

CONSTRUCTION AND DEMOLITION WASTE

SECTION 1: INTRODUCTION

What is C&D waste?

As per the Construction and Demolition (C&D) Waste Rule 2016, ‘any waste comprising building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure’ is classified as C&D waste.

Wastes also include surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities. Some municipalities also include debris recovered from desilting of drains and waterbodies in C&D waste.

Characteristics of the waste

C&D waste is an inert waste, over 90 per cent of which can be easily reused or recycled. A study by Technology Information, Forecasting and Assessment Council (TIFAC) in 2001 noted that C&D waste in India typically contains soil, sand and gravel (36 per cent), bricks and masonry (31 per cent), concretes (23 per cent), metal (5 per cent), wood (2 per cent), and others (3 per cent). But the composition of C&D waste varies from region to region, depending on prevalent construction style and building material usage. There is no exhaustive study on regional variation in C&D waste composition.

Quantum of waste generated

There is no scientific estimate available for the quantum of C&D waste generated in India. Over years different figures ranging from 10 million to 750 million tonnes per year have been given by various agencies (see *Table: Uncertainty in C&D waste estimates*). Official numbers are generally based on the assumption that about 25 per cent of municipal waste is C&D by nature, which in turn is based on typical characterization of municipal solid waste collected by cities. Given the reality that C&D waste collected by cities is accidental as it is not specifically collected and the majority of it is indiscriminately dumped in lowlying land, the assumption of 25 per cent is a gross underestimation. In fact, most other nations report C&D waste as their biggest solid waste stream, many times their municipal waste generation.

Uncertainty in C&D waste estimates

Year	Authority/institute	Estimate (million tonnes per year)
2000	Ministry of Urban Development	10–12
2001	Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology	12–15
2010	Ministry of Environment and Forest	10–12
2013	Centre for Science and Environment	530
2014	Ministry of Urban Development	No estimates exist
2015	Ministry of Urban Development	10–12
2015	Development Alternative and GIZ	750
2016	Ministry of Environment, Forest and Climate Change (Press release announcing C&D Waste Rules 2016)	530
2017	Building Material and Technology Promotion Council	165–175



Estimation of C&D waste generation

As part of its 2001 study, TIFAC developed the following rules of thumb to estimate C&D waste generation:

- Range 40–60 kg per sq. m of new construction,
- Range 40–50 kg per sq. m of building repair,
- Range 300–500 kg per sq. m for demolition of buildings.

Cities can use these rules of thumb in conjunction with their building/demolition permit data to arrive at a reasonable estimate of waste generated. But it must be kept in mind that a considerable part of this estimate, especially the demolition estimate, may be salvaged for reuse by the informal sector and may not require handling by the city.

Environmental impact due to C&D waste

Improper management of C&D waste impacts both the urban and natural environment in the following ways:

- C&D waste is routinely dumped in open drains and water channels, clogging them and leading to urban flooding during rains.
- Dumping of C&D waste in wetlands, water channels and riverbeds disrupts the hydrology and destroys the aquatic ecosystem.
- Leachate and fine chemical particles from C&D waste degrade the soil, leading to land and groundwater pollution. Especially hazardous components include paints, oil and asbestos sheets.
- C&D waste is filling up existing landfills and dump-yards, resulting in the need for more landfills or alternative dumpsites.
- C&D waste usually gets mixed up with other municipal solid waste during the process of transfer or at the collection site. Once mixed, it makes composting and/or recycling of MSW highly difficult.
- C&D waste includes hazardous substances such as sharps, broken glass, boulders, broken wooden logs, rusted metal, broken ceramics, etc., which create a hazardous environment when dumped on unfenced open places.
- C&D waste dumped on streets and footpaths blocks traffic and pedestrians, frequently contributing to traffic congestion and even accidents.
- C&D waste is one of the primary sources of fugitive dust pollution.

Not waste but a resource

India is undergoing a construction boom, which is leading to high rates of exploitation of primary resources for construction materials. Sand, soil, stone and limestone are critical resources used in the sector that are already facing supply disruptions and price spikes due to mining bans and restrictions. Therefore, use of secondary materials needs to be promoted to supplement the use of primary materials and recycled C&D waste is one of the best available options.

