ASSESSING THE IMPACT OF CONSTRUCTION ACTIVITIES ON THE ENVIRONMENT

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ABSTRACT
Around half of all non-renewable resources mankind consumes are used in construction, making it one of the least sustainable industries in the world. However, mankind has spent the majority of its existence trying to manipulate the natural environment to better suit its needs so today our daily lives are carried out in and on constructions of one sort or another. And in doing these waste materials are created.

This paper attempts to categorise the impacts of construction activities on the environment. It also discusses sources of waste and also recommends techniques for waste management. The paper concludes by discussing the effects of construction activities on the social environment.

Key words: building, construction, environment, materials, wastes.

“Buildings as are designed and constructed today contribute to serious environment problems”. - Mrs. Zigisha Mhaskar

INTRODUCTION
Wikipedia describes Building construction as the process of preparing for and forming buildings and building systems. Construction starts with planning, design and financing and continues until the structure is ready for occupancy. From the construction stage to the handing over and even through the defects liability period, wastes are being generated from materials used in creating, modifying and even finishing of walls, floors, roof carcasing etc.

The construction industry is a conspicuous user of resources. Materials are derived from numerous sources and suppliers, and minimisation of waste presents particular problem. Although many of the materials in use are common to most sites, the fragmented nature of development constrains the practical extent of recycling. Furthermore, despite the long life of its products, their eventual demolition or redevelopment can produce significant waste for land disposal unless re-used.

The impact of the built environment on the natural environment is immeasurable. Site disturbance, air pollutants, storm water runoff, solid and hazardous wastes – along with impacts of the construction activities themselves – have the potential to alter natural environment in drastic ways (S.D. Bala, 2008)

Unplanned and unsustainable urban development has led to severe environmental pressures. In this present millennium of increasing urbanization where more than half of the world’s population is living in cities and towns; there is pressure on the environment’s finite natural resources, besides creating impacts on human health and well-being (Haruna P.B, Akande O.K., 2008)

Waste arising from construction is increasing in quantity and variety as a result of increasing population, rising standard of living and development in building materials day by day. These wastes generated from building construction which are often disposed of indiscriminately without consideration for environmental safety. These environmental unfriendly practices have become endemic and probably a social norm among the generality of urban dwellers. Environmental safety has continued to attract the attention of environmentalists and governments worldwide on how this could be controlled (P. Ayuba, 2008)

Waste includes all items that people no longer have use for, which they either intend to get rid of or have already discarded. Additionally, wastes are such items which people are required to discard, or because of their hazardous properties. Many items can be considered as waste such as household rubbish, sewage sludge, waste from manufacturing activities, packing items, discarded cars, old paint containers and construction activities (P. Ayuba, 2008)

EFFECTS OF CONSTRUCTION WASTE ON THE ENVIRONMENT
It is only proper to put these effects of construction activities into categories. This categorisation is based on the part of the natural environment that such activities affect. Broadly, we can categorise them into; air pollution, noise and wastes.

A. Air Pollution
Typically, in Nigeria, when a site is cleared, the debris is collected and then burnt. This ‘bush-burning’ as we all know, releases carbon into the air. We will be over-flogging the issue of the depletion of the ozone layer, but it is inevitable. The resultant Green House effect and global warming are direct consequence of burning
debris. Apart from this, hazardous smoke (carbon monoxide) CO is released into the air constituting a health hazard to workers on site as well as occupants of other buildings nearby.

On big construction sites, emissions from motorised equipment are another source of hazardous substances released into the air. The carbon content of these emissions is even higher than that of open fire. Motorised equipment like excavators, loaders, graders, fork lift, batching plant, cement conveyors, mobile concrete mixers, tower cranes compressors and others are usually powered by diesel which burns more carbon into the air than other fuels. It is worse in our society where maintenance of equipment is not one of our strong virtues. Hence we see a lot of old engines and tired machines groaning under their heavy work loads and releasing black smoke and soot into the air.

Air quality is also compromised by particles and dust from the cement and blasts. The extent of pollution from these however depends on the silt content of the soils being disturbed, proportion of dry days (dry season), construction vehicle type and speeds, vehicle weights and number of vehicles moving on site. Workers on site are the ones who face the danger of air pollution on site. But that is not where it ends. Dust particles, smoke and cement dust are usually carried by winds to occupants of nearby structures.

