



Habitat for Humanity Challenge: Improved Construction and Demolition Waste Management

DETAILED DESCRIPTION OF THE CHALLENGE

BACKGROUND

The construction industry in India, the country of primary focus for this Challenge, is an important growth driver of the economy with a contribution of 8% to India's GDP and a projected growth rate of 7-8% year-over-year for the next decade. The industry employs 50 million people and is the second largest employment provider in the country. Additionally, it creates more than 45 million jobs either directly or indirectly. The construction industry segmentation spans across infrastructure, industrial, commercial, and residential spaces and can be divided into three prime activities – new construction, reconstruction and repair, and demolition. Along with the size and growth of the industry comes the need for more building materials every year to fuel the growth.

The Government of India has launched several flagship plans which include '[Housing for All](#)' by 2022 launched in June 2015 also called PMAY (U), which aims to build 20 million urban homes and [PMAY](#) (Gramin) to build 30 million rural houses by 2022. The second plan, '[Smart Cities Mission](#)' has an objective to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' solutions. The third plan, '[Swachh Bharat Mission](#)' (SBM) is a cleanliness campaign with objectives including modern and scientific municipal solid waste management.

The construction industry in India, as well as the worldwide construction industry, produces a tremendous amount of construction and demolition (C&D) debris every year. According Building Materials & Technology Promotion Council (BMTPC)¹, the total estimate of C&D waste produced in India is 100 million metric tons per year. The Technology Information, Forecasting and Assessment Council's (TIFAC) India has developed some estimates on C&D waste generation from the three primary construction activities:

1. 40-60 kilograms per square meter of new construction
2. 40-50 kilograms per square meter for building repair
3. 300-500 kilogram per square meter for demolition of buildings

C&D waste is generated from construction, renovation, repair, and demolition of houses and structures such as commercial buildings, factories, and dilapidated infrastructure. C&D typically consists of waste made of:

- Concrete
- Soil, sand, and gravel
- Steel, wood, and plastics
- Other materials – rubble (bricks and mortar)

