



Analysis of Construction and Demolition Waste and its Applications Based on Recent Studies

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ABSTRACT

Construction and Demolition Waste C & D waste is becoming a havoc each coming day. According to government agencies like Building Material Promotion Council (BMPTC) and Centre for Fly Ash Research and Management (C-FARM) estimated 165 million tonnes from construction. Out of municipal solid waste approximately 15% to 20% of solid waste comes from construction and demolition projects. Centre of Science and Environment (CSE) says in their latest release analysis of the C&D waste management sector, titled *Another Brick off the Wall*, India manages to recover and recycle only about 1% of its construction and demolition (C&D) waste), as the official recycling capacity is a mere 6,500 tons per day (TPD)- just about 1%. In this paper, we will analyze the C & D waste management to maintain the sustainable approach.

Keywords- *Construction and Demolition Waste, Management, Sustainability, Waste Application and Utilization.*

INTRODUCTION

According to Guidelines on Environmental Management of C & D Wastes (CPCB, 2017), Construction and Demolition Waste means waste generated from construction, renovation, repair, and demolition of residential, industrial buildings along with large structures like roads, bridges, dams. Construction and demolition waste is notable because of asbestos and lead as they are hazardous among other C & D waste like wood, concrete, metal, asphalt, plaster, steel. In this study we will discuss about generation of waste as well as important measures to reduce and recycle the C & D waste. Rajasthan is a largest Indian state and seventh largest by population. Like other states, Rajasthan is also undergoing through rapid development. Due to increasing urbanization, demand for infrastructure also increased, due to this the construction as well as demolition getting accumulated in the country increasing day by day and it became a serious concern.



Figure 1. C & D Unsystematic Waste Dumped Along Road Side

LITERATURE REVIEW STUDY

- Kamyar Kabirifar (2021) studied about construction and waste management from 2010 to 2021 in Australia. Out of 26 research documents, indicated that less attention was given to the role of tools and technologies in C&DWM. The current study addressed C&DWM regulations from a sustainability perspective as well as accurate comparisons of C&DWM regulations in Australia with other countries [17].
- Juan Xu (2022) Energy-saving strategies are crucial to slate dwellings for sustainability as well as maintaining thermal comfort. In this research, by using the meteorological parameters in winter of a typical meteorological year, the simulation of the slate dwelling with additional insulation materials on the roof and external walls, and attached sunspaces, was made.
- Chanki Nasirhusen M (2018) reviewed on the major sources and factors of generating construction waste by critical literature review.
 - For site factor, five factors were identified from the previous work as: Theft, vandalism, damage of materials on site, unnecessary inventories in site, rework, Improper cutting of materials
 - For Environmental factor, four factors identified: Waste disposal, weather conditions, improper land filling and act of God
 - For economical factor, five factors identified: separation of sources, transportation cost, and cost of waste disposal, labour of waste disposal, labour of waste disposal, labour cost, and recycling cost.



- For technical factor, eight factors identified: Lack of supervision, poor storage facilities on sites, error in design, design changes, human error, lack of communication on sites, lack of waste management, and ineffective method of work.
- Avindana John (2018), Research paper highlights keeping in view that the Raipur city-limits does not accept construction and demolition waste management plan which is creating ecology and socioeconomic problems.
- Kanchan Soni (2018), recycling and reuse of these wastes may reduce the usage of natural resources and it can also serve towards the demand of environment. The composition of construction and demolition waste (CDW) is dictated by different construction types and their components; in general, CDW is composed of concrete, asphalt, brick and ceramic materials.
- Chanki Nasirhusen M. (2018), research paper provides an overview of the construction industry in India and gives some statistics about the volume of C&D waste. Recycling of C&D waste by converting it to aggregate may offer dual benefit of saving landfill space and reduction in extraction of natural raw material for new construction activities, leading towards sustainable development.
- Aiqin Shen (2016), provided evidence for supporting the feasibility and priority of using CWCPM in concrete industry because of its cost-effective and environmentally friendly characteristics, and further studies, however, are needed to investigate its field performances.
- Anantha Rama V (2010), presents a great opportunity for the concrete industry to improve its resource productivity by using coarse aggregate derived from construction and demolition wastes. In many parts of the world, dredged sands and mining wastes can be processed for use as fine aggregate.

CONSTRUCTION AND DEMOLITION WASTE COMPOSITION

In literature, various methods have been employed to quantify the C & D waste generation at both regional and project levels. According to Technology Information, Forecasting and Assessment Council's (TIFAC), C & D waste consists of various materials. The exhaustion of natural sand deposits close to large urban centres necessitates the initiative to use CDW as a potential raw material