**INDOOR AIR QUALITY (IAQ)**

Construction practices can compromise IAQ by stirring up dust (particularly in renovations) and using products, equipment or processes that emit hazardous gases. These contaminants can then travel through the HVAC system, through pressurization differentials in the interior spaces, or even through workers’ clothing and remain in the building long after construction has been completed. Some steps that will minimize the effects of construction materials and practices on IAQ are:

- Use low emission products.
- Isolate construction sites from occupied areas.
- Schedule noxious work during off-hours and ventilate thoroughly before workers are scheduled to return.
- Sequence construction steps to apply wet materials (such as paint or solvents) first and absorbent materials, such as carpets or ceiling tiles, after the wet products have dried and emitted the highest levels of gases.
- Manage the building’s air pressure, with the construction area under negative pressure to prevent migration of contaminants to other portions of the building.
- Flush out newly constructed interior spaces with as much fresh air as possible.
- Keep the construction area clean and properly handle and store potentially polluting materials.

Application of dust suppressants like water is the easiest and most common remedy for dust on a construction site. The challenge however with this method is that it has to be done repeatedly as often as the soil dries up. For work sites near residential areas, it is suggested that adequate control of dust be employed. This can be achieved by using imperforated fencing around the site boundaries.

The workers on site should be given face masks that filter the air they breathe to minimise the amount of harmful particles they inhale.

**B. Noise**

If there was going to be any antonym for a cemetery (with respect to noise), the only apt option would be a construction site. Between a market place and a construction site, it would be difficult to determine which one has the greater noise levels. Noise generated on a construction site is considerable. Blasts, running engines of motorised equipment, hammering, welding, sawing, chiselling, demolishing – the list is endless of several site activities that generate noise. Most times, these activities go on simultaneously consequently producing a cacophony of noise unpleasant to the ear both of those on the site, passers-by and those living near the site. This is worse if the site is located near residential areas. There are some cases that come readily to mind. The constructions of, a roundabout at the AYA junction at Asokoro in the FCT; the interchange at Banex junction Wuse II also in the FCT, and then the dualisation of Minna township roads at the GRA, Dutsen-Kura and Old Airport quarters are a few of such. Only the residents of such areas can tell how much noise they have to put up with when work is in progress. Worse still is the fact that sometimes, to meet up with completion deadlines, the construction activities are carried out also at night further exposing the people to unbearable levels of noise when they need some quiet rest.

Noise control measures, including schedules for highly disruptive, high decibel operations should be adopted. By this, I mean, construction activities that produce the most noise should be scheduled at times when residents of such areas are likely not at home.

Workers on site with jobs that expose them to harsh noises should be equipped with ear mufflers. In the same manner motorised equipment should all have mufflers to reduce the amount of noise they generate. This also suggests that such vehicles and machines need to be frequently maintained to keep them in optimum conditions.
C. WASTE
Waste is defined as any material by-product of human and industrial activity that has no residual value (Serpell and Alarcon, 1998)

CLASSIFICATION OF CONSTRUCTION WASTES
Construction waste is even a bigger problem than domestic waste. They come in so much large quantities that we become almost helpless in disposing them (S.D. Bala, 2008)

In the construction industry, construction and demolition is made up of two individual components: construction waste and demolition waste. It arises from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road planning and maintenance. Quantity and content of construction and demolition waste makes up approximately 25% of all the waste generated in the environment. It is made up of numerous materials including concrete, bricks, wood glass, plastics, solvents, asbestos, roof sheets and excavated soil. Construction and demolition waste can be classified according to its source:

- New construction
- Renovation or remodeling and
- Demolition

While the types of waste generated from these three areas are similar, the amount each produces is different. Construction and demolition waste can be further classified into materials that could be recycled, hazardous waste, and stable landfill materials. Construction and demolition waste is characterized by weight or volume—wood, dry wall, and cardboard make up between 60% and 65% of job site waste. Block, brick and asphalt waste are insignificant in volume but can be important in terms of weight. For most building works, the largest share of waste that could be considered hazardous is generated from painting, sealing and staining.

