EFFECT OF CONSTRUCTION ACTIVITIES ON ENVIRONMENT

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Abstract

The effect of construction activities on the environment relates to the generation of inert waste made up of construction materials, demolition waste and emissions. The consequence of such waste includes health problems, problem of land degradation and threats to wildlife and forests. Environmental regulations are of growing importance. Remarkable and refreshing interest in environmental management system has been on the increase over the years. The paper discusses the natural and social environment of the construction industry, sources of waste and also recommends techniques of waste management. It concludes by suggesting for more collaboration between government, professional bodies and training institutions for the future success of the implementation of environmental laws in the construction industry.

Keywords: Environment, Construction, Management, Laws, Waste.

Introduction

Construction activities include buildings, highways, railroads, pipelines, marine, steel and furniture. Construction activities are inherently disturbing to the environment. They generate environmental nuisance in the form of noise, dust, muddy runoffs and improper disposal of chemical and gaseous waste. It is characterised by a high degree of fragmentation, with numerous individual participants each pursuing his singular interests on a project – by – project basis. The effect of construction activities on the environment relates to the generation of inert waste made up of construction materials, demolition waste and emissions. The consequence of such waste includes health problem, problem of land degradation and threats to wildlife and forests. There has been remarkable and refreshing interest in environmental management system over the years. A major discussion on the issue was initiated by the 1987 Brundtland Report of the world commission on environmental management system and development; Rio summit in 1992 sought to access the global response and progress recorded in this trend. Despite several environmental management regulations put in place by the government to check the menace, the trend continues unabated. The effect is more pronounced in the urban area where construction activities are high. In general, effect of construction activities on the environment is about the better management of current construction activities in harmony with natural and social environment of the construction activities.

Environmental protection has been an important issue globally. Tse (2001) observes that it was increasingly recognised that the construction industry has significant impact on the environment. Atkinson (1999) suggests that environmental assessment, environmental audits and management systems may be used more strategically to prevent pollution at source. The findings by Nitz and Holland (2000) suggest that improved environmental management must be facilitated by government agencies, rather than relying upon industry innovation.

Achieving this require adequate mitigation and multi – disciplinary collaboration for implementation and development. The paper examines these and others like the impacts of construction activities on the natural and social environment.

Construction Activities

Construction activities include buildings, highways, railroad, pipelines, marine, steel, and furniture. Construction activities would temporarily generate pollutant emissions that are

inherently disturbing to the environment. They generate environmental nuisance in the form of noise, dust, muddy runoffs, and improper disposal of chemical and gaseous waste. It is characterised by a high degree of fragmentation, with numerous individual participants each pursuing his singular interests on a project by project basis.

Construction activities are carried out in phases. Basically construction activities can be divided into three phases namely; land clearance, excavation, and finishing

The first phase involves land clearance; cutting of trees, shrubs, removal of topsoil and demolition of existing structure. During the first phase of construction, pollutant emissions would be generated from the following construction activities:

1. Cutting of trees/shrubs.
2. Demolition of existing structure.
3. Grading.
4. Construction workers travelling to and from the project site.
5. Delivering and hauling of construction supplies and debris to and from the project site and
6. Fuel combustion by on-site construction equipment.

During the second phase of construction, pollutant emissions would be generated from the following construction activities:

1. Excavation.
2. Removal of excavated soil from the project site.
3. Construction workers travelling to and form the project site.
4. Delivery and hauling of construction supplies to and from the project site and
5. Fuel combustion by on-site construction equipment.

The third phase of construction involves finishing: fitting, installation, dressing, and decoration. Pollutant emissions are typically generated from radiant emissions, fumes, equipment exhaust, and vehicle exhaust. The amount of emissions generated would vary depending on the type of construction activity and the consumables involved.

Environment

Encarta (2004) defines environment as the natural world within which people, animals and plants live. It is the total outer physical and biological system in which man and other organisms live consisting of air, water and land. The environment is the surrounding in which construction activities operate. It is the recipient of effect of construction activities. Construction activities affect the natural, social, cultural, and economic of the people within the environment and are capable of determining their form, character, relationship, and even survival. The various forms of construction environment may be identified as natural and social environment

Natural Environment

The natural environment of construction activities refer to the physical, chemical, and biological components of the environment. These include the site, construction material, vegetation, wildlife, infrastructure, air and water.

