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Waste Management For Construction And Demolition

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ABSTRACT:

Estimation and quantification, comprehensive analysis and assessment, environmental impacts, performance and behavior tests, management plan, diversion practices, and emerging technologies are the key emerging research topics. To identify research gaps and propose a framework for future research studies, an in-depth qualitative analysis is performed. This study serves as a multi-disciplinary reference for researchers and practitioners to relate current study areas to future trends by presenting a broad picture of the latest research in this field.

Keywords - Steel Slag, Workability, Compressive Strength, Flexural Strength, Spilt Tensile Strength, etc.

INTRODUCTION :

Construction and demolition (C&D) waste is generated from construction, renovation, repair, and demolition of houses, large building structures, roads, bridges, piers, and dams. C&D waste is made up of wood, steel, concrete, gypsum, masonry, plaster
. Businesses recycling materials must compete with often the low cost of landfills and new construction commodities.[4] Data provided by 24 states reported that solid waste from construction and demolition (C&D) accounts for 23% of total waste in the U.S.[5] This is almost a quarter of the total solid waste produced by the United States. During construction a lot of this waste spends in a landfill leaching toxic chemicals into the surrounding environment. Results of a recent questionnaire demonstrate that although 95.71% of construction projects indicate that construction waste is problematic, only 57.14% of those companies collect any relevant data

1.1 Demolition.

Demolition (also known as razing, cartage, and wrecking) is the science and engineering in safely and efficiently tearing down of buildings and other artificial structures. Demolition contrasts with deconstruction, which involves taking a building apart while carefully preserving valuable elements for reuse purposes.
For small buildings, such as houses, that are only two or three stories high, demolition is a rather simple process. The building is pulled down either manually or mechanically using large hydraulic equipment: elevated work platforms, cranes, excavators or bulldozers. Larger buildings may require the use of a wrecking ball, a heavy weight on a cable that is swung by a crane into the side of the buildings. Wrecking balls are especially effective against masonry, but are less easily controlled and often less efficient than other methods. Newer methods may use rotational hydraulic shears and silenced rock breakers attached to excavators to cut or break through wood, steel, and concrete. The use of shears is especially common when flame cutting would be dangerous.construction and demolition debris (C&DD) means those materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure including houses, buildings, industrial or commercial facilities, and roadways.
Construction and demolition waste includes concrete, timber, lumber, roofing drywall, landscaping asphalt, gypsum, metals, plastics, doors, windows, and plumbing materials. The waste come through the process of building and structural construction, refurbishment, and destruction. The construction and Demolition waste management rules, 2016 tell about the details and responsibilities of the pollution control board, state governments, local authorities, and services. C&D Waste is the word used to describe the waste produced during construction and demolition. In India, C&D waste has significantly increased in recent years. States should be given specific instructions by the NGT on how to handle C&D trash. Municipalities collect C&D garbage along with other types of solid waste in many areas of India, even though C&D waste ought to be collected separately. *India's tallest building Noida's twin tower which is taller than QutubMinar was demolished on 28th august in Noida*

Impact of the Construction and Demolition Waste:

- Air- Waste while disassembled generates dust and large particulates. It affects the respiratory health of waste management workers.
- water- Landfills are not enough capable to hold waste and compounds leach to the ground and then groundwater gets toxified due to heavy metals.

- Soil- Soil of the area is directly contaminated by the waste or during recycling or disposal. Waste consisting of lead mercury, cadmium, and arsenic has a bad impact on soil and then on the water.

Concerns related to rule:

- Out of 25 to 30 million tones of C&D waste only 5 % of its gets treated.
- Dirt, sand, and gravel which are 36 % of total C&D waste affect soil fertility.
- Improper functioning of pollution control boards.
- The need for recycling is critical because widespread sand mining is already eroding river beds and increasing flood damage.