Initiatives from cities that came before C&D Rules

There is global evidence that C&D waste can be recycled and reused to a large extent in the construction process itself. Mature technologies are also available for this. In India, small steps had been taken to start this process even before the 2016 C&D Rules came into force.

- **The Mumbai experience:** Way back in 1999, a decentralized solution for debris management was promoted by the Youth for Unity and Voluntary Action (YUVA) in Navi Mumbai and was supported by the City and Industrial Development Corporation (CIDCO). The collaboration led to the recycling of over 1,500 tonnes of waste during 2002–06. But the Cidco Yuva Building Centre (CYBC) was forced to shut down in 2012 as it failed to receive policy or market support.
- **The Delhi experience:** Delhi is estimated to generate about 4,600 tonnes per day (TPD) of C&D waste. IL&FS Environmental Infrastructure & Services Ltd in collaboration with the then undivided Municipal Corporation of Delhi developed a pilot project to demonstrate the potential of collecting and recycling C&D waste in Burari in north Delhi. The pilot plant began operation in 2009, with a recycling capacity of 500 TPD.
The pilot collected C&D waste from three designated zones of the Delhi—Karol Bagh, Sadar-Paharganj Zone and City. IEISL collected approximately 4.5 lakhs tonnes of C&D waste during 2010–12. This is recycled into aggregates which are converted to Ready Mix Concrete (RMC), pavement blocks, kerb stones and concrete bricks. However, the products manufactured by the recycling plant found no takers due to lack of information and the absence of support from national legal-instruments like the Indian Standards and National Building Code of India (see *Case study—Delhi*).



SECTION 2: POLICY

Policy roadblocks that existed

Recycling and reuse of C&D waste had limited scope and was economically nonviable in India because of then policy muddle.

Extremely weak national laws on C&D waste: C&D waste finds a brief mention in the Schedule III of the rule for separate collection in the Municipal Solid Waste (Management and Handling) (MSWM) Rules, 2000. This is extremely inadequate and needs immediate amendment. Additionally, there is only a 'Manual on Municipal Solid Waste Management' of the Union MoUD, 2000, which includes a chapter on C&D waste that gives basic non-binding guidelines on its handling.

The Working Sub-Group on Construction & Demolition Waste was constituted by the Union MoEF committee to evolve a roadmap for management of solid waste. It recommended in 2010 that it is necessary to generate data on C&D waste, segregate C&D waste at source, develop institutional mechanisms for waste collection, reuse and reprocess, impose charges on C&D waste generators, formulate standards for C&D waste, and amend the MSWM Rules, 2000 to address C&D waste for its collection, utilization and safe disposal. However, these recommendations were ignored in the draft Municipal Solid Waste Management Rules of 2013 by the MoEF.

No legal framework for reuse of C&D waste: Though a number of innovative cost-effective recycled building materials, components and construction techniques have been developed through extensive research and are available in market, the Indian housing and building agencies were not adopting them in their construction practices because of policy hurdles. Lack of standardization, not listing these techniques and material in Indian Standard Codes and/or Schedule of Rates, poor policy push and lack of awareness are the key barriers.

Indian laws permit use of only 'naturally sourced' building material: Indian standard specification IS 383-1970, regarding aggregates for concrete, states that they should be from natural sources or as it states 'naturally sourced'. Thus only virgin materials (sand, aggregate) mined directly from nature can be used. This did not allow the use of recycled or reused components. Thus, any use of recycled aggregate becomes 'illegal'.

Progress towards inclusion of C&D waste in national policies

Indian Standards: The Bureau of Indian Standards (BIS) in 2014 set up the Panel for Aggregates from other than Natural Sources to fast track inclusion of recycled C&D waste as legal substitute of natural aggregate in concrete mix. This was done in the third revision of IS 383: Coarse and Fine Aggregate for Concrete Specification, which was notified in 2016.

IS 383 categorizes recycled C&D waste into two types:

- i. Recycled Aggregate (RA)—It is made from C&D waste, which may comprise concrete, brick, tiles, stone, etc.
- ii. Recycled Concrete Aggregate (RCA)—It is derived from concrete after requisite processing.

The revised standard IS 383 permits use of recycled aggregates up to 25 per cent in plain concrete, 20 per cent in reinforced concrete of M-25 or lower grade and up to 100 per cent in lean concretes of grade less than M-15.

