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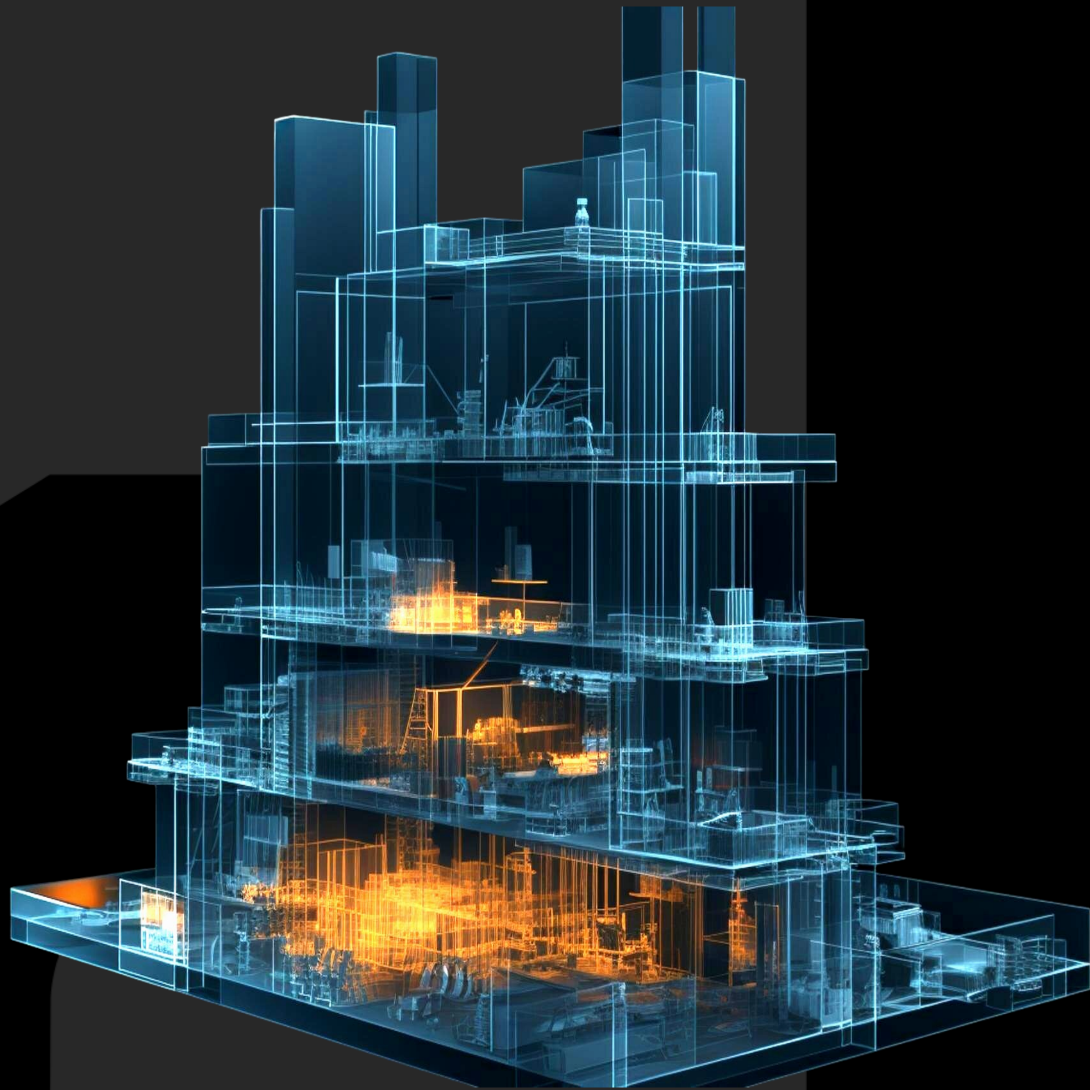
ADVANCING KNOWLEDGE FOR SUSTAINABILITY

Strategic Value and Return on Investment of BIM

for India



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Executive Summary

BIM as a strategic enabler for India's infrastructure transformation towards Viksit Bharat 2047

As India advances toward its ambitious goal of becoming a developed economy by 2047—"*Viksit Bharat*", infrastructure is the decisive lever for structural economic transformation. With GDP projected to reach USD 26 trillion (almost 13 times the current level) by mid-century, infrastructure will underpin productivity gains, enable urbanisation at scale, and anchor inclusive and sustainable growth. Delivering this vision demands a paradigm shift—**not just in *what* is built, but in *how* it is conceptualised, delivered, and governed**.

Building Information Modeling (BIM) has emerged as a cornerstone of this transformation. Initially adopted as a tool for 3D design, BIM has matured into a comprehensive platform for digital engineering—integrating design, execution, and operations across the asset lifecycle. It serves as a strategic capability to bridge India's infrastructure ambition with the delivery imperative: reducing delays, mitigating cost overruns, improving environmental performance, and enabling predictive asset management.

The empirical evidence is compelling. BIM has delivered up to **43% improvements in productivity**, **256 days in schedule acceleration**, and **millions of dollars in lifecycle cost savings** across water, energy, roads, railways, and airport projects. Its integration with geospatial analytics, IoT, and artificial intelligence is already catalysing the transition toward **Digital Twins**—dynamic, data-driven infrastructure models that simulate real-world behaviour and optimize performance in real time. This evolution from static assets to intelligent systems marks a strategic inflection point in India's infrastructure delivery model.

However, India's BIM adoption remains fragmented, driven largely by project-specific mandates and limited to high-value central government projects. To unlock the systemic value of digital infrastructure, India must institutionalize BIM through a national mandate and accelerate its convergence with Digital Twin capabilities.

As global benchmarks—from Singapore to the UK—illustrate, national-level policy frameworks are critical for scaling adoption, ensuring interoperability, and embedding digital maturity across the public and private sectors. For India, this calls for a threefold strategic response:

- **Mandating BIM for all infrastructure projects above a defined threshold**—public and private;
- **Developing a Digital Twin roadmap** as a continuum of BIM maturity.
- **Creating a federated, interoperable Common Data Environment (CDE)** to unify data governance, drive lifecycle efficiency, and enable intelligent infrastructure.

The path to Viksit Bharat 2047 demands infrastructure that is not only bigger and faster but also smarter, greener, and future-ready. BIM is no longer optional—it is **mission-critical.** And the time to act is now. Scaling BIM through policy, partnerships, and platforms will not only accelerate project execution but also shift India's infrastructure value chain upward—from engineering to intelligence, and from physical delivery to digital governance.

BIM-driven infrastructure transformation:
Unlocking cost savings, productivity gains, and project acceleration

INR 111.93 cr

Cost savings per road project

Enabled by BIM-led construction sequencing, real-time monitoring, and material efficiency—leading to a **32.6%** design duration reduction and a **36.5%** productivity gain.

256 days

Saved in water infrastructure projects

BIM accelerates design and construction through clash detection, simulation tools, and seamless MEP integration, translating into significant schedule compression.

INR 34.38 cr

Saved per energy project

Achieved via reduced rework, **24% cost savings, 30.75% productivity improvement, and predictive maintenance** enabled through digital twins.

INR 172.83 cr

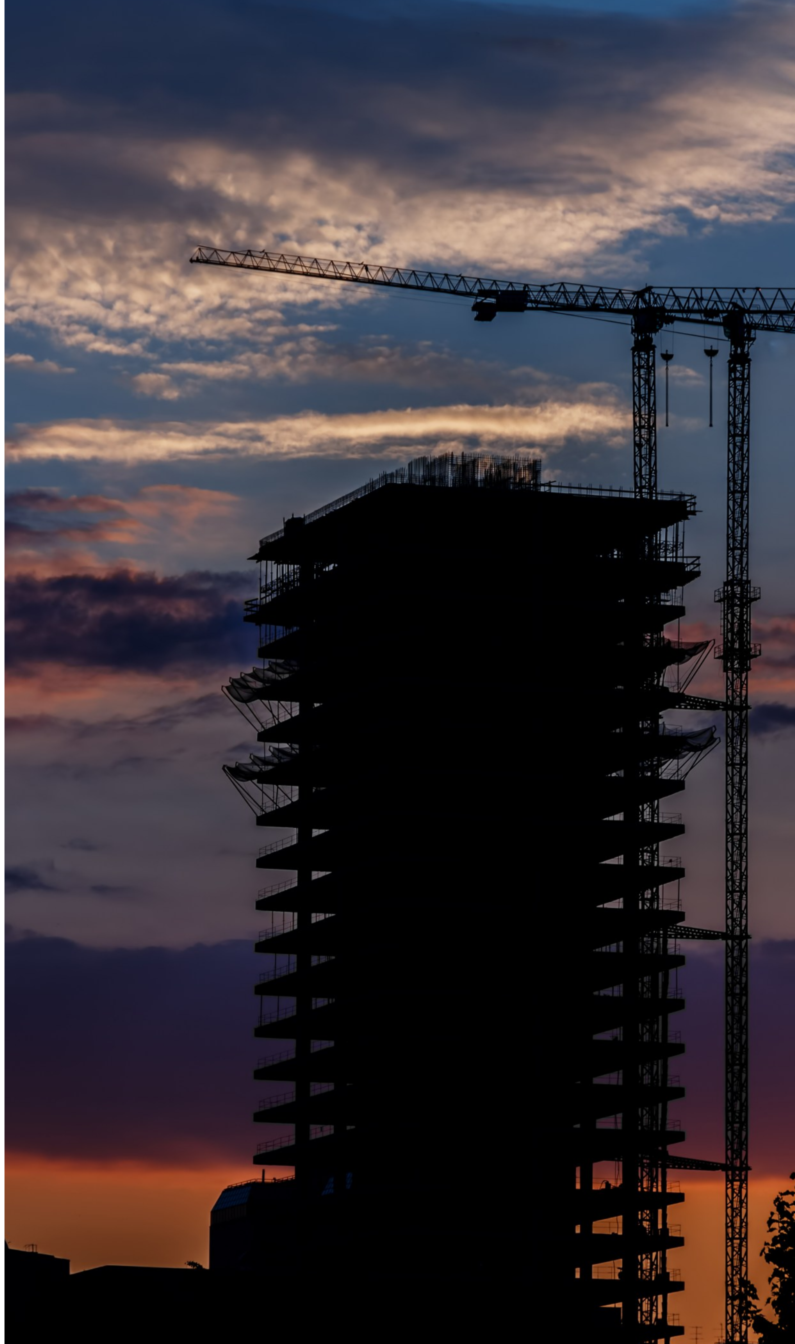
Saved in large-scale airport projects

Through 4D BIM and real-time IoT integration, enabling **30%** faster design, **35 days** of delivery acceleration, and enhanced lifecycle visibility.

