



CONSTRUCTION AND DEMOLITION WASTE (C&D)

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About C&D Waste



In recent decades, construction industry has witnessed an exponential growth. This has resulted in significant consumption of natural resources with generation and accumulation of huge quantities of Construction and Demolition (C&D) waste. The accelerated pace of urbanization and changing lifestyle patterns can be attributed to the demolition of large number of old buildings and increased renovation of existing structures, thus contributing to the overwhelming quantities of waste generated. This scenario is especially true for emerging countries that are either about to enter or have already entered the transitional construction boom phase. It is undeniable that the Indian construction industry is on track to become the world's third largest construction sector (Global Construction Perspectives and Oxford Economics, 2015). According to studies, the yearly C&D waste created in India alone is believed to be around 100 million tones, with the most of it ending up in dump yards or landfills. In today's world, optimal recycling and reuse of goods derived from the processing of C&D waste might be a cornerstone. C&D waste has further deteriorated local urban aesthetics due to its illegal dumping; led to flash flooding due to choking of drainage system, resulting in deteriorated local health conditions. C&D waste is generated during the construction, renovation, maintenance, and destruction of residences, big building structures, roads, bridges, flyovers, and other urban infrastructure within cities. The C&D waste streams are generated during the lifecycle of an urban or infrastructural project, which includes development, usage/maintenance, and demolition. Unless renovation activities are carried out, waste is seldomly generated during the usage/maintenance stage. As a result, three principal trash generation activities can be classified based on waste generation amount: construction, demolition, and renovation/repair waste.

The importance of recycling C&D waste can be demonstrated by the fact that emerging countries such as India suffer

aggregate shortages of 55,000 million cum and 750 million cum in the housing and road sectors, respectively. Mining for Construction material supply over a period of time has resulted in loss of habitats and green cover over countryside. Govt. of India through Union Ministry of Environment, Forest & Climate Change has notified a Resource Efficiency Policy in 2019. This policy envisages achieving resource efficiency in its utilization. C&D waste has also been identified as one key areas, where a national ambition to achieve its 75% recycling at national level is envisaged.

As a result, to close the growing demand-supply imbalance, the recycling and reuse of secondary materials associated with C&D waste management should be prioritized. Since the building industry and its associated industries are both resource and energy intensive, financial feasibility and environmental sustainability can only be attained through resource efficiency. Enhanced recycling decreases dependency on primary raw material extraction and mitigates the negative consequences of indiscriminate landfilling and trash disposal into aquatic bodies. It reduces pollution levels in the environment, minimizing the carbon footprint.

Acknowledging the need to adequately manage the C&D waste generated by the city of Bhubaneswar, GIZ in collaboration with the Ministry of Housing and Urban Affairs (MoHUA), through the ClimateSmart Cities (CSC) project carried out interventions to identify and address this concern. Bhubaneswar is a partner city under the CSC project. Construction and Demolition waste constitutes one of the thematic areas on which the CSC project assists the city.

This study presents the findings and recommendations for the proper management of C&D waste in Bhubaneswar. Encapsulating the existing situation, analyzing gaps, and proposing a way forward.

Bhubaneswar

The Existing Situation



About Bhubaneswar

Bhubaneswar is the state capital of Odisha. Bhubaneswar is located on the western outskirts of Odisha’s mid-coastal plain. The city is part of the apex “Golden Triangle” with Konark and Puri, it is famed for its temples and proposed for the highest density of National Monuments, attracting tourists from all over the country. The city is known to be a tourist destination, owing to the numerous temples and historical monuments such as the Lingaraja temple. Bhubaneswar Municipal Corporation governs the city (BMC).

Bhubaneswar is well connected by railways, roads, and air to the rest of Odisha and other urban centers around India. Bhubaneswar, the state capital, has witnessed significant development in the recent decade, with significant investment in the food and related sectors, engineering, and metal-based industrial industries, as well as chemical and allied processing operations. The city also has a significant cement industrial base, with companies such as IOCL, Ramco Cements Ltd, and IDCOL. In recent years, the city’s industrial character has expanded with the incorporation of an information and technology industrial park (Info-city) and the construction of IT firms.