National Building Code of India: 'Approach to Sustainability' was added as the 11th chapter to NBC in 2015. It states that:

- i. Recycled coarse aggregate may be used in concrete for bulk fills, bank protection, base/fill of drainage structures, pavements, sidewalks, kerbs and gutters etc.
- ii. Up to 30 per cent of natural crushed coarse aggregate can be replaced by the recycled concrete aggregate
- iii. This percentage can be increased up to 50 per cent for pavements and other areas under pure compression specific to the standards and practices pertaining to construction of roads.



C&D Waste Management Rules, 2016

The Ministry of Environment, Forest and Climate Change (MoEFCC) notified the Construction and Demolition Management Rules in 2016. This was the first ever of its kind and defines the responsibilities of each stakeholder.

Key highlights of the C&D Waste Management Rules, 2016:

- The Rules mandate use of recycled products in construction. Local bodies will have to utilize 10–20 per cent of material from C&D waste in municipal and government contracts for construction.
- The tipping fee for delivery of C&D waste to the recycling plant, and terms and conditions of civic body with the concessionaire may be designed to keep the price of C&D waste recycled products about 20 per cent lower than the corresponding conventional products.
- All large developers are accountable for collection and disposal of C&D waste
- Local authorities to give appropriate incentives to waste generators for salvaging, processing, and recycling, preferably in situ.
- Recycling facilities will have to be created at a safe distance from habitation with adequate buffer zone.
- Local authorities to establish a database and update it once in a year.
- All renovation projects involving demolition, even in the private sector, may be mandated to use at least 20 per cent of recycled C&D waste products.

Under the C&D Waste Management Rules, 2016, Schedule I (14), the following are exempt from the norms of pollution from dust and noise:

- For construction work, where at least 80 per cent construction and demolition waste is recycled or
- Reused in-situ and sufficient buffer area is available to protect the surrounding habitation from any adverse impact.

Duties of waste generator

- Collection and storage of C&D waste generated within their premises.
- Ensuring that other solid waste is not mixed with C&D waste
- Depositing C&D waste to collection centres or processing facilities as designated and authorized by local authority.
- Ensuring that there is no littering or deposition of C&D waste to prevent obstruction of traffic, public and drains.

Waste generators who generate more than 20 tonnes per day or 300 tonnes per project in a month shall:

- o Segregate waste into five streams: concrete, soil, metal, wood and plastic, bricks and masonry.
- o Submit waste management plan and get approval from local authority before starting construction, demolition or remodelling work.
- o Pay relevant charges for collection transportation, processing and disposal as notified by local authority.

Duties of service providers and their contractors

- Prepare comprehensive C&D waste management plan for area within their jurisdiction.
- Clean C&D waste in the work area in a reasonable timeframe depending on the duration of work and quantity and type of waste generated. This should be done in consultation with local authority.
- Tie up with authorized agencies for cleaning of C&D waste if logistics support is not available.

Duties of local authority

- Issuing direction for management of C&D waste as per the Rules within their jurisdiction and seek detailed plan or undertaking as applicable from generators of C&D waste.
- Chalking out stages, methodology, equipment required, material involved in the activities required after Construction and Demolition.
- Safely disposing of C&D waste contaminated with hazardous, toxic or nuclear material after consultation with the concerned authority.
- Making arrangement for collection of C&D waste and ensuring that clean-up is done at regular intervals.
- Get the collected C&D waste transported to appropriate sites for disposal or processing.
- Giving incentives to generator for salvaging, processing and/or recycling C&D waste, preferably in situ.
- Examining and approve waste management plan of generators within one month or within date of



submission and approval of building plan, whichever is earlier.

- Establishing C&D waste generation database and update once a year.
- Devising appropriate measures for management of C&D waste and use of recycled products in the best possible manner in consultation with expert institutions.
- Creating sustained system of IEC activities for C&D waste management through collaboration with expert institutes and civil society organizations and also disseminating through their own website.
- Providing incentive/s for use of products made with recycled C&D waste in construction activities.

Duties of State Pollution Control Boards/Committees

- Monitoring implementation of the Rules by local authorities.
- Giving authorization to C&D waste processing facility in Form III after examining the application in Form I.
- Preparing Annual Report with special emphasis on implementation status of compliance of the Rules and submit to CPCB before 31st July of each financial year.

