods within construction projects. The findings reveal that Agile techniques improve decision-making speed, transparency, and project adaptability, though barriers such as limited training and rigid contractual systems persist. The study proposes a hybrid approach integrating Agile, Lean, and digital tools (BIM, IoT, and AI) to achieve sustainable innovation and operational efficiency in construction management.

**Keywords:** Agile project management; Construction efficiency; Scrum; Lean integration; Digital technologies.

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## **Delay Analysis and Risk Mitigation in Indian Infrastructure Projects: An Empirical Study**

*Faizan Ul Haque\*, Runal Boral\*\* and Prem Mhatre\*\*\**

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### **ABSTRACT**

Infrastructural projects have a very important role to play on economic development, yet they are still faced by delays and cost overrun, which is particularly true in the developing economies like India. This empirical study paper will discuss the primary causes of delays, the current practices on the ways to reduce risks, and the implementation of innovative technologies. Our methodology was mixed because we balanced both the in-depth literature review and the responses of 36 industry participants in the form of surveys. Findings show that administrative delays (government approvals, land acquisition) are the most deplorable determinants of delay with 47.2 percent of the projects experiencing 10-30 percent schedule overruns. The moderate effectiveness is seen with the Critical Path Method (CPM) and with Risk Assessment Matrices (52.8% rating) and there appear to be high adoption barriers to BIM (41.7%), AI/ML (8.3%), and blockchain (2.8%). The approval delays have been found to be the most important factor by the Relative Importance Index (RII) analysis of the approval delays (RII=0.81). We propose a risk management model, which is dependent on technology integration, which bridges the gap between reactive and proactive project governance and the data-driven project governance.

**Keywords:** Project delay; Infrastructure projects; Project risk mitigation; Project performance.

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## **A Data-driven Framework for Improving Proactive Risk Control using Safety Key Performance Indicators in Metro Rail Construction Projects**

*Shruti Khatu\*, Mihir Bhalgat\*\* and Dinesh Aswar\*\*\**

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### **ABSTRACT**

Metro rail construction, with its intricate processes and high-risk environments, requires stringent safety surveillance mechanisms and proactive risk management. Conventional safety management in India still mostly relies on trailing indicators that reveal safety issues only after an accident occurs. This paper proposes a comprehensive, data-driven model of Safety KPIs to enhance proactive risk management for metro rail construction projects. The study employs a mixed-methods approach, combining survey responses from metro project stakeholders with qualitative insights from experienced safety practitioners. It emphasizes leadership participation, safety culture, workforce engagement, and technology adoption as vital enablers of successful KPI-based safety management. The proposed framework advances safety monitoring from compliance to predictive control by effectively aligning human, technological, and organizational factors. The research contributes to developing systematic, measurable, and adaptive safety surveillance for high-risk infrastructure projects, offering valuable and practical guidance to contractors, policymakers, and project managers. Ultimately, it aims to create a safer, data-informed, and performance-driven construction environment focused on Zero Harm.

**Keywords:** Safety key performance indicators; Metro rail construction; Proactive risk management; Safety framework.

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## The Impact of Effective Project Communication on Project Performance

*Mohith Naidu Gutha\**, *Padusha Khan Shaik\*\**,  
*Pratik Kiran Kate\*\*\** and *Sachin Batra\*\*\*\**

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### ABSTRACT

Effective communication is a cornerstone of successful construction and project management, shaping coordination, decision-making, and overall performance across complex and multidisciplinary environments. Despite advancements in management tools, technologies, and methodologies, many projects still encounter cost overruns, schedule delays, and stakeholder misalignment—issues that often stem from ineffective communication rather than technical shortcomings. The increasing interdependence among project participants highlights the need for structured, transparent, and timely communication to ensure alignment and efficiency throughout the project lifecycle. This study, titled “Evaluating the Role of Effective Project Communication in Achieving Project Success,” examines how communication quality influences project outcomes across five key dimensions: Effective Project Communication, Operational Effectiveness, Collaborative Engagement, Strategic Cohesion, and Relational Impact. Each dimension captures how communication fosters coordination, adaptability, leadership alignment, and stakeholder trust within project teams. Drawing on insights from literature and quantitative analysis of professional responses, the research aims to establish a measurable relationship between communication practices and project performance. The findings are expected to contribute to academic understanding and managerial application by positioning communication as a strategic determinant of project success. Ultimately, the study offers actionable insights to help organizations enhance collaboration, improve responsiveness, achieve sustained excellence in project execution within the construction and infrastructure sectors.

**Keywords:** Effective project communication; Project success; Construction management; Collaborative engagement.

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## **The Role of Digital Innovation and Transformation Process in Business Growth: Technological, Social and Organizational Challenges and Solutions**

*Chetna Rathee\* and Abhay Chaudhary\*\**

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### **ABSTRACT**

Digital innovation and transformation have become central to business growth in an increasingly technology-driven and competitive environment. Organizations across sectors are adopting digital tools and platforms to enhance operational efficiency, customer engagement, and strategic decision-making. Despite significant investments, many firms struggle to translate digital initiatives into sustained growth, indicating the presence of underlying technological, social, and organizational challenges. This study addresses this gap by examining how digital innovation and transformation processes influence business growth and identifying the key barriers that affect their effectiveness. The research aims to analyze the direct impact of digital innovation on business growth and to assess the role of organizational and human factors in shaping transformation outcomes. An empirical research design is adopted using primary data collected through a structured survey of managerial professionals. The data are analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) to test the proposed relationships and hypotheses. The findings indicate that digital innovation has a significant positive influence on business growth, while organizational readiness and employee adaptability play a critical mediating role. Technological constraints and resistance to change are found to weaken transformation outcomes. The study offers practical insights for managers to design balanced digital strategies.

**Keywords:** Digital transformation; Business growth; Digital innovation; Organizational change; PLS-SEM.

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## **Skill Gap Analysis for Techno Managers in Indian Construction Industry, Bridging Knowledge & Market Demand**

*Bhushan Patkar\*, Rafe Ahmed\*\* and Shaurya Lakra\*\*\**

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### **ABSTRACT**

The Indian building construction industry, worth around 9% of the national GDP, is a central driver of economic growth, job creation, and infrastructural development. Nevertheless, even with its accelerated growth under pioneering government initiatives like Smart Cities, Bharatmala, and Gati Shakti, the industry is faced with growing pressure from an accentuated techno-managerial skill shortage—a disconnect between industry needs and the skills conveyed by educational institutions. This research rigorously analyses the root causes, extent, and implications of such techno-managerial skill deficit in the Indian construction sector and recommends practical methods of correction. With a mixed-methods design that combines primary data collection through systematic surveys and interviews of professionals in top companies—DLF, Lodha Group, and Shapoorji Pallonji—and secondary analysis of scholarly literature and policy documentation, the study identifies significant gaps in both technical and managerial capabilities. In spite of the recognized significance of digital building tools like BIM, Primavera/MSP, and next-generation estimation systems, levels of proficiency among professionals are remarkably low. The research recommends a comprehensive reform agenda with a focus on curriculum modernization, standardized certification, compulsory industry internships, and national-level digital upskilling initiatives.