Suggestions for Better Functioning:

- Proper need of documentation and easily accessible data.
- Waste management asks for robust estimation and characterization of waste.
- The recent materials like Styrofoam, plastic spacers, asbestos, and other materials needs special concern.
- Infrastructure projects should focus on their waste management units with the specific target of waste they generate and reduce the burden of common sites.
- Country should move towards green buildings which need C&D trash.
- Wu et al. (2019) observed that Significant efforts have been devoted to assessing construction and demolition waste management (CDWM). However, there is little knowledge to understand the utilisation of the developed models for assessing CDWM performance, thus limiting the comparison and generalization of recognized methods and tools. By reviewing the prior published literature, this study assesses the current research methods, in particular, data collection. It also reviews the range of critical indicators for CDWM performance assessment considered by the literature and put forwards a new framework for better assessing CDWM performance. The proposed framework summarises the system boundary, research scale and performance assessment aspects documented by previous studies, and further integrate an integrated framework with procedures for better assessing CDWM performance. The literature review found that while some studies adopt a system thinking and life cycle thinking to assess CDWM performance, other research they adopt a sustainability based model to finalize CDWM performance assessment. The results also demonstrate that compared with environmental and economic aspects, the social aspect has attracted less attention. Social factors, however are crucial in CDWM. The findings about current performance assessment practices in CDWM and the proposed procedures are possible to implement for researchers and practitioners to develop sound CDWM approaches.

RESEARCH METHODOLOGY

3.1 Construction and Demolition waste

Construction waste or debris is any kind of debris from the construction process. Different government agencies have clear definitions. For example, the United States Environmental Protection Agency EPA defines construction and demolition materials as “debris generated during the construction, renovation and demolition of buildings, roads, and bridges.” Additionally, the EPA has categorized Construction and Demolition (C&D) waste into three categories: non-dangerous, hazardous, and semi-hazardous. Of total construction and demolition (C&D) waste in the United States, 90% comes from the demolition of structures, while waste generated during construction accounts for less than 10%. Construction waste frequently includes materials that are hazardous if disposed of in landfills. Such items include fluorescent lights, batteries, and other electrical equipment.

When waste is created, options of disposal include exportation to a landfill, incineration, direct site reuse through integration into construction or as fill dirt, and recycling for a new use if applicable. In dealing with construction and demolition waste products, it is often hard to recycle and repurpose because of the cost of processing

During construction a lot of this waste spends in a landfill leaching toxic chemicals into the surrounding environment. Results of a recent questionnaire demonstrate that although 95.71% of construction projects indicate that construction waste is problematic, only 57.14% of those companies collect any relevant data