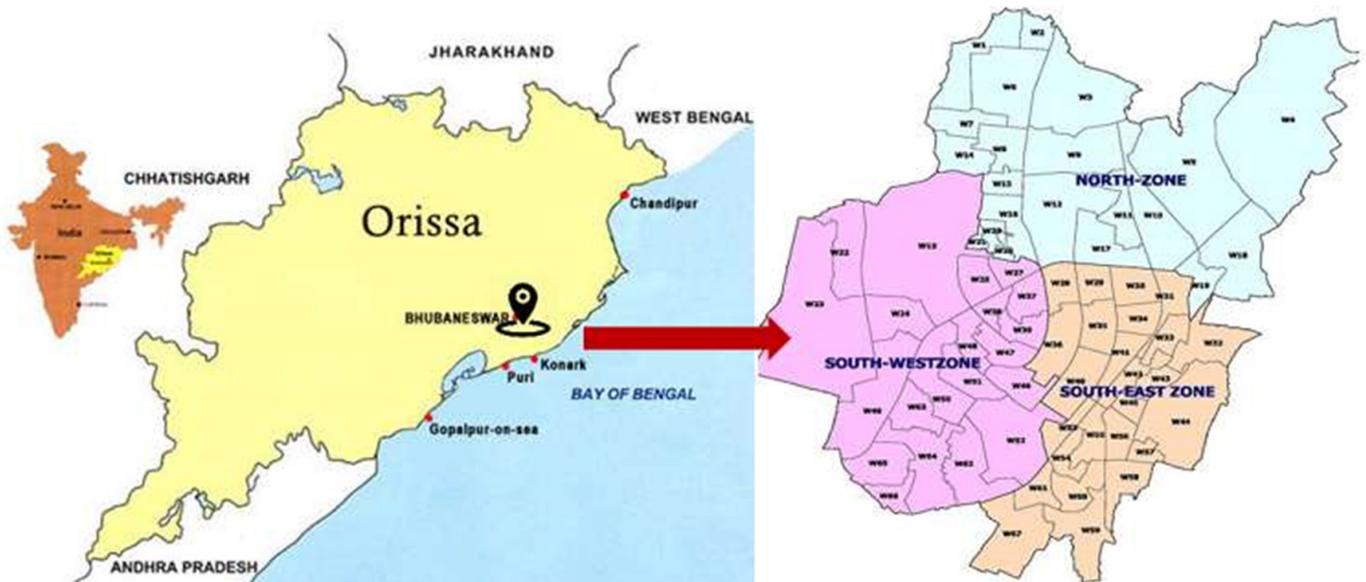


Figure 1: Bhubaneswar Municipal Corporation (BMC)

Stakeholder Mapping

The current operational C&D waste management system administered by BMC includes material flow generated by ongoing construction/demolition/remodeling activities by other Government departments and private projects at various levels. The Bhubaneswar C&D waste management system is made up of five broad stakeholders, each of whom has an active or passive role and is incorporated in the current system.

- **Practitioners: Designers/Architects (Green Planners)**
- They are indirectly involved or impacts the construction/demolition sector.
- **Regulators/Policy Makers: PWD, Roads Department, SPCB, OSHB** - The state government through parastatal bodies are directly involved in planning and implementation of the large-scale projects at State Level. As process owners, these bodies undertake

various construction projects and routinely involved in management of C&D waste.

- **Local Administration: Bhubaneswar Municipal Corporation (BMC), Bhubaneswar Development Authority (BDA)** - These local administration and planning bodies are directly vested with responsibility of C&D Waste- Management & Handling Rules 2016 and positioned as direct service providers to citizens.
- **Ground Players: Civil Construction & Demolition Contractors and CREDAI** - These ground players, responsible for ground-based implementation of construction projects are the most important stakeholders of the C&D waste management value chain. They are responsible for C&D waste generation, transportation, on-site recycling, disposal, and any alternate use.
- **Prospective Market** - Construction Material Suppliers and State Government Departments of Bhubaneswar, Odisha.