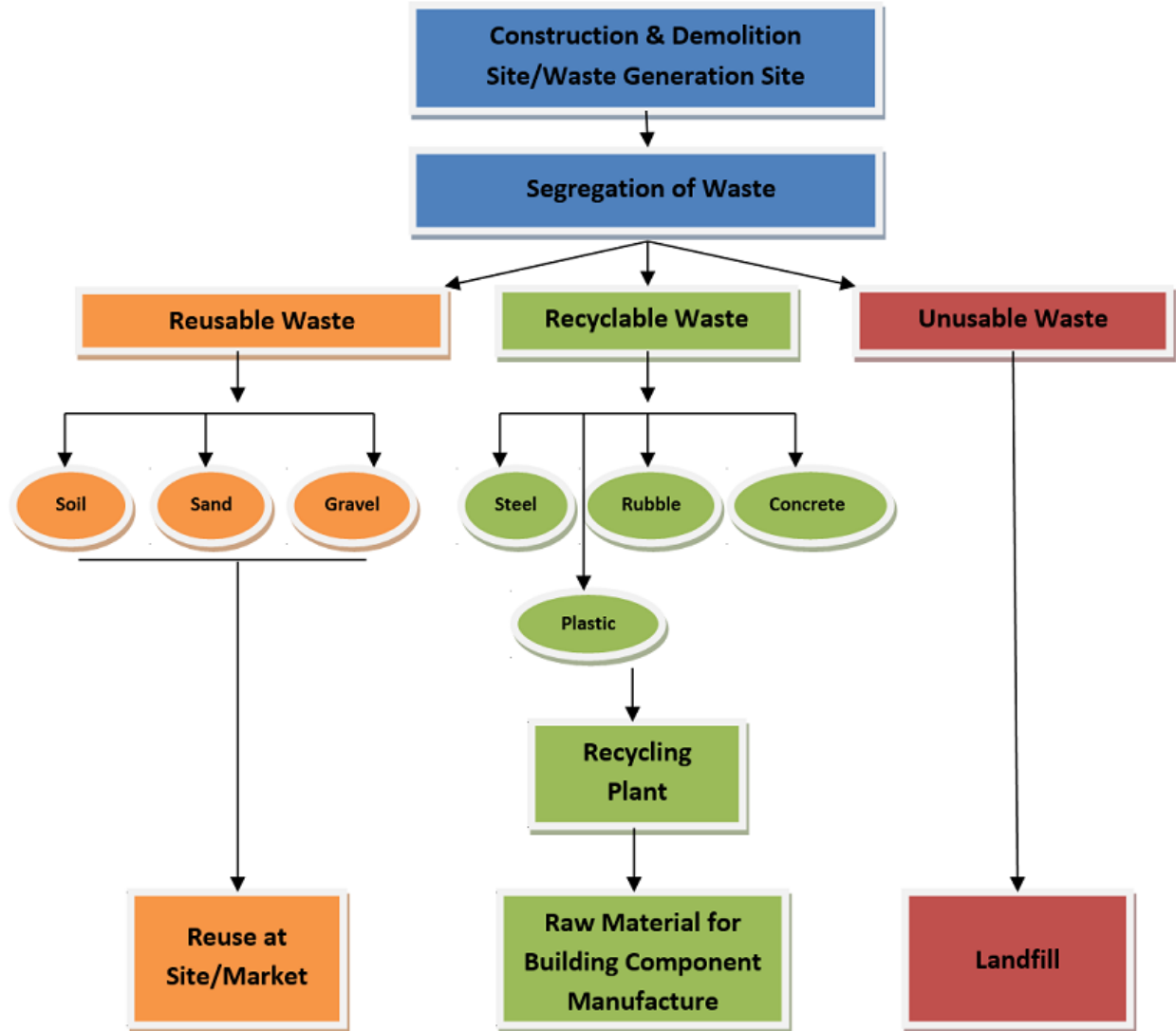


Figure 1. Flowchart depicting the segregation of C&D waste into various categories for reuse, recycling, and disposal.

The waste can be characterized (see **Figure 1**) as reusable, such as sand and gravel; recyclable, such as concrete and steel; and unusable as miscellaneous economically inseparable waste. Various studies of C&D waste in India show that different elements such as materials (concrete, bricks) and fines (sand, excavation soil) can be recycled using appropriate processes, equipment, and techniques. In addition, the Government of India published the "*Construction and Demolition Waste Management Rules*" in 2016 that address the responsibilities of different

stakeholders including generators, municipal bodies, Pollution Control Boards and Urban Development Departments in the management of C&D waste.

Despite the ability to recycle and regulations requiring it, no significant adoption or progress has been made in terms of C&D waste processing and utilization. However, some cities in India have shown a way ahead by setting up C&D waste management plants. A good example is New Delhi and the details of the work can be accessed at <https://www.ilfsindia.com/our-work/environment/construction-demolition-waste-recycling/>

Stake holders such as Urban Local bodies (ULBs) and public and private industry have identified roadblocks to the recycling and utilization of C&D waste in new construction:

1. Lack of resources and capacity, for example land, finance and trained personnel who understand C&D waste management
2. Lack of awareness and low priority on the long-term environmental impact of waste, and sustainability of resources in the country
3. Inability to make robust business cases and/or ensure profitability and integrating C&D waste management into the supply chain
4. Informal nature of the sector
5. Lack of innovation and low adoption of products made from C&D waste

If these roadblocks can be overcome there exists a huge potential to develop economically viable and revenue generating businesses in recycling of C&D waste for reuse as aggregates and creating an inventory of other products for use in the construction industry. Given the rapid depletion of natural resources it also makes sense to see this from a sustainability angle for the stake holders.