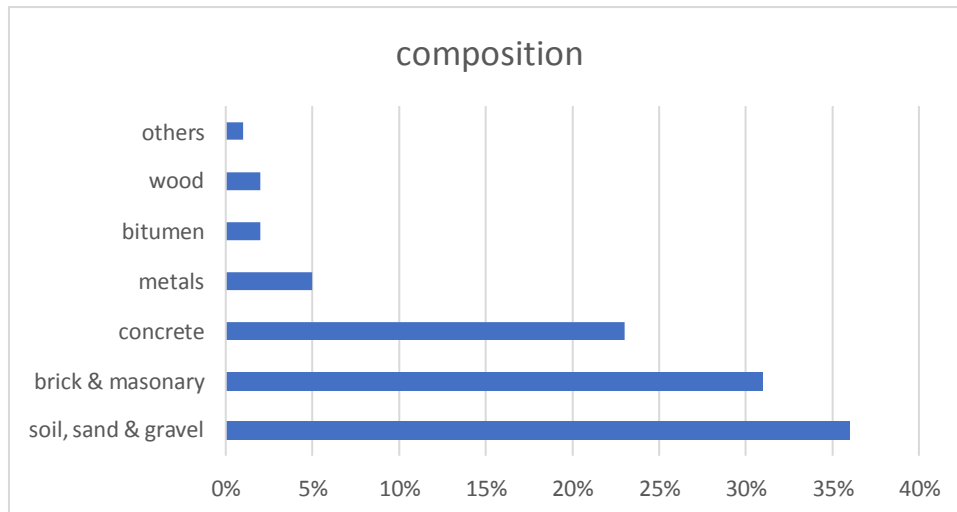


Figure 2. Material composition of C & D waste (TIFAC, 2001)

The waste found in certain area will be according to the surrounding also. As per the survey most of the construction done in any area is from the easily available material in the nearby area or surrounding except of some particular work, material is transported from anywhere else could be for an extraordinary aspects and prospect of the building. But this will rise the cost of the project as well as it is time consuming. As known that the Great wall of China was made of local material to make the construction cost effective, and in continuation and made emphasize on the strength of the wall. Also, we have the example of western Rajasthan. In western Rajasthan like Jaisalmer, Jodhpur, Bikaner sandstone is available in abundance so the most of the construction is done with sandstone. Sandstone's use can also lead to its own problems like dust pollution, health problems like silicosis, sandstone slurry.



Figure 3. Sandstone renovation waste at Gulab Sagar, Jodhpur



SUMMARY REPORT OF C & D WASTE IN RAJASTHAN DURING YEAR 2020-2021

Annual report on implementation of construction & demolition waste management rules, 2016 for the year 2020-2021.

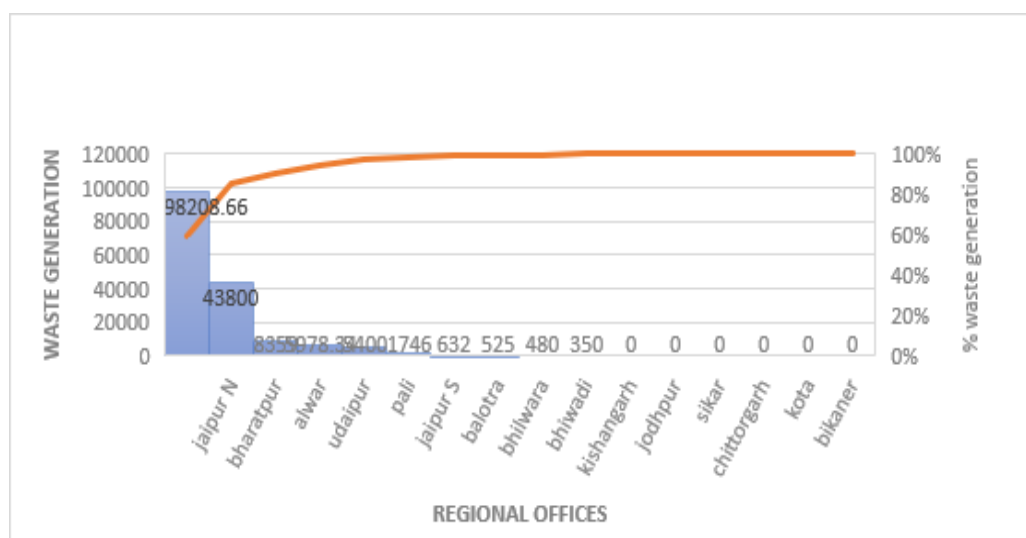


Figure 4. Graph to show the waste generation of construction and demolition waste in related regional offices of Rajasthan (2020-2021)

According to Rajasthan State Pollution Control Board (RSPCB), the report data, 2021 based on form 3rd received from 184 ULB's or Municipal bodies. This monitoring by SPCB's is conducted two times in a year that is once in six months. As per annual reports received from regional offices of state board are as follows-

- There are 7 sites that are Udaipur, Dungarpur, Pali, Takhatgarh, Sheoganj, Sumerpur, Gangapur City & Alwar have been identified for collection and processing facility.
- C&D Waste processing plant of 50 TPD has been commissioned and operational at Balicha, Udaipur.
- Further, Commissioning and implementation of facility work has been awarded by Jaipur Municipal corporation for 300 TPD C&D waste processing plant at Mathuradaspura & Sevapura landfill site.
- Total quantity of C&D Waste generated during year 2020-21 is 165479.06 MT
- Average generation of C&D Waste- 889.477 TPD
- Collection of C&D Waste- 755.997 TPD
- Data shows the maximum quantity of C&D Waste generated (MT) is from Northern Greater Jaipur.
- Processing plant is under construction in heritage Jaipur.
- The state government proposes setup C&D Waste Processing Plants in 29 cities including



state capital, Jaipur. In Jaipur a private company proposes to set up recycling facility 300 TPD on 6 acres of land near the existing dumping stations.