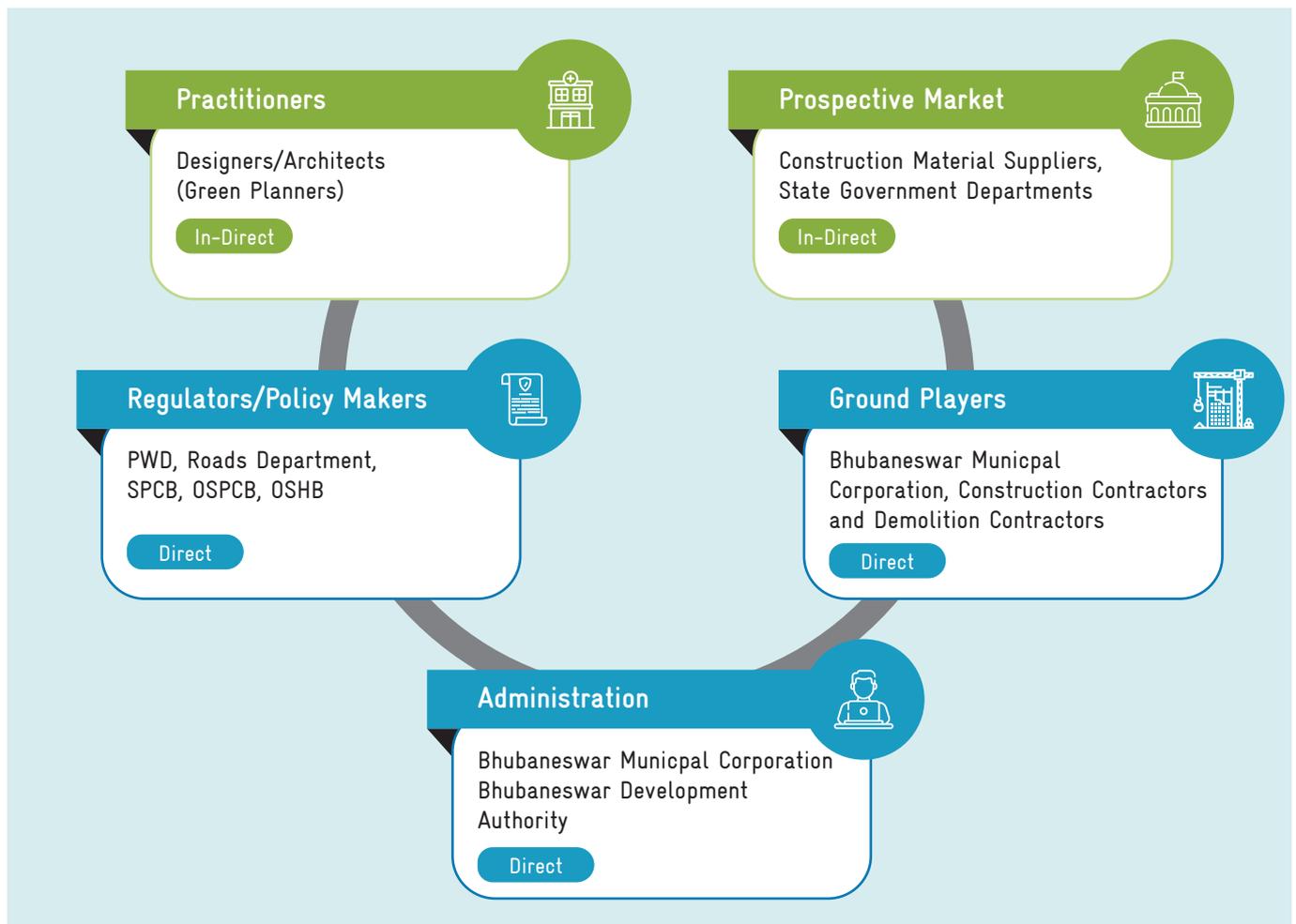


Figure 2: GIZ - Stakeholder Mapping

Overview of current situation of C&D waste management in Bhubaneswar

In 2017, the Bhubaneswar Municipal Corporation notified the Standard Operating Procedure for the Management of Construction and Demolition Waste Materials. The SOP specifies the roles of various authorities as well as the enforcement mechanism. It also specifies the administrative fees and penalties for failing to follow the BMC's instructions on C&D waste disposal.

