Analysis of Construction and Demolition Waste Management Policies from Sustainability Perspective

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Abstract—The modernization and upgradation of human habitat often results in new construction as well as the generation of construction and demolition (C and D) waste. The efficient management of C and D waste has become the main concern of the policy makers due to increasing quantum of C and D waste generation. Various research studies have investigated C and D waste from the viewpoint of demolition methodology, treatment technologies, and tools and techniques for reduction of C and D waste. Although, there is a need for integration of these different viewpoints and holistic understanding of policy efforts towards the management of C and D from a sustainability perspective. This research study is a first step towards understanding the adoption of sustainable policy practices for management of C and D waste. The sustainability measures for management of C and D waste were identified, and these measures were used for analysis of global policy practices. The analysis indicated that the financial incentives for waste minimization and concentrating on waste reduction rather than waste treatment and recycling have the potential to achieve sustainability. Thus, a policy framework for waste minimization is needed, which can propagate cleaner technologies, mechanisms and treatment. This research study has developed a framework indicating a stepwise approach for the adoption of sustainable practices in the management of C and D waste.

Key words: Waste Management Policies, Construction and Demolition

I. INTRODUCTION

The sustainable indicators like avoiding generation of wastes on site, reduction of waste by sustainable design, ensuring waste recovery and treatment, and considering life cycle analysis of building material before its selection have potential for effective management of C and D waste. Waste management policies often focus on permits, guidelines, penalties and economic incentives, waste audits, and establishment of site waste management plan. The landfill tax, waste segregation, encouraging reuse and reduce strategies, innovation in material usage technologies, employing various tools like building information modeling, selective dismantling, and sustainable construction practices can help in reduction of C and D waste. The construction industry contributes profoundly to an economy. Activities of the construction sector are also crucial to the achievement of socio-economic development goals of providing infrastructure, shelter, and employment. But with the development, there comes a need for renovations and rehabilitation, new structures are built, and old structures are demolished which leads to the generation of construction and demolition waste. C&D waste has a significant amount of generation in developed and developing economies, but it also has a large amount of recycling and reuse potential embodied in it. The improper management of C and D waste results into adverse effect on the environment. Due to land constraints, the urban local governments face a challenge in location, operation and maintenance of landfill for C and D waste. Thus, adoption of sustainability perspective in all stages of construction right from conceptualization to implementation of infrastructure becomes vital. The policy frameworks are prevailing in a country impact greatly upon construction and demolition waste generation and its management. These frameworks can provide thrust in the direction of efficient demolition technologies, financial incentives for sustainable practices, and adoption of reuse and recycling strategies. This translates into the reduction in the extraction of raw materials, transportation cost, environmental impact, and improved financial sustainability.

II. PROPOSED WORK

The policy frameworks provide impetus and direction towards the adoption of mentioned sustainable indicators, therefore, gathering and analyzing evidence from policy practices is the primary motivation for this research study. The research methodology reviews global policy initiatives in C and D waste management with respect to the institutional framework, waste minimization, and management technologies, and regulatory framework. The analysis of India’s case studies dealing with C and D waste management systems have been carried out in this research study to compare India and international policy practices. Furthermore, it maps the potential steps that could be undertaken to manage C and D waste sustainably by using reduction, reuse and recycling measures, and minimize construction waste disposal throughout the lifecycle of construction work process. The countries are chosen in such a way that each continent is selected to be reviewed. Also, the selection is based on World Bank list of developed and developing economies to give a clear idea of policy frameworks from diverse areas and economies. This research study contributes to the body of knowledge by bringing different facets that need
to be addressed by policy frameworks for sustainable management of C and D waste together. It may help municipal leaders and waste managers to get started with innovative approaches to reducing waste and reduce inefficiencies in material use.

### III. RESULTS & DISCUSSIONS

The research methodology involved jotting 38 sustainable policy indicators based on various researches, studies, discussions, guidelines, rules, acts, regulations and existing policies and directives.

These indicators were then characterized into a model of 4R’s that is reuse, reduce, recycle and rethink. Here, the mapping is done based on 5 pointe qualitative scale.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>++</td>
<td>Very much Present</td>
</tr>
<tr>
<td>+</td>
<td>Present</td>
</tr>
<tr>
<td>-</td>
<td>Undecided/ not really present</td>
</tr>
<tr>
<td>--</td>
<td>Not at all present</td>
</tr>
<tr>
<td>+-</td>
<td>Somewhat present</td>
</tr>
</tbody>
</table>

Table 1: Five Point Qualitative Analysis Scale

In the case of India, draft policy 2015 was chosen for the rating.

A. Reduce

It is highlighted from the table that most of policy frameworks employ tax rebates, waste minimization design, environmental compliance procedures for waste generation and regulatory control over waste, as reduction strategy. While most of the countries fail to employ waste management exchange websites for hazardous materials and clean city creditability rewards for waste minimization. It is also observed that developed economies have addressed compulsion on regulatory control and waste reduction targets. Also, there is absence or vague presence of waste management exchange websites and creditability rewards in developing countries.

B. Recycling

It is perceived that most of the policies employ recycling targets, segregation at site and development of energy goals. This found is more prevalent in developed countries than developing countries from Table 1.

C. Reuse

It is observed that employing reduction targets is mutual reduction measure for most of the countries. Additionally, removal of materials with high salvage value is also common reduction measure addressed in policies.

D. Rethink

Employing new and efficient techniques to sustainably manage the waste is now evolving trend in the policies. This involves measures like compulsion on the detailed calculation for waste generation, charging systems, provision of guidelines for efficient methods for waste management in addition to the employment of recycled materials in sustainable use. Newer approaches involve the creation of insurance pools to cover pollution risks.

### IV. CONCLUSIONS

The analysis indicates that the financial incentives for waste minimization and concentrating on waste reduction rather than waste treatment and recycling have the potential to achieve sustainability. Also elementary difference between policies of developing and developed countries is giving creditability for employing sustainable techniques in waste management, favoring procurement of materials with recycled contents and provision of research grants to stimulate technologies related to efficient waste management. Thus, a policy framework for waste minimization is needed, which can propagate cleaner technologies, mechanisms, and treatment. This research study has developed a framework indicating a stepwise approach for the adoption of sustainable practices in the management of C and D waste.

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**Fig. 1: Analysis**

<table>
<thead>
<tr>
<th>Waste Management Policies</th>
<th>Developed Economies</th>
<th>Developing Economies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce waste generation</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Reuse waste for secondary use</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Recycling materials</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reusing recycled materials</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reclaiming materials</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Recovering energy from waste material</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reducing waste generation</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reusing waste for energy generation</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Recycling waste for energy generation</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Reclaiming energy from waste material</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Recovering energy from recycled materials</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

**Notes:**
- "++" indicates a strong policy endorsement.
- "+" indicates a moderate policy endorsement.
- "-" indicates a weak policy endorsement.

*[Image of the figure showing various waste management policies and their levels of endorsement for developed and developing economies]*
REFERENCES

Australia

Brazil

Canada

China

Europe

Florida

Germany

Greece

Hong Kong

India

Indonesia

Japan
Korea


Malaysia


New York


Nigeria


Sri Lanka


U.A.E.

[38] “Federal law No. (24) of 1999 for the - Protection And Development of the Environment.”.

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