**Keywords:** Construction industry; Skill gap; Upskilling; Techno managers.

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## **Financial Analysis of Public-Private Partnership Projects vs. Public-Sector Comparator Projects**

*Sanskriti Shrivastava\* and Harsh Pandey\*\**

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### **ABSTRACT**

This research examines the comparative financial and operational dynamics of Public–Private Partnership (PPP) and Public Sector Comparator (PSC) models in the Indian infrastructure sector. The choice of an appropriate procurement framework plays a critical role in ensuring cost efficiency, fiscal prudence, and long-term project sustainability. The study focuses on understanding how differing financing structures influence project viability, value for money, and lifecycle performance. A mixed-method research approach has been adopted, integrating both qualitative and quantitative analyses. Financial data from selected metro and infrastructure projects were evaluated through parameters such as Capital Expenditure, Operating Expenditure, Internal Rate of Return, Net Present Value, Weighted Average Cost of Capital, and Debt Service Coverage Ratio. The statistical interpretation of these parameters was carried out using the Mann–Whitney U Test to identify variations in financial efficiency and cost behavior between PPP and PSC frameworks. The research further establishes a structured statistical framework for comparative evaluation of procurement models, enabling objective appraisal of financial sustainability and risk-sharing mechanisms. Overall, the study contributes to the broader discourse on infrastructure financing by bridging theoretical understanding with practical financial assessment, providing a basis for informed decision-making in future public.

**Keywords:** Financial analysis; Public-Private partnership; Public-sector comparator projects.

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## **Comparative Time-cost Analysis of Corporate Interior Projects: Assessing the Effect of Project Scale and Complexity in Time & Cost Performance**

*Maithili Vanahalli\*, Abhijeet Hadimani\*\*, Utkarsh B.\*\*\* and Mangesh Kapote\*\*\*\**

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### **ABSTRACT**

The construction industry contributes to a major part of the Indian economy, encompassing diverse activities from infrastructure development to specialized interior design works. In the recent years, corporate interiors have gained immense prominence in the metropolitan cities like Bengaluru. Regardless of scale, such projects encounter various challenges during planning and execution, especially time delays, cost overruns, and complex stakeholder coordination. This study aims to bring in a comparative time – cost analysis of three corporate interior projects located in Bengaluru, differing in scale and complexity, from mid-size to multi-floor office spaces. The research methodology focuses on bringing the qualitative and quantitative outcomes mainly focusing on project schedule, cost data, and stakeholder discussions to identify delay factors along with assessment of financial implications. The evaluation includes time-cost correlation, daily overhead computation and losses from extended handover timelines. The primary outcome is to understand how scale and complexity influence the magnitude of delays and related cost impacts given the VUCA environment of the project. The study also focusses on analysing the delay-related losses and recommendations and strategies with respect to improvement in planning more accurately, cost control and timely delivery within Bengaluru's growing corporate interior design sector.

**Keywords:** Comparative study; Cost over-runs; Delay analysis; Time-cost analysis; VUCA environment.

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## **Comprehensive Performance-indicators for Public Private Partnership Projects in India**

*Maneeshana Banta\*, Sejal Narkhede\*\*,  
Nipun Pratap Singh\*\*\* and K. T. Vigneswara Rao\*\*\*\**

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### **ABSTRACT**

PPP projects have grown to be critical for the development of urban infrastructure across the world, enabling investment, innovation and risk sharing between public and private sectors. In India, urban infrastructure is being developed by the PPP-based metro projects as per National Metro Rail Policy- 2017. Investment has been substantial, however the risks of cost overruns, ridership shortfalls, delays over securing land and poor governance continue. This study constructs a thorough India-specific framework for evaluating the performance of PPP metro projects. This framework includes nine dimensions: financial performance, project performance, risk management, market viability, governance and compliance, environmentally sustainable development, stakeholder relations, innovation and technology adoption, and safety and health performance. Based on a comprehensive review of literature, consultation with 42 professionals, and AHP analysis, the KPIs were identified, weighted, and ranked. The results indicate that the Safety & Health, Governance & Compliance and Stakeholder Relations are the most influential factors to assess PPP metro performance in India. The framework helps to enhance planning, accountability, decision-making capabilities and gives practical guidelines. Future research could utilize this framework to test against real-world case studies to demonstrate its relevance and prioritize sub-factors according to contextual significance.

**Keywords:** Public Private Partnership (PPP); Metro Project; Framework; Analytic Hierarchy Process (AHP).

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## **Risk Mitigation in Public Private Partnership Projects: An Indian Contextual Study**

*Srikar Thiruveedhula\*, Ankit Baranwal\*\*,  
Niraj Pathre\*\*\* and Vigneswara Rao K. T.\*\*\*\**

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### **ABSTRACT**

Public-Private Partnership (PPP) models for infrastructure development in India continue to face significant challenges in attracting private sector investment, primarily due to inadequate financial risk assessment and management practices. This study introduces a probabilistic framework for evaluating financial risk in Indian PPP infrastructure projects using Monte Carlo simulation, implemented through the @RISK software. Drawing on secondary financial data from a diverse set of PPP projects initiated since 2000—including one extending through 2034—the analysis quantifies risk across the entire concession period. The research adopts a quantitative approach, by using empirical inputs such as historical cash flows, discount rates, projected revenue growth, and operating and maintenance (O&M) costs. These variables are modelled statistically to simulate risk outcomes. Key outputs include probability distributions of net present value (NPV), annual cash-flow risk profiles, and sensitivity analyses that identify the most critical factors influencing project viability. These insights offer practical guidance for budgetary allocation, financing adjustments, and feasibility assessments under uncertain conditions. The proposed framework is scalable across sectors and can be integrated with real-time project monitoring systems to enable risk management. By adopting this approach, policymakers and investors can enhance project viability assessments, strengthen financial structures, and greater stakeholder confidence in Indian infrastructure landscape.

**Keywords:** Public-Private Partnership (PPP); Risk management; Monte Carlo simulation; @RISK software.

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## **Project Success Factors on Mega Infrastructure Projects**

*Phalguni Sonthi\*, Rahul Dhamne\*\* and Naga Tejaswi D.\*\*\**

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### **ABSTRACT**

Mega infrastructure projects play a pivotal role in shaping economic development and societal transformation, yet they frequently fall short of time, cost and performance expectations. This study investigates the critical success factors that determine successful outcomes in mega infrastructure projects, with the aim of identifying actionable levers to improve delivery. The objectives of the research are three-fold: 1) To synthesise from literature and empirical evidence the principal factors associated with successful project execution in large-scale infrastructure. 2) To empirically assess the relative importance of these factors in a selected sample of megaprojects. 3) To offer guidance for practitioners on optimising project outcomes. A mixed-method approach was adopted: an extensive literature review was followed by a quantitative survey of project stakeholders and statistical analysis to validate hypothesised success drivers. The study finds clarity and defined strategic vision, strong stakeholder alignment and engagement, competent project governance and leadership, resilient resource planning, and proactive risk and change management emerge as dominant success-enablers. These findings advance theoretical understanding of megaproject performance and have direct practical significance: by prioritising these factors, infrastructure sponsors and delivery teams can increase the probability of achieving schedule, budget and quality targets, thereby enhancing value for investors, communities and governments.

**Keywords:** Mega-infrastructure projects; Success factors; Stakeholder alignment; Risk management.

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## A Review on MEP Coordination in Projects

*Vishnu Purushothaman\*, Vinay Pandey\*\*,  
Abhishek Rana\*\*\* and Tushar Jadhav\*\*\*\**

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### ABSTRACT

MEP systems, which include mechanical, electrical, and plumbing works, are one of the most critical parts of any construction project. They take up a large portion of the overall cost, sometimes going as high as 40% of the total budget. If these systems are not managed properly, problems like cost overruns, delays, and poor quality of work can easily occur. This paper reviews the challenges in MEP coordination and identifies the best practices for MEP coordination in projects. This involves analyzing various methodologies, tool and technologies used in optimizing MEP system while minimizing conflict and delays. Findings from literature review shows that the 3D Building Information Modelling adoption improves MEP coordination. Similarly, 5D BIM allows dynamic tracking and improved cost forecasting. Early involvement of MEP teams, subcontractors and collaborative environments reduces rework and improve efficiency. Experienced Coordinators are better at contextual analysis of clashes compared to Novices. This paper investigates critical success factors for coordinating MEP work packages thereby leading to successful completion of project.

