

# Challenges in construction and demolition waste management in India

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## ABSTRACT:

Construction and demolition (C&D) waste presents a major and growing environmental and urban management challenge in India. Driven by rapid urbanization, redevelopment, and increasing use of reinforced concrete (RCC) structures, C&D waste volumes are substantial and expected to grow in the coming decades. India's legal framework — primarily the Construction & Demolition Waste Management Rules (MoEFCC, 2016) — and supporting technical guidance from the Central Pollution Control Board (CPCB, 2017) provide a foundation for segregation, processing and reuse. However, implementation has lagged because of limited processing capacity, weak enforcement at Urban Local Bodies (ULBs), poor market demand for recycled concrete aggregate (RCA), low levels of accreditation/standards, and the dominance of informal actors in collection and recycling. This paper synthesizes official documents, national reports and international case studies to (a) map the regulatory and institutional framework in India, (b) identify key operational gaps, and (c) compare India's approach with selected international practices in China and Dubai to propose a prioritized set of policy and operational measures. Recommendations emphasise permit-linked C&D management plans, supplier accreditation schemes, demand-creation through public procurement, scaling of processing capacity, formalisation of informal actors, and digital manifests for tracking. The analysis is intended to support urban planners and policymakers in designing implementable reforms. "This study employs a mixed-methods approach grounded in a comparative policy review and the synthesis of primary regulatory frameworks, including MoEFCC, CPCB, and MoHUA guidelines. The research evaluates institutional instruments, infrastructure capacity, and market mechanisms by benchmarking Indian practices against international standards from China and Dubai. The scope is defined by a comprehensive analysis of secondary data and official updates available through 2025; however, the study is limited to the synthesis of published reports and document analysis, as primary fieldwork and material sampling were outside the current research constraints."

## KEYWORDS:

C&D waste; recycled concrete aggregate; circular economy; permit linkage; India; urban planning.

## 1. INTRODUCTION

Urbanisation in India has accelerated over recent decades, creating extensive construction activity — new housing, high-rise developments, infrastructure and urban redevelopment. These activities produce large volumes of construction and demolition (C&D) waste comprising concrete, bricks, soil, metal, wood and other materials. The Government of India has estimated that the country generates approximately 530 million tonnes of C&D waste annually (MoEFCC, 2016). Managing this waste is critical to protect urban environments, reduce pressure on landfills, and recover resources through reuse and recycling. The predominance of reinforced concrete (RCC) in modern construction increases the share of mineral waste (concrete and masonry), making the need for recycling infrastructure and market uptake of recycled aggregates especially important.

## WHAT IS C&D WASTE?



Renovation  
**40%**



Demolition  
**50%**



New Construction  
**10%**

### 1.1 research objectives

The primary aim of this paper is to conduct a comprehensive evaluation of construction and demolition (C&D) waste management within the Indian context. To achieve this, the study first reviews India's existing regulatory and institutional frameworks, including specific rules, guidelines, and the various agencies responsible for implementation. Building on this foundation, the research identifies the operational gaps and challenges that currently hinder effective waste management at the municipal level. Furthermore, the paper provides a comparative analysis of Indian policies against international practices in China and Dubai to extract transferable lessons. Ultimately, these findings are synthesized to recommend pragmatic policy and operational interventions designed to advance circularity and sustainability within India's construction sector.

### 2. LITERATURE REVIEW:

The academic and policy literature on C&D waste management highlights four interrelated themes: policy design, processing infrastructure, market development for recycled materials, and institutional capacity. The Construction & Demolition Waste Management Rules, 2016 (MoEFCC, 2016) are the foundational legal instrument in India and assign explicit duties to waste generators, ULBs, and service providers. The Central Pollution Control Board (CPCB) published technical 'Guidelines on Environmental Management of C&D Wastes' in 2017 to guide siting, processing and environmental safeguards (CPCB, 2017).

