

Transforming India's Built Environment

A 2050 Vision for Wellness and Resilience

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Executive Summary

This white paper attempts to summarize and provide a structured perspective on transforming India's built environment, taking stock of emerging realities attributed to climate change and sustainability (planet, people, and prosperity). While the COVID-19 pandemic provided the original backdrop to review the status of the built environment and its resilience, climate change continues to manifest as an existential threat.

Three interdependent concurrent drivers, Decarbonize, Democratize and Digitalize are essential for the required transformations in the built environment. Decarbonization aims to drop the exponentially accruing carbon footprint attributed to modern society to fundamentally restore and reset planetary systems that society is attuned to. Democratization aims to overcome deprivation and marginalization, to be inclusive of diversity in culture, geography, and aspirations in providing a healthy and resilient living environment. Digitalization could provide the ubiquitous digital connectivity and Internet of Things as the unifying fabric encompassing environmental stewardship to network, facilitate, operate, and underscore transformations across all seven sectors in the built

environment, viz., residential, agriculture, administration, industry & commerce, education & research, infrastructure services, and transport and communication. Decarbonize, Democratize and Digitalize, like in a triple helix, are intricately linked, and may be achieved through five actionable levers: Research and Development, Technology, Human Capital, Policy and Economic Investment. This structure aims to support wellness and resilience in the built environment and restore planetary stability.

Wellness provides the much-needed paradigm to unify the outcomes emerging from the seven built-environment sectors. Clarity needs to emerge on the definition and assessment of wellness and sustainability, as it would apply to various activities and stakeholders, to achieve carbon neutrality. There is an imminent need for restoring ecosystem services and enhancing biodiversity. Wellness as a fundamental right permeates all aspects of the built and natural environment and the planet. The built environment (urban to be specific) also needs to be reconfigured keeping in mind human scale and socio-temporal

sensitivity, e.g. open spaces, pedestrian mobility, social inclusiveness, nature and recreation. In addition to equitable and affordable access to a healthy living environment, meeting inter-generational aspirations is crucial.

This white paper has taken stock of current status and challenges in the built environment while also identifying multi-sectoral recommendations at the building, community and regional/national scales. Each of the three drivers has been articulated in detail, highlighting challenges and opportunities in terms of market barriers, policy and institutional challenges, and societal saliency. Decarbonization approaches include reduction in embodied and operational carbon and circularity of materials, products and spaces. Democratization approaches include provision of inclusive, healthier built environments and communities, resilience to unprecedented health and climate risks, and reinforcing positive sustainable behavior. Digitalization approaches include all stages of building lifecycle, community-scale systems, and unlocking region-specific transformations. This involves a national computing and networking infrastructure, archiving and revival of traditional knowledge, and adoption of machine learning and artificial intelligence based analytics for the built environment.

At the UN Climate Change Conference 2021, India announced a target of net zero emissions by 2070. India will reduce its projected Carbon emissions by 1 billion tonnes and the carbon intensity of its economy by 45% by 2030.

In order to approach, and as we believe, surpass this target, it is absolutely critical to transform the built environment that constitutes nearly 40% of global energy-related GHG emissions. While other energy sectors such as centralized renewables may require significant infrastructure change and investment, building technologies can create quick climate wins. In India where half of the buildings and homes that will be standing in 2050 have yet to be built, but once built will last 50-100 years, this is a historic opportunity. It is also a contrast to decarbonizing sectors such as transport where the assets are short lived. The built environment thereby lends itself to democratization and faster adoption as one of the most cost effective and deep carbon abatement wedges while being the human theater for wellness and health.

The following ten key considerations have been identified along the three drivers with a vision of a zero-carbon built environment promoting digitally enabled equitable wellness and resilience for all.

Decarbonize

GOAL: Net zero emissions-built environment by 2050

1. Breakthrough, low-embodied, robust materials and assemblies adopting aggressive conventional and unconventional high-performance measures amenable to circularity and planetary ecosystem services;

2. Low-carbon, region-specific, durable and disaster-resilient building typologies constructed and operated with cost-effective, integrated passive and active resource efficient technologies;
3. Building-to-grid community-scale integration with cost-effective distributed energy resources to harness demand flexibility while providing equitable, reliable energy access.

Democratize

GOAL: Equitable access to wellness for a resilient built environment, that includes clean air, energy, water and sanitation, mobility, biodiversity and open spaces.

4. Resilience to counteract warming and pollution levels and providing equitable access to a clean, remedial, health-promoting built environment;
5. Attitudes and technologies leveraging a culture of resource conservation and restoring environmental vitality;
6. Knowledge management through educational, vocational, and workforce training in architecture, engineering, sciences, and sustainability through integrated living environment curricula.

Digitalize

GOAL: Scalable, secure solutions to enable dynamic effectiveness of the built environment

7. Digital tools and modeling frameworks throughout the building life-cycle including digital supply chains, energy modeling, benchmarking, and circularity;
8. Resource management and information systems that provide data analysis and scientific underpinnings for performance of traditional, passive, and active systems at building, community and regional/national scales;
9. Cost-effective, ubiquitous cyber secure, sensors and controls integrating building- to-(micro)grids.

Demonstration

GOAL: Demonstrate key strategies, tools and technologies to create net zero communities.

10. Design, implement, and operate a net zero carbon community, with a cost-effective, scalable technology suite, human capital development, that leads to wide spread policy adoption and investment.

This white paper offers breakthrough pathways, that are generically inclusive of diverse stakeholders, and through well intended stakeholder inclusion provide meaningful take aways for radical transformation towards achieving equitable wellness and planetary resilience by 2050.

This is the decisive decade. Time is of the essence.