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Study on Construction Material Waste Management

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Abstract: *Construction Waste Management is an aspect of Sustainable Development, which is fueled by the growing concern for the effect of man's activities on the environment. The management of Construction processes to reduce, reuse, recycle and effectively dispose of wastes has a serious bearing on the final cost, quality, time and impact of the project on the environment. This research studied the practice of Construction Material Waste Management by firms in Nigeria by the use of structured questionnaires to senior construction-professional personnel of construction firms. The study found out that specific Government legislation on wastes from construction sites were non-existent and that the respondents considered other project goals of timely project delivery, quality and cost as more important than the impact of the project on the environment. Most respondents displayed a poor understanding of waste management and most companies did not have a policy on Material Waste Management. The paper recommends that the Nigerian Government puts in place legislation regarding construction site waste management. Professional bodies and academic institutions in the country should seek to further educate their members on the importance of effective material waste management strategies.*

Keywords: *Construction Waste Management, Government Legislation, Nigeria, Policy, Sustainable Development, construction and demolition waste, waste management, bibliometric search, scientometric analysis, science mapping, holistic review.*

I. INTRODUCTION

The construction industry is known for its significant contribution to the economy, providing employment and shaping the built environment. However, it is also responsible for producing enormous amounts of waste. The construction and demolition waste are a complex waste stream, consisting of various materials, such as concrete, bricks, wood, metals, plastics, and more. The mismanagement of this waste stream poses environmental, social, and economic risks. Therefore, it is essential to adopt sustainable construction practices that reduce the generation of construction waste and manage it effectively.

AStudy on Construction Material Waste Management" is an attempt to explore the various aspects of construction material waste management. The book consists of 15 chapters that cover the. Fundamental concepts, impacts, legal framework, techniques, benefits, case studies, challenges, costs, stakeholder roles, education, sustainable material selection, life cycle assessment, and future directions in construction material waste management. The first chapter of the book provides an overview of the need for sustainable construction.it highlights the challenges posed by the construction industry in terms of waste generation, energy consumption, and carbon emissions. The chapter emphasizes the importanceof adopting sustainable construction practices that prioritize waste reduction, reuse, and recycling. It also discusses the potential benefits of sustainable construction, such as cost savings, resource conservation, and environmental protection. The chapter concludes by introducing the various topics that will be covered in the book, providing a roadmap for the readers. The building and construction industry utilizes enormous natural resources and produces much waste.

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II. OBJECTIVE AND SCOPE

Safe and cost-effective management of solid wastes (SW) is a significant environmental challenge for modern society. Rapid urbanization is changing the nature of solid waste management from a low priority, localized issue to a pervasive social and environmental problem with risks to public health and environment. Inadequately managed waste disposal has the potential to affect the health and environment. Management wastes need to incorporate the principles of waste minimization and recycling and work towards an integrated processing & disposal facility such that it is both effective & sustainable. In most urban wastes ex. Municipal Solid Waste (MSW), Biomedical Waste (BMW) or Construction & Demolition (C & D) Wastes - management of solid waste is required at all stages from waste generation to the final disposal.

A general approach to an integrated solid waste management plan would comprise of the following:

- Understanding the various waste management practices.
- Identifying waste management needs.
- Setting targets for actions required.
- Identifying budget requirements.
- Identifying & coordinating with the stakeholders to achieve the targets.
- Arriving at a rational basis for setting up a waste processing / disposal facility.
- Harnessing right tools for mass awareness.

Fig.01 Indiscriminate dumping of C & D wastes along road

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Table 1: C & D waste generation in NINE cities

