

Waste Management of Construction and Demolition Materials towards Sustainable Growth of Nagpur City

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Abstract:

The higher amount of buildings and infrastructures in India, number of construction and demolition (C&D) waste is increasing continuously. These wastes, if not completely recycled, will create the environmental problems. This research paper concentrates on the use of a system dynamics technique to develop a C&D waste recycling. The project is based on the recycling of the rapidly increasing construction and demolition waste. Through this process we want to take a step ahead, the idea of stopping illegal Dumping and ultimately save our mother Earth from destruction. The cost of recycled C&D solid waste resulting in reduction of overall construction cost.

The demolition is the most commonly pronounced word in the construction industry. As per the new building rules building should be demolished after its service period. Now-a-days the importance is given to sustainable and environmental friendly construction; there should be effective control of the demolition waste. The demolition waste can be reused for the construction. Construction and demolition (C and D) waste is defined as the solid waste generated by the construction, renovation, repair, alteration or demolition of residential, commercial, government or institutional buildings, industrial, commercial facilities and infrastructures such as roads, bridges, dams, tunnels, railways and airports. Construction and demolition waste is considered as high volume, low risk. It is commonly understood that this waste can be considered a resource, either for reuse in its original form or for recycling or energy recovery. Because of increasing waste production and public concerns about the environment, it is desirable to recycle materials from building demolition. If suitably selected ground cleaned appropriate industrial crushing in plants, these materials can be profitably used in concrete. Despite this, most Construction and Demolition waste ends up in landfills recycled aggregate and recycled sand that can be obtained. Further with the help of the obtained recycled material we intend to make various products such as concrete, paver blocks, hollow blocks, etc which will in turn be less costly as well. These recycled materials and products made from it are economical without any considerable change in the strength and durability aspect. Not only the cost effectiveness but it will also be aesthetically pleasing. According to Metropolitan region development authority the amount of construction and demolition waste (C&D waste) must be reduced by at least 70%. 3Rs model (Reduce, Reuse and Recycle) in the C&D waste management with costs savings.

This paper finds a broader understanding of the socioeconomic implications of waste management over time and the positive effects of these policies in the recycled to achieve the goal of C&D waste as well as the composition of Construction and Demolition waste, the need for its recycling and options that can be implemented for its efficient use in the field of concrete technology.

Keywords: C & D waste; sustainable construction systems, Recycling, Concrete.

I. INTRODUCTION

The construction industry growth very fast in recent decades, old building to be renovated or demolished and new infrastructure project want different quality and greater quantity construction materials for construction activities which result in generation of large amount of waste. It is possible to reuse most of the material and components. As the volume of waste is allowing to be crushed, processed, and reused in building works. The recycling of construction material to reduce the cost of production of new material & also reduce the consumption of natural resources. This waste, generated in the construction, maintenance and disposal phases of a building, is called construction and demolition waste. The increase in the economic growth after development and redevelopment projects in the country and subsequent increase in the urbanization in the cities has made construction sector to increase drastically, but also environmental impacts from construction and demolition waste are increasingly becoming a major issue in urban solid waste management. Environmental issues such as increase in the flood levels due to the illegal dumping of construction and demolition waste into the rivers, resource depletion, shortage of landfill, illegal dumping on hill slopes are evident in metro cities. The primary method is adopted in waste handle through by interviewing professionals like Architects, civil engineers, contractors and government officials. This includes waste from demolished structures, renovations in the real estate sector and repair of roads, flyovers, bridges, etc. this is added enormous debris that follows disasters such as during the floods, Earthquake etc. Preservation of the environment and conservation of the rapidly diminishing natural resources should be the essence of sustainable growth and development.

