

# Construction and Demolition waste – An Overview of Construction Industry in India

Roshan S. Shetty

**Abstract**—India has established itself as one of the world's fastest growing economies and this growth has brought with it a significant boost in construction activities. With the rapid growth in construction activities, it is important to assess the amount of construction and demolition waste being generated and analyse the practices needed to handle waste in order to propose a sustainable construction approach. It has become essential to study C & D waste generation and handling to develop accurate data and establish sustainable methods to manage construction waste. Reduce, Reuse and Recycle [3R's] is highly useful in handling of construction and demolition waste.

It is estimated that the total solid waste generated in India is about 960 million tonnes of which the construction waste alone is 14.5 million tonnes. Construction and Demolition waste in India during 2010 is estimated as 24 million tonnes. If measures to minimize and handle the construction and demolition wastes are not developed and efficiently adopted, it may have an impact on the environment. The paper provides an overview and statistics of construction and demolition waste of the construction industry in India. The paper gives an overview of the current status as well as the future potential for waste minimization, explores how waste management practices can be effectively implemented in construction projects.

**Keywords**—Construction & Demolition Waste, 3R's, Construction industry, sustainable construction materials

## I. OVERVIEW OF CONSTRUCTION INDUSTRY IN INDIA

INDIA has established itself as one of the world's second fastest growing economies and this growth has brought with it a significant boost in construction activities like other developing countries. According to 11<sup>th</sup> year plan, construction industry in India is the second largest economic activity after agriculture. It accounts for nearly 65% of the total investment in infrastructure. Investment in construction accounts for nearly 11% of India's Gross Domestic Product (GDP)[1]. GDP is the market value of all officially recognized final goods and services produced within a country in a given period. GDP per capita is often considered an indicator of a country's standard of living[2]. It is estimated that nearly €39.68 billion to be invested in the infrastructure sector over the next five to 10 years in power, bridges and roads, infrastructures, ports and airports, telecommunications providing a boost to the construction sector[1].

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Due to the rapid growth in the construction industry, it will be appropriate to link construction and demolition waste generation with the Indian economic growth. It is important to assess the amount of construction and demolition waste being generated. Suitable practices are also needed to handle the waste in order to propose a sustainable approach. The construction and demolition waste (C&D waste) generation and handling issues are in focus to achieve sustainability. It has become essential to study C & D waste generation and handling to develop accurate data and establish sustainable methods to manage construction waste. Reduce, Reuse and Recycle [3R's] is highly useful in handling of construction and demolition waste.

## II. CONSTRUCTION SECTOR AND INDIAN ECONOMY

In the last 5 years i.e. from 2006-07 to 2010-11, construction sector has been contributing around 8% to the nation's GDP. GDP has increased to Rs.3,84,629 crore (7.9% of total GDP) in 2010-11 from Rs.2,84,798 crore (8% of the total GDP) in 2006-07[3]. The construction sector also has major linkages with the building material manufacturing industry including cement, steel, bricks, tiles, sand, aggregates, fixtures, fittings, paints, chemicals, construction equipment, petrol and other petro-products, timber, mineral products, aluminum, glass, and plastics. Construction materials account for nearly two-third of the average construction costs. On the basis of an analysis of the forward and backward linkages of construction, the multiplier effect for construction on the economy is estimated to be significant[4].

TABLE 1  
CONSTRUCTION SECTOR-MACRO AGGREGATES

Macro variable	2006-07	2007-08	2008-09	2009-10	2010-11
GDP from Construction (at Constant prices) – Rs. Cr.	284798	315389	332557	355918	384629
Share of Construction in GDP (%)	8.0	8.1	8.0	7.9	7.9
Growth rate for GDP in Construction (%)	10.3	10.7	5.4	7.0	8.1

Source: Handbook of Statistics, RBI – 2010-11(Report – Working Group on Institutional Financing Working)

### III. CONSTRUCTION AND DEMOLITION WASTES

Environmental Protection Agency (EPA) defines construction and demolition debris as the waste material produced in the process of construction, renovation or demolition of structures (both buildings and roads). In addition, it includes the materials generated as a result of natural disasters. Components of C&D debris include materials such as concrete, asphalt, wood, brick, metals, wallboard, and roofing shingles [5]. Construction wastes are mainly leftovers from new construction materials like cut-offs, damaged materials, packaging waste, used materials during construction and all other wastes typical for activities for activities on a construction site. Demolition waste are mainly the collection of all construction materials from a building after removal of certain parts. Demolition wastes are much larger in volume than the construction wastes [6]. According to Danish Environmental Protection Agency (DEPA), 2003, 30% of the total waste generated was construction and demolition waste. 70-75% waste generated was from demolition activity, 20-25% from renovation and remaining 5-10% from new building developments.