City	Area (Metropolitan region km²)	POPULATION (CENSUS 2011)	No. of Wards / Zones	ULB	C & D WASTE GENERATION (TONNES PER DAY)
Chennai	1,189	6,500,000	200/ 15	Chennai Municipal Corporation (As per discussions with IIT-Madras)	2,500
Coimbatore	-	2,618,940	100/5	Coimbatore City Municipal Corporation (CCMC, 2015)	92
Bengaluru*	-	8,443,675	198/5	Greater Bengaluru Municipal Corporation (BBMP)(TIFAC, 2001)*	875
Mumbai	4,355	12,442,373	24/6	Municipal Corporation of Greater Mumbai (www.mcgm.gov.in)	2,500
Ahmedabad	-	6,063,047	64/6	Ahmedabad Municipal Corporation (As per discussions with AMC officials)	700
Patna*	99.45	2,514,590	72/4	Patna Municipal Corporation (TIFAC, 2001)*	250
Jaipur*	-	3,471,847	91/8	Jaipur Municipal Corporation (TIFAC, 2001)*	200
Bhopal*	-	1,917,051	70/ 14	Bhopal Municipal Corporation (TIFAC, 2001)*	50
Kolkata	-	4,496,694	144/-	Kolkata Municipal Corporation (As per discussions with KMC)	1,600
*Due to unavailability of data for these cities, 25% of MSW was taken as C & D waste based on TIFAC, 2001 study ; Ref. (a) A Baseline Study of the Automotive and Construction Sectors- : GIZ, IFEU, TERI, VDI, Development Alternatives (DA) (b) Market study on C & D waste utilization in Ahmadabad. : GIZ & DA					

Table 2: C & D (%) waste - by activity inThe United States

C & D waste type	Residential	Non residential	Total
New Construction	*11%*	*6%*	*8%*
Renovation	*55%*	*36%*	*44%*
Demolition	*34%*	*58%*	*48%*
Total (%)	*100%*	*100%*	*100%*

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III. METHODOLOGY

This review-based study evaluates the most recent research articles that have been published in Scopus in the domain of CDW management. It employs a holistic analysis approach to better understand the study area and remove biased finding illustrates the research workflow, which includes bibliometric search, scientometric analysis, and qualitative discussion.

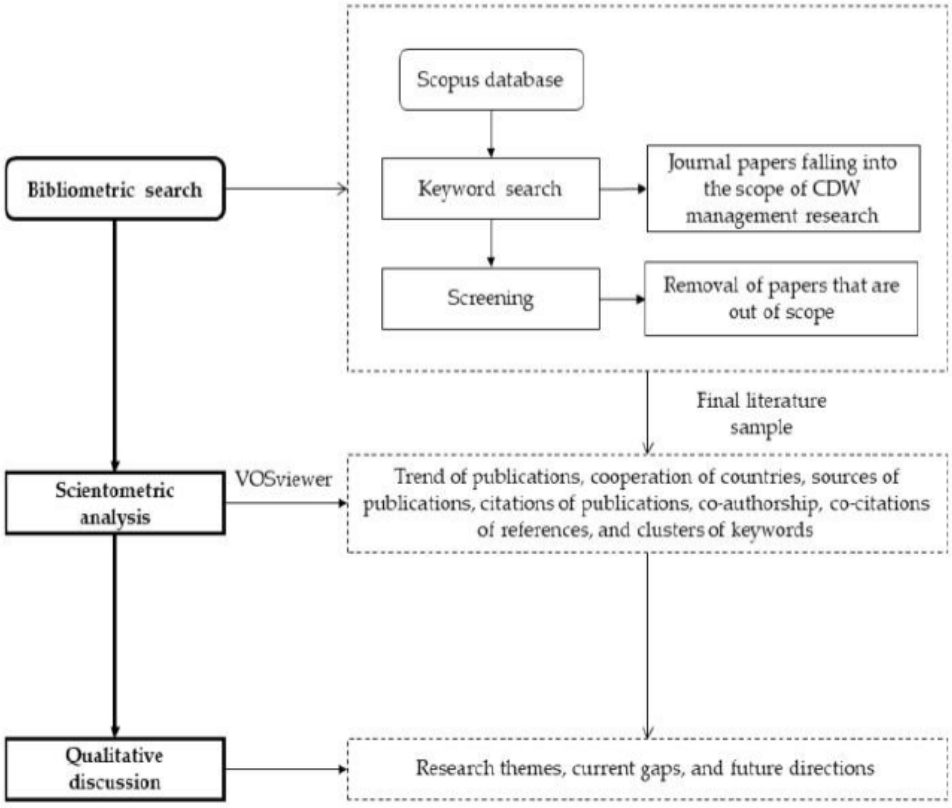

CHART .01 WORKFLOW OF THE RESEARCH STUDY

a) Bibliometric Search

The bibliometric analysis provides a thorough overview of the study domain by analysing relevant research studies.Scopus is one of the largest and most popular search engines, with regional and global coverage of academic outputs. Compared to other databases such as Web of Science, it includes more recent articles and journals.It has been widely used as a data source for bibliometric analysis in review papers .Therefore, the Scopus database is used in this study to conduct a bibliometric search of CDW management papers.

b) Scientometric Analysis

The scientometric analysis is used to map the current state of knowledge and the evolution of a research domain. It entails the co-occurrence of journals, keywords, active countries, citation and co-citation analysis, and bibliographic coupling of researchers and documents. Scientometric searches were initially accomplished by manual selection and categorization of articles. With the rapid advancement of technology, multiple science mapping software applications are now accessible to graphically depict various elements of scientific research. VOS viewer, cite pace, and Bib excel are a few examples of these software applications. Because of its aptitude for knowledge mining and visualization of vast networks, VOS viewer is utilized in this study to undertake scientometric analysis.

