REVIEW ON THE CURRENT CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT FRAMEWORK

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ABSTRACT

Rapid urbanization has increased the construction activities that generate huge amounts of wastes both during construction and demolition phase. Construction waste generation is recognized as one of the major issues in the construction firm due to its unambiguous effects on the environment in addition to the performance of the construction industry. It could cause great effects on human health and the environment. These construction and demolition waste (C&DW) need to be controlled by employing effective waste disposal techniques. In India, Construction and demolition wastes management (C&DWM) is found to be still a problem. According to [Markandeya, Kameswari 2015] the construction firms in India generates about 10-12 million tons of waste annually. This paper reviews the literature and analyzes from the C&DWM strategies in practice around the globe and the role of regulatory authorities in construction and demolition waste management.

Key words: construction and Demolition waste, construction project, waste disposal, waste management


1. INTRODUCTION

Construction and Demolition waste is the waste generated as a result of construction, renovation and demolition of building, roads, and bridges. C&DWM are the activities and
actions required to manage waste from inception to its final disposal. The construction firm generates a large quantity of solid waste that is now turning into an environmental problem for future generations. Efforts to decrease the impact of construction and demolition waste (C&DW) are through the process like legal guidelines, and legislation. Therefore, this study pursuit to create awareness of the current reputation of C&DWM practices in construction projects with the aid of reading relevant latest available articles and journals.

1.1. Indian Construction Industry and Wastes Generated

Construction and demolition waste (C&DW) are waste produced directly by the construction or demolition of buildings, roads, bridges, or other structures. This consists of concrete, wood products, asphalt shingles, brick and tile, steel, insulation, nails, and waste generated from site preparation.) The Quantity of waste generated from (C&DW) according to the Technology Information, Forecasting & Assessment Council (TIFAC2000) is given in Table: 1 [Markandeya, Kameswari 2015]

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Quantity generated in Million tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil, Sand, and Gravel</td>
<td>4.20 to 5.14</td>
</tr>
<tr>
<td>Bricks and Masonry</td>
<td>3.60 to 4.40</td>
</tr>
<tr>
<td>Concrete</td>
<td>2.40 to 3.67</td>
</tr>
<tr>
<td>Metals</td>
<td>0.60 to 0.73</td>
</tr>
<tr>
<td>Wood</td>
<td>0.25 to 0.30</td>
</tr>
<tr>
<td>Others</td>
<td>0.10 to 0.15</td>
</tr>
</tbody>
</table>

1.2. C & D Waste Management Rules, (2015-2016) in India

Municipal Solid Wastes Rules, (2000) notification number S.O. 908(E), issued by the Government of India within the Ministry of Environment and Forests, provides regulations for the Municipal Solid Waste generated inside the urban area and the guidelines are more powerful to improve the gathering, sorting, recycling, treatment, and disposal of waste in an environmentally sound manner. [Anupam, Sachan, Ramashanker2014] suggests that in the State of Maharashtra Municipal Solid Waste Rules (2000), the process involved in C&DWM includes sorting, collection, and disposal of debris and bulk waste in its Action Plan. Some composition of C & D wastes provided: by Ministry of Urban Development MoUD include the following. Approximately 10 MT -15 MT (million tons) per year by Ministry of Urban Development MoUD (2000). The quantity of C & D wastes generated annually in India has been estimated 10 - 12 million tons. Considering 30% of C & D wastes and 50% of the concrete as coarse aggregate, the entire recycled concrete aggregate (RCA) in India is of the order of 1.8 million tons per year. Waste generators, generate more than 20 tons/ day or 300 ton/month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and submit C&DW management plan and get approvals from the local authority before starting construction or demolition work. Table: 2 shows that estimate prepared (2000, 2001, 2010 and 2014) by Central Government [Harish Gayakwad, Neha, 2015].


<table>
<thead>
<tr>
<th>Year</th>
<th>Authority</th>
<th>An estimate in Million Tones</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>TIFAC (2000)</td>
<td>12—15</td>
</tr>
<tr>
<td>2010</td>
<td>Ministry of Environment and Forest</td>
<td>10—12</td>
</tr>
<tr>
<td>2014</td>
<td>Ministry of Urban Development (2014)</td>
<td>no estimate exists</td>
</tr>
</tbody>
</table>

[Anupam, Sachan, Ramashanker 2014] proposed that in India it is required to form solid waste legislation as followed in united states of America (act like Resource Recovery Act of 1970, Resource Conservation and Recovery Act (RCRA), and Solid Waste Disposal Act Amendments of 1980). Leadership in Energy and Environmental Design (LEED) is the green building rating program sponsored by the USGBC [Job Thomas, Wilson 2013]. In India, Green buildings are judged by way of Green Rating for Integrated Habitat Assessment (GRIHA). It has been getting through The Energy and Resources Institute (TERI) and is strengthened by the Ministry of New and Renewable Energy (MNRE). GRIHA tries to decrease a buildings resource consumption, waste generation, and usual ecological or environmental effect by comparing them to certain nationally applicable limits.