Duties of state government or Union Territory administration

- Preparing policy document for management of C&D waste as per the Rules within one year of notification of the C&D Waste Rules. The responsibility for policy making lies with the Secretary in-charge of development in the state government or Union Territory.
- Providing land for storage, processing and recycling of C&D waste.
- Including site in approved land-use plan by Town and Country planning department.
- Making procurement of materials made with C&D waste up to a certain percentage mandatory in municipal and government contract, subject to strict quality control.

Duties of Central Pollution Control Board

- Preparing operational guidelines for management of C&D waste.
- Analysing and collate the data received from SPCBs/SPCCs.
- Coordinating with SPCBs/SPCCs for any matter related to development of environmental standards.
- Submitting the Annual Compliance Report to the Central government before 30 August of each financial year based on reports given by SPCBs/SPCCs.

Duties of Bureau of Indian Standards and Indian Roads Congress

- Preparing code of practices and standards for use of recycled materials and products of C&D waste in construction and for roads.

Duties of Central government

- Facilitating local bodies in compliance of these Rules by MoUD, MoRD and MoPR.
- Reviewing implementation of the Rules when required by MoEFCC



SECTION 3: C&D MANAGEMENT (BUILDINGS)

On-site C&D waste management

Every construction project should earmark space on the project site for storage and segregation of waste. The size of the space must be determined based on waste generation estimate for the project. This can be made part of building permit requirement.

Project managers must be encouraged to reduce waste generation and generated waste should preferably be reused or/and recycled on-site. Depending upon the size of the project, the composition and characteristics of the waste multiple in-situ options are available. Some of the options are:

- **Backfilling**—The most common use for C&D waste in India is as a backfilling material. It is dumped in pits, trenches etc. and compacted for backfilling or used to increase elevation or make a top layer of surface for construction.
- **Direct reuse of valuables**—Materials of high reuse value like wood frames, unbroken bricks and ceramics are already widely recovered and sold in the secondary market. These are typically used for construction of temporary structures but if treated properly could be used for permanent structures as well.
- **Other applications**—C&D waste is also used in other minor applications as in filler material in roofing construction, wall decorative chips, etc.

Waste that cannot be utilized on site, must be stored in a segregated fashion and transported to the city's disposal/recycling facility as prescribed by the city authority.

Transportation and collection of the waste

C&D waste should be transported to the designated location/s on self-arrangements by generators or through other systems provided by ULBs, whichever is mentioned in the by-laws of the ULB. Either way, both the generator and the transporting entity should maintain records of the quantum of waste transported to the designated dumping area. Vehicles carrying C&D waste should be covered to avoid dust, air pollution and spilling of debris on roads. Some of the transportation options are:

Door-to-door collection: Many municipality like those in Kolkata and Chennai already offer door-to-door collection service to their citizens, it can be built-up for a wider coverage.

Intermediate collection points: To minimize transportation distances, intermediate collection points/transfer stations are useful before removal to final disposal/processing facilities. This is already being practised in Delhi and Ahmedabad. Small generators can be asked to self-transport their waste to these points.

Dedicated container system: Municipality can provide dedicated C&D waste containers to the builder as part of the building permit system. The size and number of the containers can depend on waste generation estimate. The generator can store their waste in these containers and once they are full they can be picked up by the ULB for disposal or transferred to a ULB by generator based on the by-law of the city.

In all cases, ULBs may decide to further transport C&D waste on their own or hire empanelled private contractors. In the latter case, the transporters get paid according to a schedule of rates developed by the ULB. The ULB in turn charges generators of waste (as authorized in the new Rules) for transportation/disposal cost. If there is a contracted C&D waste processing facility in the city, the concessionaire may be paid a combined fee for collection, transportation and processing of C&D waste per tonne (rate to be decided through competitive bidding).