Bhubaneswar, based on a report prepared by IL&FS on the integrated construction and demolition waste management system, generates 200–250 TPD of C&D waste annually. The generated waste is primarily composed of waste streams including majority fractions of soil and masonry construction material such as brickbats. Concrete lumps are also observed.

To assess the current state of the C&D waste cycle in Bhubaneswar, the following areas are looked at: the issuance of a Building Planning Permit, Management, transportation, and disposal on-site.

With regards to issuance of Building Planning Permits, obtaining building permits and building plan approval are mandatory and are a condition precedent towards commencement of construction activities. In the current system, there is no central computerized database of the records. BMC has initiated citizen services under their Bhubaneswar One platform online. The service has also provision for applying and getting approval on the Building Plan, named as Building Planning Approval System but the system is not fully functional currently.

When assessing the on-site management practices pertaining to C&D waste in Bhubaneswar, bulk Generators comprise government agencies, private construction businesses, and demolition contracts that generate significant amounts of C&D garbage. PWD, BDA, Odisha Housing Board, and commercial large-scale infrastructure businesses and demolition contractors are among those identified. The waste generated by construction activities varies depending on the type of building activity and typically comprise of broken bricks, tiles, concrete waste, excavated earth, debris, and wood waste.

For the management of on-site demolition waste, demolition contractors first remove or disassemble salvage items from buildings such as electrical lines, doors and windows, truss roofed structures, steel trusses, reinforcement steel, and so on. These materials are utilized in new construction or sold in the secondary market. There is a separate market for reusable building supplies, and such businesses have

partnerships with demolition firms. In a way, this generates cash for the demolition contractors.

With regards to the transportation of C&D waste in Bhubaneswar, typically, demolition and construction contractors handle their own C&D waste transportation. They use private transportation contractors, who are paid on a per-trip basis. In the case of illegally deposited waste on roadsides, open plots, and so on, the waste (construction/renovation) is mostly identified by BMC staff during routine site inspections in their divisions and panelized in accordance with the SOP.

The existing disposal of C&D waste is done in two designated disposal areas, namely, Patia site and Pokhripur site. The specified sites are abandoned quarries, which result in low-lying plots. As a result, the primary motivation for selecting these locations for C&D waste deposition is to cover these low-lying areas with inert and stable waste.

According to a survey conducted on the ground, C&D trash was discovered to be disposed of along roadways, open areas, plots, curbsides, and near water bodies. GIZ conducted a study that highlights the C&D trash strewn beside roads and bodies of water, as indicated in the map below.

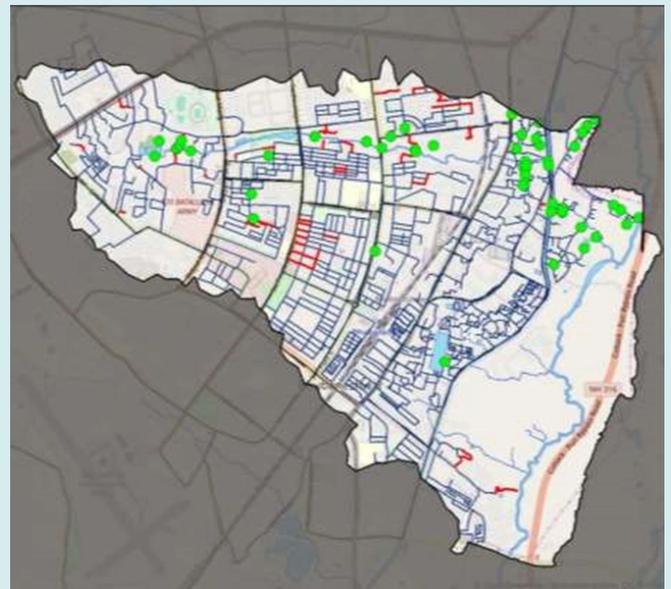


Figure 3: GIZ - C&D waste disposal

Issues/considerations related to C&D waste



The following are the identified issues pertaining to C&D waste management in Bhubaneswar