2. RESEARCH BACKGROUND

The current practice of C&D waste management is reviewed from the articles and journals using electronic databases such as Science Direct, Book reviews, and engineering journals. A total of 40 papers were reviewed, thereby, identifying existing issues and implementation of techniques in the construction firm. The selected articles in C&DWM and number of relevant papers published yearly as shown in a fig:1 were examined. The present work suggests the need for effective C&D waste management on site. This evaluation aids in the identification of the gaps and limitations in the construction and demolition waste management framework currently in practice.

![Figure 1](http://www.iaeme.com/IJCIET/index.asp)  
**Figure 1** Number of relevant papers published in years

3. REVIEW ON C&DW MANAGEMENT

[Zhikun, Menglian, Vivian, Guizhen, Cuong, 2018] discussed that waste reduction measures such as use in prefabricated components application, design modification at the design stage, sorting and reuse of material at the construction stage by the authorized person. [Serdar, Aynur, Volkan, 2017] discussed that in general, construction and demolition waste (C&DW) is divided into two types: inert materials (i.e., concrete, bricks, and sand,) and non-inert materials (i.e., plastic, glass, paper, wood, and other organic materials). [José, David, Harald,
Barbara, 2018] A best management practice for CDW in Europe, recycling includes weighing and visual inspection, manual reselection, rejection and diversion to alternative treatments, screening of large materials, magnetic separation, manual separation of plastic, wood, and other waste streams if required, crushing, and screening and secondary crushing. [Karrar, Pandey2013] investigated the 4R techniques (reduce, reuse, recycle and recovery) used in the waste management process on-site. Reusing of raw materials, using recyclable materials and reducing the use of resources and energy can be applied throughout lifecycles of a construction project - starting from design and extraction of raw materials to transport, use, dismantling, and disposal. [Markandeya, Kameswari(2015)] discussed the properties of demolition waste, its risky effects and suggests safe recycling/reuse/disposal methods. For effectively use a Construction and demolition (C & D) Waste management plan was formulated, it is important that the nearby governing bodies make the submitting and implementation of this plan mandatory. This ends in a reduction of Environmental Pollution due to C&D waste. [Serdar Ulubeyli, Aynur Kazaz, Volkan Arsla 2017] suggested that today, recycling of construction and demolition waste (C&DW) by plants is an inexpensive opportunity to the existing unsustainable disposal techniques such as land filling and fly tipping. [Robert, Deepika, Rolf, 2017] stated that waste from construction to landfill cause environmental pollution which includes: degradation of land, habitat destruction, contamination of soil and groundwater, and release of methane. [Giulia, Sarai, Lucia, (2018)]

4. C&DW MANAGEMENT TECHNIQUES
[Uzzal Hossain, Zezhou Wu, Chi Sun Poon 2017] proposed that the Life Cycle Assessment (LCA) method become carried out to evaluate the overall performance of the current management of CDW and to become aware of critical components and feasible improving actions. [Grégoire Meylan, Melanie Haupt, Mert Duygan, Stefanie Hellweg, Michael 2018] suggested that the Life cycle assessment (LCA) is a popular approach used to assess the sustainability of future waste management alternatives. [Jongsung Won, Jack C.P. Cheng (2017) Olugbenga, Lukumon, Saheed, Muhammad, Hafiz, Hakeem, Omolola, 2018] both applied the Building information modeling (BIM) which enabled project participants to enhance the method and technologies within the planning, design, construction, and demolition phases, thereby handling and minimizing C&D waste efficiently. [Tam 2013] discussed that in 2003, the Hong Kong Government carried out a waste management plan (WMP) for all construction projects. Its implementation changed into investigated through a survey and established interviews. The main benefits have been found to be the on-site reuse of materials and methods for reducing waste. Financial incentives and costs present major problems and the using prefabricated building components become taken into consideration as the most effective measure in encouraging the implementation of WMP. [Saheed, Lukumon, Olugbenga, Muhammad, Hafiz, Hakeem, 2017] described the characterized waste efficient logistic and procurement process. These include low waste purchase management, effective materials delivery management and waste efficient Bill of Quantity. The use of Just-in-Time (JIT) delivery system is important for mitigating waste through materials procurement processes and prevention of over ordering also. Thereby waste management practices at design and construction stages of the project delivery process.

5. CONCLUSIONS
Literature review reveals that, effective use of C&D waste management techniques is essential and should be insisted by the local governing bodies for a better future. The techniques applied to evaluate the performance of the C&DW management system are as follows: 3 R principles used to decrease environmental effect by reducing waste generation, enhancing the quality of secondary materials and optimizing the environmental performance. Land filling
and fly-tipping are the poor practices of C&DW disposal. (SWOT) analysis, aims to identify the status of construction waste management. Material flow analysis (MFA) can be used to assess material and energy recovery rates. Environmental life cycle costing (ELCC) can be used for measuring the costs. Environmentally friendly techniques should be implemented for the utilization of C & D waste and proper standards should be established for waste utilization. There should be easy access to the report regarding C & D generation, laws and regulatory framework and approaches to all stakeholders and the common public.

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