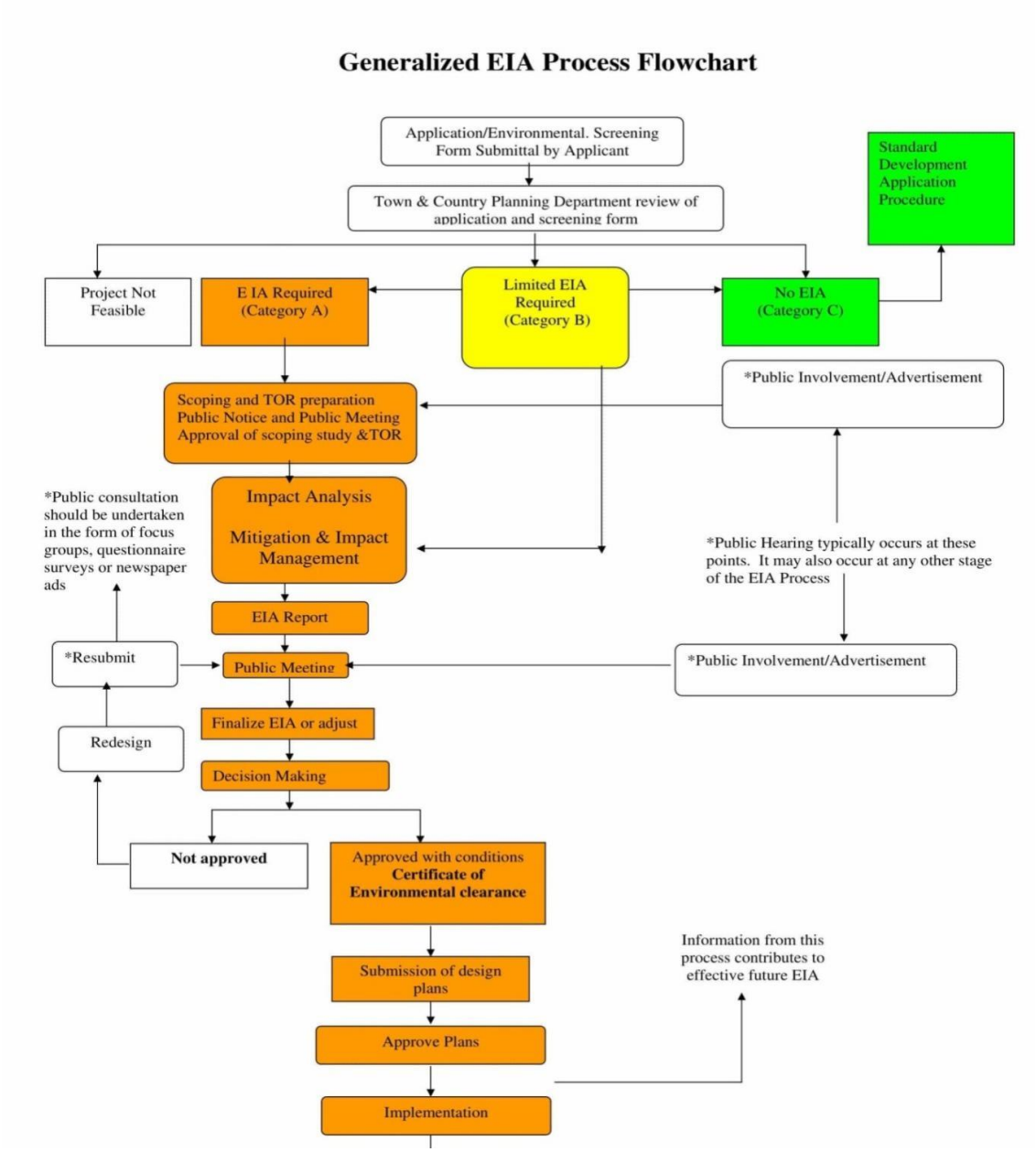
Steel reinforcement

Steel is used as reinforcement and structural integrity in the vast majority of construction projects. The main reasons steel is wasted on a site is due to irresponsible beam cutting and fabrication issues. The worst sites usually end up being the ones that do not have adequate design details and standards, which can result in waste due to short ends of bars being discarded due to improper planning of cuts. Many companies now choose to purchase preassembled steel reinforcement pieces. This reduces waste by outsourcing the bar cutting to companies that prioritize responsible material use.

Premixed concrete

Premixed concrete has one of the lowest waste indices when compared to other building materials. Many site managers site the difficulties controlling concrete delivery amounts as a major issue in accurately quantifying concrete needed for a site. The deviations from actually constructed concrete slabs and beams and the design amounts necessary were found to be 5.4% and 2.7% larger than expected, respectively, when comparing the data from 30

Brazilian sites. Many of these issues were attributed to inadequate form layout or lack of precision in excavation for foundation piles. Additionally, site managers know that additional concrete may be needed, and they will often order excess material to not interrupt the concrete pouring



4.2 EconomySurvey

The economic survey is done to know about the effect of the highway expansion on the economyof the surrounding people. Photos were taken of the shops, hotels, hawkers to explain the impactofhighwayexpansion.

In some areas, there is an obstruction due to the construction work due to which there is a loss inthe economy for the shopkeepers. Transport and monetary improvement are associated, however,their relationship is both mind-boggling and dynamic. There is a positive input circle whereintransport stimulates monetary action by working with the development of people and productswhich, thusly, promptsamore noteworthy interestfor transport. This two-way association willbe in general migrate enterprises, administrations, and work and consequently helps shape themonetary geology of a country.