Nagpur Municipal Corporation lifts, transports and dumps construction and demolition material at Bhandewadi dump yard engaging services of private operator M/s. Kanak Resources

Management Ltd. construction and demolition Waste generation 1,120 TPD/Mt. The capital investment for this plant has been estimated taking into consideration the latest manufacturing cost and the costs of the equipment and materials project is 130 cr. Thus, the aggregate produced from the concrete pieces in the construction and demolition waste is sent to a batching plant for the production of RMC, which can be used in non-loadbearing structures. Thus a wide variety of pre-cast products can be produced by using recycled construction and demolition waste as a raw material, it has been used to produce materials such as pavement blocks, bricks etc. manufacturing process like collection, segregation, screening, crushing and the used of crush material as a products

II. THE CONSTRUCTION INDUSTRY

The construction industry in India is booming. Buildings are at the core of all our demands water, energy and material but they also create waste. This waste, generated in the construction, maintenance and disposal phases of a Building, is called construction and demolition (C&D) waste. This includes waste from demolished structures, renovations in the real estate sector and repair of roads, flyovers, bridges, etc. To this is added the enormous debris that follows disasters such as during the Uttarakhand floods in 2013 But C&D waste can be an invaluable source of building material. In fact, the recent controversy in India the spotlight on the need to recycle, reuse and substitute naturally sourced building material. The amount of C&D material generate depends on activity in the entire construction, demolition, renovation etc. in construction industry vital sector of the economy, directly or indirectly, providing jobs and income to large population in India.

III. C&D WASTE GENERATION IN INDIA

As per the estimates of Centre for Science and Environment (CSE), Since 2005, India has newly constructed 5.75 billion sq. m of additional floor space with almost one billion sq m in 2013 itself. A new construction generates 40-60 kg of C&D waste per sq. m, then taking an average of 50 kg per sq m, India must have generated 15 million tonne (MT) of C&D waste in 2013. Over the last ten years, it would have produced 287 MT of this waste. Imagine the scenario if the waste generated by infrastructure projects such as roads and dams is added. Not surprisingly, in India, if C&D waste is quantified, it will be more than all the other types of solid waste put together.

Thus, it can be concluded from the various studies that there are various factors that affect the C & D waste generation such as demographic factors like population, rate of urbanization, population density and socio-economic status of people; age of the city and construction and demolition patterns and practices.

IV. IMPACT OF C&D WASTE ON ENVIRONMENT

Buildings have long lifespan and their impacts affect the lives of many generations of our ancestors and stretch into the future of unknown resources, pollution and unstable climatic conditions. Several investigations have shown that the consequences on the environment instigated by building activities are severe and require to be inhibited. Building sector contributes majorly in the development of the society. While acknowledging this fact, it is also being professed as a key contributor to environment deterioration. Some of its negative effects on the society are land depletion, energy requirement and use, solid waste production, discharge of dust and gas, noise pollution, and utilization of natural resources including non-renewable resources. In the past 100 years, the earth has heated by nearly 0.5 °C each year which is due to escalated concentrations

of a few traces of greenhouse gases; most prominent among them being the carbon dioxide (CO₂). The energy use and associated CO₂ emissions have been increasing at a faster rate globally over the past few decades. The impact of the continuous development of energy use are disastrous. The developed countries should enhance their energy efficiency to curb the problem of excessive energy use and thereby reducing the associated CO₂ emissions. Construction industry related energy use is responsible for nearly half of India's energy use because of urbanization and industrialization. The use of non-renewable fuel source in the generation of resources, during the building practices, and by the dwellers or the end-users of the buildings/structures during their lifespan is a basis of large amount of CO₂. The climatic changes due to the global warming are issuing a warning and treat to the environment and demands changes in the construction practices.

Noise produced by the construction activities at the site affect the peace, ease and healthiness of the residents and the visiting community and influences the general commotion of nearby schools, hospitals and other day-to-day services. The critical causes of noise are the demolition, operating various machinery at the site, pneumatic hammers, concrete mixers, re-processing of the C & D waste, etc. There are various harmful impacts of the noise produced from C & D waste disposal, re-processing and reuse to the environment urging the need to take initiatives and formulate the legislations in India.

V. EFFECTS OF ENVIRONMENT

Construction of any infrastructure make a considerable environmental impact through extraction of raw materials, the use of energy in production processes and transport, production of masses by by-product waste, and the damage to environment and health in all phases of the life cycle of hazardous components. The disposal of C and D wastes has become a major concern in

recent year. Some building owners, waste haulers and demolition contractors are disposing of this waste improperly and illegally in order to avoid transportation costs and tipping fees at waste disposal facilities. Illegal disposal sites have been discovered in gravel pits and ground water recharge areas, on farm land, and prime residential property, and in borrow pits and low lying areas.

