ASIAN DEVELOPMENT BANK

# Recommendations and Roll-Out Strategy

## for Mainstreaming Resource-Efficient Construction Materials in India

Cement and Steel Sectors

*Based on Technical Reports on Low-Carbon Cement and Low-Carbon Steel in India*

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## 1. Executive Summary

India's construction sector consumes approximately 391 million tonnes (MT) of cement and 82–88 MT of steel annually for construction applications, making it the single largest consumer of both materials domestically (CMA, 2024; JPC, 2024; INSDAG, 2023). By 2030, cement demand is projected to reach 550–600 MT and construction-sector steel demand to reach 115–136 MT, driven by the National Infrastructure Pipeline (NIP), Smart Cities Mission, AMRUT 2.0, and accelerated urbanisation (ICRA, 2024; CRISIL, 2024; NITI Aayog, 2024).

Resource-efficient alternatives are already commercially available and standards-compliant in India. For cement, blended variants (PPC per IS 1489, PSC per IS 455, Composite per IS 16415) account for 73–75% of production and are priced **at or below OPC parity**. For steel, scrap-based EAF products conforming to IS 1786 and IS 2062 are **at or below BF-BOF pricing**, and high-strength TMT bars (Fe 500D/Fe 550) enable 10–15% material savings that offset their modest price premium.

Despite this market readiness, procurement practice remains a bottleneck: public works specifications routinely default to OPC and Fe 415 TMT; lifecycle costing and embodied carbon criteria are absent from bid evaluation; GreenPro certification and Environmental Product Declarations (EPDs) are not systematically required; and awareness among procurement officers of IS code provisions for blended cements and EAF-produced steel remains limited.

This report synthesises findings from the companion technical reports on low-carbon cement and low-carbon steel to formulate a consolidated set of recommendations and a phased roll-out strategy (2025–2030) for mainstreaming resource-efficient construction materials across India's public and private procurement ecosystems.

## 2. Evidence Base: Key Findings from the Technical Assessments

### 2.1 Resource-Efficient Cement: Market Readiness

**Table 1. Summary of Resource-Efficient Cement Availability and Readiness**

| Cement Type | IS Code | Production Share | Price vs. OPC | $CO_2$ Reduction | Readiness |
|---|---|---|---|---|---|
| PPC (fly ash) | IS 1489 | 52–54% | –10 to –5% | 20–35% | Fully commercial |
| PSC (slag) | IS 455 | 15–17% | –5 to 0% | 40–60% | Fully commercial |
| Composite | IS 16415 | 2–3% | –3 to +3% | 30–50% | Fully commercial |
| $LC_3$ | Under dev. | <1% | +3 to +8% | 50–60% | Pilot/early commercial |
| Geopolymer | No IS code | <0.1% | +15 to +30% | 70–85% | Specialised applications |

*Source: Technical Specifications for Low-Carbon Cement Products in India (2025).*

Key finding: 73–75% of India's cement production is already blended cement. The primary barrier is not supply but procurement specification—most public tenders default to "OPC 43 Grade" or "OPC 53 Grade" despite IS code provisions explicitly permitting PPC and PSC for all structural applications under IS 456:2000.

### 2.2 Resource-Efficient Steel: Market Readiness

**Table 2. Summary of Resource-Efficient Steel Availability and Readiness**

| Steel Product/Route | IS Code | Production | Price vs. Conv. | $CO_2$ Reduction | Readiness |
|---|---|---|---|---|---|
| TMT Fe 500D | IS 1786 | 55–60% of TMT | +2 to +5% | 10–15% material saving | Fully commercial |
| TMT Fe 550/600 | IS 1786 | <5% of TMT | +5 to +8% | 15–20% material saving | Commercial; growing |
| EAF/scrap steel | IS 2062/1786 | ~12–15 MT | –5 to 0% | 70–85% | Fully commercial |
| Certified green steel | Taxonomy | Limited | +10 to +20% | Variable | Early commercial |
| $H_2$-DRI steel | IS 2062 | Pilot only | N/A | 85–95% | Pilot stage |

*Source: Technical Specifications for Low-Carbon Steel in India (2025).*

Key finding: IS standards for steel are performance-based and production-route-agnostic. EAF/scrap-based steel meeting IS 1786 or IS 2062 is fully interchangeable with BF-BOF steel for all structural applications. The most impactful immediate intervention is specifying Fe 500D as the default TMT grade, enabling 10–15% material savings.

