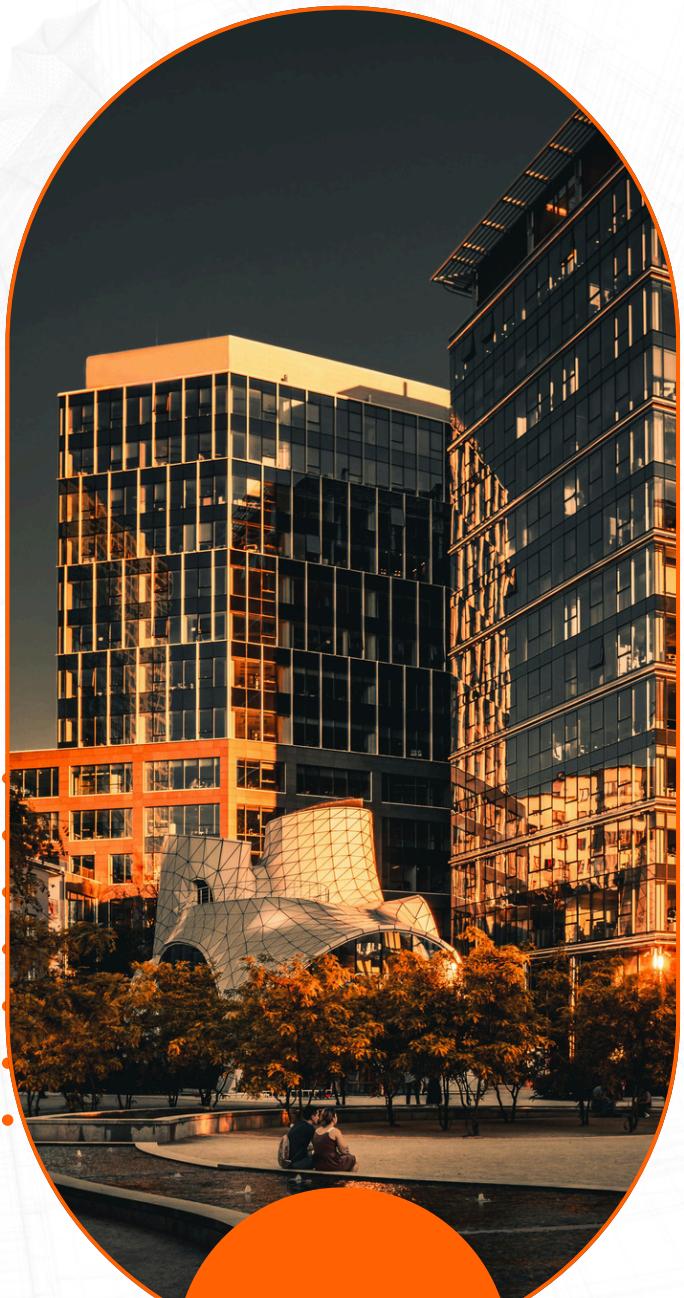




BUILDING A CIRCULAR ECONOMY IN CONSTRUCTION

and Infrastructure in India

Transitioning from Linear Growth • • • •
to Sustainable Regeneration • • • •
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INTRODUCTION: THE URGENCY FOR A CIRCULAR TRANSITION



India is on the cusp of a massive infrastructure transformation. With over **\$1.4 trillion investment** planned under the National Infrastructure Pipeline (NIP) and **smart city missions** expanding across the nation, the demand for cement, steel, sand, and other materials is surging.

However, the construction sector — which contributes nearly 9% of India's GDP — is also responsible for 30% of total solid waste generation, 22% of CO₂ emissions, and extensive natural resource depletion.

A Circular Economy (CE) approach offers a transformative alternative to the traditional “take-make-dispose” model by emphasizing resource efficiency, reuse, recycling, and regeneration — making the construction ecosystem not only economically productive but also environmentally restorative.