**Keywords:** MEP; Coordination; Project management.

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## **Delay Analysis of ACS Formwork Technology in High rise Building Construction Projects**

*Tushar Agrawal\**

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### **ABSTRACT**

Automatic Climbing System (ACS) formwork technology is widely adopted in high-rise construction due to its potential to improve productivity, safety, and vertical construction efficiency. However, despite its technological advantages, ACS implementation is frequently associated with schedule delays that significantly affect overall project performance. This study presents delay analysis of ACS formwork operations in high-rise construction projects, focusing on identifying critical delay factors, their propagation mechanisms, and their impact on project timelines. The research adopts Critical Path Method for analysis, and productivity-based performance assessment to evaluate planned versus as-built construction schedules. Empirical findings reveal that delays predominantly arise from late system procurement, unrealistic cycle time assumptions, limited availability of skilled ACS crews, and external constraints such as adverse weather and safety-related stoppages. Results demonstrate that delays in ACS activities often occur on or near the critical path, leading to cascading impacts on downstream structural and finishing works. Based on the findings, the study proposes mitigation measures, including early system selection during the design phase, data-driven cycle time planning, and structured workforce training. The study contributes to the literature by providing delay analysis framework specific to ACS formwork systems and offers practical insights for improving schedule reliability in high-rise construction projects.

**Keywords:** ACS; Delay analysis; High rise construction; Critical path method; Construction project management.

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## **Systematic Literature Review: AI and ML-integrated Framework for Scalable Rural Infrastructure**

*Shubham Marwade\*, Virendra Kumar\*\* and Bhanupratap Raghuvanshi\*\*\**

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### **ABSTRACT**

The Jal Jeevan Mission requires fast construction of rural water systems which needs new methods that combine construction activities with data-based management systems. The Systematic Literature Review (SLR) investigates whether an integrated framework that combines Geographic Information Systems (GIS) clustering with AI-based logistics and Computer Vision (CV)-based Quality Assurance (QA) methods can function effectively. The review evaluates the effectiveness of unsupervised learning algorithms including K-means clustering through an analysis of 40 peer-reviewed studies which show how these algorithms help manage logistics in areas with dispersed facilities. The research compares Deep Learning systems which include Convolutional Neural Networks (CNNs) and YOLO models to determine their ability to identify defects automatically and track construction progress. The analysis shows that Digital Twins (DT) technology enables organizations to maintain real-time synchronization between their physical systems and their digital counterparts which helps them reduce scheduling delays. The research shows that while each technology operates at full capacity their combined use provides a dependable solution which scales to handle the operational challenges and quality control delays experienced in rural development projects.

**Keywords:** Precast construction; Artificial Intelligence; BIM logistics optimization; Jal Jeevan mission.

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## **Application of Lean Tools for Waste Identification and Productivity Improvement in Construction Sites**

*Saiteja Gundeti\*, Saravanan R. S.\*\* and Nikhil Garg\*\*\**

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### **ABSTRACT**

This study focuses on identifying and minimizing waste in construction site operations by using Lean construction tools to improve productivity and the efficiency of workflows. Construction processes often face various inefficiencies, such as delays, unnecessary movement of materials, rework, excessive production, material losses, and poor task coordination, all of which negatively impact project outcomes. This analysis examines these inefficiencies at the site level to promote smoother workflows and more dependable execution of construction activities. A field-based methodology was employed, involving direct observation of specific construction tasks. Sampling techniques were used to measure productivity of workmen among various trade crews, while field surveys were conducted to understand operational issues influencing workflow. Value Stream Mapping was used to Visualize process flow, identify non-value adding activities, causes of overproduction and material waste. Accordingly, Lean-based improvement strategies were developed. The findings indicate that a considerable amount of construction time and resources is consumed by non-value-adding activities and overproduction losses, primarily due to delays and coordination issues. The study concludes that Lean construction tools are a practical approach for reducing both time and material waste, improving workflow reliability, and enhancing overall site performance.

**Keywords:** Lean construction; Non-value adding; Value stream mapping; Material waste; Waste minimization.

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## **Integrating Lean Construction Principles with Sustainable Project Management in Indian Infrastructure**

*Mrunal Dhamdhere\*, Vidya Khanapure\*\* and Harshal Kajale\*\*\**

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### **ABSTRACT**

Lean construction enhances project sustainability by minimizing waste, costs, and delays in India's infrastructure sector. This review discusses how tools like 5S, Poka-Yoke, and Kanban comply to GRIHA and LEED standards in project management. Incorporating value stream mapping to identify delays and kaizen for continuous improvement allows teams to optimize resource management. When used together, these Lean methods and green building goals help use resources better, reduce material waste, and make processes more reliable, achieving overall project savings, similar to traditional approaches. When managing a project using 5S for organization, Kanban for planning, and Poka-Yoke for quality, there is better energy use and less waste. These tools improve teamwork and maintain stakeholder management. Case studies prove that Kanban manages the supply chain, while Poka-Yoke reduces the rework and saves up to 15% in costs. However, issues like poor skills and resistance to change pose an issue. Thus, better training is required. Studies show these methods reduce delays and carbon footprints, but slow institutional shifts still hold them back. This review finds the gaps and shows how to make Lean a core part of India's infrastructure.

**Keywords:** Lean construction; Sustainable project management; 5S methodology; Poka-Yoke; Indian infrastructure.

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## **Development of a Hybrid Cost–schedule Monitoring Model using Earned Value Management (EVM)**

*Arsalan Quadir Shaikh\**

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### **ABSTRACT**

This study addresses the need for a hybrid cost-schedule monitoring framework for construction project management. Earned Value Management (EVM) is a widely used technique for evaluating the performance of a project, but its application in real world project management is limited and it lacks a structured process for evaluating cost and schedule performance together. The objective of this research is to develop a flowchart-based hybrid cost -schedule monitoring model using Earned Value Management (EVM) to support systematic performance evaluation and better managerial decision making. The proposed framework integrates project planning data with key EVM parameters such as planned value, earned value, actual cost, cost performance index, schedule performance index etc. The flowchart will provide a step-by-step performance monitoring process covering performance measurement, variance analysis, and proactive corrective action planning at regular intervals throughout the project. The study is currently under progress and the developed model will be validated through its application to a live construction project or to a virtual project. The expected outcome is a practical and easily adoptable framework that will enable project managers and teams to detect cost overruns and schedule delays early, hence improving the project control and decision making during the execution.

**Keywords:** Earned value management; Cost-schedule control; Construction project monitoring; Project performance.

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## **A Real Time Analysis of Project Management Methodologies in Different Sectors**

*Lay Shah\*, Lawanya Makde\*\*, Vini Gupta\*\*\* and Avinash Bagul\*\*\*\**

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### **ABSTRACT**

In today's competitive project management environment, it is crucial to study the project management methodologies (PMM's) tailored to suit the project environment for different industries. To assess each PMM's practical applicability, information was gathered through an online survey of project managers from different industries. By comparing PMM's such as PMBOK, Agile-SCRUM, Lean Construction, ISO 21500, and hybrid approach across different industries, the best methodology applicable for the specific industry was identified. Such analysis can help provide more flexibility and control to the project managers working in varied environments. The findings reveal that the hybrid method is the most flexible and successful in diverse environment projects through integration of the merits of the conventional and agile practices. With the help of these insights project managers can choose project management methods tailored to suit specific work environment resulting in better resource usage, management of risk proactively and take decision based on facts, enhancing the project delivery and overall organizational performance.