Studies and reports (e.g., Centre for Science and Environment, NITI Aayog/GIZ market evaluations) point to a wide variation in generation estimates (from tens to hundreds of millions of tonnes per year) and emphasize the role of accurate city-level estimates for planning processing capacity (CSE, 2019; NITI Aayog, 2020). International literature documents models where policy, industrial processing and procurement act together to create a viable market for recycled aggregate (Huang et al., 2018; BCA Singapore guidance).

### 3. REGULATORY AND INSTITUTIONAL FRAMEWORK IN INDIA

The Construction & Demolition Waste Management Rules, 2016 (MoEFCC, 2016) constitute the primary legal framework. The Rules stipulate segregation at source, authorisation of transporters and processors by ULBs/SPCBs, and duties for bulk generators (projects exceeding defined thresholds). The Rules also mandate that ULBs identify processing and disposal sites and enable monitoring and enforcement mechanisms. CPCB's 2017 guidelines provide technical specifications for segregation streams, processing technologies (crushers, screens), and environmental safeguards (dust suppression, stormwater management) (CPCB, 2017).

MoHUA's Circular on Circular Economy in Municipal Solid and Liquid Waste (2022) further positions C&D waste within national circularity objectives, encouraging ULBs to develop city action plans, integrate C&D into municipal waste frameworks, and explore public procurement to create demand for recycled materials (MoHUA, 2022).

### 3.1 Roles and responsibilities

- Ministry of Environment, Forest and Climate Change (MoEFCC): Rule-making and national oversight.
- Central Pollution Control Board (CPCB): Technical guidelines, standards and monitoring.
- State Pollution Control Boards (SPCBs) and ULBs: Authorisation, enforcement, and provision of processing sites.
- Bureau of Indian Standards (BIS): Standards for materials (e.g., aggregates) and potential standards for recycled aggregates.
- Developers/contractors (bulk generators): Prepare C&D waste management plans and ensure segregation/transport to authorised facilities.

## 4. CURRENT STATUS AND DATA

Quantifying C&D waste generation is critical for infrastructure planning. The Government of India initially cited an estimate of approximately 530 million tonnes per year (MoEFCC, 2016), a high-end figure widely referenced in policy discourse. Other estimates using different methodologies are lower, highlighting significant methodological uncertainty (CSE, 2019). MoHUA and CPCB recommend city-level estimation using building/demolition permit records, floor-area assumptions and empirical conversion factors to derive realistic local generation figures (MoHUA, 2022; CPCB, 2017).

Operational examples: Delhi's Burari plant has received and processed several million tonnes of C&D waste since commissioning, demonstrating scale potential where infrastructure investments exist (CSE, 2019). However, many Tier-II and Tier-III cities lack operational processing units and face logistical challenges in transporting bulky mineral waste to distant facilities.

## 5. CHALLENGES AND IMPLEMENTATION GAPS IN INDIA

Despite the regulatory framework, practical implementation is constrained by multiple interrelated barriers. The following subsections unpack the principal gaps.

### 5.1 Data and estimation gaps

Reliable generation estimates are lacking in many Indian cities; national figures vary widely (CSE, 2019; MoEFCC, 2016). This uncertainty undermines capacity planning for processing facilities and can lead to either under-investment (resulting in illegal dumping) or overinvestment. CPCB recommends ULBs adopt standardized estimation methods tied to permit data to improve accuracy (CPCB, 2017).