Social Environment

The construction workers and the communities that reside in and around the construction site are the social components of the environment. Construction activities impact both positively and adversely on the social environment.

EFFECT AND CONTROL OF CONSTRUCTION ACTIVITIES ON THE NATURAL ENVIRONMENT

The effect of construction activities on the natural environment is the changes to the quality of various components of the natural environment. These include changes to the original landscape, changes to the air and water quality, noise and threats to wildlife and forests.

Changes to Original Landscape

Construction activities involve site clearance, demolition of structure, excavation, quarrying and debris. These generate large amount of construction and demolition waste. Constructions wastes generate include particulate, ceramic, wood, metal, plastic, and cardboard. Disposals have been large into open dumps with a fraction going into sanitary landfills and another fraction reuse in backfilling. These operations involve use of heavy duty machines and equipment which devastate the site. The consequences of which hasten soil erosion, denude forest, pollute fresh water sources, and reduce both indoor and outdoor air quality. Borrow pits are created where embankment materials are removed. Consequently, this left the landscape with unsightly appearance and a breeding ground for mosquitoes.

Control Measures for Change to Original Landscape

Construction and demolition wastes control measures involve reducing the amount of waste generates through proper planning strategy that would minimise the waste produced. Reuse could be made of the wastes for restoration of weathered site, land filling or deposited at authorised dumps. Construction of directional drainage at the sites to prevent erosion and landslides, planting trees and shrubs would reduce the menace of gullies at the sites.

The National Laws on Land (Petroleum Degree, 1989) states:

"The chief petroleum engineer shall have access at all times to the areas covered by oil exploration licences, oil prospecting licences and oil leases, and to all refineries and installations which are subject to this decree, for the purposes of inspecting the operations conducted therein and enforcing the provisions of this decree, and any regulations made there-under and the condition of any licences or leases granted under this degree or under any corresponding law for the time being in force in Nigeria".

The relevant regulatory authority is empowered to make regulations for the conservation of not only petroleum resources but also to the prevention of pollution of land, water courses and the atmosphere. Most of the regulatory authority in the country lacks regulations controlling effect of construction pollutants in the environment.

Changes in Air Quality

Construction activities would temporarily generate pollutant emissions. Five major classes of pollutant emissions discharged into the air by construction activities have been identified. These are Reactive organic compounds (ROC), Carbon monoxide (CO), Nitrogen dioxide (No_2), sulphur (IV) oxide (SO_2), and particulate matters (PM). The amount of emissions generated at times, would vary depending on the type and scope of construction activity that is involved. Mostly construction activities pollutant emissions would be generated from the following activities:

- Demolition of existing structure.
- Cutting and felling of trees and shrubs.
- Grading
- Excavation
- Construction workers travelling to and from the project site.
- Hauling of excess excavated soil from the project site.

- Delivery and hauling of construction supplies and debris to and from the project site.
- Combustion of fuel by equipment and plants.

Changes of air quality by emissions can endanger human health, the health and welfare of plants and animals, reduce visibility and can even cause material decay. Several respiratory infections like lung cancer, bronchitis, and pneumonia have been attributed to excess emissions of ammonia, carbon monoxide and particulates into the environment. Edelson et el (1996); reported that respiratory disease kills 47,000 American a year.

Control Measures for Air Pollutant Emissions

Construction activities are inherently incompatible with sensitive land uses such as residences, law courts, hospitals and many others due to unavoidable issues of noise, dust and potential drop in air quality. Many countries have set both regional and local standards in legislation defining construction level and source emission standards. Such standards, if exceeded would have significant impact on the environment.

In Nigeria the first national policy on environment was launched in 1989. The policy was a direct consequence of the dumping of toxic wastes at the Koko Port in Delta State. The policy emphasised the role of the natural environment in sustaining local and national economic and ecological systems.

National Laws on Air and the Atmosphere states that:

"Any person who violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood, or passing along a public way or does any act which is, and which he knows or has reason to believe to be, likely to spread the infection of any disease to life, whether human or animals is guilty of a misdemeanour"

Air, which we breathe, is also a transportation path for aircraft as well as a medium through which sound-wave travel. By virtue of it location, therefore it is subject to influences by activities on both land and sea. This underlines the need to regulate all activities which may affect the air.

