UN environment programme

Global Alliance for Buildings and Construction

# TRANSFORMING THE BUILT ENVIRONMENT THROUGH SUSTAINABLE MATERIALS

## INDIA: ODISHA & MAHARASHTRA

India is witnessing an unprecedented expansion of its built environment, with an estimated 5.7 billion $m^2$ of new building stock expected by 2030, 21.5 billion $m^2$ by 2040, and 45 billion $m^2$ by 2060. Meeting this demand will require $4.5 trillion in infrastructure investment by 2040, according to the Indian Economic Survey (2017-18). By 2030, nearly 40% of India's population—around 600 million people—will live in cities, driving a sharp rise in both embodied and operational carbon emissions.

Buildings constructed today will remain in use for decades, often beyond 2070, making it critical to address emissions across the entire life cycle. Industry leaders are increasingly adopting strategies that simultaneously reduce embodied carbon (from material production and construction) and operational carbon (from energy use). A pragmatic approach—"Avoid, Shift, Improve"—guides this transformation: build less where possible, choose low-carbon and circular materials, and improve building design and efficiency.

The United Nations Environment Programme (UNEP) is supporting India's transition to a circular, low-carbon, and resource-efficient built environment. Through enabling frameworks for sustainable materials, the project promotes responsible material use, stimulates local sustainable markets, and helps India raise its climate ambition within the buildings and construction sector.

Implemented in collaboration with:

bmTPC

MAHAPREIT

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SED FUND

## THE CHALLENGE

In India, construction practices are often driven by speed and cost, which can limit the adoption of sustainable approaches. The sector also faces a lack of regulations and mandatory reporting on environmental performance, making it challenging to track and reduce carbon emissions effectively.

Environmental performance data for building materials is scarce, highlighting the urgent need for a greener supply chain. A cradle-to-grave approach is essential to minimize emissions throughout the lifecycle of buildings—from material production and construction to operation and eventual decommissioning.

Adopting green materials and systems in India is further slowed by the need for approvals and updates to building codes and standards, which is often a lengthy and complex process. There is also a lack of confidence in new low-carbon materials, underscoring the importance of pilot projects, proof-of-concepts, and strong leadership to demonstrate their effectiveness.

Even where sustainable alternatives exist, availability at scale remains limited, and access to finance for producing greener materials is a significant barrier. Overcoming these challenges is critical for India to transition to a low-carbon, climate-resilient, and resource-efficient built environment.

## THE SOLUTION

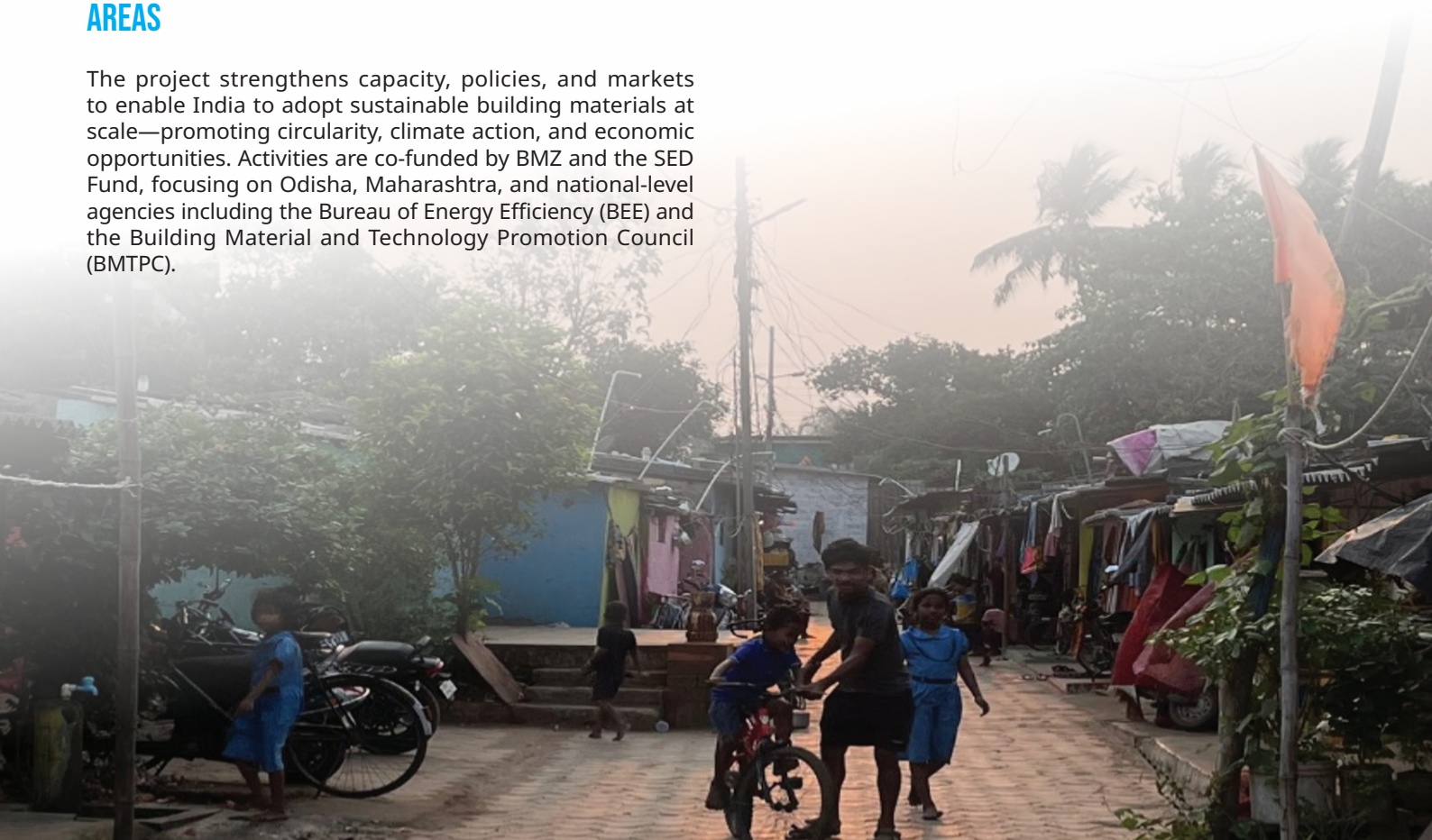
Transitioning to sustainable materials means rethinking how we design, source, use, and reuse materials. It required creating enabling frameworks, updating building codes and standards, support research and encourage innovation and increased access to financing.Promote the adoption of sustainable management and production of bio-based materials