See Table 1(below) for a city wise population and waste generation data.

| City      | Population (Census 2011) | Daily C&DW (t/day) | Annual C&DW (Mt/annum) |
|-----------|--------------------------|--------------------|------------------------|
| Mumbai    | 12,442,373               | 2,500              | 0.75                   |
| Delhi     | 16,787,941               | 4,600              | 1.38                   |
| Bangalore | 8,443,675                | 875                | 0.26                   |
| Chennai   | 6,500,000                | 2,500              | 0.75                   |
| Kolkata   | 4,496,694                | 1,600              | 0.48                   |
| Jaipur    | 3,471,847                | 200                | 0.06                   |
| Patna     | 2,514,590                | 250                | 0.08                   |
| Ahmedabad | 6,063,047                | 700                | 0.21                   |

| City       | Population (Census 2011) | Daily C&DW (t/day) | Annual C&DW (Mt/annum) |
|------------|--------------------------|--------------------|------------------------|
| Bhopal     | 1,917,051                | 50                 | 0.02                   |
| Coimbatore | 2,618,940                | 92                 | 0.03                   |

### 5.2 Processing capacity shortfalls

Processing facilities (crushing and screening plants, Material Recovery Facilities) remain limited. Multiple reports indicate that only a small subset of cities have functional, permitted C&D recycling plants, and many existing plants operate below capacity due to feedstock shortages or market absorption problems (NITI Aayog/GIZ reports; CSE case studies). Long haul distances and high transport costs make recycling uneconomic in many contexts.

### 5.3 Enforcement and institutional barriers

Enforcement by ULBs is inconsistent. The 2016 Rules provide for penalties and require ULBs to ensure processing facilities, but local political economy constraints, limited technical capacity and competing budget priorities reduce enforcement rigor. Permit processes often do not consistently require proof of disposal contracts or approved C&D management plans, weakening compliance incentives.

### 5.4 Market, quality and standards issues for RCA

Perceived quality issues for recycled concrete aggregate (RCA) and lack of a robust national accreditation framework discourage widespread use. Singapore’s BCA accreditation scheme exemplifies how supplier certification can build confidence (BCA, 2010). In India, absence of standardized accredited suppliers and limited procurement mandates constrains demand; private developers frequently prefer virgin aggregates due to perceived reliability.

### 5.5 Informal sector and social dimensions

A significant share of collection and small-scale recycling is handled by informal actors (demolition contractors, waste pickers) who lack registration, technical training and environmental safeguards. Formalizing and upskilling these actors is essential to improve traceability, environmental compliance and livelihoods.

### 5.6 Economic and logistical constraints for small generators

Household renovation and small construction generate dispersed, small volumes that are costly to collect and transport. Without subsidized collection or convenient drop-off points, small generators often resort to illegal dumping or hiring informal haulers, further complicating formal management.

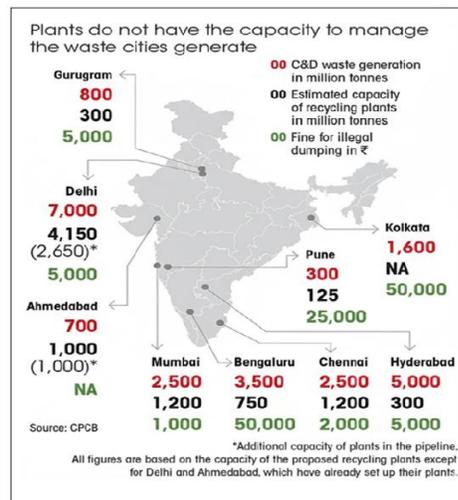
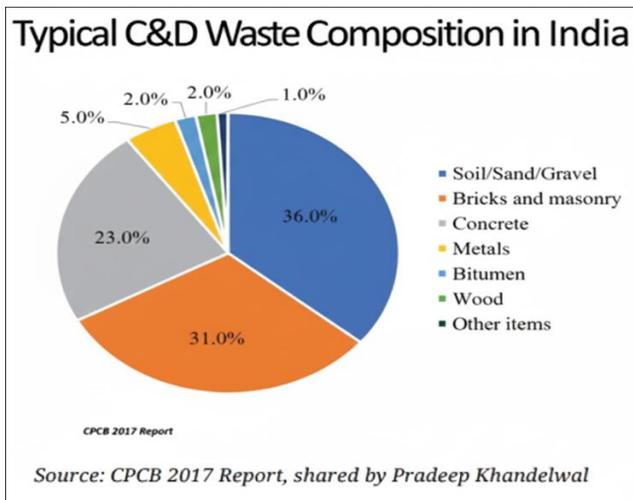


Image 1 above – percentage of type of wastage.