Construction waste management impacton environment and economy

Construction waste management has its influence on the environment in all stages ofthe construction process. Waste is generated during acquiring raw materials, during theproduction of construction materials, at the construction site and during the exploitationstage, up to the deconstruction or demolition of the building or structure. As well asresidue mineral materials, that accumulate through most of the stages of construction,other waste is also being generated during the technological processes ofmanufacturing and the exploitation\service stages. More than 90% of open-pit mines inthe

Russian Federation are purposed for the subsequent production of constructionmaterials. Mineral raw material is often acquired through the open-pit method, whichcauses number of negative effects on the environment and the economy. Such effectsare destruction of soil, disturbance of water regimes, air, water and soil pollution, birdsand animals leave their habitats, vast areas of land are being rendered unusable forfarmer activities.(Oleynik2016,2.) Theserepercussionstranslate intosignificant lossof habitable and useful land, cause great disturbances for the local flora and fauna,relocate range animals and ruin the natural balance in the area. Another influence, thatCWM has on the environment, comes from the practices used to manage hazardous ortoxic materials, where improper handling may result in damaging soils or waters,creating health risks for the population and future negative effects on nature, withpossibleexcessivedepletion of natural resources

Wastemanagementdevelopmenthaspotentialtofreetheenvironmentfromundesiredpollutants, while providing financial benefits to the stakeholders, materialmanufacturers, waste contractors and construction companies. Sustainable wastemanagement development is often overlooked in the developing countries, withorganizations prioritizing more imminent financial gains and because of a lack of aholisticapproachtothe issuefromthe hierarchyofstakeholders(Agamuthuetal.
2020, 16-17). Effective regulations and laws failing to be adopted create a more difficultbackground for changes in favor of better sustainability. Not investing in moreresponsible waste management strategies means ignoring risks of potentialenvironment harmand missed economic benefits Construction site waste can be separated into inert and non-inert materials as alreadymentioned before. Inert waste, consisting of glass, metal, concrete, bricks and blocks,rocks, mineral insulation materials, soil and sand is a viable choice for backfilling. Suchmaterials as concrete, bricks, blocks, and rocks can also be used as a substitute forcourse concrete aggregate, as the world sees a surge in research concerningsecondary materials in the role of aggregates in concrete. Soil and sand, whenseparated can be used for creating green areas around the street infrastructure if aproject involves such development. Non-inert materials like plastics, wood, paper, andbiodegradablematerialsareforemosttobeconsideredforreuse,recyclingorrecovery.

The first and main key to proper waste sorting is separating the inert and non-inertwaste from each other. Inert waste can become useful as already described, andusually fees for landfill of inert waste are lower than for non-inert or mixed waste.Further separation depends on the particular situation and potential directions for thematerials.Acompanyshouldknowintheplanningstage,whichorganizationscouldbeutilizing the waste streams, then the materials should be separated from the inertwaste, and so on. Effectively every individual sorting bin for any individual sort ofmaterial should have a direct purpose. It is also important to note that some wastehandling contractors around the world provide their own sorting facilities, rendering on-site sorting optional, in this case the waste collector is responsible for the furtheractions.

Groundworks

Eventhoughthegroundpreparationstagewasnotobservedduringthevisits,groundpiles and other natural material storages were discussed on site. During the groundpreparation and excavation, the main waste being generated is solid dirt. Fromremoving the soil layer, the fertile soil is reserved for later use in creating green areasaround the streets and yards. The amount of saved fertile soil depends on its qualityand the initial taken amount of soil usually exceeds later needs, thus excess soil isdriven away from the construction site and disposed of. An interesting and uniquepractice was seen at the "Inkeri" site, where from the initial cleaning of the territorywere saved and stored on the site natural boulders as a decoration on the finished

Questionnaire Results

Q1. Is the noise coming from the construction site tolerable? Rate (0-10)