Construction activities generate mostly particulate matters which constitute health hazards to the construction workers and the environment. Table 1.0 shows some construction activities and their associated air pollutants and effect on human health.

Table 1.0: Effect of Construction Activities Air Pollutant on human health.

Construction activities	Type of pollutant emission	Effect on human health
Demolition	Aggregate dust and noise	Respiratory infection and auditory problem
Quarrying	"	Visionary and hearing defect
Cutting and felling of trees	"	Respiratory and hearing defect
Excavation	"	Eyes and lung defect
Equipment exhaust	Ammonia, carbon monoxide, sulphur and CO_2	Lung infection
Vehicle exhaust	"	"

Source: Authors Field Survey

Table 1.0 shows some construction activities and their associated air pollutant and effect on human health. Construction workers are more susceptible to these problems; visionary, cancer, bronchitis, pneumonia, and asthma.

Constant wetting of the construction area, drive ways and access roads with water on regular basis would reduce the amount of visible dust. Vehicular movement speed limit at the construction area, as practice in some countries would reduce the quality of exhaust from the combustion engines. The construction materials hauling by these vehicles should be cover to avoid being blown by wind

Changes to Water Quality

Changes to water quality is contamination of water by external bodies such clays, fine particles, oil spills, and other chemicals washed into streams and rivers of a construction site. Clays and fine particles are released of construction activities like road grading operations, stockpiles of materials, dewatering operations, and other ground disturbing activities. These particles increase the sediment content of the waters. Deposition of sediment would exacerbate the existing nutrient impairment in the rivers.

Fuels, oils, lubricants and other hazardous materials with the potentials to degrade water quality are released from equipment during construction activities. Excavation equipment, generators, and construction equipment would use these hazardous materials on a regular basis during construction. Such practice not only deteriorates the quality of water but also renders it unfit for domestic uses and destroys the aquatic lives. The affected water may be the only source of water for the community and consequently, this may lead to epidemic like typhoid fever and diarrhoea.

Control Measures for Change to Water Quality.

Technology capabilities and legislative control devices are available to abate most of the water pollution problems of constructions activities. Such a legislative control as practice in other countries like USA and Hong Kong require a construction firm to prepare a comprehension Best Management Practice Plan (BMP) known such as Storm Water Pollution Prevention Plan (SWPPP) for the regulating authority's approval. (USA, EIR, 2006). The trend is for the construction firm to state in details how it is going to maintain water quality of the water channels of the area. These legislative control measures have help to alleviate the water pollution problem in the countries.

The BMP would include the design erosion and sediment controls and other elements likely to contaminate the waters. Such as employ by USA's SWPPP include:-

- Temporary erosion control measure to be employed for disturbed area. The measure such as silt fence and sediment basin is clearly defined in the plan.
- Road used during construction to be cleaned of accumulated earth and debris in the construction zone during project construction.
- Oils, fuels, lubricant and other toxicants spilled or disposed according to applicable laws and regulations.
- How excavated materials deposited or stored temporarily would not be placed to open water channels, and must be wetted and covered as necessary to prevent runoff and erosion.
- Fuelling areas must be designated to afford separation from surface waters during fuelling activities to prevent accidental spills from reaching the water channels.
- Establish native grass or other vegetable cover over areas that have been disturbed by construction as soon as possible after disturbance to establish vegetative cover. This will reduce erosion by slowing runoff velocities enhancing

infiltration and transportation, trapping sediment and other particulates and protecting soil from raindrop impact.

A similar plan is prepared for hazardous materials and oil spills. The local regulatory authority uses this to assess the level of compliance of the company to the applicable laws and regulations.

Threats to Wildlife and Forests

Wildlife, which include animals and birds live in the forests. Clearing of the site and other construction operations like piling, drilling and blasting generate high level of noise and dust in the environment and consequently destroy the forests and the natural habits of the wild animals. The problems and challenges posed by these threats are immense; removal of ground covers, cutting and felling of trees, though construction activities constitute major activity of man responsible for deforestation, erosion, and destruction to wildlife.

