Sustainable transformation of construction waste: An approach for CSR enhancement

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Construction industries globally account for 40% of green house gas emissions with a potential to reverse the current growth trend in developed and developing nations, if measures are not initiated towards curbing them. India is producing nearly 14.5 million tonnes of construction waste per year. 70% of waste comes from cement and steel alone, that has a large carbon footprint at production stage. The component of materials cost comprises nearly 40%–60% of the project cost. Therefore material waste generation from construction activity is also huge in monetary terms. This paper deals with an innovative service that provides a sustainable solution to construction site for waste mitigation, through transformation of their waste output as a resource into another end product and disbursing the basic products for building affordable and rapid housing as a free service to the deprived sections of society. This process re-engineering will benefit construction projects in terms of certified emissions ratings and carbon credits.

INTRODUCTION

Construction industry plays a key role in socio-economic development of any country. Nowadays construction industry is rapidly growing because of increase in standard of living, demands of infrastructure projects, changes in consumption habits, as well as natural increase in population. This development will call for innovation and introducing new technology with foray of new techniques in the construction sector with high potential growth in public infrastructure, industrial, commercial and residential sectors [1]. This growth has contributed significantly in waste generation which has become serious problem. Considering the green house gas emissions from waste, cement and residential sector had elevated with Compounded Annual Growth Rate of 7.3, 6.4 and 4.4 from year 1994 to 2007 in India alone only.

MAJOR CAUSES OF WASTE GENERATION

The major causes of waste generation are:

1. Excess Production
2. Pipeline Waste
3. Laboratory Tests
4. Non Conformity with Standards
5. Change in Design and Drawings
6. High attrition rate with semi skilled workforce

PRESENT STATUS OF C&D WASTE MANAGEMENT IN INDIA

According to TIFAC (2000) [2] study and as stated by Jain M (2012) [3], following are the present waste handling measures adopted by the industry at various levels.
• Items recovered during construction/demolition is sold in the market at a discount with respect to price of new material.

• Items that cannot be re-used are disposed to landfill site.

• Municipal corporations allow C&D waste in their landfills. No landfill tax is imposed.

• Different constituents of waste are not segregated prior to disposal.

• Builders/owners bear the cost of transportation, which at present, ranges between US$ 6 to 13/truckload depending on the distance of demolition site from landfill area.

• Municipal authorities incur cost of US$ 1.50 to 2 per tonnes of waste, but presently no charge is levied by them on the owner or builder.

• Though directives exist for disposal of waste to landfill areas, presently penal action against violators is practically not taken.

• Severe crunch of skilled work force and high attrition rate in Indian construction industry directly contribute to generation of waste.

SUSTAINABILITY APPROACH FOR WASTE RECOVERY

Currently cities, particularly in the developing world are undergoing tremendous expansion, driven largely by population growth as well as immigration driven by the prospects of higher income in the cities. This demographic shift would bring with it its own set of unique challenges, which are of particular importance when seen in the context of, the prevailing socio-economic inequalities in developing countries and the resource constraints faced by an expanding world population.

Rapid Urbanization accompanied by surge in energy needs would call for innovative approaches to tackle the existential resource constraints in a manner that would combine efficiency with cost effectiveness right from the design stage to all the other aspects of the cities functioning. There is an intrinsic relationship between urban development and the way a city manages its

![Figure 1. Framework for sustainable approach towards waste mitigation, management and recovery](image-url)
resources. Cities which are resource efficient integrate greater productivity with reduced environmental impact offering a more holistic model for urbanisation. As such, the transition towards sustainable cities depends on how well this integrated approach to urban planning is taken up and seen as a major opportunity for investment in the field of renewable energy, waste management and other such areas that account for the sustainability of cities.

The paper provides a approach on the possible energy resilient systems that are required to ensure city wide sustainability. It would address some of the core infrastructural choices such as energy efficiency, Waste management, and urban ecosystem management available for cities at local level that can help them transition to more sustainable versions in future.

According to research done by TIFAC, in construction industry 70% of companies are “Not aware of the recycling techniques” while rest 30% are not even aware of recycling possibilities.

An innovative service that provides a sustainable solution to construction firm for waste mitigation is through transformation of their waste output as a resource into another end product and disbursing the basic products for building affordable and rapid housing as a free service to the deprived sections of society. This process re-engineering can also benefit companies and construction projects in terms of certified emissions ratings and carbon credits. The dissemination of the basic products will be carried through a NGO working in building houses for poor people.