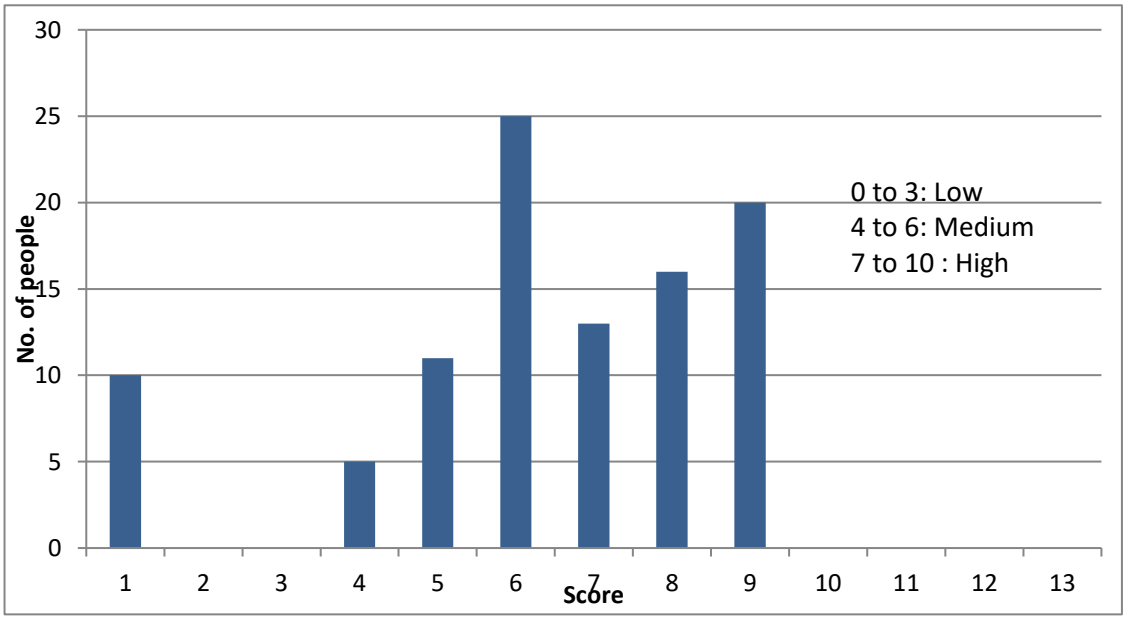


Figure 5.6 Questionnaire result for noise

As shown in the graph most of the people are between scores 6 to 9 which shows that the noise coming due to highway expansion project or other building construction project is not tolerable. It causes high noise pollution. The noise pollution should not exceed the limit as given by the IS 3028-1998. Noise pollution is one of the major ecological poisons that are experienced in day-by-day life and effectively affects human execution. The sound pressing factor is an essential proportion of the vibrations of air that makes up strong, and because the reach that the human audience members can identify is exceptionally wide, these levels are estimated on the logarithmic scale with units of decibel (dB)

The targets of the investigation are:

i. (i)To survey the effect on human work proficiency because of road traffic boundaries, distinctive noise lists, and attitudinal reaction.
ii. (ii) To study the traffic behavior in the investigation region.
iii. (iii)To study the current status of noise levels in the examination region.
iv. (iv) Identification of ideas to minimize it.

Q2. What do you think about the air quality at the construction site? Rate (0-10)