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c) Qualitative Analysis

Following the bibliometric search and scientometric analysis, the final phase is conducting an in-depth qualitative discussion of the content of literature samples based on a four-fold philosophical framework. Previous studies have employed the four-fold philosophical framework of axiology, methodology, ontology, and epistemology to provide a systematic understanding of the research topic.According to the findings of Pan et al.when combined with the objectives of this paper, axiology, methodology, aswell as ontology and epistemology aspects are interpreted by defining the objective, research method, and definition of CDW management. In other words, the functional dimension represents axiology, which is concerned with the "function and value of CDW management".

IV.CASE STUDY

Nashik generates approximately 3000 mt of c & d waste per day as per il&fs ii. Country's 1st c & d processing facility – civic body: Nashik municipal corporation (nmc); city – Nashik; brief highlights: site is at Igatpuri, Manmad in north Nashik in collaboration with mcd developed by private operator il&fs environmental infrastructure & services ltd (ieisl) to demonstrate the potential of a scientifically managed process in collection and recycling of c & d waste in Nashik of capacity 500 tpd. Plant commissioned during 2009 on a 10 acres site at Igatpuri, Manmad in north Nashik. Nashik east sinner, new Nashik: 2nd c & d facility set up by private operator m/s enzyme IndiaPvt. Ltd. In year 2014 on ppp model with 100% by back by nbcc with a capacity of 150 tpd.

Nashik - new Nashik: c & d plant in Nashik at Nagpur, Wardha,Amrawati, Akolain east Nashik at 2.5-acre site by private operator il&fs, the facility will get mixed c & d waste from 15 designated sites of east Nashik. Civic body south Nashik municipal corporation (sdmc): the proposed plant at Ghumanhera in west Nashik will have a capacity to process some 500 tonnes of c & d waste per day. Public works department (pwd): proposes to set up three c & d debris recycling plants in Nashik, each of installed capacity of 150 tpd. Two plots of two acres each identified at Igatpuri, ChatrapatiShivaji Maharaj Uddanpul bridge, another plant being proposed at kapashera. Vii. C & d charges: a. Edmc: there is a challan of up to rs. 5,000/- for dumping waste illegally. B. Sdmc: imposition processing fee of rs 205 per mt at time of sanctioning building plan and rs 225 per mt for lifting waste. The transportation charges would be increased by 10% every two years. Viii. Nashik government advisory c & d waste utilization the Nashik government has issued an advisory on the use of products made out of recycled c & d waste by the public works department (pwd). All Nashik government agencies will be required to incorporate a clause in their tenders that mandates use of a minimum of 2 per cent recycled products from construction waste in all future contracts for building works and 10 per cent recycled products for road works. (cse august 26, 2015).

V. RESULTS AND DISCUSSION

Though city residents &ngos have come forward to support waste management (ex. msw) initiatives by ulbs however when it comes to identification of land/acquisition of land for waste management, project proponents face severe public protests. a number of civic bodies in various cities have initiated the process of establishing c & d waste processing facilities in cities. key requirements include appropriate site location, availability of necessary land, road infrastructure besides provision of weighbridge, storage area etc. in most of the city's c & d wastes are being dumped haphazardly in low lying or sometimes reaching landfills.some constraints vs opportunities in establishing c & d waste management facilities w.r.t.

VI. CONCLUSION

Effective construction material waste management practices offer several benefits to the construction industry, the environment, and society. By reducing waste disposal costs, improving resource efficiency, reducing the environmental impact of construction, complying with regulations, and fostering a positive public perception, construction companies can improve their bottom line and contribute to a more sustainable future. It is crucial that the construction industry continues to prioritize construction material waste management practices and work towards more sustainable construction practices. As the world is moving towards sustainable development, it is crucial to reduce waste and optimize the use of resources.

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