Figure 2. Methodology for transformation of construction debris into pavement blocks for parks, pathways and pedestrian ways.
**Approach A: Transformation of construction waste into precast products and recycle aggregates for public infrastructure projects by Urban Local Bodies**

Solid waste management and developing public infrastructure (parks & gardens) are obligatory functions of Municipal Corporation and Regional Development authorities in India. Central Pollution Control Board has estimated current quantum of solid waste generation in India to the tune of 48 million tons per annum of which waste from Construction Industry accounts for 25%. Management of such high quantum of waste puts enormous pressure on solid waste management system.

Construction waste is bulky and heavy and is mostly unsuitable for disposal by incineration or composting. The growing population in the country and requirement of land for other uses has reduced the availability of land for waste disposal. So far waste management and disposal cost had been a sunk cost component in the construction arena. Economic costs from waste disposal include:

- Cost of operating and maintaining landfill sites
- Cost of transporting waste to landfills
- Loss of financial benefit from using recycled or salvaged materials

![Diagram](figure3.jpg)

*Figure 3. Business as usual scenario vs sustainable business model for private enterprise [5]*
Urban Local Bodies with a distinctive cross industry synergy approach are utilizing waste to generate electricity and other resources, on similar platform a sustainable business approach can be developed for utilizing construction debris with other waste materials to create precast products. Urban Local bodies [3] can levy user charges for construction projects for construction waste collection and transportation to landfill sites. At landfill sites the waste will be recycled and reutilized along with cement and fly ash for creating basic needful products for developing pedestrian pathways, gardens, parking lots.

**Approach B: Transformation of construction waste into affordable housing products for underprivileged sections of society**

Waste mitigation and recycling approach for construction companies can help them achieve triple bottom line by minimizing negative impact from socio-environment concern and leverage positive impact by rendering value out of waste to society.

- Finance- Reduce existing operation cost towards waste mitigation and earn carbon credits.
- Social- Strengthen the CSR cause by facilitating durable products for building affordable housing as a free service through NGO’s to deprived sections of society.
- Environment- Mitigating emissions by employing real time intelligent waste management systems.

Sustainable transformation of waste into resource will create tangible benchmark achievements for companies in terms of carbon savings that can be reported to market as one of the key performance indicator in carbon efficiency and economy. Companies today need to have a fair degree of flexibility in structuring CSR initiatives [4] linked to their core business value of creating habitat spaces to enhance their brand equity and given that it is mandatory for them to spend at least two percent of its average net profits made in the preceding three financial years per Company’s Act, 2013, India.

**CONCLUSIONS**

This paper explores the possibilities of how it might be possible to innovate a solution towards the problems of construction waste management which at the same time will create ancillary benefits in terms of energy and resource efficiency for safe housing and civic infrastructure development. Multiple stakeholders namely private enterprise, civil society and the government can contribute towards a system which creates industrial symbiosis such that the waste generated by the construction industry could be channelled towards the creation of safe housing for the urban deprived. Industrial symbiosis as an ideological construct implies utilitarian benefits for all the players involved within the system. In our case we envisage the benefits of the same in the form of waste management, a routine housekeeping activity for the construction industry being a means of responsible corporate stewardship and green brand building, for the civil society organisations, the relationship provides cost effective resources to effectively address the issue of safe housing, and for the government the proposed system can be seen as a means of enhancing civic responsibility and in ensuring adequate and safe housing, thereby generating greater social and resource equity as well as resource efficiency.

**WAY FORWARD**

Sustainable Construction waste transformation approach is in line with Mission on sustainable habitat of Indian Government’s National Action Plan on Climate Change. The awareness of climate change due to emission of green houses gases in the corporate world and their initiatives to offset its adverse effects are going to be considered as one of the greatest and widest ranging market parameter which will be factored progressively for stock pricing in the years to come by the modern day efficient markets. Municipal Solid waste Manual 2014 as notified by Ministry of Urban Development, Government of India recommends that the urban local bodies (ULBs) shall plan for appropriate management of C&D waste generated including processing facility and further plan to use the recycled products in the best possible manner.

Presently there is no organized market for utilizing construction waste as a resource to manufacture an
affordable product for rapid housing systems. Policy level change is expected to trigger after the Smart City Project by Government of India takes shape.

References

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