The land disposal of C and D waste presents a threat of ground water contamination because of trace amounts of hazardous constituents, which are sometimes encountered. The potential for ground water contamination results from small amounts of hazardous materials, such as organic compounds or heavy metals that may be present in substances that have been applied to construction materials, or by the improper disposal of residues or bulk chemicals in the waste stream. Degradation of ground water quality may also result from larger amount of generally non-toxic chemicals, such as Chloride, Sodium, Sulphate, and Ammonia that may be present in leachate generated from C and D waste materials (Ex: wood, concrete, metal, drywall, asphalt) when land filled. Therefore the improper disposal of C and D waste poses a threat to ground water quality.

VI. MANAGEMENT STRATEGIES FOR C&D WASTES

Various strategies have been taken up in different cities in India and are discussed as C&D waste management strategies exist in Delhi and Ahmadabad. Processing facilities have been set up in collaboration with private entities. Proper collection and transportation systems have been set up to aid processing. Illegal dumping practices are also discouraged due to penalties on open dumping. Chennai and Kolkata are some exceptions to unaccounted C & D waste production. Kolkata keeps records of the extent of C & D waste getting dumped in landfills. Chennai is the only city which gives demolition permits to waste generators as compared to reconstruction permits given in other cities. This facilitates the estimation of C & D

waste generated based on area and type of the buildings demolished. Many investigations have concluded a decline in environmental effects including CO₂ emissions which can be ascribed to recycling of C & D waste. Life cycle Assessment (LCA) studies can provide elementary guidance to design engineers and researchers working in this field.

VII. CONCLUSION

There should be a proper institutional mechanism to take care of the collection, Transportation, intermediate storage (if necessary), utilization and disposal of the C&D waste. In number of municipalities, the sanitary department or the Health Department is responsible for garbage whereas the Engineering or the planning department is responsible for C and D waste. Under such circumstances, it is extremely important that either the Solid Waste Management department is made responsible for collection of C and D waste or these departments work in close coordination. It is essential that proper accountability is fixed and official information is readily available regarding day to day situation.

The civic authority should consider the following points and after deliberations get them approved by the competent authority, except those which already exist in their municipal act. The civic authority should notify that no person should dispose of C and D Waste on the streets/pavements/storm drainage/ open land belonging to the municipality or the government. In case such waste is dumped on a private land, the owner of such land would be accountable for the act and would be held responsible for any degradation of the surrounding environment or causing of any pollution. Such waste should be stored within the premises till they are removed from the site to a place notified/permitted by the body. In case of new construction, the advance is to be deposited with the application for sanction of the building plan. The charges would be notified by the civic authority and would be refundable after due deductions in case of

compliance of the stipulated laws. In case of any default, the whole amount would be confiscated. These rules/notifications would also be valid for Government, Semi-Government and Public Sector Departments.

ACKNOWLEDGMENT

I have great pleasure in presenting these projects reports entitled “Waste Management Of Construction And Demolition Materials Towards Sustainable Growth Of Nagpur city. For partial fulfilment of the Degree of Master of Architecture in (Architectural and Construction Project management).

I would like to extend sincere thanks to my guide Prof. Sanjay D. Joshi, Professor S.P.S.M.B.H.’S College of Architecture, Kolhapur for the support and guidance he provided to me. His enduring patience, motivation and valuable time he gave me and has greatly appreciate when he is holding responsibility .In course of project topic include the working pattern along with study part. Also the basic practical experience like Data collection in site , different construction methods, basic details waste disposal ,landfill patterns etc. Along with the project gave me enough knowledge and encouragement.

I would also like to thanks for giving me support and freedom to think independely and differently, because of which things produced some good work to extends my sincere thanks to Prof. S.

G. Dige, Principal S.P.S.M.B.H.’S College of Architecture, Kolhapur and Prof. A. P. Dighe, H.O.D. M. Arch for providing all necessary facilities to carry out the project work and whose encouragement has been a perpetual source of inspiration.

I am also thankful to my family and friends for kind co-operation during research work application and express deep sense of gratitude to all the staff members for their co-operation. I finally thanks to all those who directly or indirectly helped me in my work.

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