**Keywords:** Project Management Methodologies (PMM); Agile-SCRUM; Hybrid approach; Comparative analysis.

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## **Project Scheduling and Monitoring and Application of Impacted As-Planned Method for Quantifying Delay Events in an EPC Project**

*Sujit Dhumal\*, Nachiket Bhavsar\*\* and Smita Patil\*\*\**

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### **ABSTRACT**

Delays are a recurring problem in Engineering, Procurement and Construction projects and often lead to cost overruns, schedule extensions, and disputes over entitlement to additional time. Because of this, effective project planning and a clear understanding of delay causes are essential. This paper focuses on how delays affect project completion and explains approaches used to analyse delays in construction projects, with particular emphasis on the Impacted As-Planned (IAP) method. The study reviews previous research on construction delays and discusses common delay classifications. It also outlines widely used Delay Analysis Methods, including As-Planned versus As-Built, Impacted As-Planned, Collapsed As-Built, Window Analysis, and Time Impact Analysis. Special attention is given to the IAP method, examining its theoretical basis, application procedure, advantages, and limitations. The paper compares different delay analysis methods and explains how each method interprets delay impacts and critical path changes under varying levels of available project information. The review indicates that Window Analysis and Time Impact Analysis can provide reliable results but require detailed and regularly updated schedules. In contrast, the IAP method remains useful when project records are limited. To improve understanding, a simplified EPC schedule developed in Primavera P6 is used.

**Keywords:** Impact; IAM; EOT.

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## **Recurring Cost Overruns and Schedule Delays in High-Speed Rail Infrastructure: A Global Systematic Review**

*Ayush Naik\**

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### **ABSTRACT**

High speed rail infrastructure projects are widely promoted as sustainable transport solutions, yet many projects continue to face serious cost overruns and schedule delays, although numerous studies have examined these issues, existing research remains fragmented. Engineering-based studies often treat overruns as technical problems, while governance and policy research rarely links these issues with cost–time evaluation. This study presents a systematic review of peer-reviewed literature published over the past fifteen years, using a structured process of selection, screening, and thematic synthesis, through which 30 relevant studies were identified. The review shows that cost overruns and schedule delays are not purely technical failures but are strongly influenced by political, contractual, and organizational factors. Common issues include early cost underestimation encouraged by procurement practices, overly optimistic planning assumptions. Quantitative evidence consistently indicates that each additional year of delay can increase project costs by around 5%, yet realistic risk allowances are rarely included because conservative forecasts may threaten project approval. Although advanced tools such as Monte Carlo simulation and Bayesian network models exist, their practical use remains limited. Overall, the findings suggest that technical solutions alone are insufficient and that improving high-speed rail project performance requires stronger governance, clearer accountability, and transparent forecasting practices.

**Keywords:** High speed rail; Cost overruns; Schedule delays; Project governance; Megaprojects.

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## **Generative Design in Project Management: A Theoretical Exploration of Centralized Neural Network Framework**

*Ashutosh Pratap Singh\**

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### **ABSTRACT**

The field of project management is changing very fast as the complexity of projects is on the rise, and the use of artificial intelligence in organizations continues to expand. Even though several AI-based tools are currently used to complete the following tasks: scheduling, reporting, and risk assessment, the tools, in question, are normally used separately, and they are not implemented as a unified system. This disjointed strategy restrains flexibility, organizational learning, and integration of decisions throughout the lifecycle of the project. The study investigates a theoretical framework of a Centralized Neural Network with the assistance of Generative AI to improve project management activities. The research is not aimed at system development or algorithm derivation, but rather at a research gap within existing literature that there are very few integrated, learning-driven AI architectures to project management. The Qualitative Research approach is embraced to understand how such a framework can enhance coordination, risk anticipation, and managerial decision-making in comparison with standard AI tools. The paper finds that a Centralized Neural Network strategy can serve as an organizational intelligence layer to help manage projects more dynamically, and to be more proactive. The suggested framework offers a base to the future empirical studies.

**Keywords:** Generative Artificial Intelligence; AI in project management; Neural network framework.

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## **TRACK 7**

**INNOVATIVE, ENTREPRENEURSHIP & VENTURE (IEV)  
DEVELOPMENT/START-UP PROPOSALS**

## **Optimizing Land Use for Renewable Energy Projects for Sustainable Land Use Planning through a Web-based Platform**

*Rohan Mistry\*, Rushabh Morekar\*\* and Priyanka Bendigiri\*\*\**

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### **ABSTRACT**

The objective of the present work is to create a web-based platform to reduce the gap between the developers and the land parcel owners. To make the process time efficient, cost effective, seamless and secure, we plan using Land parcels for sustainable energy production (e.g. Solar Energy) which can be considered in an Innovation and Entrepreneurship model. This platform uses tools which will help developers to search for appropriately suitable Land, and the landowners willing to Sell their land Parcel for Commercial Land use for Sustainable Development of Infrastructure. At the same time this platform aims to help the existing landowners, such as farmers, of selected region aware about generating income from unused land parcel in terms of Selling or Leasing. This will support sustainable development & Economic Growth while bidding for appropriate land appreciation value, transaction transparency between the stakeholders and long-term trust building between the concerned parties. Through this platform, we aim to execute several different Features to support and promote land development for sustainable Infrastructure development.

**Keywords:** Land use optimization; Renewable energy projects; Land leasing; Compensation; Stakeholder management.

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## **Bid Easy: A Digital Platform for Transparent Contractor-Client Management in the Indian Construction and Interior Design Industry**

*Akash Palve\*, Kunal Shinde\*\* and Vishal Bhat\*\*\**

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### **ABSTRACT**

The Indian construction and interior design industry plays a vital role in the nation's economy yet continues to struggle with inefficiencies in contractor–client relationships. Problems such as unclear pricing, inconsistent work quality, payment delays, and poor communication often lead to project disputes and time overruns. The objective of this research is to explore how digital technology can enhance transparency and accountability in this ecosystem through the development of Bid Easy a digital platform for streamlined contractor selection and project management. The study employs both primary and secondary research methods. Primary data was gathered through surveys conducted with homeowners, designers, and contractors in the Pune and Mumbai regions, while secondary data was derived from industry reports and competitive analysis of existing platforms. The research findings reveal that a majority of stakeholders face challenges related to trust, pricing transparency, and payment reliability, indicating a clear demand for verified and technology-enabled solutions. The study concludes that Bid Easy, through its features such as AI-based cost estimation, transparent bidding, escrow-linked milestone payments, and real-time project tracking, has the potential to significantly reduce inefficiencies in contractor–client interactions. By combining technology and trust, the platform ensures transparent and scalable project management in India's construction sector.

**Keywords:** Construction technology; Contractor management; Digital transformation; Smart project delivery.

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## **Innovations in Real Estate Redevelopment: Holistic Feasibility and Compliance Assessment for Urban Housing Projects**

*Aaryash Sankpal\*, Rohit Malwade\*\* and Pabitra Roul\*\*\**

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### **ABSTRACT**

**Objective:** This paper aims to analyze innovations in feasibility assessment for housing redevelopment projects in urban areas by comparing traditional manual methods with emerging digital models. It seeks to identify how digital systems improve accuracy, regulatory compliance, and decision-making under India's evolving frameworks such as RERA, DCPR, and UDCPR. **Method:** A comparative analytical approach is adopted using theoretical models and illustrative case simulations of redevelopment projects in Maharashtra. The study evaluates performance across parameters like FSI utilization, compliance accuracy, assessment time, and stakeholder transparency. **Findings:** Digital feasibility tools significantly reduce analysis time and errors while enabling real-time validation of planning norms. Automated rule engines enhance compliance with development control regulations and improve inter-stakeholder coordination. The results indicate higher FSI efficiency, financial efficiency and faster project readiness compared to traditional methods. **Implications:** Integrating AI-based decision-support systems within redevelopment feasibility frameworks can streamline approval processes, promote transparency, and enhance financial and technical viability for sustainable urban transformation.