2. THE CASE FOR **CIRCULAR CONSTRUCTION**



Aspect	Linear Model (Current)	Circular Model (Future)
Resource Flow	Extract → Use → Dispose	Reuse → Recycle → Regenerate
Waste Management	Landfill and dumping	Closed-loop recovery systems
Material Life	Single use	Extended lifecycle via reuse/remanufacture
Carbon Impact	High embodied carbon	Low-carbon circular materials
Value Chain	Fragmented	Integrated and regenerative

According to a NITI Aayog (2023) report, implementing circular economy principles could reduce India's construction waste by 80% and save nearly ₹2 lakh crore annually by 2030.

3. CIRCULAR ECONOMY PRINCIPLES FOR CONSTRUCTION



Design for Longevity & Adaptability

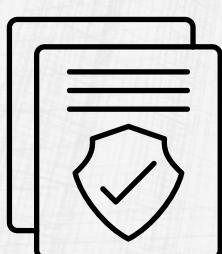
- 01.** Adopt modular and prefabricated designs to extend the lifespan of buildings and infrastructure.
- 02.** Encourage Building Information Modelling (BIM) for efficient material management and deconstruction planning.

Material Reuse and Resource Recovery

- Reuse structural steel, doors, bricks, and flooring from demolition projects.
- Deploy construction and demolition (C&D) waste recycling plants – currently only 53 cities have functional ones, but the potential exceeds 150 million tonnes/year.

Use of Secondary Raw Materials

- Promote use of fly ash, slag, recycled aggregates, and geopolymers concrete in public works.
- Example: The Delhi Metro Rail Corporation (DMRC) uses 98% recycled construction waste for its stations.



Circular Procurement and Public Policy

- Mandate circularity criteria in government tenders and procurement under GFR 2017 revisions.
- Incentivize “green procurement” via tax rebates or performance-linked sustainability credits

Digital Tools and Data Governance

- Implement Material Passports and Digital Twins for tracking resources throughout the infrastructure lifecycle.
- Use IoT and AI for predictive maintenance, reducing waste and extending asset life.



4. POLICY AND INSTITUTIONAL ENABLERS

Government Frameworks

- NITI Aayog's Circular Economy Action Plan (2022) lists construction as a priority sector.
- Construction and Demolition Waste Management Rules (2016) mandate 100% segregation and recycling of waste.
- Bureau of Indian Standards (BIS) has released codes for recycled aggregates and alternate materials.

Financing and Incentives

- Introduce Green Infrastructure Bonds and Circular Construction Credit Schemes.
- Enable Extended Producer Responsibility (EPR) for large construction firms.

Skill Development

- Integrate Circular Design Thinking into architecture, civil engineering, and urban planning curricula.
- Upskill municipal engineers and contractors in waste segregation and reuse technologies.

5. CASE STUDIES FROM INDIA AND BEYOND

Location	Circular Practice	Impact
DMRC, Delhi	Recycled 98% C&D waste	Reduced 200,000 tonnes landfill burden
Mumbai Coastal Road Project	Use of fly ash & dredged material	Reduced virgin material use by 30%
Amsterdam (Netherlands)	Citywide Circular Strategy 2050	Targeting 100% reuse of materials
Singapore	Smart Materials Exchange Platform	Reuse rate >90% in public infrastructure

6. PATHWAY TO A CIRCULAR FUTURE

Phase	Key Actions
Short-term (2025)	Enforce C&D waste recycling norms; incentivize circular startups.
Medium-term (2030)	Integrate circularity in Smart City and AMRUT 2.0 projects.
Long-term (2047)	Achieve zero-waste, net-zero carbon infrastructure ecosystem.



7. CONCLUSION: BUILDING A REGENERATIVE BHARAT

The journey toward a Circular Economy in Construction and Infrastructure is not just an environmental imperative — **it is an economic and social opportunity.**

By designing out waste, rethinking resource flows, and aligning industry, academia, and policy, India can become a **global leader in circular construction innovation.**

A Circular Bharat is one where every demolished building becomes a resource, every project a node in a regenerative network, and every engineer a steward of sustainability.