POINTS OF CONCERN

There are following points which are matter of concern, we must understand the problems to find related solutions.

- The waste is increasing day by day, but because of lack of any particular process there is severe problem occurred that is scarcity of land for disposal. In Jodhpur, RICCO is allotting land to the owners of sandstone park only for disposal of sandstone slurry.
- When the renovation or construction work take place then the waste is left here and there without prior separation or discrimination of waste which led more difficulty in processing.
- Gigantic heaps of wastes are generating but disposal is not in the same percentage of generation.

APPLICATION AND UTILIZATION OF C & D WASTE ACCORDING TO RECENT STUDIES

- Recently (2021), researchers' team of Indian Institute of science (IISc) developed low embodied carbon alkali-activated bricks and blocks by utilization of fly ash and furnace slag.
- London based scientist (2021), introduced a paint called celour which actively captures CO₂ from the surrounding environment that is made from waste concrete powder or leftovers from recycling concrete.

Other common construction waste utilization-

S.NO.	C & D WASTE	UTILIZATION
1	Brick	Bricks are recycled by crushing and using as filling materials.
2	Concrete	Crushed concrete aggregate
3	Ferrous metal	Ferrous metal can be recycled multiple times.
4	Masonry	Recycled masonry aggregate.
5	Non-ferrous metal	Aluminium, copper, lead, and zinc materials can be recycled.
6	Paper and cardboard	These waste materials are recycled and reprocessed to produce new paper products.
7	Plastic	Recycled plastic, such as street furniture, roof and floor, PVC window noise barrier, <u>cable ducting</u> , panel.
8	Asphalt	Asphalt pavement recycling in resurfing projects
9	Glass	Glass can be melted and used in various things
10	Timber	Turning waste timber into usable products, wooden flooring, garden decking



PRESERVATIVE MEASURES & SUGGESTIONS

As per concern, construction and demolition waste management plays a very important role to conserve energy, resources and will lead to sustainable future for the upcoming generations.

To manage the waste our first priority is to lead to follow the R's rule.

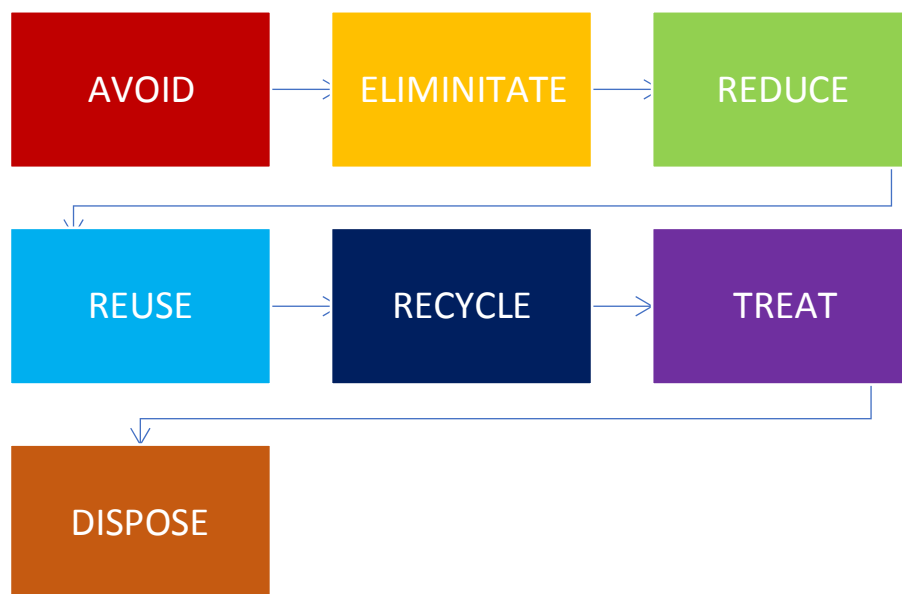


Figure 5. C &D Management Process

- In construction, those material should be avoided or used as per guidelines which if left as waste could create hazard to environment.
- There should be proper estimation of material use and generated waste from the construction and demolition practices.
- The wastes should be handled and segregated properly. Detailed instructions should be provided to the subcontractors and laborers for separation and collection of wastes.
- The waste generated should treated in such a way that the disposable waste remained would be very less.
- In this way, many C & D waste could be used as concrete waste as aggregates, bricks can be reused after removal of mortar and glass, metal & alloys have recyclable value.
- There should be a proper chain for the processing waste as someone's waste could become raw material for the other so in such case if the waste is estimated there should be authority available for using the waste material.



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