Establishing C&D Waste Baseline Generation Inventory through linkage with BPAS

Bhubaneswar does not have a baseline available for the quantity and characteristics of C&D waste. BMC lacks a central repository for building permissions and comprehensive information on the date, zone, ward, type of development (land use), etc. The relationship between building permit data and C&D waste generation cannot be established due to a lack of this information. A Building Planning Approval System (BPAS) is available on the BMC website as part of Citizen Services. The platform is intended to allow residents to apply for and get permission through an online platform.

Mapping of C&D Waste Generation Trends for Forecasting

For planning any high investment facility such as C&D waste processing facility, current and forecasted quantities should be known. A long-term forecasting of C&D Waste may not be possible practically in present system, as there is no past information and trends available related to number of construction/demolitions permits.

Mapping of C&D Waste Flow

The amount of waste produced is not necessarily the same as the amount received at the disposal/secondary locations. This is especially true in the case of C&D waste. There are numerous ground players who divert and repurpose waste. In the current situation, an exact quantity of C&D waste cannot be calculated.

Fleet Size Optimization for C&D Waste Collection and Transportation

BMC currently has only one JCB, one tractor, and one tipper for the collection and transportation of C&D trash, all of which are over ten years old. Furthermore, SWM Operators are expected to offer the service as and when required, as specified in the SOP for C&D waste.

Conducting environmental due diligence prior to C&D waste site selection and Site Operational Planning

The BMC has notified two C&D waste storage facilities located in the city. These are old stone quarries which are low-lying areas. There had been no environmental evaluation performed prior to the selection of these sites. Furthermore, it was observed that there was no established site management strategy, and hazardous materials were discarded on-site.

Material Circularity Concept (Alternate Use) for C&D Waste Management

The Bhuasuni site currently receives a daily average load of 500+ TPD. Since there is no practice of using inert material for daily cover, this waste remains uncovered. This generates a considerably foul odor, causing local unrest in neighboring villages. It was this very reason that impeded the last project's implementation and resulted in its legal cancellation. As a result, it is critical for BMC to ensure that site maintenance at Bhuasuni is improved.

Notification of C&D Bylaws

The C&D waste bylaws have been framed but not notified yet. The bylaws define a process for C&D waste management, beginning with generation and involving generators. Generators must submit a Waste Management Plan with their building permit application, as well as pay fees based on their estimated waste generation.

Integration of SOP and C&D Bylaws

In the defined process flow, there is no synergy between the SOP and the bylaw. The draught C&D waste management bylaws require the filing of C&D waste management plans for various generator categories with building planning approval documents.

Capacity Building

Capacity building for estimation and Inventorization of C&D waste management should be done as part of the institutional restructuring. Legal compliances related to C&D waste management must be identified and managed. Provision for preparation of an on-site C&D waste management plan and

waste minimization strategy. Strategize to increase material circularity and alternative C&D waste management methods.

Redefining Financial Accounting and Integration with BPAS

The C&D squad issues notices and penalties if C&D waste is disposed of indiscriminately. This is a form of reactive revenue generation. The penalties are imposed, and the Zonal Office follows up, which is a time-consuming and cost-intensive process in itself. This strategy could only generate 21.94 lacs in revenue from June 2017 to February 2020. A comparative analysis cannot be performed as there is no independent record of the expense.

Development of MRV System for C&D Waste Management System

Sustainable C&D waste management has emerged as a critical area, as it has a significant climate change impact in terms of GHG emissions. The development of a monitoring, reporting and verification (MRV) system towards handling and recycling of C&D waste may be conducive for decision support system towards management of future GHG emission reduction from urban construction in the city.

Recommendations



Based on the identified gaps in the existing system of C&D waste management, the following are the recommendations and the proposed way forward.

