



Reuse of Construction and Demolition Waste in Edun, Ilorin, North Central Nigeria

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Abstract-This study aims to report the investigation of reuse of construction and demolition waste in some selected areas in Ilorin metropolis in North central Nigeria and to reveal the benefits of reusing construction and demolition waste on a construction site. In a construction site, the materials intended for use are all important in the construction process, but not all materials procured and delivered to the site would be put to use. These remaining materials constitute part of construction waste. Whereas, in a demolition site all rubbles from the demolition constitutes demolition waste. This present study visited construction and demolition site, salvage market at Edun in Ilorin metropolis. The investigation revealed that there are specific C & D wastes that are being reused. Also most of the C & D wastes are given away and others sold at a very low price to avoid the cost of storage and transportation of these wastes which reduces the profit of the contractor. It was further revealed that most construction wastes on site occur due to poor management and lack of awareness of effective waste management. Finally, the study recommends that reusing of construction and demolition waste should be salvaged and incorporated into new construction, stored for future use and moved into the salvage market.

Keywords: *Construction and demolition waste, construction and demolition waste reuse.*

1 INTRODUCTION

Construction materials account for about half of all materials used and about half the solid waste generated worldwide. They have an environmental impact at every step of the building process, extraction of raw materials, processing, manufacturing, transportation, construction and disposal at the end of a structure's useful life. Governments worldwide have responded to the need to reduce waste with regulation and legislation that have framed a market for building materials and products derived from the construction and demolition (C&D) waste stream.

There are now more than ever clear opportunities for business and industry to invest in activities that will create profit and improve environmental outcomes by extracting valuable resources from the Construction & Demolition waste stream.

Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials. In renovation (demolition & reconstruction), appliances, masonry materials, doors and windows are recyclable. Several millions of tonnes of waste are generated in the construction industry annually. This rate is alarming because it is in multiples of household waste production. Construction industry gives less concern to waste reduction due to the complex nature of reuse and recycling which is a top priority in curbing waste generation. Effective implementation of waste management plan (WMP) is a major means of reducing waste on construction projects. A waste management plan represent waste issues on the map and identification of existing waste problems is of top priority; it then pinpoint the volume of waste for reduction, salvage, reuse or recycling. (Olatunji, 2008).

Effective waste management is of growing significance for the construction industry. Adding the cost of storing and transporting construction waste, along with the loss of revenue from not reclaiming waste

materials, it makes financial sense for construction companies take action to minimize waste. The use of recycled aggregate derived from concrete rubble in the production of ready mixed concrete was demonstrated in the example of an office building, erected in Darmstadt, Germany.

Generally, the economic interest in re-using or recycling building materials is governed by three factors which are the availability and thus the cost of natural or new building materials, the availability of disposal space, the tipping charges and the taxes for dumping, and the transportation cost. Materials, as one of the resources employed by the construction industry pass through a number of processes before they are finally incorporated in the construction. These processes bring about the inadequacies of the materials such that at the end not all the materials procured and delivered to sites are used for the purposes for which they are ordered. This excessive loss in materials is what is called Waste. (Akinkulore, 2005).

According to (Famuyibo ,1997) waste is any unwanted or discarded material, which may be in solid, liquid or gaseous form and apparently has no consumer value to the person abandoning it. The subject of waste generation on construction sites is a major problem all over the world (Faniran, 1988). This stemmed from the dangers posed by this problem such as high depletion of construction materials and contractors' profits, environmental hazards, reduction of contractors competitiveness and so on (Olateju, 1997; Ademoroti, 1997; Motete, 2003).

1.1 Significance of study

The objective of this study is to develop concepts for the reutilization of construction materials, including waste debris, by means of recycling into other components that are useful in construction. This study would identify the primary opportunities, constraints, and means to divert Construction & Demolition debris from the solid waste stream, evaluate Construction & Demolition material recycling technologies and materials, identify construction materials from existing facilities that may be directly salvaged or reused without substantial alteration or reprocessing, and develop guidelines that project managers can use to organize a construction project recycling program.

In the past, practices to reduce, reuse or recycle waste did not achieve widespread implementation for a number of reasons. Firstly, people are not aware of benefits of minimizing waste, nor have any experience of reusing recycled or reclaimed materials. In addition some even believe that the cost of reusing or recycling these wastes was prohibitive. This research is meant to reveal various losses arising from material wastage and it will also serve as a form of enlightenment to the general populace particularly those in the construction industry.

2 Materials and Methods

Construction waste materials are generated during new construction, renovation, and demolition of buildings, roads, and other structures. Construction and demolition materials include brick, concrete, masonry, soil, rocks, lumber, paving materials, shingles, glass, plastics, aluminum (including siding), steel, drywall, insulation, asphalt roofing materials, electrical materials, plumbing fixtures, vinyl siding, corrugated cardboard, and tree stumps. If properly planned, a vast majority of C&D materials can be recovered through reuse and recycling, which conserves resources and energy.

