

Construction and demolition waste management in India – A case study of Ahmedabad city

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Abstract

Ahmedabad is the largest city in the state of Gujarat and the 5th largest in India in terms of population. It is one of the most important economic and industrial hubs in India. Additionally it is one of the fastest growing cities in India, leading to large infrastructural projects including metro rail and river front. Construction is also increasing in the peripheries of the city with an anticipation of better connectivity in the future. Increase in construction activities has led to increase in generation of Construction and Demolition (C&D) waste in the city over the years. The present paper studies C&D waste management model followed in the city. To get a scientific understanding of the waste, the C&D waste was characterized and analyzed for suitability in product diversification. Results obtained from the study showed that high quality non-reinforced concrete products can be produced from complete replacement of natural aggregates by C&D based recycled aggregates. Additionally, recycled products manufactured using C&D waste are cheaper compared to market rates of products made with virgin aggregates.

Keywords: Ahmedabad, demolition, waste, utilization, management.

Introduction

Ahmedabad is one of the most important economic and industrial hubs in India. With an area of about 467 km² and population of 5.5 million, it is the largest city in the state of Gujarat and the fifth largest in India. Additionally it is one of the fastest growing cities in India leading to huge infrastructural projects including metro and river front¹. Most of the construction occurs inside the main city. Construction is also increasing in the peripheries of the city in the anticipation of improved connectivity in the future due to development of roads and metro rail. On an average all buildings in the commercial and residential area is G+5 storied high. Structures are usually made of concrete and bricks. Use of red bricks is common but fly ash and hollow bricks have also gained popularity in the last decade due to government restrictions, easy availability of raw material and ease of manufacture. Old buildings are mainly made of stone and lime mortar. Most of the raw materials for construction are available locally. Sand is procured from peripheral cities and is easily available. However supplies become restricted during the rainy season due to flooding of rivers. Availability of good quality natural aggregates is an issue and needs to be procured from long distances. This is a cause of high cost of concrete and associated materials. The availability of natural aggregates and demand for construction in Ahmedabad are currently on opposite trajectories. Therefore need for alternatives such as C&D waste based aggregates becomes important and relevant for the city.

Overview of C&D waste management in Ahmedabad

The subject of C&D waste, its management and utilization is a new subject to most of the Indian cities. Thus the utilization is in a nascent stage. However with the recent Solid Waste Management regulations of the Government of India, most of the cities are on the overdrive of looking at sustainable management systems and its use. Similar to other cities, the demolition activities in Ahmedabad are not tracked and thus accurate data on the C&D waste being generated are not recorded. On an average Ahmedabad Municipal Corporation (AMC) estimates that more than 700 tons of C&D waste is generated in Ahmedabad city per day¹. Considering 300 days of productive construction and demolition activity, around 0.2 million tons of C&D waste is generated in the city².

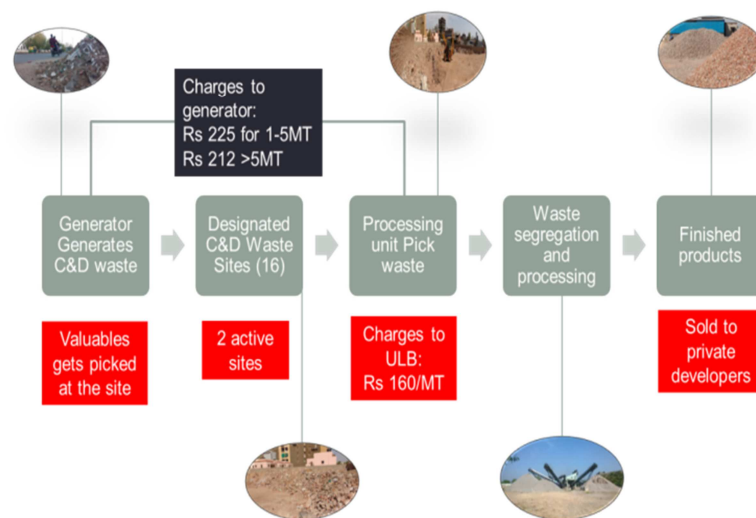


Figure 1 C&D waste management system followed in Ahmedabad

The recently introduced model of C&D waste management in Ahmedabad (Figure 1) is based on Public Private Participation (PPP). A private company, Amdavad Enviro Projects Pvt. Ltd (AEP) is responsible for managing and processing all of C&D waste in the city. AEP charges AMC \$2.5/ton tipping fee to pick up waste from any of the 16 designated dumping sites. AEP is responsible for transporting the C&D waste from the collection points to the processing facility, whereas the generator dumps the C&D waste at designated dumping locations. Collected waste is processed at a centralized processing plant into coarse and fine aggregates. Processed waste is used for manufacture of standard grade building materials like Paver blocks, Kerb stones and other products which are commercially sold in the construction market.