Plants generally have been the natural consumption of carbon (IV) oxide in large quantity. Plant use carbon (IV) oxide to manufacture their food through the process of photosynthesis. Clearing and non replacement of this forests component has left excess carbon (IV) oxide in the environment. This has been responsible for green effect and consequently creating global warming when it combines with radiations from the sun. Charles (1992) and Isah et al observed that the health of a wildlife population is closely tied to that of the environment. When the environment becomes disturbed, the wildlife flee or get eliminated by the unfavourable new environment. Harrison(1993) argued that when land is cleared for construction to commence, wildlife lose their food and the habitat in which they are used to and consequently, these conditions affect their survival, resulting in changes in gestation period, birth rate and premature death. Therefore it is the opinion of this paper that construction activities exert pressure on wildlife and the forests.

Control Measures for Threats to Wildlife and Forests.

Several measures to preserve and safe our Forests include planting of trees, establishment of forest reserve, and public campaign toward preserving the forests. These have been put in place for quiet sometimes now and effort should be intensifying to prevent indiscriminate felling and cutting of trees. The forest is the natural habitat of the wildlife and effort to preserve the forest should include collaboration with all stakeholders at all levels in order to maintain the required balance in the ecosystem.

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.

Noise Pollution

Construction activities would require the use of noise generating equipment like papers, backhoes drilling and blasting machines. During construction, it is likely that more than one piece of constructions equipment would significantly raise the noise level of the construction environment. Noise level may fluctuate depending on the construction phase, equipment type and duration of use, distance between the source of the noise and the immediate community that receive noise.

Noise is unpleasant sound. It is a form of environmental degradation and has serious impacts on human health. Operations like pilling, drilling, blasting and powered mechanical equipment generate high level noise. It has been established that a five-decibel or increase over the current ambient exterior noise level would be noticeable and would likely evoke a community reaction. In 1995, there were 92 convictions of construction noise in Hong Kong with fines between US $64 - $12,120 (Tse, 2001).

Noise may be annoying; it causes displeasure at leisure and relaxation periods. The major problem associated with persistence exposure to high noise level is that the hearing acuity of a person may be damaged. Many construction workers have suffered a serious loss of auditory sensitivity when compared with those in other sector of economy that generate negligible low noise level. The impacts of noise in the immediate neighbourhood include loss of efficacy in their engagements and interference with speech communication. This could lead to other complication like restlessness and development of high blood pressure are deadly

Control Measures for Noise Pollution.

Construction activities noise pollution control measures applied in various countries include the use of mufflers by construction firms when using heavy duty machines and equipment.

Mufflers are a noise control device capable of reducing noise impacts by absorbing not transmitting it to the receptors.

All residential units located around the construction site must be well informed of what precautions measure to take in other to prevent unwanted damaged to live and property within the area of coverage of the noise pollution. There should be more pragmatic approach to enforcing the time periods for which high level noise generating operation would be allowed in a construction environment.

Legislation regulating heavy duty trucks to follow designated routs, speed limit and indiscriminate use of horns in construction environment should be enforced and revving firm is fine accordingly. Noise protective devices like plastic foam, earmuffs and earplugs should be made available to construction staff at the site in other to prevent sensitive auditory damage to hear-cells of the receptive of noise.

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). Physical planning regulating authorities should be adequately equipped with necessary manpower and redirected for effective monitoring of contractors compliance with the required standards of operations.

4). All development plans should be accomplished with certified Environmental Management Standards.

5).Since the governments are the dominant clients in the construction industry, public projects should be awarded to contractors with comprehensive EMS plan for controlling the effect of constructing activities.

6). Education of the end-users, who are predominantly the public sector clients, is crucial to create market demand for environmentally friendly construction activities.

7). Educational, professional and Research Institutions have prominent role to play in other to instil a greater sense of accountability amongst construction industry participants by stipulating acceptable standards of behaviour and establishing a supportive regulatory framework.

Conclusion

Since the inception of the environmental protection law in 1989, government and many environmental protection organisations have tried to propose legislative control, policies, campaigns and other activities for protecting the environment. These have generated high awareness among the people. However the implementation of most of this laws to the later at the local level is yet to be achieved. This is evidenced in the absence of pollution control guidelines in most urban and local physical planning control authorities.

Since the government is a very dominant client in the construction industry, the extent to which the government wishes to restrict its choice of contractor to those firms that have an Environmental Management Standards in place, will demonstrate its commitment to environmentally responsible operations.

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