REFERENCES

¹(2018) *Utilisation of Recycled Produce of Construction & Demolition Waste: A Ready Reckoner*, Ministry of Housing & Urban Affairs

Other Reference Sources:

1. Guidelines for construction and demolition waste management 2016 https://dpccocmms.nic.in/SPCB_DOCUMENTS/MSW.pdf

2. Training Manual on C&D

waste https://www.devalt.org/images/L2_ProjectPdfs/CandDWasteManagementTrainingManual.pdf?Oid=188

3. Strategy for Promoting Processing of Construction and Demolition (C&D) Waste and Utilisation of Recycled Products https://niti.gov.in/sites/default/files/2019-03/CDW_Strategy_Draft%20Final_011118.pdf

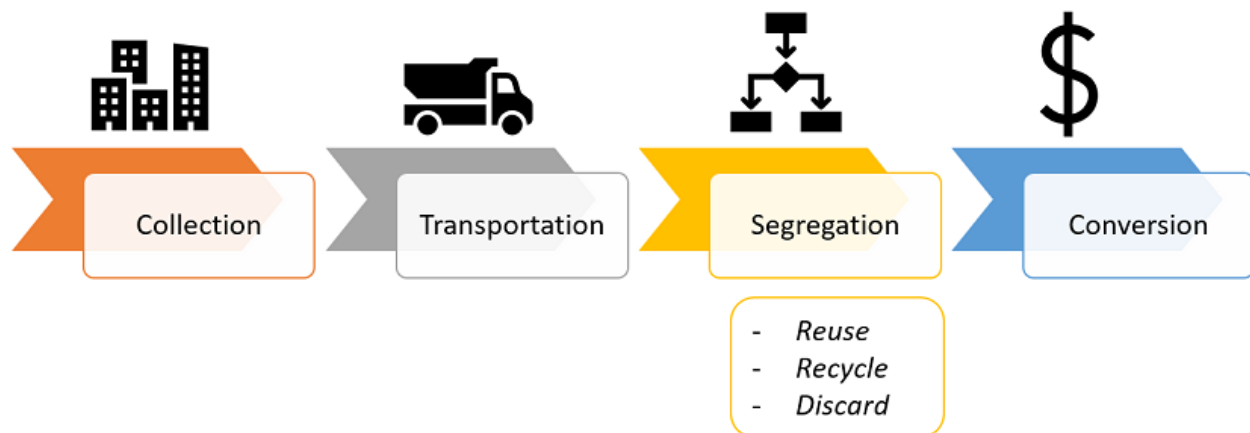


Figure 2. Steps involved in converting C&D waste into useful products for new construction. **Note** the Conversion step represents many different processes and is **outside the scope of this Challenge** but may be the focus of future Challenges.

THE CHALLENGE

While there are several steps in going from C&D waste to utilization of products in new construction (see **Figure 2**), this Challenge focuses on the first several steps that involve the collection, transportation, and segregation of C&D waste. An important aspect of the collection step is the ability to estimate the quantity of waste by category for both individual sites and entire regions. For the transportation step, the logistics of loading, transporting, discharging, and storing C&D waste are important. While collection and transportation are important early steps in the process, segregation of waste by sorting and grouping of the waste into various categories such as masonry, rubble, wood, steel, plumbing, pipes etc. may be the most critical.

Habitat for Humanity and the Terwilliger Center recognize the urgent need for efficient and effective C&D waste management as it would lead to impactful social, environmental, and economic benefits, and thus they are seeking innovative approaches, ideas, solutions, frameworks, and plans to help enable Urban Local Bodies (ULBs) and/or industry to improve C&D waste management.

Proposed solutions should address one or more of the following **Solution Areas**:

1. **Collection**: Methods for the estimation of quantity and characterization of C&D waste at individual sites and/or estimation of C&D waste generation trends in a given geographic area
2. **Transportation**: Methodologies for C&D waste logistics – loading, transportation, discharging, and storage
3. **Segregation**: Methodologies for efficient and cost-effective segregation of various categories of C&D waste – sand, gravel, wood, steel, plastic, etc. (see **Figure 1** for categories beyond reusable, recyclable, and unusable)

Additionally, the potential solutions may comprise of the following types:

1. Local, mini and/or mobile **models** to enable segregation
2. **Technology innovations**/infrastructure for collection/transportation/segregation
3. Waste inventory management, **supply chain management**, capacity calculation and optimal placement of Crushing Plant (Plant and Equipment)
4. **IT solutions** for routing and waste management
5. **Business models** that demonstrate viability of the model with calculations of operations cost, land, machinery, and other administrative overhead

Evaluation Criteria

The proposals will be evaluated based on the following criteria:

- Innovation of the idea/solution proposed
- Robustness and completeness of the solution proposed

- Ease of implementation and customization of the solution for local contexts in India
- Cost-effectiveness of the proposed solution
- Evidence in support of the feasibility of the solution

Project Criteria

Submitted proposals along with all relevant supporting materials should include the information described in the Detailed Description of the Challenge.