**Keywords:** Redevelopment; Feasibility assessment; Urban infrastructure; Regulatory compliance.

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## **ConstructiTech BIM Smart a Digital solution for CRIP**

*Pratyush Mund\*, Nivrutti Bhayaje\*\* and Shreyas Patole\*\*\**

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### **ABSTRACT**

The Indian construction sector is a significant contributor to the nation's GDP and employment continues to face recurring challenges. Cost overruns, project delays, design errors, and communication gaps among stakeholders. Despite global technological progress, the adoption of digital construction methodologies like Building Information Modelling (BIM) remains limited particularly among Small and Medium Enterprises (SMEs) and mid-scale developers due to high implementation costs and lack of technical expertise. ConstructiTech BIM Smart is a seed-stage startup conceptualized to bridge digital divide by providing scalable, cost-effective, and user-friendly solutions for the Indian construction ecosystem. Integrating 3D modelling, clash detection, virtual walkthrough, 5D cost control and real-time field management into a unified digital platform, enabling better collaboration, transparency and project predictability. The study adopts a business model development approach comprising market analysis, competitor analysis, customer validation, and minimum viable product (MVP) assessment. The findings reveal a growing awareness of BIM's potential but also highlights key barriers to adoption – such as inadequate training modules, software costs and lack of localized solutions. Addressing these gaps through customized, cloud-based tools and technical training modules, we aim to enhance operational efficiency and digital readiness in India's construction sector towards goal of Digital and Sustainable infrastructure development.

**Keywords:** Building Information Modeling (BIM); Construction management; Digital innovation; Project efficiency.

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## **ONE-S: A Unified Platform for Interior 3D Visualization with Real-time Access to Branded Market Materials**

*Diptikanta Dalal\*, Raj Kagadada\*\* and Swaraj Suryawanshi\*\*\**

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### **ABSTRACT**

There is a big gap between design visualization and actual material integration, which has been brought to light by the quick digital change of the architectural and interior design industries. Inefficiencies are still experienced by professionals because of disjointed material databases, poor vendor connectivity, and laborious manual operations, even with advances in 3d rendering and modelling. ONE-S is a unified digital platform designed to address various problems by connecting real-time brand networks and market-available material data with interior design visualization. This study uses a mixed method approach, which combines process analysis of existing design techniques with survey-based validation from experts of the sectors. To determine the main issues with material sourcing, cost calculation and visualisation accuracy from the data gathered from architects, interior designer and 3d visualizers was analysed. so, there is a high need for a platform which centralized that combines material selection, real time visualization and vendor accessibility. A substantial amount of time and money can be saved by this platform. According to the study findings the professional communication can be improved by ONE-S. As a first step towards a more centralized, integrated and effective design environment this research lays the groundwork for creating the platforms MVP.

**Keywords:** Interior visualization; Material library; Cloud platform; Real-time design; Digital workflow.

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## Smart Warehousing

*Yash Dhure\* and Abhinandan Parishwad\*\**

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### ABSTRACT

This research aims to analyze and mitigate the inefficiencies in the warehousing systems, such as manual dependency, inventory mismanagement, and operational bottlenecks. Exploring these inefficiencies and examining how automation, technology can resolve and enhance performance and reliability, in creating a robust and reliable warehousing system. With the rapid evolution of Industry 4.0, this paper examines the technologies used in smart warehousing from the perspective of Industry 4.0, through a systematic review of existing operational systems, literature, and case studies. The study identifies critical gaps in warehouse performance related to process optimization, real-time tracking, and data-based decision making. This paper adopts bibliographical analysis as its primary methodology and proposes a conceptual framework for a smart warehouse ecosystem that leverages data and automation to reduce human errors, improve operations, and foster sustainability. Ultimately contributing to the development of a roadmap for transitioning from a traditional warehouse management system to a smart warehousing system under the paradigm of Industry 4.0.

**Keywords:** Industry 4.0; Warehousing system; Inefficiencies; Smart warehousing.

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## **Echoes of Tradition: A Green Blueprint in Rural Renaissance**

*Sneha Jain\**

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### **ABSTRACT**

Every minute, 25–30 villagers migrate to urban areas, seeking livelihood opportunities while unintentionally draining the socio-economic and cultural essence of India's villages. This rapid urban shift burdens cities and accelerates environmental challenges, contributing to a 1.32°C rise in global temperature. This project envisions transforming neglected rural communities into Smart-Eco Villages that act as carbon sinks while enhancing livelihoods. The goal is to achieve a 30% increase in rural income and a 20% reduction in local greenhouse gas emissions by 2030, aligning with India's Net-Zero 2070 mission and Panchamrit targets. Villages will be assessed through a comprehensive Smart-Eco-Village Matrix, integrating social, economic, and environmental parameters. These insights will guide sustainable strategies leveraging the carbon-credit mechanism to restore balance between rural and urban economies. A dedicated Measuring, Reporting, and Verification (MRV) tool will ensure transparency and track impact, fostering rural empowerment, climate resilience, and the revival of India's cultural and environmental heritage.

**Keywords:** Self-sustaining; Eco-Villages; Migration; Circular economy.

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## **Transforming Spaces, Restoring Balance: Redefining Green Construction through CCSU and Lifecycle Innovation**

*Disha Dinesha\*, Snighda Thakur\*\* and Priyam Desai\*\*\**

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### **ABSTRACT**

The construction sector faces the dual challenge of meeting performance demands while minimizing its environmental footprint. This study investigates the convergence of sustainable material innovation and carbon capture, storage, and utilization (CCSU) strategies to develop scalable solutions for green construction. It focuses on creating advanced composite materials that enhance durability, carbon performance, and lifecycle efficiency while reducing embodied carbon and supporting circular economy principles. The concept is further translated into a functional building installation that showcases the practical application of these ideas in real-world construction. This installation is aimed to make the building breathable. Additionally, the study explores the integration of CCSU within construction ecosystems through carbon-sequestering materials and design methods aimed at minimizing operational emissions. The paper aims to present a framework that balances cost-effectiveness, structural performance, and environmental responsibility, demonstrating how material and design innovations aligned with CCSU can collectively transform the construction industry toward a more sustainable, efficient, and high-performance future.

**Keywords:** Carbon capture storage and utilization (CCSU); Embodied carbon; Circular economy; Lifecycle efficiency.

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## **Transforming Vacant Urban Spaces through Tech-enabled Rental and Facility Management: An Entrepreneurial Case of StayPlus India**

*Pushpendra Singh\*, Rishabh Chhabra\*\* and Sagar Tumpal\*\*\**

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### **ABSTRACT**

India's urban housing landscape faces a persistent paradox—millions of homes remain vacant while a large segment of the population struggles to find affordable, well-managed rental options. This study examines StayPlus India, a tech-enabled entrepreneurial venture conceptualized to bridge this gap by transforming vacant properties into efficiently managed rental assets. The research aims to explore how technology and facility management can be integrated to enhance property utilization and create sustainable rental ecosystems. An exploratory approach was adopted, combining secondary data from real estate reports with digital surveys of property owners and tenants in Tier 1 and Tier 2 cities. The findings highlight that trust deficits, maintenance issues, and fragmented management practices are key barriers to effective property utilization. The study demonstrates that a digital platform offering preventive maintenance, verified tenancy, and guaranteed income can help overcome these challenges. The research concludes that the convergence of facility management principles and Prop Tech innovation presents a scalable solution for revitalizing India's underutilized housing stock and fostering responsible urban development.