### 2.3 Cross-Cutting Findings

- **No green premium for mainstream alternatives:** PPC/PSC cement and scrap-based EAF steel are priced at or below conventional alternatives. High-strength TMT bar premiums (2–8%) are offset by material savings.
- **Standards are not the barrier:** IS codes for both cement (IS 1489, IS 455, IS 16415) and steel (IS 1786, IS 2062) explicitly permit resource-efficient alternatives. The barrier is specification practice, not standards.
- **Procurement officers lack awareness:** Fewer than 30% of procurement officers have training on certification-based or sustainability-oriented procurement (Digital India Foundation, 2022; INSDAG, 2023).
- **GreenPro/EPDs exist but are unused:** Both cement and steel manufacturers offer GreenPro-certified and EPD-documented products, but these are not required in public procurement specifications.
- **Regional supply chain considerations:** Fly ash and GBFS availability for cement, and scrap availability for EAF steel, vary regionally. Procurement strategies must account for local supply chain conditions.

## 3. Recommendations for Mainstreaming Resource-Efficient Construction Materials

### 3.1 Procurement Specification Reform

The single most impactful intervention is reforming default material specifications in public works contracts. Current specifications systematically exclude resource-efficient alternatives not because of standards limitations, but because of specification inertia.

**Table 3. Recommended Specification Reforms**

| Material | Current Default Specification | Recommended Revised Specification | Rationale / IS Basis |
|---|---|---|---|
| Cement (general) | "OPC 43 Grade" or "OPC 53 Grade" | "Cement conforming to IS 269, IS 1489, IS 455, or IS 16415" — permit all IS-compliant types | IS 456:2000 permits PPC/PSC for all structural applications; blended cements offer equal/superior durability |
| Cement (mass concrete) | "OPC 43 Grade" | "PPC (IS 1489) or PSC (IS 455) preferred for mass concrete" | IS 456:2000 Clause 8.2.5 recommends PPC/PSC for severe exposure; lower heat of hydration |
| TMT bars | "Fe 415 TMT to IS 1786" | "Fe 500D TMT to IS 1786:2008 (minimum); Fe 550 for seismic zones" | Fe 500D provides 20% higher yield; IS 13920:2016 recommends Fe 500D for seismic design |
| Structural steel | "IS 2062 E250" | "IS 2062 E250 minimum; E350/E450 encouraged where design permits" | E350/E450 enable lighter sections (10–15% material savings); IS 800:2007 supports optimised design |
| Steel (recycled content) | No requirement | "Preference for steel with ≥70% recycled content (mass balance verified)" or "No restriction on production route for IS-conforming steel" | IS standards are route-agnostic; EAF steel meets identical requirements |

### 3.2 Embodied Carbon Criteria in Bid Evaluation

Lifecycle costing and embodied carbon should be progressively integrated into procurement evaluation:

- **Phase 1 (Disclosure):** Require all bidders to declare embodied carbon ($tCO_2e$/tonne) for cement and steel supplied, based on EPDs or manufacturer declarations. No scoring impact initially.
- **Phase 2 (Scored criteria):** Allocate 5–10% bid evaluation weightage to embodied carbon for tenders above ₹50 lakh. Proposed formula: Adjusted Bid = Purchase Price + (Embodied Carbon × Shadow Carbon Price ×

Quantity).

- **Phase 3 (Maximum thresholds):** Establish maximum embodied carbon thresholds per material category (e.g., cement ≤0.60 $tCO_2e/t$; structural steel ≤1.5 $tCO_2e/t$). Products exceeding thresholds are non-compliant.

The shadow carbon price for Phase 2 should be set at ₹1,000–2,000 per $tCO_2e$ initially (aligned with India's carbon market pilot pricing under the Carbon Credit Trading Scheme, 2023), progressively increasing as market maturity develops.

### 3.3 Mandatory GreenPro / EPD Requirements

GreenPro certification (administered by CII) and EPDs (per ISO 14025/EN 15804) are market-available, third-party-verified mechanisms that can be immediately incorporated into procurement:

- For cement: require GreenPro certification or equivalent EPD for all tenders above ₹1 crore. GreenPro-certified products are available from UltraTech, ACC, Ambuja, Dalmia Bharat, and JSW Cement.
- For steel: require GreenPro certification or EPD for tenders above ₹5 crore. GreenPro-certified products are available from JSW Steel, Tata Steel, and JSPL.
- Accept India's Green Steel Taxonomy ratings (Ministry of Steel, 2024) as equivalent certification for steel products.
- Establish a centralised registry of GreenPro/EPD-certified construction materials, hosted on the GeM or CPWD portals, to facilitate procurement officer access.