The submitted proposal should include the following:

1. A **detailed description** of your proposed solution addressing one or more of the **Solution Areas** listed above.
2. Evidence in support of the feasibility of the solution such as details on the **implementation of the solution** (or similar solutions) in other geographic areas, if available. Submissions should also include relevant details on how the solution may be adapted for or implemented in India.
3. Business models, estimation models, technical diagrams, technical specifications, videos, case studies in support of the proposed solution.

The Seeker may wish to partner with the Solver at the conclusion of the Challenge. Solver should describe their expertise and include a statement indicating their interest in this opportunity.

The proposal should not include any personal identifying information (name, username, company, address, phone, email, personal website, resume, *etc.*) or any information the Solvers may consider as their Intellectual Property they do not want to share.

This is an Ideation Challenge, which has the following unique features:

- **There is a guaranteed award.** The awards will be paid to the best submission(s) **as solely determined by the Seeker**. The total payout will be \$15,000, with at least one award being no smaller than \$5,000 and no award being smaller than \$1,000.

- The Solvers are not required to transfer exclusive intellectual property rights to the Seeker. **Rather, by submitting a proposal, the Solver grants to the Seeker a royalty-free, perpetual, and non-exclusive license to use any information included in this proposal, including for promotional purposes and sharing with potential development partners. Habitat for Humanity will make awarded solutions freely available to other partner organizations.**

Submissions to this Challenge must be received by 11:59 PM (US Eastern Time) on 25-Jan-2021. **Late submissions will not be considered.**

After the Challenge deadline, the Seeker will complete the review process and make a decision with regards to the Winning Solution(s). All Solvers that submit a proposal will be notified on the status of their submissions; however, **no detailed evaluation of individual submissions will be provided.**

ELIGIBILITY

Employees and interns of Habitat for Humanity International (HFHI), as well as their immediate family members (spouse, parent, child, sibling, and their respective spouses) or persons living in the same household, whether related or not, are eligible to enter the Challenge; provided that they **will not be eligible to receive an award** if their Solution is chosen. In addition, the Solutions of employees and interns of HFHI will fall under HFHI's employment policies and be considered work product of HFHI. **Please note**, employees and interns of Habitat for Humanity Affiliates and independent National Organizations are eligible to enter and receive an award if their Solution is chosen.



Terwilliger Center for Innovation in Shelter

ABOUT THE SEEKER

Habitat for Humanity International

[Habitat for Humanity](#) is a global nonprofit housing organization working in more than 70 countries around the world. Habitat's vision is of a world where everyone has a decent place to live. Habitat works toward our vision by building strength, stability and self-reliance in partnership with families in need of decent and affordable housing.

Through the Terwilliger Center for Innovation in Shelter (TCIS), Habitat for Humanity facilitates more efficient and inclusive housing market systems, making affordable housing possible for millions of more families.

Habitat for Humanity formally launched the Terwilliger Center for Innovation in Shelter at the historic Habitat III, which took place in Quito, Ecuador, in October 2016. The Terwilliger Center is one of Habitat's key commitments toward the implementation of the United Nation's member states' New Urban Agenda.

The Terwilliger Center consolidates more than a decade of experience in developing market-based solutions for housing and the body of work resulting from these early efforts, formerly referred to as the Center for Innovation in Shelter and Finance. Through the Terwilliger Center, Habitat will accelerate and facilitate better functioning inclusive housing markets to enable more than 8 million people access to improved shelter solutions by 2020. www.habitat.org/tcis



Habitat is supported in this project by SeaFreight Labs (www.seafreightlabs.com), an open-innovation consultancy using global challenges to cost-effectively deliver breakthrough innovation. Participation in this project is a direct result of the recent SeaFreight Labs decision to join the Pledge 1% movement.