**Keywords:** Prop Tech; Facility management; Entrepreneurship; Vacant properties; Urban housing.

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## **Enhancing Consumer Health Awareness through AI-driven Food Label Analysis: A Study of the Know Your Food mobile application Project**

*Yug Pandar\**

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### **ABSTRACT**

The increase in consumption of packaged foods in India has raised serious concerns regarding nutritional quality and consumer health awareness. Many consumers struggle to interpret complex food labels, leading to uninformed dietary choices and increased risk of lifestyle-related diseases. The project Know Your Food addresses this challenge by developing an AI-driven mobile application that enables users to scan packaged food labels and receive instant, simplified health insights. The proposed solution uses Optical Character Recognition and image processing techniques to extract ingredients and nutritional information from packaged food. The project follows the design thinking methodology, agile and lean startup principles to guide problem exploration, prototype development, and user validation. A functional prototype was developed using various technological tools and testing was conducted with a group of user participants demonstrated encouraging results, clarity of information, and overall satisfaction and usability. Participant feedback highlighted the need for faster scanning performance and broader packaged food database coverage as key areas for enhancement. The results validate the effectiveness of AI-driven food label analysis in improving food transparency and empowering consumers. The study establishes a strong foundation for a scalable health-technology solution that combines artificial intelligence, nutrition awareness, and consumer-centric design within the Indian market context.

**Keywords:** Nutritional awareness; Artificial Intelligence; Packaged food analysis; Optical character recognition.

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## **Discover India: Innovative Travel for Every Journey – Identifying Tourism Opportunities in India**

*Tejas Shewale\*, Vaibhavee Kavthalkar\*\*, Abhishek Gupta\*\*\* and Yuvraj Patil\*\*\*\**

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### **ABSTRACT**

The tourism sector in India offers vast opportunities for innovation, yet solo travellers, students, and backpackers continue to face challenges related to affordability, safety, and accessibility. Discover India: Innovative Travel for Every Journey aims to bridge this gap by developing an integrated travel platform that promotes community-based and experience-driven tourism. The project introduces the concept of “Backpacker Pooling,” inspired by carpooling, enabling travellers with similar destinations and interests to share trips, reduce costs, and enhance safety. Targeting youth and educational institutions, the platform connects travellers to verified accommodations, local guides, and curated itineraries while supporting sustainable tourism practices. Market research and MVP validation conducted in Maharashtra revealed that 80% of respondents are open to shared travel models, with 70% prioritizing safety and reliability. By empowering local communities, promoting lesser-known destinations, and supporting small-scale tourism enterprises, Discover India aligns with India’s Atmanirbhar Bharat vision. The project aspires to redefine domestic travel by making it more affordable, safe, and socially engaging, contributing to the growth of an inclusive and sustainable tourism ecosystem.

**Keywords:** Tourism innovation; Community-based travel; Backpacker pooling; Sustainable tourism; Travel entrepreneur.

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## **InspAIre- AI in Defect Detection & Repair**

*Janhavi Naik\**

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### **ABSTRACT**

For many years the construction industry has struggled with the persistent problems like poor quality control, cost overruns and delays. Rework, inadequate supervision and improper inspection techniques are the frequent causes of these issues. Additionally, it is found by smaller contractors that obtaining professional advice is challenging due to the high cost of advisory services. InspAIre is proposed as an AI based framework to assist contractors and engineers in effectively identifying and addressing building issues. The concept Involves data collection from construction sites, utilizing image-based learning to identify typical issues such as surface imperfections and fissures. Site engineers can capture and upload defect images via a user-friendly mobile interface to the InspAIre web platform where the images are analyzed and faults are classified. The integrated AI then suggest appropriate repair techniques and materials based on relevant IS regulations. A quicker and less expensive substitute for conventional consulting is provided by InspAIre through the fusion of intelligent analysis with the field data. The framework aims to improve quality management consistency, reduce rework and enhance design on job sites and ultimately providing a scalable approach to sustainable, effective and transparent building methods.

**Keywords:** Artificial Intelligence; Construction defect detection; Quality management; Digital consultancy.

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## **Redefining Waste: Entrepreneurship and Innovation in Sustainable Plastic Recycling**

*Rushikesh Wagh\* and Mohit Kadam\*\**

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### **ABSTRACT**

The PlastiX Project is a great initiative for sustainability which aims to waste plastics into high-value, functional products through scientific innovation and entrepreneurship. Instead of considering all plastic waste as a single stream, PlastiX sets aside and treats each type of plastic in a manner dictated by its chemical and structural properties to get the best performance and reuse. By maximising recycling and material formulation techniques, the project can produce these separated plastics into different products like tiles for walls and floors, modular furniture, and architectural facades that are all durable, fire-resistant, and attractive. Each product has high strength, resistance to weather, and flexibility in design, thus it complies with both functional and sustainability requirements. The PlastiX project, through the methods of market research, prototyping, and customer feedback, has proven that it has a large-scale adoption potential. The decentralized manufacturing system not only helps in reducing pollution but also contributes to the creation of local jobs and businesses, especially in the countryside. By combining scientific recycling innovation with social entrepreneurship and the principles of the circular economy, PlastiX provides a scalable route to the development of sustainable materials, conservation of the environment, and green growth that is inclusive.

**Keywords:** Waste plastic recycling; Circular economy; Social and green entrepreneurship; Environmental entrepreneurship.

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## **Quick Build: A Modular and Reusable Site Office Framework for Rapid Mobilization**

*Vaibhav Gajera\*, C. A. Jassena\*\*, Mir Atfan Abbas\*\*\* and Sanjay Bhojar\*\*\*\**

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### **ABSTRACT**

The construction sector is often derailed and less productive due to lack of proper infrastructure on site including poorly organized and inefficient site offices. Traditional setup normally includes high fabrication and integration costs structural elements that require crane assistance has low flexibility with relocatability and reuse. There is also a lack of comfortable and ergonomically designed settings which can detrimentally affect the effective coordination of work. The initiative of Quick Build, is focused on a modular, lightweight and re-locatable site office framework, using rapid assembly to address challenges of constrained space, rapid mobilization and reusability. The principles are few, lightweight construction thermal efficiency and structural durability with rapid deployability. Methodology for forms did involve market assessment of existing temporary infrastructure, conceptual and structural design development, material assessment of thermal and load performance, prototype modeling. Under the proposed solution we are able to improve site-level coordination and encourage sustainability by practicing reuse and material efficiency. The objectives of the project include to determine whether Quick Build will provide a viable model to enhanced functional and environmental performance for a future ready short term, temporary site infrastructure.

