

Constructional Waste Utilization – A Review

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Abstract— Sustainable design and construction is perhaps nothing but conserving natural resources for future generations. Globally, cities generate about 1.3 billion tonne of solid waste per year. This volume is expected to increase to 2.2 billion tonne by 2025. Here, an attempt has been made to study the environmental impacts of construction uses. A viable use of alternatives to virgin materials is discussed. The reuse and recycling of construction and demolition waste (C&D) materials have been emphasized here. It can be concluded that, environmental considerations strongly favor more utilization of wastes keeping in mind the risk of utilization of certain waste materials.

Index Terms— Sustainability, Construction and Demolition waste, Construction waste management

I. INTRODUCTION

In India, construction industry is growing at an annual rate of 10 percent over last 10 years as against the world average of 5.5 percent per annum. The built up area is expected to increase by almost five times from 21 billion sq. ft. in 2005 to approximately 104 billion sq. ft. by 2030 as documented in a report submitted by Centre for Science and Environment, New Delhi. This growth directly gives an indication of the wastes that is probably going to be generated in the due course of time. The waste that will be generated during construction and maintenance activities constitutes mainly of bricks and blocks, concrete debris, wood, tiles, gravel, soil etc. and is called as the construction and demolition waste. The reason for vast quantity of waste generated can also be attributed to the increase in standard of living, changes in consumption habits, as well as the natural increase in population (Katz and Baum 2011).

The statistics also say that the total C&D waste generated in India just by buildings in a single year i.e. 2013 is 530 MT. This calculation does not account the consideration of the wastes generated by infrastructure projects such as roads and dams. At this point, a question arises to why not use the construction wastes generated as an alternative to the natural resources.

A. Issues related to Construction waste

The types of C&D waste generated are as depicted in figure 1. Various studies have been done to know the impact of material waste on the cost of project as well as to know the adverse effect on the environment. The construction work in a project was divided into three categories based on the waste generated; structural frame, early finishing and late finishing (Katz and Baum 2011).

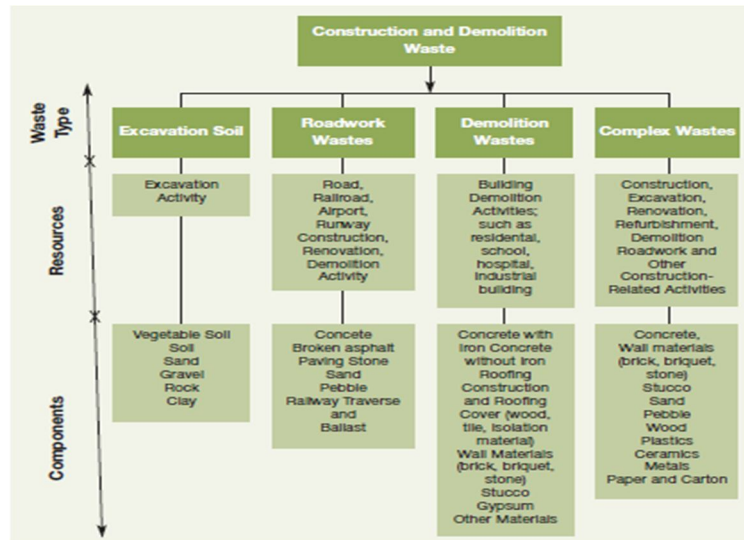


Figure 1 - Types of C&D waste (source-Centre for Science and Environment, New Delhi)

It is found that the structural frame work which is essentially the construction materials supplied to site such as steel, concrete or wood produces little wastage and most of the waste produced at this stage can be recycled effectively. The early finishing works such as partition walls, plastering, floor tiles, piping etc. contributes larger quantities of mixed waste and wastes from the finishing works are found to be the largest. The post processing and treatment plants for separation is more intense for early finishing and late finishing wastes generated. However, this is site specific and the difficulty of separation of wastes during treatment increases with the increase in the project amount and site. Figure 2 show an outline of waste generated during project lifetime.