Construction and demolition waste can be classified into 2 components; major components includes cement concrete, bricks, cement plaster, steel from rcc, doors & windows, roofing support systems, rubble, stones, timber etc. and minor components includes conduits, GI pipes/Iron pipes/Plastic pipes, electrical fixtures, panels, glass etc. Table II shows the quantity of wastes generated per year

TABLE II  
QUANTITY OF CONSTITUENT GENERATED PER ANNUM

Constituent	Quantity Generated in million Tons p.a. (Range)
Soil, sand & gravel	4.20 – 5.14
Bricks & masonry	3.60 – 4.40
Concrete	2.40 – 3.67
Metals	0.60 – 0.73
Bitumen	0.25 – 0.30
Wood	0.25 – 0.30
Others	0.10 – 0.15

Source: Technology Information, Forecasting and Assessment, Department of Science and Technology, Government of India [7]

### IV. CONSTRUCTION AND DEMOLITION WASTE

The disposal of C&D wastes is becoming a major concern in the recent years. The wastes are being disposed off improperly and illegally in order to avoid transportation and tipping costs. Farm land, prime residential areas, pits and low lying areas have become disposal sites. These landfills have also become threats to ground water contamination. It is estimated that the construction industry in India generates about 10-12 million tons of Construction and Demolition (C&D) waste annually. With rapid urbanization the quantum of C&D waste is ever increasing and needs urgent attention [8].

#### A. Benefits of C&D waste recycling

It eases the production and emission of greenhouse gas and

other pollutants by reducing the need to extract raw materials and transporting the materials long distances. It reduces the need for new landfills and the costs involved in it. Recycling saves energy and also reduces the environmental impact. It creates employment opportunities in recycling industries. A lot of money can be saved by reducing the project disposal costs, transportation costs and the cost of new construction materials by recycling old materials onsite.

#### B. Environmental benefits of recycling construction and demolition waste

The environmental benefits of recycling construction and demolition waste are considerable. By assessing carbon di oxide and energy use at a large scale recycling plant, researchers have shown that, over its 60 year life span, the carbon di oxide emissions prevented will be te times as much as those produced, and eight times as much energy will be saved,, than is used [9].

#### C. Recycling of C and D Waste

C and D waste management can be defined as the procees related with the proper storage, collection and transportation, recovery and recycling, processing, reusing and disposal of C and D wastes in a manner that is in consensus with the principles of human wellbeing, economic, engineering and other environmental considerations.

C and D waste management includes following steps.

1. Storage and segregation: C and D wastes should be deposited/collected at source or place of generation. If they are Separation can be carried out at source during C and D activities or it can be achieved by processing the mixed material to remove the solid wastes. Separation at source is most efficient in terms of energy utilization, cost and time. Additional segregation is required for reuse/recycling of materials like timber, glass, steel, plastic, plaster board and so on before demolition.

2. Collection and transportation: The time taken for handling (loading and unloading) large volumes of wastes should be kept to minimum by using front-end loaders and trucks.

3. Recycling and reuse: The growing population and requirement of land has reduced the availability of land for C & D waste disposal. C and D waste is not suitable for the disposal by incineration or by composting methods. Reuse and recycling are important strategies for management of waste. Other reasons that support the adoption of these strategies are reduced extraction of raw materials, reduced transportation cost, improved profits and reduced environmental impact. To conserve the conventional natural aggregate for other important works, all fast exhausting sources of conventional natural aggregate has demanded the use of recycling/ reuse technology

4. Disposal: C and D waste does not create chemical or bio-chemical pollution. Hence maximum greater portion of the C & D wastes can be reused and recycled. The material can be used for filling or levelling of low-lying areas. In the developed countries, special landfills are created for inert waste, which are normally located in abandoned areas.

Construction & Demolition (C&D) Waste Management Plan should identify: The construction and demolition waste materials that will likely be generated on a building site; the procedures that will be used to collect and sort the waste materials on site; how will the waste material be transported from site; the location to which the materials will be hauled; how the materials will be reused or recycled [10].

#### V. DISCUSSION

The waste prevention and minimization should be the first priority followed by reuse and recycle. Best practices should be adopted as there would be numerous opportunities for the beneficial reuse and recycling of the demolition materials ex. use of recycled materials for site clearance etc.,. Use of recycled materials reduces the quantities of waste which ultimately needs to be landfilled.

The effort should be to prevent waste generation and also to reduce the amount of waste generated during the construction. The contractors should plan the construction process to eliminate or reduce waste. They should be responsible to minimize the volume arising in the site, use the reclaimed materials in the works and influence wastage caused by poor materials handling.

#### VI. CONCLUSION

To optimize proper functioning and formulation of a project, C & D Waste Management Plan must start at the earliest possible stage of the project. The management of construction and demolition waste should be given due consideration throughout the duration of a project in order to promote an integrated approach. The waste management system should be planned and implemented which is holistic, integrated and sustainable. The plan should also target for waste diversion and recycling through implementation of new policies, information technologies, awareness and waste management facilities. Waste minimization, reuse and recycling should be managed project wise by nominated C & D waste manager. It is necessary to have more accurate and detailed data on C & D waste generation. Reduce, Reuse and Recycle [3R's] should be adopted to minimize C & D waste. highly useful in handling of construction and demolition waste

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