**Keywords:** Site office design; Rapid mobilization; Reusability; Modular; Prototype modelling.

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## **AI-driven Construction Monitoring with InfraGuard AI**

*Jayesh Chavan\*, Shubham Rathod\*\* and Aniket Harkal\*\*\**

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### **ABSTRACT**

The construction industry faces ongoing challenges related to safety, compliance, and real-time monitoring. Conventional surveillance methods relying on human supervision are prone to fatigue, inaccuracy, and limited coverage, making them inadequate for modern construction environments. This paper introduces InfraGuard AI, an artificial intelligence-driven monitoring system that leverages computer vision, deep learning, and real-time video analytics to automate site surveillance and enhance safety management. Built using YOLOv5, PyTorch, and OpenCV, the system integrates with existing CCTV infrastructure to detect PPE violations, unsafe behaviors, and unauthorized entries, generating instant alerts and automated reports aligned with ISO 45001 standards. A pilot deployment on an active construction site demonstrated significant improvements: incident response time reduced by over 70%, PPE compliance increased by 20%, and manual monitoring efforts were cut by 50%. InfraGuard AI's predictive analytics and smart dashboard provide actionable insights for supervisors and safety officers, promoting proactive risk management. The system offers scalability, cost efficiency, and enhanced accountability across diverse project types. Future developments will integrate thermal imaging, LiDAR sensors, and cloud-based analytics for improved hazard detection and multi-site control, making InfraGuard AI a transformative solution for safer and smarter construction monitoring.

**Keywords:** Artificial Intelligence; Computer Vision; Construction safety; Real-time monitoring; InfraGuard AI.

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## **Dynamic Facade: Redefining Architecture with Kinetic Motion**

*Prajwal Shende\* and Vipul Mendhekar\*\**

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### **ABSTRACT**

The facade of a building is the principal interface between the inside spaces and the outside world and it has a direct effect on thermal comfort, daylight, ventilation, and energy performance. In dry and hot climatic zones like Ahmedabad, Rajasthan, Arizona, and the Middle Eastern parts—where much higher temperatures, intense solar radiation, and low humidity are common—facade configuration becomes highly important. This research investigates a kinetic facade system that responds to environmental conditions to minimize heat gain, optimize ventilation, and restrict dependency on mechanical cooling. With the use of parametric design software and physical model prototyping, the research discusses how the moving parts fold, unfold, expand, or contract based on sunlight and climatic changes. Every module varies its angle to manipulate transparency and shading to maximize comfort and energy efficiency. Lightweight panels provide effortless installation on current structures while providing solar energy potential. The research intends to develop a design and performance framework that leads architects towards responsive, sustainable facades that minimize carbon footprints, improve occupant comfort, and facilitate climate-responsive architecture in hot, arid climates.

**Keywords:** Kinetic facade; Responsive architecture; Hot and dry climate; Thermal comfort; Parametric design.

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## **Development of GIS based Site Selection Tool**

*Prathamesh Ade\*, Aayush Kothari\*\*,  
Aishwarya Nagaraj\*\*\* and Mihir Sengupta\*\*\*\**

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### **ABSTRACT**

This project offers a GIS-based sustainable site selection decision support tool to help agencies, urban developers and planners to find the most suitable location for construction and evaluate accordingly. It creates a simple user-friendly interface for data-driven decision making by incorporating sustainability criteria such as environmental effect, land use, land degradation etc. along with soil properties like bearing capacity, moisture content, permeability etc. into GIS. The approach uses Multi Criteria Decision Analysis (MCDA) techniques to analyse and rank sites based on various factors obtained by combining soil parameters with Sustainability criteria. It is planned to be designed as a standalone system that facilitates efficient and transparent planning by enabling users to define weightages and generate visual, map-based results. By bridging the gap between sustainability and spatial evaluation, the approach aims to help professionals in effective site selection. With India's growing GIS market along with increasing demand for sustainable urban development, this system provides an innovative, cost effective, automated solution to promote data backed, environmentally responsible and efficient land use decisions.

**Keywords:** GIS; Site selection; Urban planning; Spatial analysis; Sustainability.

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## **Rice Husk in Engineered Wood Panels: An Analysis of Materials, Manufacturing, Performance and Market Viability**

*Shridhar Kumbhar\**, *Keshar Lawane\*\**,  
*Aashish Bhalerao\*\*\** and *Aditya Shahare\*\*\*\**

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### **ABSTRACT**

The global push for sustainable materials has turned agricultural waste into valuable industrial resources. Among these, rice husk, the protective outer layer of rice grains, has become a promising ingredient for eco-friendly engineered wood panels. This report examines the potential of rice husk composites by looking at their properties, production processes, and market performance compared to traditional plywood. Rice husk has a high silica content, which gives it natural resistance to moisture, fire, and pests while addressing key weaknesses of wood-based materials. However, this same silica creates challenges in manufacturing, such as increased wear on equipment and poor bonding with polymer matrices. Ongoing improvements in pre-treatment and interface modification are helping to solve these problems. While rice husk composites may not always equal plywood in strength, they are quite durable, especially in humid or harsh conditions. New developments in bio-based binders and processing methods have broadened their applications. They now include high-quality natural fiber composites for decking and cladding, along with affordable particleboards and insulation materials. Ongoing research and increasing market adoption are turning rice husk from a simple agricultural byproduct into a high-performance, sustainable material. This supports a new era of green construction and manufacturing solutions.

**Keywords:** Rice husk composite; Engineered wood; Natural fiber composites; Bio-based binders.

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## **BEP- BIM Execution Plan**

*Akanksha Mahale\*, Onkar Jagtap\*\*, Harshit Joshi\*\*\* and Sagar Malsane\*\*\*\**

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### **ABSTRACT**

In today's evolving construction environment, the Building Information Modeling Execution Plan (BEP) has emerged as a vital instrument for ensuring effective collaboration, data consistency, and process transparency across multidisciplinary project teams. A well-structured BEP defines clear roles, responsibilities, workflows, and standards that guide stakeholders throughout the BIM lifecycle. However, the current industry landscape reveals a significant variation in how organizations develop and implement BEPs, often resulting in communication gaps and inefficiencies in project execution. This study aims to critically analyze the importance of BEP in enhancing coordination and decision-making within BIM-enabled projects. It further explores how global leaders such as Autodesk, Trimble, and Bentley establish BEP frameworks to achieve seamless integration between modeling, scheduling, and project management. Through a combination of literature review, practitioner interviews, and case-based analysis, this research identifies key components, challenges, and opportunities in BEP adoption. The findings contribute to developing a structured and adaptable BEP framework tailored for the Indian construction industry, promoting improved collaboration, reduced project risks, and higher BIM maturity across organizations.

**Keywords:** BIM execution plan; Automations; Construction industry.

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## **ASK BuildEase: Digitizing the Construction Material Supply Chain for a Seamless Procurement Experience**

*Krushna Gadewar\*, Abhay Malpani\*\* and Sanskar Baheti\*\*\**

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### **ABSTRACT**

Title: ASK BuildEase: Digitizing the Construction Material Supply Chain for a Seamless Procurement Experience India's construction industry, valued at over USD 700 billion, faces persistent inefficiencies in procurement due to fragmented vendor networks and manual coordination (KPMG, 2023). ASK BuildEase is a digital marketplace designed to simplify this process by directly connecting contractors, suppliers, and customers through a unified B2B/B2C platform. The startup aims to enhance transparency, price competitiveness, and reliability in material sourcing while supporting small and mid-scale contractors who form the backbone of India's construction ecosystem (NITI Aayog, 2022). This study adopts a mixed-method approach involving market surveys and competitive benchmarking to evaluate the feasibility and adoption potential of BuildEase. Findings highlight that over 80 percent of respondents preferred digital procurement for time and cost efficiency (Deloitte, 2024). BuildEase's model integrates verified supplier listings, digital payments, logistics tracking, and AI-based analytics for demand forecasting. The initiative aligns with national programs such as Digital India and Make in India (MoHUA, 2023). The study concludes that startups like ASK BuildEase can significantly modernize India's construction supply chain by leveraging technology, trust, and transparency, ultimately improving efficiency and sustainability.