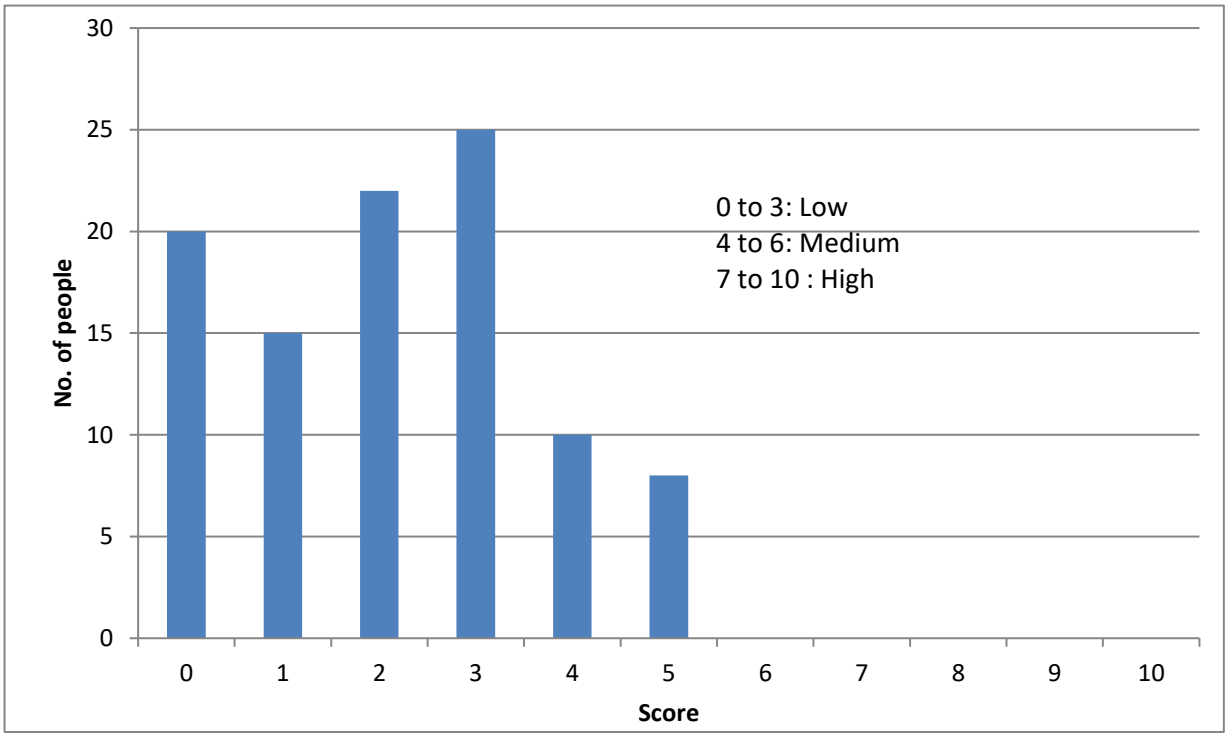


Figure 5.7 Questionnaire results for air quality

This graph shows the people's reviews on the air quality of the highway environment and building construction site. We can see in the graph that people give a score between 0-5 to the air quality near the highway. It shows the low quality of the air due to the construction work on the highway and due to running vehicles on the highway. The motor vehicles running on the highway exhaust harmful gases which is the main cause of the reduction of air quality near the highway. Dust coming from the construction site from the crushing of aggregates, and the concrete contributes to environmental pollution. This bad air quality near the highway is very harmful to the living beings near the highway especially the sensitive people. It also affects the domestic animals and the birds around the highway. There is the use of heavy machines at the construction sites for different uses. These heavy machines exhaust harmful gases into the environment which contributes to the poor air quality near the highway. It is very dangerous for the workers to do work in these conditions at the working site. They should use all the safety measures to reduce the effects of this bad environment on their health. The poor air quality index causes breathing problems, asthma, heart diseases, lungs diseases. It is true that in this modern world we need highways to fulfill all the transport needs. The highway expansion is important as no. of motor vehicles is also increasing day by day.
It is a negative effect on the environment of highway widening. This report helps us minimize these adverse effects to the environment by replacing the old ideas and methods of construction

Conclusion

With the help of all the observations and surveys, we can conclude that C & D waste have adverse effects on the environment and living beings. So, it is very important to resuse and recycle the C & D waste.

This study includes:

- Air quality index is bad during the construction phase due to C & D waste open disposal. On an average AQI is above 151 during the construction phase. So, sensitive people should avoid coming out unnecessarily. So, CDWM is very important
- As we have collected the different data of C & D waste so we can replace the constructions materials which cause more c & d waste to the materials which can be reused and recycled.
- As we can see in the Pie chart that 65% of people think that C & D has an adverse effect on roadside vegetation. It cause environmental pollution. So, C & D waste management is most important
- We can use C & D waste in like wooden barriers in foundation, steel proofing, covering and many other multipurposes

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