Estimated percentages for a typical 3 bedroom apartment are shown below:

<table>
<thead>
<tr>
<th>Predominate materials</th>
<th>Rough %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>20-35%</td>
</tr>
<tr>
<td>Drywall</td>
<td>10-20%</td>
</tr>
<tr>
<td>Corrugated iron sheets</td>
<td>10-20%</td>
</tr>
</tbody>
</table>

Source: Laquatra, J. and M.Pierce (2004).

<table>
<thead>
<tr>
<th>Secondary materials</th>
<th>Rough%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shingles</td>
<td>1-8%</td>
</tr>
<tr>
<td>Concrete</td>
<td>1-8%</td>
</tr>
<tr>
<td>Fiberboard</td>
<td>1-8%</td>
</tr>
</tbody>
</table>

Source: Laquatra, J. and M.Pierce (2004).

Materials comprising 1% or less, listed in approximate order of quantity, from one or less include:

- Fiberglass insulation
- Carpet scraps, padding, and backing
- Sheathing
- Aluminium
- Vinyl siding
- Concrete block
- Copper wire
- Other wire
- PVC pipe
- Core pipe
- Core cardboard
- Plastic buckets
- Dirt and rock from excavation
- Aluminium duct-work
- Foam packaging
- Plastic sheeting or bags
- Steel banding
- Lunch garbage, pop cans
- Plastic pails
- Flooring scrap
Materials comprising less than 1% but notable because they are considered hazardous materials:
- Paint
- Driveway sealant(pails)
- Tubes
- Tiles adhesives.

Also during construction and demolition the following residues are produced:

**Recovered Materials** are those removed for reuse and those removed to be recycled into new products. Potentially recyclable construction and demolition waste may include scrap metal, asphalt, glass, shingles and electrical wire. However, before planning to remove reusable or recyclable materials from construction and demolition waste, the sorting must take place at the construction or demolition site.

**Hazardous materials and hazardous waste.** Variety of hazardous materials in old buildings, lead-based paint and asbestos are the most common ones that demolition contractors need to deal with.

In spite of the existing regulatory laws guiding building construction and Demolition in this country, evidences have shown nationwide that many operators in the construction industry do not respect the environmental codes of practice. Federal Government has very little control over regulation as a whole. The FEPA was established in 1988 to control the growing problems of waste management and pollution in Nigeria (Onibokun and Kumuyi 2003). Vision 2010 was FEPA’s attempts to address environmental problem in the nation. The report proposed goals to be accomplished by the year 2010 that would lead toward sustainable development in regard to solid and construction waste management. The report say the goal is to ‘achieve not less than 80% effective management of the volume of municipal solid waste generated at all levels and ensure environmentally sound management’. Vision 2010(2005) strategies to achieve this goal include education and awareness programs, strengthening existing laws and ensuring compliance, and encouraging local and private sector participation.

Construction waste disposal discipline is also lacking among the professionals involved in the construction industry. Some of these construction wastes have serious implication on the environmental safety, they include:
- The issue of blockage of drainage leading to flooding has become a perennial problem in Nigeria especially in cities like Lagos, Ibadan, Port Harcourt, Kano and other big cities.
- The major contributing factors to this issue are the indiscriminate dumping of waste into the gutters.
- These constitute obstacles to the free flow of water causing the gutters to over flow leading to flooding with destructive consequences.
- Most construction waste goes into landfills, increasing the burden on landfill and operation. Waste from sources such as solvents or chemically treated wood can result in soil and water pollution.
- The obstruction of urban traffic when construction waste is disposed along roads. Some of these effects are shown below:

<p>| Table 1.0: Effect of Construction Activities Air Pollutant on human health. |</p>
<table>
<thead>
<tr>
<th>Construction activities</th>
<th>Type of pollutant emission</th>
<th>Effect on human health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition</td>
<td>Aggregate dust and noise</td>
<td>Respiratory infection and auditory problem</td>
</tr>
<tr>
<td>Quarrying</td>
<td>&quot;</td>
<td>Visionary and hearing defect</td>
</tr>
<tr>
<td>Cutting and felling of trees</td>
<td>&quot;</td>
<td>Respiratory and hearing defect</td>
</tr>
<tr>
<td>Excavation</td>
<td>&quot;</td>
<td>Eyes and lung defect</td>
</tr>
<tr>
<td>Equipment exhaust</td>
<td>Ammonia, carbon monoxide, sulphur and CO₂</td>
<td>Lung infection</td>
</tr>
<tr>
<td>Vehicle exhaust</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