Along with the Building Planning Approval System (BPAS), it is advised that the BMC begin compiling the necessary information in a retrievable format. The information should preferably include the date, zone, ward, kind of construction (land use), application type, area, owner's information, and information about the activity, whether it is construction, demolition, or rebuilding.

The proposed system for C&D mapping must additionally include information about the administrative area (zone/ward/division), the type of activity (construction/ demolition/ rebuilding), and the number of floors and area in order to conduct a temporal and spatial assessment.

To have accurate estimations, the ground participants and stakeholders must be involved. A workshop at the city level might be held to further strengthen the planning process and provide reliable estimates. Estimating the assured amount is crucial before embarking on any PPP initiative-based system for C&D waste.

The fleet planning and deployment to be integrated with baseline inventories and area-wise mapping of C&D waste, which will work as a catalyzing tool for BMC to achieve this objective. As a result, the required infrastructure—collection vehicles and loading/unloading equipment—can be estimated based on the quantity and kind of vehicles.

To avoid environmental concerns, it is strongly advised that any new C&D waste storage locations be subjected to localized environmental due diligence. Even if the sites are notified for increased levels through the deposition of C&D waste, the sites should be contoured and a set level for backfilling established. In terms of level-setting, the site earmarking can be balanced so that it does not affect any existing natural water drainage pattern. This may prevent local floods in the event of heavy rainfall. In terms of site planning, it is recommended that these sites be marked with contour points and a defined level be established; that the site be encircled by vertical nets, and that water be sprayed to reduce dust pollution.

For the Climate Adaptive use of Stone Quarries as Future Water Storage Areas It is advised that a baseline of the geochemistry of all such locations be established and integrated with future water requirements of the Bhubaneswar Capital Region.

For the purpose of on-site waste screening and segregation of Hazardous C&D waste fraction, it is suggested that asphalt shingles be collected separately from other C&D waste streams. These streams may be converted into other products or consumed in conjunction with other road construction materials.

BMC is advised to create a list of potentially hazardous waste fractions of C&D waste and train its employees and contractors to work on this project. The best way to handle these sorts of waste is to authorize the business that operates the Odisha Common Hazardous Waste Management facility to handle and manage them.

As a first step toward site management, BMC should ensure priority access to daily cover material, which might be in the form of fly ash and good earth. BMC should also ensure that C&D waste can be transported to the Bhuasuni site from Cuttack and Bhubaneswar.

The BMC can use a consultative process to finalize the bylaws in consultation with stakeholders. Furthermore, C&D Byelaws will be notified in accordance with standard procedure.

Regarding the integration of the SOP and the C&D bylaws, it is advised that the generator applies for building permits and submit the waste management plan, together with the expected fees, as specified in the bylaw. In response, the Town Planning Department provides a Customer Service Coupon (CSC) to the generator and both departments—Zonal Office and SBA Cell—receive information from BPAS concerning the location, owner, area, and waste management plan for their respective areas. Furthermore, the department can begin proactive monitoring of such locations in accordance with the submitted Waste Management Plan. Furthermore, it is advised that appropriate manpower—drivers, loading and unloading workers—be kept in the corporation and zonal offices.

The C&D waste inventory must be utilized for resource deployment and optimization for C&D waste management. BIMs can be used for C&D waste assessment and IoT intervention for management. The resource synergy between C&D waste and MSW management must be developed.

As recommended under institutional strengthening and process streamlining, the BPAS is advised to act as the starting point in the entire process and provide directions to the C&D squad (Zonal Office) and SBA Cell to strengthen the financial accounting system.

As part of BPAS, the BMC may charge a service fee depending on the expected quantity supplied in the C&D waste management plan.

An MRV (Monitoring, Reporting, and Verification) system framework, has been proposed, to enable climate change impact mitigation from C&D waste management. This system allows for the establishment of a baseline for current GHG emissions consequences arising from present C&D waste management. This system may be further extended to Municipal Solid waste as well.

The suggested MRV system will be used to monitor progress and develop future strategies. Furthermore, the report suggests a plan for implementing the aforementioned recommendations as well as a path ahead.

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