Most contractors consider the waste produced during construction or demolition as a homogenous by-product of the construction process. All cut-off material, packaging, and spent containers are placed into the same refuse container even though the nature of the waste may vary across each type of activity. Major renovation projects, for example, create significantly more amounts of C&D waste than new construction projects, particularly if the renovation involves substantial demolition of the existing structures.

In this present study six sites were visited and two salvage markets at Obbo road and Edun market. Questions were asked the supervising Engineer on how these C & D waste were generated and what they were used for. Inquiries were made on prices of reusable construction waste material. A comparison was done on selling price of new construction material and the reuse C & D waste material.#

3 Results

The findings from the construction sites revealed how most construction and demolition waste are put to use

Typical C&D Waste Materials and their Uses

- I. Asphalt: is crushed and recycled back into new asphalt. Markets for recycled asphalt paving include aggregate for new asphalt hot mixes and sub-base for paved road.
- II. Land Clearing Residuals: Trees and brush can be recycled as compost or mulch; soil can be reused as fill and cover.
- III. Wood: Reuse timbers, large dimension lumber, plywood, flooring, molding, lumber longer than 6 feet. Clean, untreated wood can be recycled, re-milled into flooring, or chipped/ground to make engineered board, boiler fuel and mulch.
- IV. Wooden door frames/ window frames: these are mostly sold to be reused in building small shops, kiosks, poultry house, pig house etc.
- V. Louvers: these are moved to the salvage market if they are not broken to be resold at a lower price and it is used in new construction. Though the request is very low.
- VI. Asbestos: these are reused in new construction if they are in good shape.
- VII. Metals: Recycle metals found at a construction, demolition, or renovation sites. Common metals include steel, aluminum, and copper. Local metal scrap yards or recyclers that accept metal materials are typically accessible. Metals are melted down and reformed into metal products. Markets are well established for metals.

Concrete: Concrete is commonly recycled. It is crushed, the reinforcement bar is removed, and the material is screened for size. Market outlets for recycled concrete include road base, general fill, pavement aggregate and drainage media. Broken or crushed concrete may be used as backfill material, fill, roadbed aggregate, or aggregate for new concrete. Aggregate made from recycled concrete can also be used in asphalt paving. Recycling concrete saves on disposal fees for concrete contractors, reduces the expenses of buying new gravel and decreases the cost of making asphalt paving material. Recycled concrete can be used for many of the applications for which virgin concrete is used, such as foundations or the concrete layer used below the cold and hot mixes on highway bridges.

The table below shows the prices of used of C&D waste in Ilorin metropolis and their prices. These materials are salvaged from C&D sites and resold at Edun market. Most end users of these materials from investigation include poultry farmers; pig farmers for building their animal's homes. Others include small scaled commercial traders for building their shops and kiosks.

Table 1: Prices of C&D waste material for reuse sold at Edun market in Ilorin

C&D Material for Reuse	Unit	Quantity	Selling Price (NGN)	New Material Selling Price (NGN)
Roofing sheet		1	250.00	650.00
2"x2" Wood	Inch	1	100.00	300.00
2"x4" Wood	Inch	1	200.00	350.00
1"x12" Wood	Inch	1	450.00	650.00
Iron Frame	Set	1	300.00	3500.00
Louvers	Piece	1	20.00	50.00
Asbestos (6ft)	Feet	1	100.00	950
Asbestos (8ft)	Feet	1	150.00	950
Broken sandcrete blocks/ Crushed Concrete	Tonne	1	4500.00	Nil

Some pictures of C&D waste materials for sale at the Edun market.



Figure 1: Used Wooden Frames



Figure 2: Used Roofing Sheet and wooden frames



Figure 3: Used Wooden Frames



Figure 4: Used Asbestos and Iron frame

4 CONCLUSION AND RECOMMENDATION

4.1 Conclusion

It can be concluded from the review study that construction and demolition waste contribute a lot to municipal solid waste and the major sources include improper site storage, transportation and delivery of materials to site. Though, elimination of construction and demolition waste cannot be achieved, competent management can reduce the creation of construction and demolition waste to an extent and

waste created on construction and demolition waste can be recycled and reused to reduce consumption of resources.

4.2 Recommendation

From the above conclusion, the following are recommended:

- I. Design professionals should urge owners to explore the benefits of recycling and make a commitment to the process for their projects.
- II. Design professionals should specify the following recycling requirements for waste materials generated on a project
- III. Prequalified recycling firms should be named in the specification.
- IV. Reusable demolition materials should be salvaged and incorporated into new construction, stored for future use, or moved into the salvage market.
- V. Alternate bids should be used to determine the added cost or savings of the recycling requirements.
- VI. Contractors and subcontractors should voluntarily initiate recycling programs.
- VII. The costs or savings of the recycling programs should be included in the bids.
- VIII. To stimulate the markets for waste materials, design professionals should select and specify used materials or new products made of recycled materials whenever possible.

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