560 hours

Workforce time saved in rail projects

BIM integration led to **80-day** construction savings**, 26%** productivity boost, and minimized disruptions through data-driven maintenance planning.



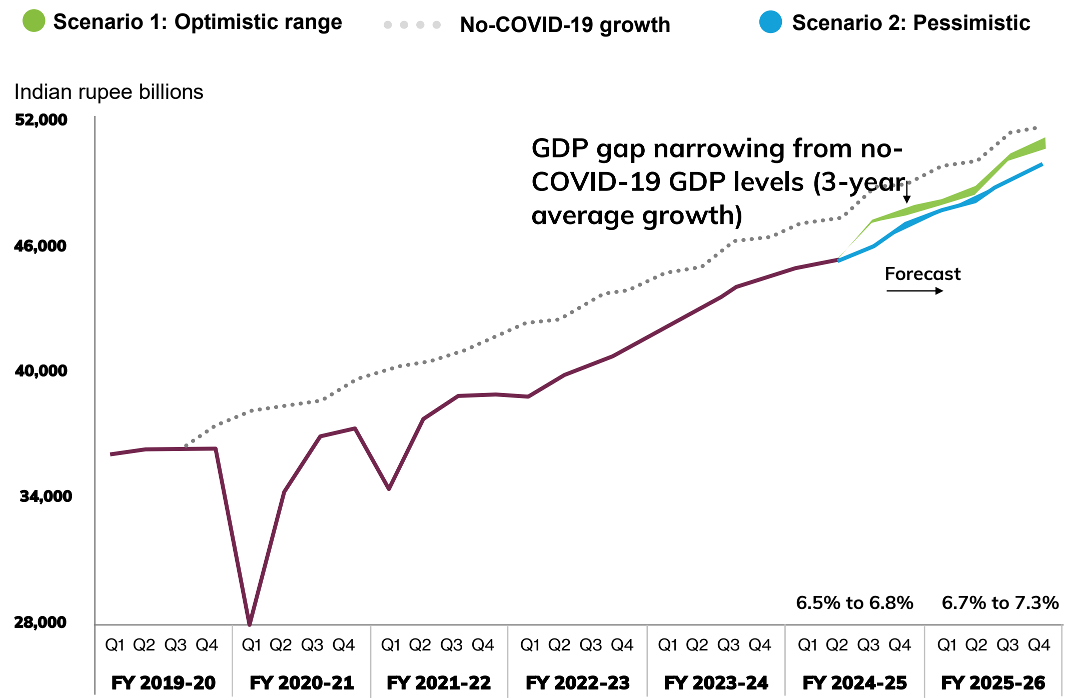
India's economic outlook: Resilient and expansive

India's economic outlook for 2025 remains strong, with projections indicating continued growth despite global challenges:

- **GDP growth:** The IMF forecasts India's GDP growth at 6.5% for FY25 and FY26, maintaining its position as the fastest-growing major economy.
- **Global position:** India is expected to become the world's fourth-largest economy in 2025, surpassing Japan with a projected GDP of USD4.34 trillion.
- **Growth drivers:** The economy's momentum is supported by robust private consumption, sustained macroeconomic stability, and ongoing public sector reforms.
- **Future outlook:** The IMF suggests that India's strong performance provides an opportunity for critical structural reforms to achieve its goal of becoming an advanced or a developed economy by 2047, overtaking Germany and France. This growth is forecasted to be driven by strong demographic advantages and aggressive infrastructure expansion.

India's growth remains strong, but modest global growth may dampen its economic outlook next year

Real GDP (seasonally adjusted, level values)



Source: IMF

Infrastructure and BIM: Enablers of Viksit Bharat

India's ambition to become a developed nation by 2047 (Viksit Bharat) hinges on a robust infrastructure push, driven by large-scale capital expenditure, sustainability, and technology integration.

Viksit Bharat@2047 represents the government of India's ambitious vision to transform the nation into a developed entity by the centenary of its independence in 2047. Encompassing diverse facets of development such as economic prosperity, social advancement, environmental sustainability, and effective governance. This vision underscores the critical juncture at which India currently stands. Realizing this vision demands unwavering dedication, a firm belief in India's destiny and a profound recognition of the vast potential talent and capabilities of its peopl, particularly the youth. With the largest demographic share, the youth are positioned as the vanguard in leading India towards recessive Bharat by 2047.

Key facts

INR 11.21 Lakh Cr

Allocated(3.1% of GDP), in alignment with the Viksit Bharat@2047 vision

<8%

Reduction of logistics cost from 13 - 14 %

49 INR Lakh Cr

FDI inflow doubled from ₹24.5 lakh crore (2005 - 2014)

INR 2.13 Lakh Cr

Allocated to ministry of road transport & highways

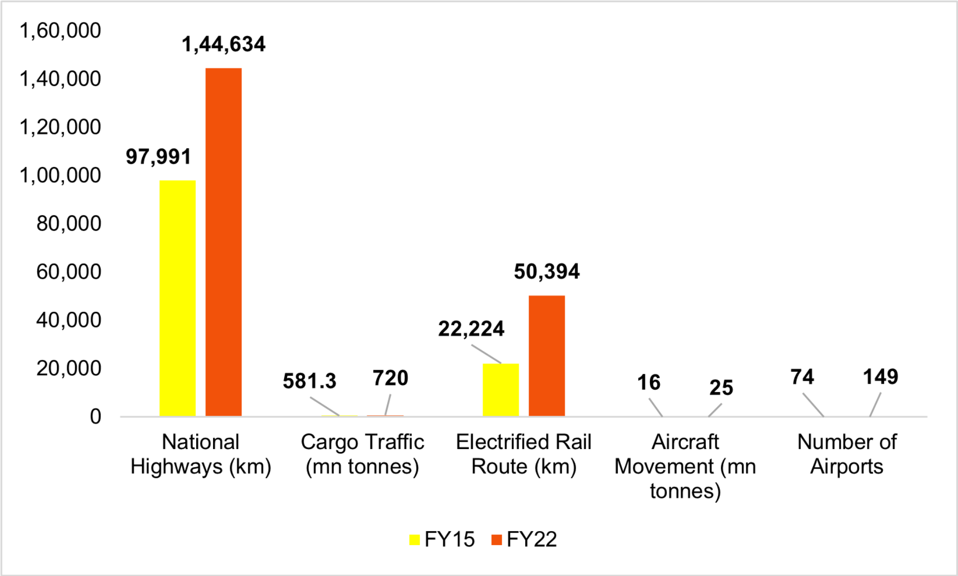
INR 2.03 Lakh Cr

Allocated to ministry of railways

Key developments

- **Real-time tracking** of infrastructure projects via **OCMS** and **PM Gati Shakti dashboards**.
- **ULIP** and **GIS-based portals** enhanced for **integrated infrastructure planning**.
- Expansion of **high-speed rail, expressways, metro rail, and logistics hubs** for multimodal connectivity.
- Support for **green hydrogen hubs** and **eco-friendly ships** to decarbonize maritime transport.
- Push for **inland waterway cruise tourism** and **rural road last-mile connectivity** under **PMGSY** and **Bharatmala**.
- Incentivization of **PM-eBus Sewa** to modernize public transport and cut emissions.
- **PM Gati Shakti**: Implementation of 3 major railway corridor programs aimed at reducing logistics costs and improving efficiency.
- **Urban Mobility**: Expansion of **metro rail and NaMo Bharat**.
- **Airport Development**: Both expansion of existing and development of new airports under **UDAN scheme**.
- **Port Infrastructure**: Projects related to **port connectivity, tourism infrastructure**, especially in **islands like Lakshadweep**.

Accelerated expansion of transport infrastructure (FY15–FY22)



BIM ROI in INDIA

- Increasing capital expenditure and digital push create fertile ground for BIM adoption across infrastructure verticals.
- BIM applications in railway corridors (PM Gati Shakti), smart cities, ports, airports, and highways provide clear ROI pathways in planning, construction, and O&M.
- Alignment with government vision (Viksit Bharat 2047, Amrit Kaal) signals long-term support for modern technologies like BIM.

Infrastructure: The foundation of India's growth ambition

Infrastructure in India is not merely a sectoral domain—it is a foundational pillar of the country's long-term economic transformation. As the nation advances toward its trillion-dollar economic aspirations, infrastructure serves as a critical enabler, underpinning productivity, competitiveness, and inclusive growth. From next-generation highways and high-speed rail corridors to integrated logistics ecosystems, smart urban centers, and digital infrastructure, India's infrastructure agenda is intrinsically linked to its broader vision of sustainable and equitable development.

Key highlights of India's infrastructure growth

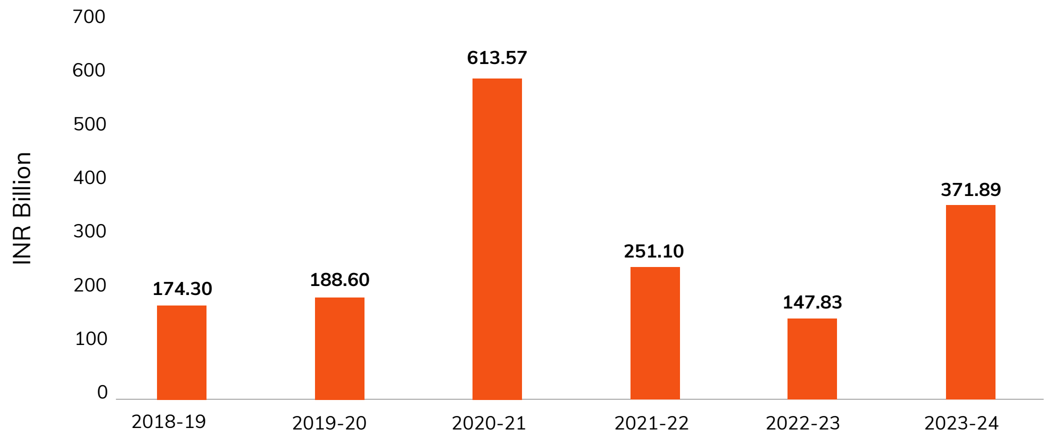
Infrastructure as a growth multiplier

- **High economic returns:** Each Indian rupee spent on infrastructure yields a return of ₹2.5 to ₹3.5 in GDP, highlighting strong multiplier effects.
- **Rising investment:** The Union Budget 2025-26 allocated ₹11.21 lakh crores pushing infra spending to 3.5% of GDP.
- **Capex surge:** Government infrastructure capital expenditure has grown 3.3 times since FY20.