**Keywords:** Construction supply chain; Digital marketplace; Startup innovation; Procurement; BuildEase.

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## **Bridging the Gap Between Homeowners and Contractors: The BuildMatch Approach**

*Saahil Manojkumar Singh\*, Kalpit Karnat\*\*,  
Sahil Patil\*\*\* and Milind Phadtare\*\*\*\**

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### **ABSTRACT**

The construction industry in India remains largely fragmented, with homeowners and small developers facing persistent challenges in identifying reliable contractors, managing contracts, and ensuring project transparency. BuildMatch is a digital platform designed to bridge this gap by connecting clients with verified local contractors while offering integrated project management and consultancy services. The platform introduces a rating and verification system based on BuildMatch's proprietary evaluation model, ensuring accountability and quality control from the initial contractor selection to project completion. In its first phase, BuildMatch focuses on design consultancy, project supervision, and contract management, incorporating features such as escrow-based payment handling, real-time supervision, and guided contractor selection via expert consultation. By centralizing these services, BuildMatch aims to formalize the unorganized sector of small and mid-scale construction, fostering trust, efficiency, and digital adoption within India's real estate ecosystem. The paper discusses the platform's design framework, operational model, and scalability potential, highlighting its role in transforming how construction projects are sourced, managed, and delivered.

**Keywords:** Construction management; Contractor selection; Digital platform; Project supervision; BuildMatch.

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## From Concept to Market - Studio Peace

*Kanika Agarwal\**, *Karanveer Dhawan\*\** and *Rashie Bothra\*\*\**

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### ABSTRACT

Studio Peace is a design-led startup that aims to redefine the modern Indian interior design experience through intentionality and visualization-driven solutions. The venture was conceptualized to bridge the gap between designers and clients by providing clarity, accessibility, and trust in the design process. The project follows the Innovation and Entrepreneurship Venture (IEV) framework, employing methods such as market research, customer discovery, competitor benchmarking, and prototype brand testing through digital platforms. The findings reveal a strong market opportunity among young, urban professionals seeking affordable yet personalized design services that align with contemporary Indian aesthetics. Early engagement metrics validate the brand's positioning as calm, educational, and aspirational, indicating potential for scalable growth. The study highlights how visualization can serve as both a communication and business development tool in the creative industry. Overall, Studio Peace represents a model for building a purpose-driven, digitally enabled interior design venture capable of adapting to evolving consumer behavior and market dynamics.

**Keywords:** Interior design; Entrepreneurship; Brand development; Visualization; Digital business.

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## **ProcureX - for Construction Materials: Hyperlocal Delivery with Real-Time Tracking**

*Gaurav Dahibaokar\* and Shikhar Vala\*\**

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### **ABSTRACT**

India's government is pushing hard for digital upgrades in the construction world through programs like PM Gati Shakti, the Smart Cities Mission, and Digital India—complete with perks from AMRUT 2.0 and the National Infrastructure Pipeline. The goal? To fix messy supply chains, cut down on those frustrating procurement hold-ups that drain ₹88,500-1,32,800 crore every year, clear up shady pricing, and meet the growing call for green materials in what's shaping up to be a ₹1.07 lakh crore industry by 2025. For small and mid-sized businesses in Maharashtra—handling 40% of the action—B2B platforms like these are a gamechanger, rolling out local sourcing, smart AI for logistics, and easy financing to make sustainable buying a reality. The feasibility study on ProcureX (also known as QuickMart), an AI-powered tool for grabbing building supplies, aims to improve eco-friendliness, sharpen resource use in city builds, and reduce outdated dependencies. We'll explore features like filters for low-carbon items, building on real-world tests conducted with 75 users in Q3 2025, which showed 70% faster cycles and 22% cheaper deals. You can anticipate a combination of hands-on trials in Maharashtra, conversations with more than 200 people, and MVP number-crunching.

**Keywords:** Procurement; Construction; AI-driven; Hyperlocal logistics.

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## **Start-up for MSME Unit – Cow Dung Paint Manufacturing Plant**

*Anurup Killedar\*, Bhushan Patil\*\*, Sawan Nalawade\*\*\* and Piyush Chandak\*\*\*\**

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### **ABSTRACT**

This paper presents a comprehensive study on the establishment of Sattva Paints, an eco-friendly cow dung-based paint manufacturing venture located in Kolhapur, Maharashtra. The initiative aims to provide a sustainable, non-toxic, and affordable alternative to conventional synthetic paints while promoting rural entrepreneurship and environmental conservation. The research integrates market analysis, product development, and financial evaluation to assess the feasibility and scalability of Vedic Prakritik Paints in India's growing ₹70,000-crore paint industry. Two variants—distemper and emulsion—were developed using natural raw materials such as cow dung, lime, and mineral pigments, resulting in a Bureau of Indian Standards-certified product with antimicrobial, antifungal, and heat-resistant properties. The findings reveal that eco-paints can reduce production costs by nearly 40% compared to chemical alternatives, achieve a break-even within 18 months, and generate rural employment through MSME and PMEGP schemes. This venture demonstrates the potential of circular-economy models in transforming agricultural waste into high-value green products, aligning with India's sustainable development and make in India initiatives.

**Keywords:** Eco-friendly paint sustainable construction; Cow dung utilization; Rural entrepreneurship.

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## About the Editors



**Dr. Sushma Shekhar Kulkarni** stands as a transformative force in academia, leading NICMAR University as Vice Chancellor while steering the Global Engineering Deans Council. With a distinguished academic pedigree spanning doctoral, postgraduate and undergraduate qualifications in Civil Engineering, her visionary governance has shaped higher education for nearly four decades. An internationally recognized expert in Concrete Technology and Educational Transformation, her research legacy includes 155+ publications, two patents, and mentorship of 12 Ph.D. candidates. Global thought leadership is evidenced through 140+ keynote addresses at premier forums including IUCEE, IFEEs, and GEDC, while editorial contributions enhance academia through JEET (Scopus-indexed) and the Journal of Real Estate, Construction and Management. Honoured with 35+ prestigious accolades including the Duncan Fraser Global Award and ISTE's Best Engineering College Principal recognition, she serves as Fellow of IEI, Promoter of IUCEE Foundation, and Lifetime Member of ISTE/ISTD - continuing to pioneer advancements in engineering education worldwide.



**Dr. Agarwal Anil**, a paragon of construction management intellect, has been the architect of NICMAR University Pune's rise to university status as its Dean of Academics. Celebrated with dual Teaching Excellence Awards, his mastery spans curriculum innovations, BIS standards reforms, and corporate training for industry giants. His scholarly contributions, including 60+ publications and pivotal roles in national committees, position him among India's leading authorities in the Construction Quality and Project Management domain.



**Dr. Harish Singla** holds a bachelor's degree in Commerce and Masters in Business Administration (Finance). Having spent more than 25 years in academia and he has served in various prestigious institutes in the past. His core teaching interest lies in Accounting and Finance. He has published more 30 research papers in ABDC and Scopus Indexed journals. His current research interest lies in dealing with behaviour issues in investing and finance, management of intellectual capital and intangible resources and various behavioural issues in construction management. He is currently dean and professor of NICMAR School of business (NBS).



**Dr. Devang Desai** is a Mechanical Engineer from NIT, Surat and has postgraduate and doctorate degree in Marketing Management. He has more than 25 years of experience in corporates and academics. His teaching & research interest includes Marketing Management, Business Development & Project Marketing, Strategic Management, Human Resource Management, and Entrepreneurship & Innovation Management. He is currently dean and Senior Associate professor of School of Project Management.



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