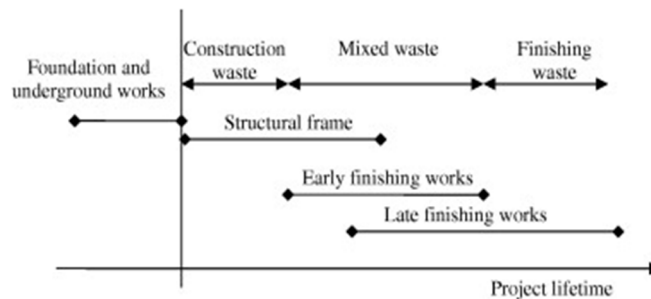


Figure 2 - Outline of waste generated during project lifetime (Katz and Baum 2011)

The implications created from these huge quantities of waste generated from construction industries are illegal dumping. Illegal dumping is the unlawful deposit activity of waste onto land and causes problems to public in general and to the environment. This unethical disposal of waste is contributing to global pollution (Nagapan et al. 2012).

Further, let us focus on how various countries are trying to resolve this major problem which directly benefits us to come out with timely measures

Hong Kong

A Land constraint is the serious problem in Hongkong and it cannot afford landfills. Strict rules were imposed on the disposal of C&D waste. The government took several initiatives to mitigate this problem such as Waste disposal ordinance, 10-year plan to reduce waste and pollution, waste reduction framework plan etc. (Nagapan et al. 2012). It imposes construction waste charge on developers. 100 percent waste utilization is charged at HKD \$27 per tonne while more than 50 percent waste needing landfill disposal is

charged at HKD \$125 per tonne. The revenue generated is used to maintain and subsidize C&D waste recycling centres. It also offers tax concessions to C&D recycling centres.

Singapore

The problem of illegal dumping was more severe in Singapore especially in remote places such as Lim Chu Kang, Mandai etc. The government took the matter seriously and National Environment Agency (NEA) took the entire responsibility of construction waste and enforcement of illegal dumping problem. The legislation has tightened their rules and regulations with penalties imposed for illegal dumping. The emphasis is also been given for recycling of C&D waste. It is documented in one of the report submitted by Centre for Science and Environment, New Delhi that Singapore now recycles 98 percent of waste that is being generated.

South Korea

Low carbon green growth strategy adopted in the country includes C&D waste management. Separate building codes for recycled asphalt concrete aggregates and road pavements have been adopted. The recycling rate is pronounced every year.

Japan

Japan being the role model for effective utilization of wastes way back in 2000 utilized 95 percent of waste concrete in roadbed and backfilling, while 98 percent of asphalt and concrete.

Way forward for sustainable construction waste management

The strict policies and regulations to protect environment from consequences of waste disposal is of immediate necessity. Waste management is not only concerned with environmental issues but also with economic and social benefits. The strategy for adoption of waste management can be considered piecewise as shown in Figure 3. The priority steps to be followed in attaining sustainability are the prevention, minimization, reuse, recycling, recovery and disposal of wastes.

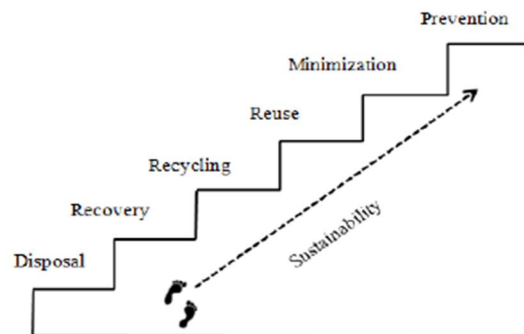


Figure 3 - Sustainable waste management Hierarchy (Nagapan et al. 2012).

The Centre for Science and Environment, New Delhi lists the various steps that is helpful in attaining the target which is as follows,

- Bureau of Indian Standard (BIS) code of practice on recycled material.
- Promote alternative material in buildings.
- Include provision on collection, disposal and reuse of C&D waste in the Municipal solid waste and management rules.
- Promote efficient construction management practices to minimize waste.
- Promote use of alternative material in other infrastructure.
- Introduce tax policies to minimize waste generation and prevent unsafe disposal.

II. CONCLUSION

On a broader perspective, the construction waste management appears to be having a great environmental benefit associated with using waste materials in construction. The utilization of wastes effectively benefits the reduction of usage of virgin resources. The amount of waste that is being generated due to construction

practices alone has been discussed in this paper. The possible growth rate of these wastes has been shown. The various types of wastes that are generated are discussed along with a comprehensive review of how the waste management has been addressed by various countries. This paper indirectly benefits the relevant authorities when trying to address the issues concerned with waste management.

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