Private sector and foreign direct investment (FDI) contributions

- Over US$100 billion in infrastructure-linked FDI since 2020, supported by initiatives like the National Investment and Infrastructure Fund (NIIF).
- Enhanced public-private partnerships (PPPs) through a three-year pipeline for PPP projects, fostering innovation, and efficiency in execution.

FDI Inflows in the construction and infrastructure sectors



Source: DPIIT

Flagship initiatives driving growth

Roads and highways

- **Bharatmala Pariyojana** targets 2 lakh-km by 2025; Phase I: 34,800 km, Phase II: 8,500 km with **INR 1.2 lakh crore.**
- **INR 30,000 crore** set for rural roads to boost connectivity and logistics.
- Delhi-Mumbai Expressway nears completion; **22 greenfield expressways planned**.

Railways

- India's rail infrastructure is expanding with metro growth and a goal of **100% electrification by 2030**.
- Over **INR 1 lakh crore** is invested in modernization focused on decarbonization, safety, and logistics efficiency.
- **44,488 km of projects** underway, **12,045 km commissioned** by March 2024.

Energy

- A major portion of **INR 111 lakh crore** in the **National Infrastructure Pipeline** is allocated to power infrastructure.
- India aims to raise non-fossil fuel energy sources from **42% to 64%** by 2030.
- Focus is on improving generation, transmission, and distribution systems to meet growing energy needs and sustainability goals.

Water Infrastructure

- The **Jal Jeevan Mission (JJM)** focuses on providing tap water connections to rural households with continued funding.
- The **National Infrastructure Pipeline (NIP)** includes water projects as part of its **USD 1.8 trillion** target by 2025.
- Projects like the **Ken-Betwa River Linking** aim to enhance water availability for drinking and irrigation.

Airports

- **UDAN** operates on 619 routes, connecting 88 airports, including 13 heliports and 2 water aerodromes by 2025.
- The government aims to increase airports from 140 in 2022 to 220 by 2025.
- The 2025-26 Budget allocates **INR 70,000 crore** for airport modernization, with a target of 120 new destinations by 2035.

Strategic Impact

Infrastructure development is not just about physical assets - it is a driver of:

- Logistics efficiency and reduced business costs.
- Urban transformation and rural connectivity.
- Growth in ancillary sectors such as cement, steel, energy, and IT.

As India accelerates toward its **USD 5 trillion** economy goal by 2025 and its **USD 26 trillion** vision by 2047, infrastructure remains the backbone of its growth story - enhancing productivity, inclusiveness, and sustainability across sectors.

Enabled with technology: Driving efficiency and sustainability

India is witnessing a paradigm shift in infrastructure development, underpinned by the accelerated adoption of advanced digital technologies. The government's focus on digitization, particularly through building information modelling (BIM) and the emerging deployment of digital twins, is redefining how infrastructure is planned, executed, and managed.

01 Government-led digital integration

National initiatives such as **PM Gati Shakti** reflect a systems-level approach to infrastructure digitization. The program aims to establish a comprehensive digital platform integrating transport, logistics, and utilities infrastructure signifying a policy shift toward data-driven governance, inter-agency coordination, and transparent land and infrastructure management.

INR 10 lakh cr
asset monetization pipeline

100%
Targeted digitization of land records by 2026

INR 5000 cr
Investment in geospatial data digitization

02 BIM as a foundation for smart infrastructure

BIM has evolved as a cornerstone technology in India's digital infrastructure roadmap. By enabling integrated project visualization, lifecycle cost optimization, and collaborative design, BIM is driving significant improvements in execution efficiency and sustainability. Further, BIM represents a strategic asset—not only enabling cost control, but also driving environmental performance, enhancing asset lifecycle management, and supporting long-term value creation.

39 months
project delay reduction

38%
carbon emission cuts

20%
maintenance cost reduction

30%
construction cost Savings

10%
lower water usage

03 Digital twin: the next frontier

India is beginning to adopt Digital Twin technology, advanced virtual replicas of physical infrastructure that are continuously updated with real-time data. These digital models enable predictive maintenance, risk simulation, and performance optimization at scale. Though still in the early stages of implementation, Digital Twins are gaining momentum in areas like urban planning, smart cities, and key infrastructure corridors. They complement Building Information Modeling (BIM) by extending value beyond construction into asset operation and management.

Globally, the market for digital twins in the buildings sector was valued at **USD 1.61 billion** in 2023 and is projected to grow at a robust annual rate of 32.6%, reaching **USD 20.38 billion** by 2032. Their impact is substantial, Digital Twins can reduce a building's carbon emissions by up to **50%** and improve operational and maintenance efficiency by **35%**, driving smarter and more sustainable building management.

USD 1.61 bn
digital twin market in 2023

35%
boost operational and maintenance efficiency

50%
carbon emission cuts

04 Economic and employment implications

The impact of BIM and digital twin adoption goes beyond technical efficiency, these technologies are expected to drive significant economic and social benefits. Projected cost savings and productivity gains could generate over **6.5 million jobs**, primarily through reinvestment in new infrastructure development. This digital shift has the potential to foster inclusive economic growth and enhance service delivery across both urban and rural areas.

In the Asia-Pacific region, women currently represent only **8.7%** of total employment in the infrastructure sector. However, the integration of digital technologies can help improve gender diversity. In fact, two-thirds of businesses believe there are more women in their workforce today compared to five years ago. Companies that have adopted more technology were **22%** more likely to report an increase in female participation over that period.

8.7%
current women infrastructure workforce

6.5 mn
projected job creation

22%
projected increase in female participation

Evolution of BIM in India

BIM in India has evolved from initial resistance to mainstream adoption. Introduced in the late 2000s, it faced challenges like high costs, limited expertise, and reliance on traditional methods. However, the rise of complex projects and global players accelerated its use. Public sector initiatives, such as MAHA Metro in Nagpur, led early adoption with 5D BIM for cost and construction management. Now backed by government mandates, BIM is widely recognized for reducing delays, lowering costs, and enhancing lifecycle management—driving efficiency and sustainability in India's infrastructure sector.

The shift from CAD to BIM: A decade of transformation

Initially, BIM adoption in India faced challenges due to skepticism and the dominance of traditional 2D CAD methods. However, over the past decade, BIM has experienced a significant transformation, evolving from isolated pilot projects to becoming a vital strategic asset within the Architecture, Engineering, and Construction (AEC) industry.

BIM adoption timeline in India

Late 2000s — 1 — **Introduction to BIM**

- One of the first major BIM use cases was around 2008-2014 during the Mumbai International Airport Terminal 2 project, where BIM was piloted for clash detection and coordination on a 5 million sq. ft. area.
- Most firms still relied on traditional 2D CAD, and there was resistance to change entrenched practices

2010 - 2015 — 2 — **Rising awareness**

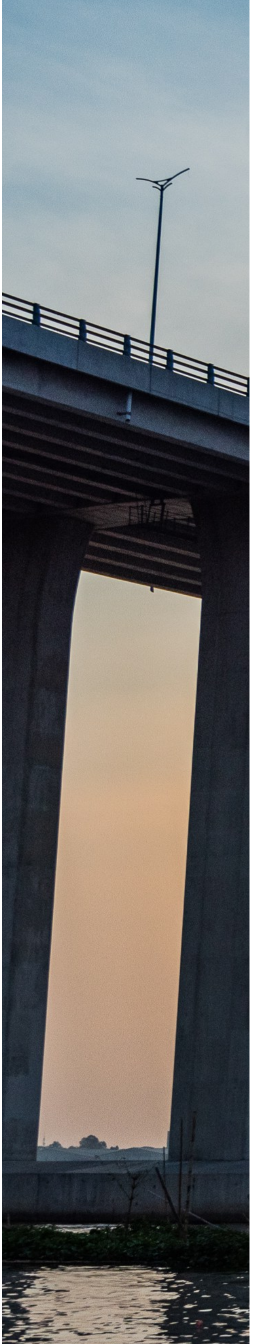
- In the early 2010s, awareness of BIM's potential benefits (such as clash-free coordination and cost estimation) began spreading, but adoption remained modest.
- By 2015, momentum was building – project stakeholders increasingly saw BIM as a "must-have" technology for large projects

2016 - 2020 — 3 — **Acceleration of BIM adoption**

- From the mid-2010s, Indian developers and infrastructure projects began adopting BIM, with real estate, airports, and metro systems integrating it into bids despite early implementation challenges due to limited strategy and experience.
- By 2017–2018, RFPs for major projects explicitly required BIM for design coordination, quantity take-offs, and scheduling, as contractors and owners recognized its efficiency benefits.

2020s — 4 — **Mainstreaming and advanced use case of BIM towards digital twin**

- In the 2020s, BIM in India entered a phase of wider acceptance, with growing use of advanced applications like 5D cost integration and links to ERP systems by 2021.
- Public infrastructure agencies have increasingly adopted BIM as a standard, mandating its use in large-scale government projects.



Key challenges in infrastructure project Delivery

India's construction and infrastructure sector is a cornerstone of national economic development, accounting for approximately **9% of GDP** and employing over 50 million people. With the Government of India committing over **INR 143 lakh crore (USD 1.7 trillion)** under the **National Infrastructure Pipeline (NIP),** the sector is poised to play a pivotal role in achieving India's long-term growth and urbanization goals. However, this ambition is constrained by structural inefficiencies that undermine capital productivity and project delivery.

This operational drag poses a material risk to India's infrastructure aspirations—necessitating a fundamental shift in how assets are designed, built, and managed.