### 3.4 Lifecycle Costing Methodology

A standardised lifecycle costing (LCC) methodology should be adopted for construction material procurement, replacing pure L1 (lowest price) evaluation:

**Cement LCC Formula:** Total Cost = Purchase Price + (Transport Cost) + (Shadow Carbon Cost × Embodied $CO_2$). For a typical ₹370/bag PPC vs. ₹380/bag OPC, the LCC advantage of PPC increases to ₹15–25/bag when carbon costs are included at ₹1,500/$tCO_2e$.

**Steel LCC Formula:** Total Cost = Purchase Price + (Shadow Carbon Cost × Embodied $CO_2$) – (Material Savings from Higher Grades × Unit Price). For Fe 500D vs. Fe 415 in a typical RCC structure, the net LCC saving is approximately 5–8% despite 2–5% higher unit price, due to 10–15% material quantity reduction.

### 3.5 Capacity Building and Institutional Strengthening

Effective mainstreaming requires building human capital and institutional capacity across the procurement value chain:

- **Procurement officer training programme:** Develop and deliver a standardised 3-day training module covering: IS code provisions for blended cements and EAF steel; lifecycle costing methodology; GreenPro/EPD requirements; specification

drafting for resource-efficient materials. Target: 10,000 officers across central and state agencies by 2027.

- **Structural engineer awareness:** Partner with the Institution of Engineers (India), IITs, and NITs to integrate resource-efficient material specification into continuing professional development (CPD) programmes. Focus on Fe 500D design optimisation per IS 456:2000 and blended cement performance per IS 1489/IS 455.
- **Contractor and developer engagement:** Conduct regional awareness workshops in partnership with CREDAI, BAI, and NAREDCO addressing the "green premium" misperception and demonstrating material-performance equivalence under IS standards.
- **BIS and standards body engagement:** Advocate for: (i) completion of BIS standard for $LC_3$ cement (CED 2 committee); (ii) development of IS code for geopolymer cement; (iii) incorporation of recycled content declaration in steel Mill Test Certificates; (iv) annual revision of BEE star rating thresholds for construction materials.

### 3.6 Supply Chain Development

Sustained supply of resource-efficient materials requires targeted supply chain interventions:

- **SCM logistics for cement:** Establish dedicated fly ash transportation corridors (rail sidings, bulk handling terminals) between thermal power plant clusters and cement manufacturing hubs in SCM-deficit regions (Kerala, north-east, southern Tamil Nadu). Estimated investment: ₹1,500–2,000 crore through PPP models.
- **Steel scrap formalisation:** Accelerate implementation of the Steel Scrap Recycling Policy 2019 through: establishment of Authorised Recycling Centres in all Tier-1 cities; vehicle scrappage centre network expansion; construction demolition waste recovery mandates aligned with CCD Waste Management Rules 2016. Target: domestic scrap availability of 70–80 MT by 2030 (from current 25–28 MT).
- **$LC_3$ scale-up:** Support transition of $LC_3$ from pilot to commercial production through: capital subsidy for calcination infrastructure at cement plants; facilitated access to kaolinitic clay deposits; inclusion of $LC_3$ in CPWD and NHAI specifications under IS 16415:2015 provisions.
- **Regional procurement strategies:** Calibrate material specifications to local supply chain conditions—e.g., prefer PPC in fly-ash-surplus regions and PSC near steel plants; accept any IS-conforming cement type in SCM-deficit regions to avoid supply constraints.

### 3.7 CGD Waste Integration into Procurement

Construction and demolition waste recycling should be systematically integrated:

- Mandate minimum recycled aggregate content (10–20% by weight for non-structural applications) in all public works contracts, aligned with IS 383:2016 quality requirements.
- Require CCD waste management plans for all projects above ₹10 crore, per the CCD Waste Management Rules 2016.
- Establish procurement preferences for contractors demonstrating ≥20% recycled content in non-structural concrete (footpaths, paving, sub-base, fill).
- Develop state-level processing infrastructure for CCD waste, targeting recycling rates of 30–40% by 2028 (from current <5%).

