

AI in Construction: Building Smarter, Safer, and Stronger

Artificial Intelligence (AI) is rapidly transforming industries worldwide, and construction is no exception. Long known for its complexity, unpredictability, and resource intensity, the sector is now discovering that AI can be a powerful partner in solving some of its biggest challenges. From smarter design processes to safer worksites and more sustainable use of materials, AI is reshaping the future of construction.

At the planning stage, AI offers capabilities that were unimaginable a decade ago. Advanced tools can analyse historical data, generate multiple design scenarios, and forecast potential cost or schedule overruns with remarkable accuracy. For steel-intensive projects, this means engineers can optimize structural designs, cut down unnecessary material usage, and ensure projects are delivered both economically and sustainably. What once required weeks of planning can now be simulated and refined in a matter of hours. For instance, software like Autodesk's Generative Design has been used in large infrastructure projects to evaluate thousands of structural options simultaneously, helping design teams select layouts that minimize steel consumption while maintaining safety and performance standards.

On the job site, AI is bringing a new standard of safety and efficiency. Computer vision technologies monitor real-time video feeds, identifying hazards such as missing protective gear or unsafe

equipment operation before accidents happen. Predictive analytics also ensure that machinery and fabrication tools receive timely maintenance, preventing breakdowns and reducing costly delays. For companies handling large-scale steel construction, these insights are invaluable in maintaining worker safety and ensuring project continuity.

Quality control is also benefiting from AI integration. Robotic welding, AI-guided fabrication, and drone-based inspections are improving accuracy and minimizing human error. These technologies detect deviations early, reduce rework, and guarantee consistency in steel assembly and installation. At the same time, AI-

driven sustainability tools evaluate energy use, HVAC demands, and material recycling strategies, helping projects meet environmental standards while lowering long-term operating costs.

Perhaps most importantly, AI is not here to replace human expertise but to amplify it. By automating repetitive tasks, processing complex datasets, and offering predictive insights, AI allows construction professionals to focus on higher-value decisions and innovation. The result is faster project delivery, improved worker safety, reduced waste, and stronger longer-lasting structures.



Mapping India's Urban Heat Vulnerability Using AI and Satellites

India's cities are heating up faster than ever and the consequences are becoming impossible to ignore. With rapid urbanization, dense concrete jungles, and a changing climate, the urban heat island (UHI) effect is leaving millions vulnerable—particularly those in low-income settlements where access to cooling infrastructure is limited. In response, India is turning to artificial intelligence and satellite technology to map urban heat vulnerability at an unprecedented level of detail.

This initiative marks a major step in using cutting-edge digital tools to understand how heat affects people differently across urban landscapes. By combining AI algorithms with high-resolution satellite imagery, researchers can now identify which neighbourhoods, and even which individual buildings, face the greatest risks from rising temperatures. These maps are layered with data on factors such as population density, building materials, access to green spaces, and socioeconomic conditions, creating a holistic picture of heat exposure and vulnerability.

Unlike traditional heat monitoring methods which rely on broad temperature averages, this AI-driven system drills down to the granular level. A densely packed cluster of tin-roofed homes, for instance, may record dangerously high heat retention compared to a nearby area shaded by trees and equipped with proper ventilation. Such insights are crucial for policymakers, city planners, and developers as they design strategies to protect vulnerable communities and build resilience into India's urban fabric.

The applications extend directly into construction and infrastructure planning. Developers can use these findings to make informed choices about materials, insulation, and urban design. For example, steel and other reflective materials could play a critical role in reducing heat absorption in large-scale housing projects. Similarly, integrating AI insights with urban construction can ensure that new projects are not only structurally sound but also climate-resilient.

At a time when heatwaves are becoming one of the deadliest climate threats in



South Asia, the fusion of AI and satellites offers hope. By pinpointing where the risks are greatest, India has the opportunity to direct cooling solutions, whether through reflective surfaces, urban greening, or

smart infrastructure, where they are most needed. This effort represents more than a technological leap; it is a rethinking of how cities can be built to withstand the pressures of a warming planet.

LuLu IT Twin Towers in Kochi: Infrastructure with Scale and Purpose



Kochi's IT capabilities are on the rise with the inauguration of the LuLu IT Twin Towers at SmartCity, Kakkanad, completed at an investment of ₹1,500 crore. Spanning 12.74

acres and soaring to 152 meters, the twin towers now hold the distinction of being South India's tallest and largest IT-focused commercial complex.

Construction took nearly six years to finish. The towers feature approximately 35 lakh square feet of office space, spread over 30 to 33 floors depending on reporting, and are intended to house between 25,000 and 30,000 IT and ITeS professionals. The design emphasizes both functionality and sustainability. The project has received a LEED Platinum pre-certification, positioning it among the most energy- and water-efficient commercial buildings in the region. Features

such as solar panels, rainwater harvesting, wastewater recycling, and smart energy systems reflect this approach.

One notable infrastructure component is a large-scale robotic car parking system capable of accommodating approximately 3,200 vehicle, paired with an additional 1,300 conventional parking spots designed to maximise efficiency in space and time. Beyond offices and parking, the development

includes significant amenities: a food court seating 2,500, a 600-seat auditorium with partition options, recreational zones (outdoor gym, sports turfs, landscaped common areas), and even a creche for employees' children. Vertical circulation is well-supported with 67 lifts, 12 escalators, and multiple entry-exit points, including scenic glass escalators and a rooftop terrace offering panoramic city views.