Key challenges in infrastructure project delivery

27 %
Infrastructure Projects Experience Cost Overruns

45 %
Time Overruns

20 %
Significant Project Time is Lost Due to Fragmented Workflows, Low Digitization, and Poor Coordination

>30 %
Indian Construction Firms Leverage Digital Tools in Project Planning and Execution

Source: According to the Economic Survey 2023–24, data from the Online Computerized Monitoring System (OCMS)

Building Information Modelling (BIM) offers a compelling pathway to address these gaps. As a data-centric platform, BIM can integrate planning, design, and execution across disciplines, enable real-time collaboration and clash detection, and improve transparency, reduce delays, and support lifecycle cost optimization Adopting BIM at scale is not merely a technological upgrade—it is a strategic necessity to unlock time, cost, and quality efficiencies across India's infrastructure ecosystem.

BIM mandates from India and abroad

	Australia	Brazil	Egypt	India
BIM policy	**NATSPEC National BIM Guide** (Primary – Government)	**Guia de Implementação BIM** (Primary – Government)	**Egyptian Code for BIM** (Primary – Government)	No BIM Paolicy
Approach	Guideline-based approach aiming for a consistent and coordinated BIM adoption.	Build suitable environment for investment in BIM.	Facilitate BIM adoption and improve project coordination for businesses.	No Defined Approach
Mandate	No mention of any mandate.	Not mandatory.	Guideline	All central housing projects over INR 100 crore – MoHUA; highway projects over INR 100 crore – NHAI; some municipal BIM mandates for approvals (limited use).

Indonesia	Malaysia	New Zealand	Singapore	UK	USA
PANDUAN - Adopsi BIM dalam Organisasi (Primary – Government)	**BIM Guide Series (1-5)** (Primary – Government)	**New Zealand BIM Handbook** (Primary – Genesis of handbook at industry workshop. Then government collaborated)	**Singapore BIM Guide version 2** (Primary – Government)	**AEC (UK) BIM Technology Protocol**	1. **National BIM Guide for Owners** (Primary – Main author of this document is National Institute of Building Sciences. They are an NGO.) **2. U.S. General Services Administration -** BIM Guide Series (Primary -U.S. General Services Administration)
Guide-based approach to assist organizations in BIM adoption.	The main objective of BIM Guide is to educate construction players and to improve the productivity and efficiency	The aim is to develop a common industry language and improve coordination.	The approach is to focus on strategic technology adoption to improve productivity.	Focus on maximizing efficiency, best practices, and structured BIM file management.	**1.** Guide building owners to develop requirements for BIM use in contracts. **2.** Organizational mandate requiring BIM for federal agency projects
Just a guide	Mandated BIM for public projects over **MYR 100 million;** private projects not mandated. (Not mentioned in the BIM guide)	The government wants to move towards mandating the use of BIM, but no timeline is given.	Mandated BIM submissions for building projects of more than **5,000 square** feet	**UK BIM framework** mandates the use of BIM in public projects	Organizational mandate

The future of BIM in India: From digital engineering to 'intelligent' infrastructure

Evolving competency needs and upskilling efforts in infrastructure sector

India's infrastructure sector stands at an inflection point—where exponential economic growth, accelerating urbanisation, and intensifying sustainability imperatives are converging with a transformative wave of digital innovation. In this evolving context, Building Information Modelling (BIM) is not just a design and coordination tool—it is emerging as a strategic platform for end-to-end infrastructure delivery.

While BIM adoption in India has made encouraging progress, the next phase of growth will be defined by four interlocking priorities: deepening digital integration, bridging the skills gap, converging emerging technologies, and institutionalizing common data environments (CDEs).

1. Embracing digital momentum

India is fast becoming a regional leader in adopting digital technologies across the construction and infrastructure sector. With nearly **35% of tech spending dedicated to digital tools, firms are integrating geospatial technologies, drones, satellite photogrammetry, and cloud platforms into core workflows.** These innovations are driving operational efficiency, real-time collaboration, and stronger project governance—key advantages in today's complex delivery environment. The sector's evolution from CAD to BIM, and now AI-driven digital ecosystems, reflects a strategic pivot: technology is no longer a support tool but a central driver of scalable, resilient, and sustainable infrastructure development in India.

2. Bridging the skill gap for digital maturity

Despite strong digital adoption trends, India's construction sector faces a critical challenge: a widening digital skills gap that threatens to constrain the pace and quality of transformation. While technologies such as BIM, Virtual Design and Construction (VDC), and Artificial Intelligence (AI) are increasingly accessible, the sector continues to grapple with a shortage of specialized talent.

Evolving competency needs and upskilling efforts in infrastructure sector

30%

Indian firms report shortages in BIM and VDC capabilities

36%

Identify AI and machine learning as the most urgent competency gaps

Proactive Industry response to competency gaps

82%

Firms are undertaking internal upskilling Initiatives.

72%

Partnered with academic and skilling institutions to co -develop training aligned with emerging needs.

Source: Deloitte

Closing this digital talent gap is vital to enabling full-cycle BIM adoption and unlocking advanced capabilities such as predictive analytics, automated regulatory compliance, and data-driven infrastructure lifecycle management. Without this foundational investment in human capital, India risks undermining its vision for a future-ready, technology-enabled infrastructure ecosystem.

3. Integration of AI, IoT, and emerging technologies

Advanced digital technologies—including Artificial Intelligence (AI), the Internet of Things (IoT), data analytics, and cloud computing—are collectively reshaping the way infrastructure is planned, designed, constructed, and maintained. These technologies are no longer peripheral; they are becoming central to driving efficiencies, reducing costs, and enabling smarter, more sustainable infrastructure outcomes. Their integration is redefining the scope and impact of infrastructure delivery across sectors such as transportation, energy, water, and urban development.

In India, this digital transformation is gaining significant momentum. According to recent insights, **nearly 86% of Indian businesses anticipate that AI will become absolutely indispensable to their operations within the next five years.** This signals a major shift in mindset and readiness to adopt intelligent technologies at scale. Already, the sector is witnessing the emergence and implementation of next -generation applications, including predictive maintenance systems, autonomous construction machinery, real-time traffic and asset monitoring platforms, intelligent building management systems, and digital twins that simulate infrastructure performance. These innovations are not just enhancing operational efficiency—they are laying the foundation for a smarter, data-driven future for India's infrastructure ecosystem.

Predictive safety systems using computer vision (e.g., helmet and vest detection).

AI-based risk scoring models to anticipate cost and schedule overruns.

AI copilots that streamline documentation, quality assurance, and regulatory reporting.

4. Building a robust common data environment (CDE)

A Common Data Environment (CDE) is the digital backbone of BIM-led project execution. It serves as a centralised platform for capturing, managing, and disseminating all project-related information—including design models, documentation, and non-graphical data—across the entire lifecycle of an asset.

As defined under ISO 19650, the international standard for BIM, **a CDE constitutes "a single source of information used to collect, manage, and disseminate documentation, graphical model, and non-graphical data for the whole project team.**" For India to scale its infrastructure ambitions efficiently, embedding robust CDE frameworks will be essential to eliminate data silos, improve traceability, and deliver high-performance infrastructure assets with greater transparency and accountability.

Benefits of a common data environment

Improved collaboration among stakeholders

Enhanced data integrity and version control

More efficient approvals and change management Processes

A solid foundation for post-construction asset management and operations

Return on Investment (ROI)

Water

BIM creates strong value in the water sector—including treatment plants, distribution networks, and flood management systems—by enabling integrated planning, reducing lifecycle costs, and improving asset performance. As infrastructure grows more complex and regulated, BIM supports design accuracy, resource optimization, and risk mitigation. For large-scale projects such as desalination plants and sewer systems, BIM enhances early coordination and constructability, leading to faster approvals, reduced rework, and long-term operational efficiency.

Quantitative ROI

50%
Design time reduction

USD 2.56 mn
Cost savings per project

256 days
Saved in construction and project completion

38%
Improvement in productivity

1,202 hours
Resource time saved

Qualitative ROI

Plan and design

- Sophisticated hydraulic modelling facilitates precision in pipe sizing, pressure balancing, and surge mitigation—enhancing overall network resilience.
- Digital analysis tools enable early identification of low-pressure zones and potential leakage points, particularly in complex or aging water systems.
- BIM fosters seamless collaboration across civil, structural, and mechanical, electrical, and plumbing disciplines, significantly reducing manual drafting efforts and drawing volumes.
- The early adoption of BIM during design is enabling asset managers to embed lifecycle considerations—maintenance, renewals, and decommissioning—into capital planning from day one.

Construction

- BIM integrates hydraulic and structural modelling to enhance the layout of treatment plants, pump stations, reservoirs, and mains.
- Clash detection and scenario modelling minimize rework, conserve materials, and optimize land use—critical for urban water infrastructure projects especially in environmentally sensitive sites.
- BIM-enabled digital twins simulate construction in real time, ensuring coordination across utilities, engineers, and contractors.
- BIM supports data-driven planning for flood-prone, hilly, or congested areas, enabling safer and more efficient execution of water projects.

Operations and maintenance

- BIM integrated with geographic information system GIS and supervisory control and data acquisition (SCADA) systems enables real-time tracking of pressure, flow rates, and leakage across water distribution networks.
- BIM supports simulation of hydraulic performance and energy use, helping utilities improve water recovery and reduce operational carbon emissions.
- BIM enhances operations platforms with remote diagnostics, pump performance monitoring, and data-driven water quality analysis.
- BIM enables easier planning for retrofits, capacity expansions, and system upgrades by providing accurate as-built documentation.
- By leveraging BIM and sensor data, utilities can anticipate failures in pipelines, valves, and treatment systems—improving reliability and reducing lifecycle costs.

Energy

ROI across the energy sector—including power generation, transmission, distribution, and renewables—by enabling data-driven planning, minimizing lifecycle costs, and enhancing asset resilience. As infrastructure projects grow in complexity, scale, and regulatory oversight, BIM serves as a strategic enabler of design accuracy, resource optimization, and risk mitigation. For large-scale assets such as hydropower plants, wind farms, substations, and transmission corridors, BIM facilitates improved early-stage visibility, coordination, and constructability, leading to expedited approvals, fewer change orders, and sustained operational efficiencies.