### 3.8 Gender-Responsive and Inclusive Procurement

Mainstream resource-efficient procurement should be aligned with social inclusion objectives:

- Include sub-targets for women-owned and SC/ST-owned construction material suppliers within overall MSME procurement mandates (3% women-owned, 4% SC/ST per existing policy).
- Provide preferential GreenPro certification support (subsidised fees, expedited processing) for MSME and women-owned cement and steel producers.
- Ensure ergonomic and accessibility considerations in material specification (e.g., bag weight limits, handling provisions) to promote inclusive construction labour practices.

## 4. Phased Roll-Out Strategy: 2025–2030

The roll-out strategy is organised in three phases, calibrated to institutional capacity, market readiness, and policy development timelines.

### 4.1 Phase I: Foundation (2025–2026)

**Table 4. Phase I Action Plan**

| Action | Responsible Agency | Material | Target Date | KPI / Indicator |
|---|---|---|---|---|
| Issue advisory to CPWD/state PWDs permitting PPC/PSC as default cement in all non-specialised structural applications | MoHUA, CPWD | Cement | Jun 2025 | Advisory issued; CPWD specification amended |
| Amend CPWD/NHAI specifications to mandate Fe 500D as minimum TMT grade | CPWD, NHAI, MoRTH | Steel | Sep 2025 | Revised specifications published |
| Require embodied carbon disclosure (no scoring) for cement and steel in all central tenders >₹1 crore | MoHUA, GeM | Both | Dec 2025 | 100% disclosure in qualifying tenders |
| Launch procurement officer training programme (3-day module) | MoHUA, NITI Aayog | Both | Mar 2026 | 5,000 officers trained |
| Publish centralised GreenPro/EPD registry on GeM portal | GeM, CII | Both | Jun 2026 | Registry operational |
| Issue state-level advisory recommending blended cement and Fe 500D adoption | MoHUA | Both | Jun 2025 | Advisory to all states |
| Pilot lifecycle costing in 10 large central infrastructure projects | CPWD, NHAI | Both | Dec 2026 | Pilot results published |

### 4.2 Phase II: Acceleration (2027–2028)

**Table 5. Phase II Action Plan**

| Action | Responsible Agency | Material | Target Date | KPI / Indicator |
|---|---|---|---|---|
| Mandate GreenPro/EPD for all cement procurement >₹1 crore on GeM | MoHUA, GeM | Cement | Jun 2027 | 80% of qualifying tenders comply |
| Introduce 5–10% embodied carbon scoring in bid evaluation for central tenders >₹50 lakh | MoHUA, MoF | Both | Dec 2027 | Scoring operational in GeM |
| Mandate blended cement (PPC/PSC/Composite) as default in all CPWD specifications | CPWD | Cement | Mar 2027 | OPC specified only for pre-stressed/specialised applications |

| | | | | |
|---|---|---|---|---|
| Establish 5 regional SCM logistics hubs (fly ash, GBFS) | MoEFCC, MoS | Cement | Dec 2027 | 5 hubs operational |
| Scale Authorised Recycling Centres for steel scrap in 20 Tier-1 cities | MoS | Steel | Dec 2028 | 20 ARCs operational |
| Include $LC_3$ (under IS 16415) in CPWD/NHAI approved material lists | CPWD, NHAI, BIS | Cement | Jun 2027 | $LC_3$ listed as approved alternative |
| Mandate minimum 15% recycled aggregate in non-structural public works concrete | CPWD, MoHUA | Aggregates | Dec 2027 | Specification amended |
| Mandate Fe 500D minimum for all state PWD and municipal projects (Tier-1 states) | State PWDs | Steel | Dec 2028 | 80% compliance in Tier-1 states |