Collection points

Setting up of collection points is one of the key components of waste disposal practices. The presence of more than one transfer station per zone is suggested for an efficient management system. The establishment of more transfer stations will make the transportation process easier by reducing the distance of travel for small generators of waste. In big cities, where there is an unavailability of large land plots for use as transfer stations, setting up of small collection sites is recommended. The area required for transfer station and processing facility depends on the waste generated and size of plots available, which needs to be decided by a feasibility study by the ULB. For example, Delhi has 168



C&D collection points/transfer stations and Ahmedabad has 16 designated collection points. In case of space constraints, a transfer station with a lower storage capacity can be set up in a land space of about 200–300 sq. m. In such a case, it is recommended that multiple transfer stations be set up in a high-generation zone. Ideally, one collection point per population of 25,000 people should be provided. These collection points should not be clubbed with municipal solid waste dumping points, as it might lead to contamination of waste.

Every collection point needs to have wide enough access to accommodate waste carriers.

Disposal site selection

A huge portion of the waste is disposed of in lowlying areas, open spaces, roadsides, etc. in an unauthorized manner. Changes to be adopted—C&D waste should not be allowed to be dumped in landfills before recovering useful materials from the waste stream. The small fraction of C&D waste that comes out as unusable waste product after processing needs to be disposed of properly in a sanitary landfill and should not be mixed with other MSW. The hazardous fraction of C&D waste needs to be dumped in a hazardous waste landfill.

More than 90 per cent of the C&D waste composition in Indian cities can be processed or recycled and reused as secondary raw materials. Even for cities that do not have dedicated recycling facilities, the C&D waste debris can be used to some extent for approved public works construction projects where possible, and the rest should be disposed at designated dumping sites which provides an opportunity for recycling them in the future.

No eco-sensitive areas like wetlands should be used as dumping sites.

Specifications for setting up a recycling plant

The state government or concerned ULB is responsible for identification of land needed to set up recycling facility. The land chosen for setting up of processing facility needs to have adequate space for storage and sorting of incoming C&D waste, weighbridge, processing equipment, manufacturing and storage of finished products, testing and administrative facilities.

In addition, ancillary facilities such as proper access roads, compound wall, entrance gate, underground water tank (sump), IT systems, electrical connections, etc. are also needed. Developing on-site facilities are the responsibility of the contracted party while off-site facilities such as access roads, electrical/water supply are the responsibility of the ULB. The detailed criteria for site selection for Storage and Processing or Recycling Facilities for Construction and Demolition Waste is mentioned in Schedule I of the C&D Waste Rules 2016.

Roughly 5–7 acres of land will be needed to handle waste up to 1,000 TPD.

Cities with very high waste generation capacity of over 1,000 TPD may need more than one processing facility in different zones (as is already the case in Delhi), while cities with a generation capacity of 1,000 TPD or less can have a single centralized processing facility. In small towns where the generation of C&D waste is low, using a mobile crushing unit for processing C&D waste may be a suitable option. Mobile crushers come in all sizes and processing capacities starting from bobcat machine-sized crushers with a processing capacity of around 5 TPH and higher. As the mobile crushing units have an advantage of moving around, small towns can fund and utilize this facility for processing operations.

The option of having a jointly funded common facility can also be considered for a cluster of small towns.



SECTION 4: C&D MANAGEMENT (INFRASTRUCTURE)

C&D waste management for infrastructure projects is similar to that of building projects. Given that C&D waste generated from infrastructure projects like metro and flyovers is highly uniform and largely concrete by composition. It makes economic sense for mega developers like Delhi Metro Rail Corporation to have their own recycling facility as they can save on transportation cost and processing fee to ULBs, and custom engineer the recycled product to their project requirements.

SECTION 5: C&D WASTE PRODUCTS

The major applications of C&D waste are listed below:

- **Granular Sub-Base (GSB)**—Crushed C&D waste can be used as GSB layer for road construction, regardless of the type of construction. The granular sub-base layer is formed by piling and compacting C&D aggregates of different sizes one over the other directly below the pavement surface. This acts as the load bearing and strengthening component of the pavement structure; in addition, it provides drainage for the pavement structure and protects the structure from frost.
- **Recycled Concrete Aggregates (RCA)**—Pure concrete waste can be recycled to make aggregates of different standard sizes to replace natural aggregates in construction processes.
- **Recycled Aggregates (RA)**—Crushed aggregates of standard size made from a mix of C&D waste materials is termed as Recycled Aggregates (RA). RA can be used for partial replacement of natural aggregates for construction of non-load bearing structures.
- **Manufactured Sand (M-Sand)**—Manufactured sand is also produced by crushing of C&D waste, and the finer particle fraction can be used to replace natural sand in construction of non-load bearing structures.
- **Smelting**—Scrap metal recovered from C&D waste is melted through smelting process and recycled to make new products.