Quantitative ROI

24%
Reduction in design time

14%
Faster project delivery

USD 4.17 mn
Saved per project

30%
Increase in productivity

20%
Material savings

15%
Lifecycle ROI, reflecting long-term financial performance

Qualitative ROI

Plan and design

- BIM facilitates real-time, multidisciplinary collaboration across dispersed teams, essential for complex terrains like offshore or mountainous energy sites.
- Simulation tools embedded in BIM facilitate early-stage analysis of seismic, wind, and soil conditions, ensuring safer, more resilient infrastructure designs—especially critical for assets exposed to natural hazards.
- BIM enables spatial efficiency and clash detection, reducing material waste and planning time, especially in large-scale, space-constrained projects.
- 3D design workflows enhance visualization, reduce documentation errors, and align stakeholders early, leading to higher design quality under tight schedules.

Construction

- Advanced BIM-based simulation tools enable precise integration of Mechanical, Electrical, and Plumbing (MEP) systems with structural elements, reducing rework and ensuring constructability in complex energy facilities.
- Digital construction scheduling (4D BIM) enhances timeline accuracy, particularly in modular and large-scale solar and wind projects, minimizing delays and improving resource utilization.
- Real-time visualization of construction progress supports effective sequencing, clash resolution, and cross-team coordination, mitigating on-site conflicts.

Operations and maintenance

- Intelligent digital twins, integrated with operational data, enable remote diagnostics, real-time performance monitoring, and lifecycle management of energy assets.
- IoT-enabled BIM systems facilitate predictive maintenance strategies, minimizing unplanned downtime and enhancing asset reliability and operational continuity.
- High-fidelity 3D asset models streamline inspection processes, support efficient planning for upgrades, and improve the accuracy and accessibility of maintenance documentation.

Roads and highways

BIM delivers measurable value across the road infrastructure lifecycle—from feasibility planning through construction to maintenance—by enabling geospatially accurate designs, reducing rework, and streamlining asset management. In the context of expanding urban mobility demands, climate resilience requirements, and constrained budgets, BIM supports data-driven decision-making and optimized resource allocation. For complex road projects such as expressways, flyovers, and urban arterials, BIM facilitates early detection of design conflicts, effective stakeholder engagement, and coordinated construction sequencing—ultimately reducing delays, cost overruns, and post-construction maintenance burdens.

Quantitative ROI

32%
Reduction in design duration

36%
Rise in productivity

103 days
Saved on average in execution Timelines

9%
Material savings, contributing to waste reduction and cost control execution

USD 13.6 mn
Cost savings per project, improving budget adherence

Qualitative ROI

Plan and design

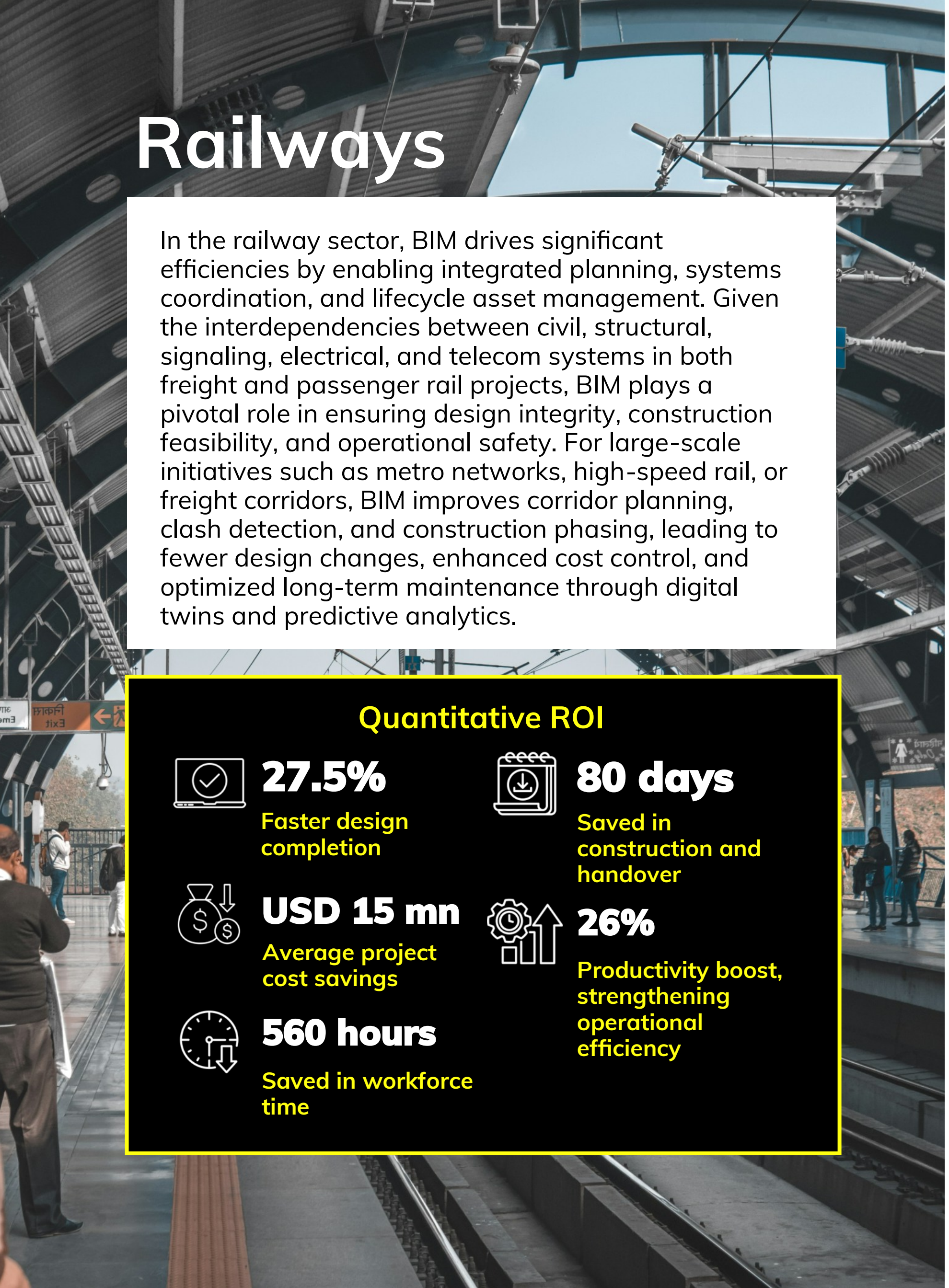
- BIM uses 3D modeling and terrain analysis to optimize road alignment, reduce rework, and improve early engineering accuracy—saving land, materials, and time.
- It enables coordinated work across civil, structural, environmental, and geotechnical teams, reducing conflicts and speeding approvals.
- Detailed models improve design accuracy and support constructability reviews for smoother contractor planning and execution.
- Simulations of traffic, hydrology, weather, and soil help identify risks early and strengthen design resilience.

Construction

- BIM-enabled clash detection tools proactively identify spatial and systemic conflicts before physical construction begins, mitigating cost escalations and avoiding delays.
- By integrating scheduling data into the model, BIM enhances construction sequencing, optimizes resource utilization, and enables predictive planning across work packages.
- Integration of drones, laser scanning, and sensors into the BIM environment provides accurate, real-time feedback on site progress, quality, and deviations from design intent.

Operations and maintenance

- BIM-enabled digital twins, integrated with GIS and IoT systems, support real-time monitoring of roadway conditions, enabling proactive management of asset health and traffic performance.
- Sensor networks embedded in roads and bridges enable early detection of stress, fatigue, and wear—allowing for timely intervention and avoidance of emergency repairs.
- Centralized asset information models support condition assessments, maintenance scheduling, and lifecycle cost optimization, enhancing long-term service delivery.
- BIM facilitates predictive maintenance regimes that reduce unplanned closures, improve user safety, and ensure continuous network availability.



Railways

In the railway sector, BIM drives significant efficiencies by enabling integrated planning, systems coordination, and lifecycle asset management. Given the interdependencies between civil, structural, signaling, electrical, and telecom systems in both freight and passenger rail projects, BIM plays a pivotal role in ensuring design integrity, construction feasibility, and operational safety. For large-scale initiatives such as metro networks, high-speed rail, or freight corridors, BIM improves corridor planning, clash detection, and construction phasing, leading to fewer design changes, enhanced cost control, and optimized long-term maintenance through digital twins and predictive analytics.

Quantitative ROI

27.5%
Faster design completion

80 days
Saved in construction and handover

USD 15 mn
Average project cost savings

26%
Productivity boost, strengthening operational efficiency

560 hours
Saved in workforce time

Qualitative ROI

Plan and design

- BIM, combined with advanced digital tools and geotechnical modeling, supports alignment optimization that minimizes land acquisition, reduces environmental disruption, and ensures cost-effective routing for rail corridors.
- BIM enables centralized, real-time collaboration among multidisciplinary teams—spanning civil, structural, systems, and environmental disciplines—reducing manual drafting, streamlining design workflows, and enhancing productivity.
- Early deployment of BIM allows planners to simulate future asset behavior, enabling better-informed design decisions and alignment with long-term performance and maintenance strategies.
- Enhanced visualization and simulation capabilities improve stakeholder engagement, regulatory alignment, and early risk identification—facilitating smoother approvals and reduced design iterations.

Construction

- BIM enhances precision in complex builds like tunnels and stations, cutting rework and speeding delivery.
- It identifies clashes and material waste early, improving efficiency and sustainability.
- Integrating reality capture such as LiDAR, photogrammetry ensures as-built accuracy and smooth coordination.
- Digital workflows boost traceability, enable timely decisions, and reduce cost overrun risks, improving delivery certainty.

Operations and maintenance

- BIM-integrated predictive tools, powered by IoT and sensors, replace manual checks with data-driven fault detection, cutting downtime.
- Digital twins offer real-time rail performance insights, enabling dynamic maintenance and operational efficiency.
- Centralized asset models support accurate lifecycle planning, targeted interventions, and extended asset life.
- Benefits include lower maintenance costs, fewer disruptions, and improved safety—driving long-term value across the rail network.