## THE PROGRAMME SUPPORTS THREE KEY ACTIVITY AREAS

The project strengthens capacity, policies, and markets to enable India to adopt sustainable building materials at scale—promoting circularity, climate action, and economic opportunities. Activities are co-funded by BMZ and the SED Fund, focusing on Odisha, Maharashtra, and national-level agencies including the Bureau of Energy Efficiency (BEE) and the Building Material and Technology Promotion Council (BMTPC).

## KEY ACHIEVEMENTS AND ONGOING ACTIVITIES

1. **Integrating Embodied Carbon in the National Building Codes** and Energy Convervation Building Codes for the commercial and residential sector in collaboration with the Center for Advanced Research in Building Science and Energy, CEPT University and Bureau of Energy Efficiency
2. **Establishing the "Mainstreaming Alliance for Resilient and Green Buildings"** in collaboration with IFC, a national collaboration platform to enable knowledge-sharing, identify synergies, and support evidence-based policies for sustainable, resource-efficient construction.
3. **State level climate action roadmaps for buildings and construction** under development in Odisha following the GlobalABC methodology. A baseline report has been prepared for Maharastra to guide future actions.
4. **Capacity Building:**
   - Conducted a capacity needs assessment to identify skills gaps in the construction value chain.
   - Delivered training programs in Delhi with the Building Materials and Technology Promotion Council, RMIT University, and Bioregional, targeting both startups/SMEs in sustainable building materials and policymakers, regulators, urban local bodies, developers, and architects involved in the Pradhan Mantri Awas Yojana (PMAY).
5. **Pilot Project Implementation and scale-up :** Ongoing pilots in (Thane) Maharashtra and (Bhubaneswar) Odisha to demonstrate sustainable, climate-resilient building materials and designs, Lessons from these pilots will inform PMAY 2.0, Jaga Mission, and cluster redevelopment projects, combining social impact with pioneering climate-smart approaches



# CASE STUDY – PRAGATI VIHAR REDEVELOPMENT, BHUBANESWAR, INDIA

The Pragati Vihar redevelopment in Bhubaneswar, Odisha, is a pioneering example of community-led, climate-resilient in-situ slum transformation. Leveraging the Jaga Mission's framework of land rights for slum dwellers, secure tenure enabled residents to access housing subsidies under the Pradhan Mantri Awas Yojana–Urban (PMAY-U) and additional grants via the Technology & Innovation Sub-Mission (TISM).


Facilitated by UNEP, Tata Steel Foundation, and Ashok B Lall Architects, the project adopted a co-learning and co-production approach with the community. Site planning addressed flood risks by raising the site level and integrating municipal infrastructure alongside sustainable solutions like rainwater harvesting and rooftop solar energy. The project has secured government subsidies under the PMAY project for the construction of 44 houses (around $3200 per house/ beneficiary).

**Resource-Efficient & Climate-Responsive Design**

The redevelopment emphasizes low-carbon, resource-efficient construction with circular economy principles:

- Low-rise, compact row housing maximizes land use.
- Shaded semi-open yards, extended roof slabs, and raised plinths enhance thermal comfort and flood resilience.
- Adaptive ventilation strategies and ceiling/exhaust fans ensure year-round climate comfort.
- Reduced concrete and steel usage by 30%.
- A 16% reduction in embodied carbon per unit area was achieved through constrained masonry, reduced steel and RCC use, and incorporation of Construction & Demolition (C&D) waste.
- Circular materials such as fly ash blocks, AAC blocks, GGBS cement, and salvaged fittings were used, while roof insulation and reflective finishes improve thermal performance.
- Reduction in indoor temperatures by 2-3 degrees and enhanced air quality
- Shared green spaces, rainwater harvesting, and solar PV systems enhance ecological and energy resilience.

***Credit: Ashok Lall Architects***

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