Market uptake of C&D products

One of the main challenges faced by C&D waste processing units in India is market uptake of products made with processed waste due to lack of knowledge in the construction industry and perception of inferior quality. These include:

- **Lack of confidence in recycled products:** The experience in Delhi and Ahmedabad has shown that the market for recycled products made from C&D waste is still quite weak in India. Engagement with the construction industry repeatedly demonstrates that potential buyers are hesitant about such recycled products that they perceive to be inferior in quality. Even when informed about the updated IS 383 that allows recycled aggregates in many applications, potential buyers appear risk averse, pointing to their clients who seem to prefer 'conventional' products.
- **Poor economic viability of recycled products:** Currently aggregates are taxed at 5 per cent and manufactured products are taxed at 18 per cent making the use of recycled products economically unviable for customers. GST relaxation for C&D waste recycled products including manufactured products such as tiles, paver blocks, bricks, sand and aggregates may be considered.

To ensure enhanced market uptake of C&D waste-based products, two approaches that can be adopted:

1. Preferential buy back by government and private entities
2. Eco-labelling and green certification of products

Examples of recycled C&D waste products used in India:

New Supreme Court complex: This extension project has used pre-cast cement concrete blocks of Grade M10 made of recycled C&D waste sourced from Delhi's Burari plant. About 1.8 million blocks were used as non-load bearing walls in the project.

Express Road in north Delhi: The DDA venture for construction of the pilot 100-m wide and 10-km long express road connecting NH-10 and Bakkarwala is using recycled aggregates of size –150mm to +26.5mm. About 600,000 tonnes of recycled C&D waste will be used to make the pilot road.



SECTION 6: TECHNOLOGY OF C&D WASTE PROCESSING

Stationary processing unit

Stationary C&D waste processing unit is an assembly of crushing, sieving and washing machinery interconnected by conveyer belts for material movement. The machinery is housed on steel/concrete platforms on a permanent basis. The crushing units will also have dust control systems, noise control systems, magnetic separator devices and other additional devices based on requirements. The systems are either semi-automated or completely automated units. The capacity of stationary processing units can vary according to the need from 100 TPD–2,000 TPD or even more.

Mobile crushing units for C&D waste recycling

Mobile C&D waste crushing units for C&D waste are rare in India today but are likely to become more common in the future in light of the new Rules. The technology is very similar to the stationary processing unit but all the equipment will be mounted on top of customized mobile unit/truck. The concept involves integrating all the equipments on one truck, which has a customized chassis and body compared to conventional trucks. This kind of design provides the flexibility to ensure that the crushing station can be easily transported by and moved to construction/demolition sites to enable on-site crushing without the transfer of materials from one place to another, saving significant transportation costs given the quantity of waste to be processed is large enough. The feasibility of the technology also depends on the use of finished products, distance to be transported, availability of labour and nature of waste (segregated waste). Mobile crushers come in all sizes and processing capacities starting from bobcat machine sized crushers with a processing capacity of around 5 TPH and higher. Since the entire assembly line needs to be mounted on mobile units the processing capacity of these units will be comparatively limited to around 1,000 TPD.

Technology options for small towns and cities

For small cities and towns, which generate much lesser quantity of waste, different approaches may be needed. C&D waste recycling is new in India; experience from the first few recycling units has shown that a centralized stationary processing facility is financially viable only for waste generation above 100 TPD. However, as the market and business models mature, stationary processing facilities might be viable for smaller capacities also. Although mobile crushing units are a viable decentralized model that could be adopted by small cities, such kind of a facility is not recommended for towns generating C&D waste quantities less than 20–30 TPD. For such towns, the following processing approaches are recommended.

Mini mobile crusher: The utilization of mini mobile crushers is a practical solution for ULBs generating less than one or two truckloads of C&D waste per day. The mini-crushers with processing capacities of around 5 TPD can be maintained by the ULB for processing waste into finer secondary raw material or the mini crushers can be maintained by designated pre-cast concrete building material manufacturers, to whom the C&D waste can be delivered as a business model.