### 4.3 Phase III: Consolidation (202G–2030) Table 6. Phase III Action Plan

| Action | Responsible Agency | Material | Target Date | KPI / Indicator |
|---|---|---|---|---|
| Establish maximum embodied carbon thresholds for cement (≤0.60 $tCO_2e/t$) and steel (≤1.5 $tCO_2e/t$) in all central tenders | MoHUA, MoS, BEE | Both | Jun 2029 | Thresholds notified |
| Mandate lifecycle costing as default evaluation methodology (replacing L1) for all construction material tenders >₹10 lakh | MoF, MoHUA | Both | Dec 2029 | LCC operational across GeM |
| Achieve domestic steel scrap availability of 50–60 MT (towards 70–80 MT target) | MoS | Steel | Dec 2030 | Scrap availability tracked by JPC |
| Complete BIS standardisation for $LC_3$ and initiate geopolymer IS code | BIS (CED 2) | Cement | Dec 2029 | IS code for $LC_3$ gazetted |
| Achieve ≥85% blended cement share in public procurement (from current ~73%) | MoHUA, CPWD | Cement | Mar 2030 | Procurement data from GeM/CPWD |
| Achieve ≥40% EAF/scrap share in construction steel procurement | MoS, CPWD | Steel | Mar 2030 | JPC production data |
| Establish real-time sustainability procurement dashboards for cement and steel | GeM, MoHUA | Both | Dec 2030 | Dashboard operational |

| | | | | |
|---|---|---|---|---|
| Mandate CCD waste recycling rate of 30–40% for all projects >₹25 crore | MoHUA, MoEFCC | Aggregates | Dec 2030 | Compliance monitored by CPCB |

## 5. Monitoring and Evaluation Framework

Effective implementation requires a structured monitoring architecture with defined institutional responsibilities, data collection mechanisms, and accountability measures.

### 5.1 Institutional Architecture

- **Inter-Ministerial Coordination Committee:** Chaired by Secretary, MoHUA, with representation from MoS, MoEFCC, BIS, BEE, CPWD, NHAI, GeM, and NITI Aayog. Meets quarterly to review progress against KPIs, resolve inter-agency issues, and approve annual work plans.
- **Technical Working Group:** Comprising representatives from BIS (CED 2), cement and steel industry associations (CMA, MAIT, INSDAG), academic institutions (IITs, NITs), and CII's Green Products Council. Provides technical input on standards development, threshold calibration, and supply chain assessments.
- **State-Level Nodal Officers:** Designated officers in each state PWD/urban development department responsible for local implementation, training coordination, and compliance reporting.

### 5.2 Key Performance Indicators

**Table 7. Monitoring KPIs by Phase**

| KPI | Baseline (2024) | Phase I Target (2026) | Phase II Target (2028) | Phase III Target (2030) |
|---|---|---|---|---|
| Blended cement share in public procurement | ~60–65% | 70–75% | 80–85% | ≥85% |
| Fe 500D share in public TMT procurement | ~50–55% | 70–75% | 85–90% | ≥90% |
| Tenders with embodied carbon disclosure | <5% | 50% | 80% | 100% |
| Tenders with GreenPro/EPD requirement | <2% | 20% | 50% | 80% |
| Procurement officers trained | <5,000 | 5,000 | 15,000 | 25,000 |
| Domestic steel scrap availability (MT) | 25–28 | 30–35 | 40–50 | 50–60 |
| CCD waste recycling rate | <5% | 10% | 20–25% | 30–40% |
| EAF/scrap share in construction steel | ~25% | 28–30% | 32–35% | 35–40% |

### 5.3 Data Collection and Reporting

- Quarterly procurement data extraction from GeM portal covering material type, certification status, embodied carbon declarations, and pricing.

- Annual sustainability procurement report published by MoHUA, with ministry-wise and state-wise breakdowns.
- Biannual compliance audits by CAG, building on existing audit methodology for procurement compliance.
- Independent third-party evaluation at the end of each phase (2026, 2028, 2030) by an empanelled evaluation agency.
- Stakeholder feedback mechanism through annual consultations with industry associations (CMA, INSDAG, CII), civil society, and procurement officers.