Image 2 - city wise recycling plants capacity.

## 6. COMPARATIVE STUDY: CHINA AND DUBAI

Examining international practice identifies policy levers India can adapt. The analysis below summarises salient features from China and Dubai and notes applicability to Indian context.

### 6.1 China: targets, industrial processing and reuse quotas

China has pursued aggressive reuse targets and industrialization of C&D recycling. Some provinces set reuse/recycling targets of 70% or higher and promote large centralized processing facilities, integrating recycled aggregates into road construction and other municipal works (Huang et al., 2018). Localized permit conditions and demolition controls ensure higher feedstock quality. However, enforcement and implementation vary across regions.

### 6.2 Dubai (UAE): mandatory segregation, licensing and procurement linkages

Dubai Municipality enforces mandatory segregation (Technical Guidelines No.7), licensing of waste haulers, and ties waste management to building regulations and green-building incentives (Dubai Municipality, 2021). Centralized tracking and licensing ensures accountability; green procurement and rating systems create demand for recycled materials.

### 6.3 Singapore: accreditation and market confidence

Singapore's Building and Construction Authority (BCA) developed accreditation for recycled aggregate suppliers and technical guidance for recycled material use in public projects (BCA, 2010). Accreditation, standardized test methods and procurement requirements support market uptake and quality assurance.

## 7. POLICY-GAP TABLE (SUMMARY)

See Table 2 (below) for a consolidated policy-gap comparison across India, China and Dubai.

| Policy Instrument             | India (Status)  | Gap   | China/Dubai Practice                | Recommendation   |
|-------------------------------|---|---|-------------------------------------|--|
| Permit linkage for demolition | Optional/weak in many ULBs (2016 Rules require plans) | Permits often issued without disposal plans | Linked to approval; quotas enforced | Make permit issuance conditional on approved disposal plan |

## 8. RECOMMENDATIONS

Based on the gaps identified and international best practices, the following recommendations are prioritized for Indian cities:

Short-term (0–2 years):

1. Require demolition/construction permits to include an approved C&D waste management plan or contract with an authorised processor.
2. Mandate source segregation for bulk generators and create designated drop-off windows for small generators.
3. Initiate city-level mapping of demolition hotspots and processing sites to plan capacity.

Medium-term (2–5 years):

4. Develop a national/state accreditation scheme for recycled aggregate suppliers (testing, lab certification).
5. Use public procurement to create demand (mandate minimum recycled content in municipal road works and earthworks).
6. Formalize and upskill informal recyclers via licensing, microfinance and technical training.

Long-term (5+ years):

7. Promote cluster-based industrial recycling parks near demolition hotspots, supported by concessional financing.
8. Implement digital manifests and GPS-tracked transport for transparency and enforcement.
9. Integrate C&D management into city climate and circular economy strategies.

## 9. CONCLUSION

Scaling C&D recycling in India requires coordinated action across policy, market and institutions. Permit linkage and accreditation can provide immediate governance fixes; however, market creation (procurement mandates), infrastructure investments and social inclusion (informal sector formalization) are essential to achieve durable outcomes. The comparative cases show that accreditation and procurement are powerful levers, while targets and industrial capacity are enablers. Financial incentives and regulatory certainty will reduce perceived risks for private investors in recycling plants.

C&D waste management is a manageable but complex policy challenge. India's regulatory architecture is relatively comprehensive on paper; the primary barrier is execution. By aligning permit systems, building market confidence through accreditation and procurement, and investing in processing capacity, Indian cities can convert demolition streams into valuable secondary raw materials. Given projected growth in RCC construction and urban renewal, timely action will be necessary to prevent environmental degradation and realize circular economy benefits.

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