Intervention methodology adopted

The intervention study presented in the present paper was designed based on a mix of secondary literature and field visits. Visits were made to each of the 16 dump sites and GPS coordinated plotted in a GIS map. Visits were made to raw material quarries, building material producers, contractors and construction agencies to understand the C&D waste being generated and their use. Data collected during the market study was used to map the locations to identify better management practices.

Results and analysis

As a part of the study, GPS coordinates were utilized to visit and map the dumping sites in order to visualize the current management procedures and suggest changes. The result of the GIS map is given in Figure 2. From the study it was found that apart from the local authority designated 16 sites, there were 4 more dumping sites which were being used for easy lifting. These sites are scattered all along the periphery of the city due to space constraints within the congested central place. Out of all the 16 sites only three are being actively used. This is due to their proximity to the reconstruction sites.

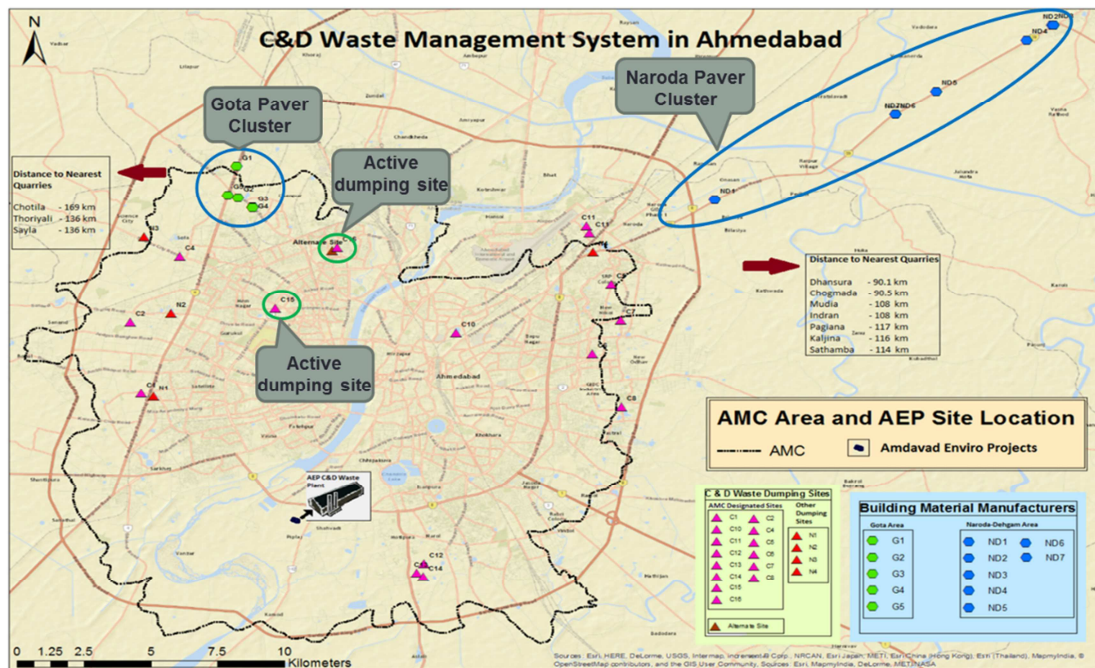


Figure 2. Hotspots of C&D waste management and reuse

It was also found out that in and around the city of Ahmedabad, two large building material clusters are located. These are Gota Paver cluster in the North-West and Naroda Paver cluster in the North East. The location of the presently operational C&D waste processing unit of AEP was also found out to be in the Southern part of the city (Figure 2). It was also observed that the dumping sites in and around AEP were not used and they have to transport C&D waste from the Northern area. The dumping sites situated in the North East and Western parts are not feasible economically due to lack of material quantity and the distance of transportation, although the lifting and transportation costs are being subsidized.

The possibilities of extended use of processed C&D waste were looked at from the demand side also. Various discussions were held with the paving block manufacturers on the acceptance of C&D waste based raw materials. It was found that processed C&D waste can have a market subject to fulfillment of attaining similar quality compared to the existing products and reduced cost. It was further studied that the properties of recycled C&D waste aggregates and natural stone aggregates in Ahmedabad were similar with no great difference. Thus various mix designs were made and strength evaluated. It was concluded that within the existing cost of production even better quality products can be made with C&D waste based aggregates or similar quality of building materials can be made even at cheaper costs.

Conclusions and way forward

Results of the study show that there is a large scope for improvement of C&D waste management in Ahmedabad. There is a scope for setting up more commercial processing units based on the GIS map in and around the building material producer's clusters. These will reduce the distance of transport and make available equivalent grade of processed C&D waste based aggregates at an affordable rates. This system if implemented will benefit all. Whereas the building material manufacturers will have an enhanced profit with equivalent quality, the users will also get a green product having improved properties. If a strong demand and supply system is established then the demand of C&D waste aggregates will increase establishing the sustainability of the solid waste management model.

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