Airport

Airports are complex infrastructures with airside, landside, and terminal components requiring high coordination and security. BIM streamlines this complexity by integrating architectural, structural, MEP, and ICT systems into a unified digital model. It enhances spatial planning, regulatory compliance, and stakeholder engagement during design, while supporting precise sequencing, facility management, and adaptability during construction and operations. For terminal expansions, runway upgrades, or greenfield projects, BIM improves design coordination, reduces retrofit downtime, and ensures greater operational efficiency throughout the asset lifecycle.

Quantitative ROI

30%
Design time reduction

USD 21 mn
Cost savings per project

35 days
Saved in overall delivery

Qualitative ROI

Plan and design

- BIM enables 3D spatial modeling and simulation of terminal layouts, enhancing efficiency in passenger movement, retail placement, and security checkpoint design.
- BIM facilitates real-time collaboration across architectural, structural, MEP, and information and communications technology systems, reducing design conflicts and accelerating approvals.
- Advanced modeling supports what-if analysis for varying passenger loads, operational scenarios, and phased expansions—enhancing long -term scalability.
- High-fidelity visualizations and virtual walkthroughs enhance communication with regulators, operators, and community stakeholders, enabling faster consensus and fewer design changes.

Construction

- 4D BIM integrates construction scheduling with design models, enabling precise sequencing in active airport environments with minimal disruption to operations.
- Early identification of spatial and system conflicts through BIM reduces rework, cost overruns, and delays—especially critical in constrained terminal spaces.
- Centralized digital models enhance coordination among contractors, subcontractors, and suppliers, streamlining logistics and material flows in high-traffic zones.

Operations and maintenance

- BIM-based digital twins integrated with IoT systems provide continuous monitoring of critical assets (e.g., HVAC, lighting, baggage systems), enhancing operational visibility.
- Sensor-driven data enables condition-based maintenance, reducing unexpected failures and optimizing service continuity in mission-critical airport systems.
- A unified BIM model supports streamlined maintenance scheduling, asset tracking, and document management, improving operational efficiency and compliance.

CUSTOMER STORIES

Customer Story 1

Expanding connectivity and efficiency

Delhi Metro Phase IV

Project overview

The Delhi Metro phase iv project is a significant expansion initiative by the delhi metro rail corporation (dmrc), aiming to extend the metro network by approximately 103.93 kilometers. This phase includes the construction of new lines, extensions to existing ones and the addition of new stations to enhance last-mile connectivity for citizens. The project features both elevated and underground sections, with notable engineering challenges such as tunnelling under multiple railway tracks. Construction began in December 2019, and the project is expected to be fully operational by 2026, improving mobility and reducing congestion across Delhi.

Project cost: **INR 24,948.65 Cr**

SDGs addressed

9: Industry, innovation and infrastructure
11: Sustainable cities and communities
13: Climate action

Technology/solution used

Online collaboration platform via
Autodesk BIM 360
Autodesk Revit

Project challenges

Problem statement

- **Funding and approvals:** Delays in Centre–State funding and clearances for tree-cutting and land acquisition postponed project start.
- **Labor shortages:** COVID-19 lockdowns caused major workforce gaps, disrupting construction schedules.
- **Engineering complexity:** Tunnelling under 17 railway tracks and executing 3-kilometer-long drives required precision TBMs and advanced techniques.
- **Structural challenges:** Parametric modelling was used for complex elements (U-/T-girders, pier caps), with rebar modelling for seismic compliance.
- **Tight deadlines:** Early delays heightened pressure to meet the 2026 delivery target for priority corridors.

Solution implemented and approach

- To tackle these challenges, DMRC adopted BIM to improve design accuracy and coordination.
- Autodesk BIM 360 enabled real-time collaboration and data sharing across stakeholders.
- Autodesk Revit supported detailed design and parametric modelling. On-site BIM coordinators ensured effective implementation.

Fact file

State: National Capital Region (NCR), New Delhi
Project Owner: Delhi Metro Rail Corporation (DMRC)
Project Stakeholders: JICA, India Infrastructure Finance Company Limited, World Bank, L&T, Bombardier Transportation, H.R Builders, Kumar Infraprojects Limited, ITD Cementation India Limited, MBL Infrastructure Limited, Sam India Builtwell Private Limited, Arvind Techno-engineers Private Limited, Mott Macdonald, Gammon, Siemens, Systra, Arch Consultants Limited.

Value propositions

Qualitative benefits

- **Better coordination:** BIM improved teamwork and reduced errors.
- **Safer construction:** Early clash detection enhanced safety.
- **Sustainable design:** Enabled energy-efficient, eco-friendly infrastructure.

Quantitative benefits

- **Reduced time and cost:** BIM cut project duration and costs by 33%.
- **Higher productivity:** Streamlined workflows boosted labor productivity by 43%.
- **Fewer emissions:** Achieved a 50% reduction in greenhouse gas emissions.

Customer story 2

Building a future-ready campus

IIT Palakkad

Project overview

Established in 2015 with 120 students, IIT Palakkad has grown to accommodate around 1,200 students, with plans to expand to 12,000. To support this vision, the institute is developing a permanent campus featuring the Nila and Sahyadri sectors, equipped with academic spaces, hostels, innovation labs, and research centers. By adopting technologies like BIM, IIT Palakkad aims to foster a collaborative, future-ready academic environment and establish itself as a leading multidisciplinary institution.

Project cost: **INR 595.4 Cr**

SDGs addressed

4: Quality education

9: Industry, innovation and infrastructure

17: Partnerships for the goals

Technology/solution used

- Autodesk Docs
- Autodesk BIM 360 Build
- Autodesk Construction Cloud
- Autodesk Revit

Project challenges

Problem statement

- **Data management challenges:** Managing large volumes of project data and stakeholders was difficult; IIT Palakkad adopted BIM and a CDE to streamline access and reduce data loss.
- **Communication gaps:** Miscommunication caused delays; a centralized platform was introduced to align stakeholders and support informed campus planning.

Solution implemented

IIT Palakkad adopted Autodesk Construction Cloud solutions to address these challenges, aiming to connect stakeholders across the project and enhance data management capabilities.

Implementation approach

- **Technical collaboration:** Autodesk and Microgenesis teams ensured smooth integration of Autodesk Construction Cloud and Autodesk Revit with existing software, enhancing workflow efficiency.
- **Organized data management:** A structured folder system with defined permissions enabled controlled access, reducing errors and boosting productivity.
- **Enhanced team collaboration:** Multidisciplinary teams collaborated via the CDE, improving design workflows and communication.

Value propositions

Qualitative benefits

- **Efficiency and cost savings:** BIM with Autodesk Construction Cloud eliminated paper workflows, version errors, and data loss, cutting construction time and costs.
- **Quality and decisions:** Detailed models improved clash detection and constructability, enabling better decisions and higher quality.
- **Sustainability and compliance:** BIM supported green practices and GRIHA compliance, aiding progress tracking and environmental goals.

Fact file

State: Kerala

Project owner: Indian Institute of Technology, Palakkad

Project stakeholders: Microgenesis

Customer story 3

Engineering marvel beneath the Himalayas

Atal tunnel

Project Overview

The 9.02 km Atal Tunnel, the world's longest highway tunnel above 10,000 feet, connects Manali to Lahaul-Spiti in Himachal Pradesh. Built at 3,000 meters in the Pir Panjal range, it features a single -tube, double-lane horseshoe design. The tunnel ensures all-weather connectivity, reduces travel time to Leh, and boosts national security, tourism, and agriculture in the region.

Equipped with modern safety systems, it highlights India's engineering prowess and has improved residents' access to essential services.

Project cost: INR 3,200 Cr

SDGs addressed

8: Decent work and economic growth

9: Industry, innovation and infrastructure

11: Sustainable cities and communities

Technology/solution used

- Supervisory Control and Data Acquisition (SCADA)
- AutoCAD Civil 3D
- New Austrian Tunnelling Method (NATM)

Project challenges

Problem statement

- **Geotechnical issues:** Tunnelling through the Seri Nala Fault Zone caused heavy water ingress (8,000 L/min) with debris, risking excavation.
- **Harsh climate:** Winter snowfall blocked northern access, forcing reliance on the southern portal.
- **Logistics and seismic risk:** Managing debris and ensuring stability in seismic zones posed major challenges.

Solution implemented

A combination of advanced engineering techniques, real-time monitoring systems, and adaptive construction methodologies were employed to address the challenges.

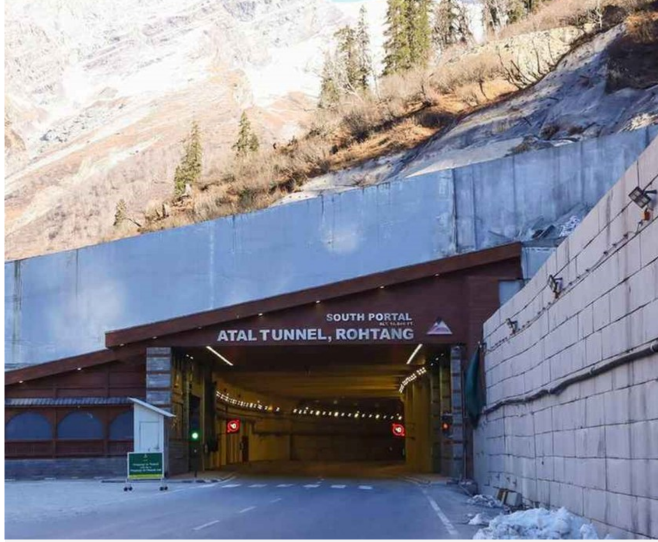
Implementation approach

- Utilization of Supervisory Control and Data Acquisition (SCADA) systems for real-time monitoring and control of tunnel operations.
- Deployment of AutoCAD Civil 3D for detailed design and geospatial analysis, facilitating precise excavation and construction planning.
- Application of the New Austrian Tunneling Method (NATM) to navigate through challenging geological conditions.

Value propositions

Qualitative benefits

- **Centralized coordination:** BIM enhanced transparency and communication across agencies.
- **Safety planning:** Enabled early hazard detection in landslide-and snow-prone areas.
- **Clash detection:** Reduced rework, waste, and costs through early clash resolution.
- **Time management:** BIM simulations helped recover delays and maintain progress.