Source: Abdulrahman and Olagunju 2008

**EFFECT AND CONTROL OF CONSTRUCTION ACTIVITIES ON THE SOCIAL ENVIRONMENT**

The social environment of the construction activities refer to the people that work in the construction and the host communities. Construction activities is characterised by a high degree of fragmentation, with numerous individuals including skilled and unskilled labour. The skilled labour involve include multidiscipline like; architects, engineers, quantity surveyors, contractors, traders, administrators and artisans. The unskilled labour include; labourers, cleaners, and food vendors. The impacts maybe beneficial as in employment opportunities, provision of social amenities and cultural exchange or adverse as in construction accidents, displacement of communities, and noise generation.

**Employment Opportunities**

Construction industry has been described as the large employer of labour. Tse, (2001) states ‘construction industry as a whole employs almost 10% of the total labour force’. The unemployed graduates in Nigeria
have been put as 199,785. Increased expenditure in construction therefore would have consequential benefits for individuals by providing employment in construction work. The bulk of unskilled labour at any construction activities is generally drawn from the host community. As observed by Okeke (1997) food vendors, shop owners and every business of the community naturally experiences sales boom because of the presence of the construction industry in the area. The bigger the scope of the project the large the size of employment opportunity it generates to the community.

**Provision of Social Amenities**

Construction activities involve provision of infrastructure like access road, water, and electricity and communication facility. In large construction project such as dam or bridge, the host community may even be provided with schools and healthcare centre. These are provided by the contractor for the benefit of the host community and others own might decide to relocate there for economic benefits. Through these people of different cultural, ethnics and religion backgrounds are brought together over a long period of time. Consequently intermarriage among the host community and the construction staff may come to bear and people in the area have easy market for their goods and services.

**Recommendations**

1). There is the need to have Environmental Management Standards (EMS) for regulating construction activities in the Nigeria Construction Industry as the practice in other Countries.
2). There should be pressure from the governments toward enforcing the EMS by contractors in the Construction Industry.
3). The Environmental Impact Assessment (EIA) to be made mandatory for new projects relating to construction of new townships, industrial townships, settlement colonies, commercial complexes, hotel complexes, hospitals, industrial estates, and office complexes above a certain size to obtain prior environmental clearance from the planning regulatory body before starting any construction.
4). The initial step in a construction waste reduction strategy is good planning. Building construction designs should be based on standard sizes and materials ordered for accurately.
5). Federal government and regulatory bodies in charge of the built environment should ensure that anyone engaged in building construction, modification or demolition to maintain a record of all sites used for construction and demolition waste disposal for the period of construction.
6). Regulatory bodies that issue building permits should ensure that each permittee is notified in writing of the legal requirements for construction and demolition waste disposal and should ensure that the building codes that prevent the use of used materials such as structural members.
7). Regulatory bodies in the construction industry should ensure that anyone selling, conveying or transferring property that contains construction and demolition waste must disclose the existence and location of the waste disposal site to a potential buyer early in the negotiation process.
8). Anyone hauling materials that could fall or blow off a vehicle, including construction and demolition waste, must cover the load or secure it so that none of it can become dislodged and fall from the vehicle.

**CONCLUSION**

Environment consists of the air, the water, and the land. Man and other life forms are also components of the environment. The environment has been regarded by many as being at risk from the harmful influences of industrialized society. Construction and human activities also impact the environment negatively therefore environmental protection has become very important and a global concern. Government policies on the environment are piecemeal where they exist and are poorly implemented. Therefore, there should be adequate policies, enabling legislation, and an environmentally stimulated and enlightened public. Successful construction waste management in Nigeria will require a holistic program that will integrate all the technical, economic, social, cultural, and psychological factors that are often ignored in construction waste programs.
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