India Pushes Builders Toward Greener Materials

India's construction industry is starting to shift from traditional methods to greener, more sustainable practices, with governments and urban bodies stepping in to drive the change. Eco-friendly materials and

certifications often come with higher upfront expenses; thus, the main hurdle for builders has been cost. To offset this, both central and state governments are offering incentives. Gujarat now provides additional Floor Space

Index (FSI) at discounted rates for green-certified projects, while Andhra Pradesh waives fees on environmental and RERA registrations for developers adopting Indian Green Building Council (IGBC) standards.

Cities, too, are drafting long-term plans. Thiruvananthapuram recently launched its Net Zero Carbon and Resilient Buildings (NZCRB) roadmap, in partnership with WRI (World Resources Institute) India, to guide material use, procurement, and emission tracking in construction. Such initiatives are designed not just to encourage energy-efficient buildings, but also to tackle the "embodied carbon" in materials like steel and cement.

India already ranks among the top countries in global green building footprints, but with rapid urbanisation and growing climate pressures, adoption of sustainable materials needs to scale much faster. Developers are beginning to see the financial logic too. Green-certified buildings often bring long-term energy savings, lower operating costs, and faster approvals. The push to mainstream green construction is still in its early stages, but a mix of incentives, policies, and shifting market demand is laying the foundation for more sustainable cities.



Carbon Credits Gain Ground as India Locks Them to Construction and Steel Circularity

India's carbon credit market is progressing beyond abstract trading, integrating incentive schemes directly into industries such as automotive recycling and green steel production. One pathway making strides is via End-of-Life Vehicle (ELV) scrappage, where dismantling old, inefficient vehicles at registered facilities now generates

verified carbon credits. These credits can be traded, redeemed against taxes, or used by companies to offset their own emissions targets. By attaching a monetary value to emission reductions, the government is nudging both individuals and industries toward greener choices. A recent pilot project in New Delhi underscored the potential.

Meta Materials Circular Markets (MMCM), in collaboration with IIT Bombay, enabled two registered vehicle recycling facilities to receive carbon credits through verified environmental data. Using blockchain technology, the process ensured transparency and traceability—key ingredients for a credible carbon market.

This approach has broader reverberations for the steel-intensive construction sector. India's steel industry currently emits around 2.5 to 2.85 tonnes of CO₂ per tonne of crude steel, significantly more than the global average of 1.4 tonnes. As vehicle scrappage boosts scrap availability, secondary steel producers using Electric Arc Furnaces (EAFs) can shift away from energy-heavy blast furnace methods, cutting both emissions and import dependence.

The government is also advancing green steel initiatives, defining emission thresholds such

as green steel under 2.2 t CO₂/t, and five-star green-rated below 1.6 t CO₂/t, and seeking ₹1.7 trillion in budgetary support for low-carbon production.

These actions reflect an emerging policy ecosystem that aligns waste, recycling, and industrial strategy with carbon accounting. Carbon credits are evolving from abstract instruments into concrete levers that reward effective climate-aligned practices—from scrappage to reused steel in construction.



Courtesy of Business Standard

Ask the **Expert**



Shapes spaces that celebrate local context and heritage, creating architecture that is both rooted in place and guided by a strong conservation ethos.

Architect Surya Prasanth

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Can AI-driven design tools realistically help reduce material wastage in steel-intensive projects, and how soon do you see this becoming standard practice in India?

I truly believe AI-driven design tools can transform the way we look at material usage, especially in steel-intensive projects where wastage is often unavoidable. Much of this waste happens due to overdesign, repetitive detailing, or miscalculations that are hard to control manually. AI, on the other hand, can study multiple design options instantly, simulate different load conditions, and suggest the most material-efficient solutions. This helps us predict exact requirements and avoid excess steel consumption, while also saving both cost and carbon footprint.

What excites me most is that AI will not replace architects or engineers but act as a partner in design. It will sharpen our decisions, reduce errors, and allow us to focus on creativity and context while the tool takes care of optimization. The collaboration between human judgment and AI's precision can open up smarter ways of building - where efficiency and sustainability go hand in hand. Globally, such tools are

already proving successful in large-scale infrastructure and industrial projects. In India too, the shift is beginning, especially as sustainability, rising material costs, and stricter environmental regulations demand new approaches. Initially, adoption will be strongest in urban developments and industrial facilities, but once the benefits are visible, it will filter into mainstream construction practices.

In my view, within the next five to seven years, AI-driven design will become standard practice in India. The early adopters - progressive firms, institutions, and government-backed projects - will lead the way.

Ultimately, the larger purpose of AI in design is not just about saving steel or reducing expense. It is about creating a culture where nothing is wasted, every resource is optimized, and design becomes truly responsible toward both people and the planet.



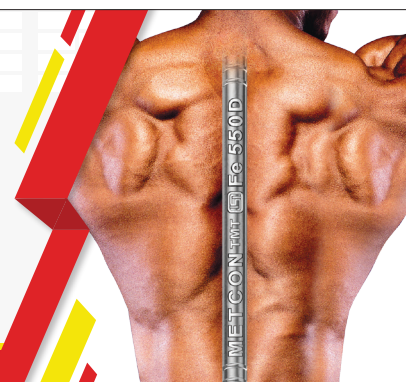
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