Fact File

State: Himachal Pradesh

Project Owner: Border Roads Organization (BRO)

Project Stakeholders: Snowy Mountains Engineering Corporation (SMEC), Australia, Rail India Technical and Economic Services Limited (RITES), STRABAG SE, Afcons Infrastructure Limited, Geoconsult, 3G-Vaymtech, Savronik, Encardio Rite

Customer story 4

The world's tallest statue

Statue of Unity

Project overview

The statue is built on an islet, Sadhu Bet, approximately 3.5 kilometers downstream from the Sardar Sarovar dam in Gujarat's Narmada district. Apart from being the world's tallest sculpture, the 182-meter Statue of Unity also holds the distinction of being among the fastest to be completed in just 34 months. Two structural concrete cores were used to anchor the Statue of Unity, which supports the steel framework (cast from scrap which was sourced from all over India) attached to the 2,000 tons of exterior bronze paneling. A viewing gallery constructed at 135 meters, at the chest level, allow 200 visitors to enjoy the breath-taking views of the Narmada dam and other surrounding landmarks.

Project cost: INR 2,989 Cr

SDGs addressed

8: Decent work and economic growth

9: Industry, innovation and infrastructure

12: Responsible consumption and production

Project challenges

Problem statement

- **Design complexity:** Recreating a lifelike, detailed 182-meter statue of Sardar Vallabhbhai Patel from a photograph required advanced sculpting and engineering precision.
- **Structural stability:** The walking pose with a 6.4-meter foot gap required innovative solutions like reinforced steel frameworks and RCC core walls for balance and load distribution.
- **Wind resistance:** Designed to withstand winds up to 180 km/h, with aerodynamic features to counter suction effects using wind tunnel testing.
- **Seismic resilience:** Built to endure Zone IV earthquakes up to magnitude 6.5 within a 12-kilometer radius through advanced seismic engineering.

Implementation approach

- BIM software was utilized for early-stage clash detection and design coordination.
- Constructible 3D BIM models were adopted to streamline the fabrication and assembly of structural steel and bronze panels.
- Digital workflows were integrated to effectively manage scale, structural constraints and environmental loads.

Value propositions

Qualitative benefits

- **Improved safety and workflow:** Autodesk tools enhanced safety by identifying hazards early and streamlining execution.
- **Real-time collaboration:** Enabled seamless teamwork, early clash detection and reduced rework, improving speed and quality.

Quantitative benefits

- **Time savings:** Project completed two months ahead of projected timelines.
- **Efficiency gains:** 25% boost in overall productivity.
- **Fewer errors:** Resolved 70+ clashes before fabrication, avoiding costly rework.

Fact file

State: Gujarat

Project Stakeholders: L&T, Turner India Limited, Tata Consulting Engineers, Silicon Engineering Consultants Private Limited, Eversendai Construction Private Limited, Silicon Engineering Consultants Private Limited, Tuner construction, Michael Graves and Associates, Meinhardt Group

Customer story 5

Larsen & Toubro's 230 MW AC solar power generation project

Ettayapuram Solar PV Project

Project overview

Larsen & Toubro (L&T) executed a 230 MW solar power project in Tamil Nadu to reduce thermal power dependence and promote clean energy. The project includes a solar PV plant, pooling substation, and transmission lines for grid integration.

Expected to generate 549 million units annually and offset 473 tons of carbon emissions, the project supports regional energy transition and environmental sustainability.

SDGs addressed

7: Affordable and clean energy

12: Responsible consumption and production

13: Climate action

Technology/solution used

- Autodesk BIM 360 Docs
- Autodesk BIM 360 Design

Project challenges

Problem statement

- **Logistical and environmental challenges:** Managing vast land areas and complying with regulations, including the DCR clause requiring domestic PV modules and cells.
- **Supply chain and procurement:** Material shortages, price fluctuations, and logistics delays, worsened by the COVID-19 pandemic.
- **Regulatory and policy issues:** Changing policies, environmental norms, and delays in clearances impacted timelines and costs.
- **Technological and design:** Required innovative design to ensure efficient, reliable, and cost-effective solar energy generation and grid integration.

Solution implemented

L&T leveraged BIM to create a digital twin of the project, enabling real-time collaboration and efficient project management.

Implementation approach

- Autodesk BIM 360 Docs managed all project documents in the cloud, ensuring team access to latest of plans and models.
- Autodesk BIM 360 Design aggregated project lifecycle data offering insights for better performance tracking and decision making.
- A CDE enabled effective coordination across multidisciplinary teams.

Value propositions

Qualitative benefits

- **Remote collaboration:** BIM ensured real-time coordination during the pandemic with minimal disruption.
- **Design accuracy:** 3D models minimized clashes and improved planning for solar and transmission layouts.
- **Transparency and control:** Enabled progress tracking and timeline adherence, even under COVID-19 constraints.

Quantitative benefits

- **Faster flow of information:** Reduced data latency from 1 month to 1 day.
- **Shorter timeline:** Reduced project duration by 10%, saving time and costs.

Fact file

State: Tamil Nadu

Project owner: Larsen & Toubro

Project stakeholders: Central Electricity Regulatory Commission (CERC), Tamil Nadu Electricity Regulatory Commission (TNERC)

Customer story 6

Enhancing regional connectivity

Noida International Airport (Jewar Airport)

Project overview

Developed by Yamuna International Airport Private Limited (YIAPL), a Zurich Airport subsidiary, Noida International Airport is a key infrastructure project for Delhi-NCR. Designed in four phases, it will scale from handling 12 million passengers annually in Phase I to over 70 million.

With two terminals and six runways planned, the airport targets net-zero emissions and supports regional growth with a ₹5,700 crore investment. It will ease congestion at IGI Airport, boost connectivity, and create jobs. Commercial operations began on April 17, 2025.

Project cost: INR 29,650 Cr

SDGs addressed

8: Decent work and economic growth

9: Industry, innovation and infrastructure

11: Sustainable cities and communities

13: Climate action

Technology/solution used

- Autodesk BIM 360 Software
- BIM 360 Collaborate Pro
- BIM 360 Design
- Autodesk Revit

Project challenges

Problem statement

- **Global team coordination:** International architectural teams required real-time collaboration using advanced communication and project management tools to align design and construction strategies.
- **Pandemic disruptions:** COVID-19 travel restrictions limited in-person meetings, prompting a shift to digital platforms to maintain coordination and project timelines.
- **Complex design needs:** Building a modern, sustainable airport demanded innovative designs, green practices and advanced systems to balance efficiency, comfort and environmental goals.

Solution implemented

The team adopted BIM methodologies to enhance collaboration, design accuracy, and project management.

Implementation approach

- The team used Autodesk BIM to boost collaboration, design accuracy and project management, enabling real-time data sharing and reducing errors.
- Digital platforms ensured smooth stakeholder communication during pandemic travel restrictions, keeping timelines on track.
- A balanced approach combined efficiency, sustainability and passenger comfort, using green practices, advanced air traffic systems and innovative architecture.

Value propositions

Qualitative benefits

- **Global collaboration:** BIM enabled real-time coordination across time zones, ensuring design consistency.
- **Design accuracy:** Autodesk BIM 360 helped detect and resolve conflicts early, minimizing rework.
- **Sustainability:** Simulations supported energy, daylight, and material efficiency for a greener, efficient airport.

Fact file

State: Uttar Pradesh

Project owner : Noida International Airport Limited (NIAL) (

Project stakeholders: Tata Projects, PwC, Landrum & Brown and experts from Zurich Airport International, Jacobs, ICAD Holding with Wipro, Consortium (Haptic Architects, Nordic, Grimshaw and STUP)

Customer story 7

Pioneering sustainable aviation infrastructure

Navi Mumbai International Airport

Project overview

The Navi Mumbai International Airport (NMIA) is a greenfield airport development located in Navi Mumbai. The master plan envisions a four-phase development, culminating in an ultimate capacity to handle 60 million annual passengers. The project aims to alleviate congestion at Mumbai's existing Chhatrapati Shivaji Maharaj International Airport and cater to the growing air traffic demand in the region. The initial phase is designed to accommodate 20 million passengers annually, with subsequent phases progressively increasing capacity.

Project cost: **INR 29,650 Cr**

SDGs addressed

8: Decent work and economic growth
9: Industry, innovation and infrastructure
11: Sustainable cities and communities
13: Climate action

Technology/solution used

- Autodesk BIM 360 Software
- BIM 360 Collaborate Pro
- Autodesk Revit

Project challenges

Problem statement

- **Complex site conditions:** The project site required significant pre-development work, including the levelling of Ulwe Hill, reclamation of marshland, diversion of the Ulwe River, and relocation of high-tension power lines.
- **Stakeholder coordination:** Coordinating among multiple stakeholders, including international design firms, local authorities, and construction teams, required robust communication channels and data management systems.

Implementation approach

- A digital twin of the airport captured structural, mechanical and spatial elements, enabling real-time design visualization and simulation.
- Tools like Autodesk Revit and BIM 360 enabled smooth collaboration among architects, engineers, contractors and stakeholders across the project lifecycle.
- BIM's clash detection identified conflicts between structural, architectural and MEP systems early, reducing costly rework.

Value propositions

Qualitative benefits

- **Improved coordination:** BIM enabled real-time data sharing on a central platform, aligning architectural, engineering, and execution teams.
- **Enhanced design accuracy:** 3D models minimized uncertainties in NMIA's complex H-shaped terminal design.

Quantitative benefits

For workers' accommodation

- **Completion time:** BIM-enabled planning and sequencing led to a 1-month acceleration in the construction of worker accommodations.
- **Design efficiency:** Reduced design errors led to 50% improvement in design efficiency.

Fact file

State: Maharashtra
Project owner: City and Industrial Development Corporation (CIDCO) (26%), Mumbai International Airport Limited (MIAL) (74%)
Project Stakeholders: Zaha Hadid Architects (ZHA), L&T, Cyril Amarchand Mangaldas, CIDCO-Louis Berger-INECO-RITES consortium, Adani Group

Customer story 9

Redefining India's convention landscape

Bharat Mandapam

Project overview

Bharat Mandapam, or the International Exhibition-cum-Convention Centre (IECC), is a world-class facility located in New Delhi's Pragati Maidan. Spread across 123 acres, it features a modern convention center, expansive exhibition halls, and a grand amphitheater.