## 6. Risk Assessment and Mitigation

### Table 8. Key Risks and Mitigation Strategies

| Risk | Likelihood | Impact | Mitigation Strategy |
|---|---|---|---|
| Regional SCM supply shortages (fly ash, GBFS) constraining blended cement production | Medium | Production disruption in SCM-deficit regions; reversion to OPC | Diversify SCM sources (calcined clay for $LC_3$); invest in logistics infrastructure; permit any IS-conforming cement in deficit regions |
| Steel scrap supply insufficient to meet EAF expansion targets | Medium-High | Higher scrap prices; continued BF-BOF dominance | Accelerate Scrap Recycling Policy implementation; expand vehicle scrappage centres; develop CCD waste steel recovery |
| Contractor resistance to specification changes (blended cement, Fe 500D) | Medium | Non-compliance; reversion to conventional specifications | Awareness campaigns; demonstration projects; mandatory contractor training as tender precondition |
| Insufficient procurement officer capacity for lifecycle costing | High | Ineffective implementation of embodied carbon criteria | Phased rollout (disclosure before scoring); automated LCC tools in GeM; dedicated training programme |
| Price volatility in green steel / $LC_3$ during transition | Medium | Budget overruns; resistance from project managers | Use LCC (not unit price) to demonstrate lifecycle value; buffer pricing through framework contracts |
| BIS standardisation delays for $LC_3$ and geopolymer | Medium | Limits procurement options for advanced materials | Use IS 16415 (Composite Cement) as interim standard; accelerate CED 2 committee work |

## 7. Fiscal and Economic Implications

### 7.1 Cost Savings from Resource-Efficient Procurement

Mainstreaming resource-efficient materials at scale delivers net fiscal savings:

- **Cement:** If 85% of public cement procurement transitions from OPC to blended cements by 2030, the weighted average price reduction (₹5–15/bag for PPC vs. OPC, depending on region) applied to estimated public procurement of 50–60 MT/year yields annual savings of ₹500–1,500 crore, before accounting for carbon cost internalisation.
- **Steel:** Transitioning from Fe 415 to Fe 500D as default TMT grade enables 10–15% material savings. Applied to estimated public construction steel procurement of 25–30 MT/year, this yields material savings of 2.5–4.5 MT/year, equivalent to
  ₹13,000–27,000 crore in procurement cost avoided at current prices.
- **Embodied carbon reduction:** Combined cement and steel interventions could reduce embodied carbon in public construction by an estimated 15–30 MT $CO_2$e/year by 2030, contributing substantively to India's Nationally Determined Contribution (NDC) targets.

### 7.2 Investment Requirements

Key public investment requirements for enabling infrastructure:

- SCM logistics corridors (fly ash, GBFS transport): ₹1,500–2,000 crore (PPP model)
- Steel scrap recycling infrastructure (ARCs, processing facilities): ₹2,000–3,000 crore (public-private, Scrap Recycling Policy)
- CCD waste processing plants (50 plants in major cities): ₹1,000–1,500 crore (municipal/PPP)
- Training and capacity building programme: ₹200–300 crore over 5 years
- GeM/procurement system upgrades (LCC engine, sustainability dashboard): ₹50–100 crore

Total estimated public investment: ₹4,750–6,900 crore over 2025–2030. This investment is substantially outweighed by the projected procurement cost savings of ₹13,500–28,500 crore/year by 2030 from material efficiency alone, yielding a payback period of less than 6 months at full scale.

## 8. Summary and Priority Actions

Mainstreaming resource-efficient construction materials in India does not require new technologies, new standards, or green premiums. The evidence base demonstrates that commercially available, IS-compliant, competitively priced alternatives already exist for both cement and steel. The constraint is procurement practice, not market supply.

**The five highest-priority actions are:**

- **1. Amend CPWD, NHAI, and state PWD specifications** to permit all IS-conforming cement types (IS 1489, IS 455, IS 16415) as default, and mandate Fe 500D as minimum TMT grade. This single intervention is estimated to deliver the largest impact—both in material efficiency and cost savings—with zero additional procurement cost.
- **2. Introduce embodied carbon disclosure** for all central tenders above ₹1 crore, progressing to scored criteria (5–10% weightage) by 2027. This creates market demand signals for resource-efficient products.
- **3. Require GreenPro certification or EPDs** for cement and steel in all tenders above defined thresholds. This leverages existing certification infrastructure without requiring new institutional frameworks.
- **4. Launch a national procurement officer training programme** targeting 25,000 officers by 2030, covering IS code provisions for resource-efficient materials, lifecycle costing methodology, and specification drafting.
- **5. Invest in enabling supply chain infrastructure**—SCM logistics for cement, scrap recycling for steel, CCD waste processing—totalling ₹4,750–6,900 crore over 5 years, with estimated payback of less than 6 months at full-scale implementation.

These actions, implemented through the three-phase roadmap (2025–2030), would position India among global leaders in resource-efficient construction procurement, delivering simultaneous economic, environmental, and social benefits while strengthening domestic manufacturing capacity and reducing import dependence.

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