Cluster processing approach: A cluster approach for processing C&D waste is also feasible if ULBs sharing close boundary can operate a common C&D waste treatment facility. The stationary facility can be located at a common region accessible or equidistant from multiple ULBs. The facility can be maintained by a single ULB and other ULBs can supply C&D waste on a prorated basis based on a written agreement. Urban development authorities responsible for management of multiple ULBs (e.g. Chennai Metropolitan Development Authority, Mumbai Metropolitan Region Development Authority) can also coordinate the adoption of this kind of approach



Case study—Delhi

The pilot plant at Burari in North Delhi has been expanded to a capacity of 2,000 TPD. Currently the city has three recycling plants (at Burari, Shastri Park and Mundka) with combined capacity of 2,650 tonnes a day. Three more plants are in pipeline that will add 2,000 tonnes to existing capacity. All the plants are in North Delhi except one in Shastri Park. These are supported by a network of 168 collection points in the city, about half of them are in the jurisdiction of North Delhi Municipal Corporation.

Logistics of the Burari plant: Total of 4.3 million tonnes of C&D waste has been received by the Burari plant as of May 2019 since its commissioning in 2009. About 3.7 million tonnes of this waste (87 per cent of the total received) was processed, another 138,000 tonnes was used for plant site reclamation, 131,000 tonnes was sent to Bhalswa sanitary landfill to avoid frequent incidents of fire breakout, remaining 313,000 tonnes is still lying on the site unprocessed as shown in the graph below.

Collection: North-DMC has designated 104 collection points across the jurisdiction area, which receive C&D waste in small quantities every day. These collection points are mainly municipal stores or vacant land which belongs to the North-DMC. Their size also vary significantly. For instance, the point near Lok Nayak Jai Prakash Hospital is spread across a vast area. The point receives large quantities of waste since it caters to the most of walled city, which is too congested to be designated with multiple collection points. While it is suggested to designate a collection point no further than 3 km from the generation site, identification of collection points can be challenging in mega cities such as Delhi.

Transportation: Capacity of one truck is around 15 tonnes; waste is lifted from these points when it reaches this weight. Under a DBFOT model, the plant management lifts waste from a collection point when it reaches 15 tonnes of weight. North-DMC pays the plant a tipping fee of Rs. 226 per tonne, which increases at a rate of 5 per cent every year (it was Rs 148 in 2009 when the plant was commissioned). Around 20–25 trucks per day are circulating around the corporation area for collection of C&D waste. The plant owns six trucks; the rest are contracted with private agencies.

Bulk waste generators are mainly authorities like DMRC, PWD, DDA, etc. They mainly transport the C&D waste directly from construction sites and pay a processing fee of Rs 205 per tonne to the plant.

According to the data shared, maximum waste is received from Public Works Department Delhi at 44 per cent of the total, followed by North-DMC at 37 per cent (North-DMC largely represents the waste transported from collection points to the plant), Central Public Works Department (CPWD) transported 5 per cent, Delhi Metro Rail Corporation (DMRC) 6 per cent, Delhi State Industrial and Infrastructure Development (DSIIDC) 3 per cent, Delhi Development Authority (DDA) 1 per cent and National Building Construction Company (NBCC) brought less than 1 per cent of C&D waste to the plant.

Segregation and processing: All the waste received at the plant firstly passes a weigh-bridge and then is manually segregated to take out rejects such as rags, metal, plastic, etc. The waste is then divided into two streams to be processed separately: one with only concrete and the other with mixed waste comprising of bricks, mortar, mixed concrete, etc. The only-concrete stream undergoes a dry process and mixed waste undergoes a wet process. About 90 per cent of the waste received at the plant has been mixed waste which has undergone wet processing.

Uptake of recycled products: Level of awareness is extremely poor among the citizens and efforts made by government agencies to change this is negligible. This reflected in uptake of recycled waste products that the C&D waste plants are manufacturing. BIS officially recognized recycled C&D waste as legal substitute to natural sand in concrete mix in 2016. Delhi government has issued advisory asking all public agencies to mandate 5 per cent use of such products for non-structural applications while examining and approving building plans. But they have nothing to show for it, in fact Delhi plants storages are over-flowing with unsold recycled products.