The center includes a multi-purpose and plenary hall with a combined seating capacity of 7,000—exceeding that of the Sydney Opera House—plus a 3,000-seat amphitheater. Its architecture blends traditional Indian elements with modern design, symbolizing the nation's cultural and developmental journey.

Project cost: **INR 2,700 Cr**

SDGs addressed

9: Industry innovation and infrastructure

11: Sustainable cities and communities

12: Responsible consumption and production

Technology/solution used

- Autodesk BIM 360 Software Suite
- Autodesk Revit

Project challenges

Problem statement

- **Architectural complexity:** Moving from a rectangular to an elliptical design required innovative engineering to reflect the Yamuna River's symbolic connection.
- **Integration of heritage and modernity:** Blending traditional Indian art forms with modern architecture challenged designers to maintain both aesthetic harmony and functionality.
- **NGT construction ban:** Early-phase progress was delayed by National Green Tribunal (NGT) restrictions, necessitating strict environmental compliance.
- **COVID-19 disruptions:** Travel limits and fewer physical meetings during the pandemic slowed coordination and construction timelines.

Implementation approach

- The project team established a BIM protocol and selected appropriate software tools to ensure compatibility across all stakeholders.
- Detailed 3D models were created using Revit to integrate architectural, structural and MEP systems, facilitating early clash detection and resolution.
- Autodesk BIM 360 software was used for site layout planning, material management, and construction sequencing to optimize efficiency.

Value propositions

Qualitative benefits

- **Global collaboration:** BIM enabled real-time coordination across teams like ARCOP and AEDAS, ensuring design consistency and reducing miscommunication.
- **Accurate design:** Integrated 3D models improved precision, enabling early clash detection and minimizing rework.
- **Sustainability and project management:** BIM simulations supported green practices, while centralized tracking improved timelines and resource use on Bharat Mandapam.

Fact file

State: New Delhi

Project owner: Owned, operated and managed by ITPO (Ministry of Commerce and Industry, GOI)

Project stakeholders: ARCOP, AEDAS, Meinhardt Singapore, Envirotech Design Private Limited, Technical Projects Consultants Private Limited, Integral Design International Studio Private Limited, Shapoorji Pallonji & Company Private Limited. (SPCPL), National Buildings Construction Corporation (NBCC), Atmos Sustainable Solutions Private Limited

Customer story 10

Commemorating Adi Shankaracharya's legacy

Statue of Oneness

Project overview

The Statue of Oneness, a 108-foot tribute to 8th-century philosopher Adi Shankaracharya, stands atop Mandhata Hill in Omkareshwar, Madhya Pradesh, overlooking the Narmada River. Depicting him as a 12-year-old in motion, it symbolizes his early spiritual journey.

Part of the Ekatma Dham project, it includes Advait Lok—a cultural complex with a museum and the International Advaita Vedanta Sansthan—to promote Advaita Vedanta. The initiative aims to position Omkareshwar as a global center for spiritual learning and tourism.

Project cost: INR 2,141 Cr

SDGs Addressed

9: Industry innovation and infrastructure

11: Sustainable cities and communities

12: Responsible consumption and production

Technology/solution used

- Autodesk Revit
- Autodesk Navisworks

Project Challenges

Problem statement

- **Scale and geometry:** Designing the 182m statue required converting Sardar Patel’s form into a structurally feasible model.
- **Structural and site challenges:** Built near a river in seismic Zone IV, it was engineered to resist 180 km/h winds and seismic loads.
- **Panel precision and logistics:** Aligning 6,500 bronze panels demanded millimetric accuracy. Remote access and monsoons required optimized scheduling for 3,000+ workers.

Implementation approach

- A high-res 3D scan of the clay model was digitally layered into bronze cladding, concrete core, and steel support for accurate execution.
- BIM tools like Revit and Navisworks enabled early clash detection, reducing site errors and rework.
- BIM-linked fabrication allowed off-site assembly with QR tracking for faster, error-free installation.

Fact file

State - Madhya Pradesh

Project owner - Government of Madhya Pradesh

Project stakeholders - CP Kukreja Architects, Vasudev Kamath, Acharya Shankar Sanskritik Ekta Nyas

Value propositions

Qualitative benefits

- **Structurally complex modelling:** BIM enabled precise digital prototyping of the 108-foot walking statue, addressing balance and load-distribution challenges.
- **Long-term material simulation:** BIM simulations assessed material behavior under diverse environmental conditions over time.
- **Fabrication risk reduction:** Pre-construction clash detection and load simulations minimized errors and optimized structural resilience.

Quantitative benefits

- Clash detection and modular design accelerated construction, reducing timelines by an estimated 15–20%, particularly during steel and bronze panel installation.
- Precise fabrication and reduced rework lowered material costs by ~10% and helped optimize labor expenditure.

Customer story 10

Enhancing ROI across the lifecycle

BIM in water infrastructure

Project overview

This case study outlines how Building Information Modeling (BIM) transforms the water infrastructure lifecycle. Faced with aging assets, regulatory pressures, and climate demands, water utilities adopt BIM to accelerate delivery, cut costs, and improve asset visibility. Organizations report up to **30% faster project timelines** and **20% lower lifecycle costs** through BIM adoption

SDGs addressed

9: Industry, innovation and infrastructure

11: Sustainable cities and communities

13: Climate action

Technology/solution used

- Autodesk Revit
- Autodesk BIM 360
- Integration with GIS, SCADA, and Digital Twins

Project challenges

Problem statement

- **Aging assets** – Frequent leakages and inefficiencies due to old infrastructure.
- **Regulatory compliance** – Rising need for transparent ESG and environmental reporting.
- **Inefficient planning** – Limited digital tools hinder risk assessment and resilience planning.
- **Construction inefficiencies** – Traditional methods lead to delays and cost overruns.

Solution implemented

BIM was adopted as a core strategy across planning, construction, and O&M. It enabled better coordination, sustainability, and data-driven decisions by integrating hydraulic models, asset data, and real-time system monitoring into a unified workflow.

Implementation approach

- Hydraulic and structural BIM models for optimized network design
- Climate simulations for resilience and overflow prevention
- 3D/4D BIM for stakeholder engagement and faster approvals
- Embedded asset and maintenance data for smarter O&M

Value propositions

Qualitative benefits

- Faster approvals and reduced design iterations
- Future-ready infrastructure and simplified upgrades
- Improved sustainability and ESG compliance
- Foundation for AI, digital twins, and advanced analytics

Quantitative benefits

- 30% faster project delivery
- 20% lifecycle cost savings
- 25% less rework
- 10% reduction in non-revenue water

Fact file

State - North Carolina, USA

Looking Ahead: BIM as the Engine of Infrastructure Transformation

The next decade will witness BIM's transformation from a design-centric modelling tool to a strategic platform for infrastructure governance and delivery. No longer confined to 3D visualization, BIM is poised to integrate with AI, IoT, geospatial systems, and digital twins—creating a single source of truth across the entire lifecycle of infrastructure assets.

This evolution will position BIM as the digital backbone of infrastructure planning, execution, and monitoring in India. Through real-time data integration, predictive analytics, and automated decision support, BIM will enable infrastructure that is not only delivered faster and with fewer cost overruns, but also more resilient, efficient, and environmentally sustainable.

To unlock this potential, India must focus on four critical enablers:

- **Policy-Level Mandates and Incentives for BIM Standardization**
- **Investment in Interoperable Platforms and Open Data Standards**
- **Public-Private Collaboration for Digital Capability Building**
- **Fostering public-private partnerships (PPPs) and localizing innovation ecosystems**

If executed holistically, BIM can power India's National Infrastructure Pipeline (NIP)—delivering infrastructure that is not only faster and cheaper, but also smarter, greener, and future-ready. It is no longer a question of "if" BIM should be scaled, but "how fast" and "how boldly" India can deploy it as the foundation of its digital infrastructure revolution.

Overview of Research Methodology:
ROI of BIM in India's Infrastructure Sector

As part of Autodesk and Geospatial World's ongoing commitment to advancing digital transformation in infrastructure, this study undertakes a strategic examination of the **Return on Investment (RoI)** of **Building Information Modelling (BIM)** in the Indian context. The research aims to bridge the knowledge gap between policy, implementation, and impact, offering actionable insights for decision-makers across the infrastructure value chain.

1. Strategic Objective: The primary objective is to quantify and articulate the value of BIM implementation in India's infrastructure projects—beyond isolated use cases—by identifying scalable benefits, implementation challenges, and success factors. The analysis supports policy frameworks and investment decisions towards a digitally enabled infrastructure ecosystem.

2. Methodological Approach: Geospatial World employed a case study-based research design, combining qualitative insights with quantitative metrics. The methodology was tailored to the complexity and diversity of the Indian infrastructure landscape, with a focus on relevance to both public and private sector stakeholders.

3. Case Study Identification and Scope

- Curated a diverse portfolio of infrastructure projects from India across segments such as transport (metro, highways), water, energy, and building and campuses.
- Prioritized projects with measurable BIM integration across planning, design, construction, or operations stages.
- Ensured geographic and institutional diversity to reflect pan-India applicability.

4. Data Collection and Analysis

- Conducted primary interviews with key project stakeholders including government bodies, EPC firms, consultants, and BIM solution providers.
- Reviewed project documentation—design plans, cost reports, timelines—to extract measurable outcomes.
- Applied a structured assessment framework across the following RoI dimensions including cost efficiency, time savings, quality and risk mitigation, operational value, and stakeholder collaboration.

5. Synthesis and Insights

- Undertook cross-case synthesis to identify common value drivers and barriers.
- Developed a maturity-impact matrix to correlate BIM adoption levels with RoI outcomes.
- Extracted strategic insights for wider adoption and policy enablement.

6. Validation and Stakeholder Engagement

- Findings were validated through expert consultations with experts employed with Geospatial World on a confidentiality basis.
- Feedback loops were established to ensure practical relevance and strategic alignment with national priorities such as Gati Shakti, Digital India and Viksit Bharat initiatives.

The study serves as a critical input into the national conversation on infrastructure modernization. By grounding BIM's value in evidence and strategic insight, the study aims to accelerate adoption, inform policy, and catalyze digital infrastructure outcomes at scale.

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