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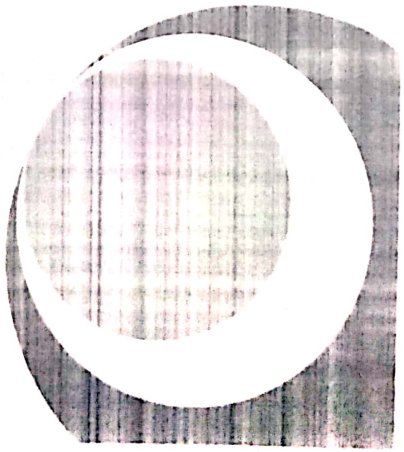

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Research Article

Management of Sawmill Wastes in Nigeria: Case Study of Minna, Niger State

Ogunbode E.B.[1*], Fabunmi F.O.[2], Ibrahim S.M.[5], Jimoh I.O.[3], and Idowu O.O.[4]

[1]Department of Building, [2]Department of Estate Management and Valuation, [3]Department of Civil Engineering, [4]Department of Urban & Regional Planning,Federal University of Technology,Minna, Nigeria
[5]Department of Building, Niger State Polytechnic, Zungeru, Niger State, Nigeria.

[1*]Corresponding Author's Email: onbodmail@yahoo.com. Tel: +2348063286122

ABSTRACT

Ways by which sawmills in Minna, handle the waste they generate were evaluated using questionnaires, personal interviews and physical observation. Eight (8) major sawmills were studied. The study revealed that wastes generated by these sawmills consist of sawdust, wood cut-off and bark of log of woods. Wastes are disposed off majorly by open dumping, open burning, domestic usage, bedding for poultry and for landfill. Although most sawmills are aware of the guidelines and regulations governing the treatment and disposal of sawmill wastes, they hardly abide by them. The personnel who are assigned to sanitize the mill environment possess inadequate safety wares. The study also revealed that Environmental Protection Agency Sanitary Inspectors and the Development control Board in the city inadequately perform their duties. This paper also highlighted the need to enlighten the public, sawmill workers and the government on the dangers of indiscriminate disposal of sawmill wastes.

Keywords: disposal, environmental education (EE), open burning, sawdust, and sawmill waste.

INTRODUCTION

Waste generation is a concomitant aspect of living; it cannot be banished but can only be managed. The problems posed by these wastes are many: they degrade the urban environment, reduce its aesthetic value, produce offensive odours during the rains and pollute the air with smoke when the wastes are burnt uncontrollably. They also constitute health hazards in themselves if they are not timely disposed; they become breeding places for worms and insects (Dosunmu and Ajayi, 2002).

Disposal of solid waste is the ultimate step in a management system. In advanced technologies, disposal is preceded by some engineering activities such as sorting and quantity reduction (White et al., 1997). This is done in order to sort out materials that can be turned into some economic value. Several method of disposal waste exists. The choice of any method depends on a number of factors. These factors according to Eerd (1997) include: characteristics of the solid waste to be disposed, cost consideration (i.e. how much is available and how much the method could cost), availability of disposal site (cost of land for example) and cost of labour and technical implication of the methods.

Any community whether in the advanced or less developed countries is open to choose among the following options of solid waste disposal methods: converting, recycling, sorting and salvaging, open dump, controlled tipping/sanitary and landfill/daily burying. Others include: composting, incinerating and disposal into sea (Oluwande, 1974; Rushbrook and Pugh, 1999).

The 'open dump' method of solid waste disposal is considered as both native and dangerous (Rushbrook and Pugh, 1999). This is because there is no control on the leachate (the contaminated liquid draining from waste) generated and constitutes a direct risk to human health. Though, open dump is initially thought to be cheap and easy it is in the long run the costliest (Eerd, 1997). Johnnessen and Boyer (1999) observed that it remains the predominant means in developing countries.

There is consequently the need for environmental education (EE) for saw mill workers to evolve an environmentally friendly disposal practice. Schaefer (1980) sees EE as a learning process through which the people's knowledge and awareness about the environment and associated challenges are increased. It is also the means through which necessary skills and expertise to address the challenges are developed. It is aimed at fostering attitudes, motivations and commitments to make informed decisions and take responsible actions. This erudition progression and awareness strategies will help improve sawmill workers attitudes, motivations and commitments towards appropriate disposal and management of sawmill waste.

EE also entails practice in decision-making and self formulation of a code of behaviour about issues concerning environment quality. In opinion of USEPA (2005), effective EE should equip people to gain an understanding of how individual actions affect the environment. Not only so, they must through it acquire skills that can be used to evaluate various sides of issues and become better equipped to make informed decisions.

At this junction it should be noted that saw mill waste is a so classified as a solid waste from the forestry formal sector of the economy. Forests have been the major source of livelihood for most Nigerians. The forestry sector is one of the main pivots on which the nation's welfare was built. The forest is not only important for material goods but also as a valuable ecological and cultural resource. The forestry sub sector has over the years contributed immensely to the socio-economic development in the country and it ranks among one of the highest revenue and employment generating sectors. The forest enterprises in Nigeria can be classified into either informal or formal sector enterprises (GWVC, 1994; Sambo et al, 2007). The informal enterprises are small forest based enterprises operating without formal corporate entity, this include enterprises that engage in the production of firewood, charcoal, chewing stick and sculptured wood items. The formal sector enterprises include the organized wood based industries such as plywood mills, particleboard mills and furniture factories and sawmills.

A sawmill is a facility which processes raw timber into dimensional lumber for shipping and eventual sale. Prior to the development of sawmills, people harvested timber and cut the resulting logs into planks by hand, an often painstaking process. Sawmill wastes are the eventual wastes generated in the planning, sawing and processing raw timber into dimensional lumber. Saw mills by nature generate a lot of wastes i.e. saw dusts, wood off cuts, wood backs, plain shavings, wood rejects, etc. National Technical Experts, (2004) also explain that there are two sources of waste at wood working factory, namely wet-waste from wood log saw milling and dry-waste from sawn-timber processing. Large part of sawn timber (which is going to be further processed into semi-finished product) is being produced in the woodworking factory and partly supplied from smallholder sawmills. It is estimated that about 60% of sawn-timber demand is produced in the factory and smallholder sawmills supply the remaining 40%.

As the demand for wood and its product increase, the volume of wastes being generated cannot but increase. Hence, one of the greatest environmental problems facing the city today is how to dispose properly, the waste being generated daily by the ever – increasing activities of the sawmill industries.

The sawdust often spilled on open spaces, sometimes occupy lands for development. They also constitute bad working environment for those working in the area, due to accumulation of wastes over a period of time most especially during raining season.

There are many sawmills owned and operated by small entrepreneurs in Minna, Niger State of Nigeria. The amount of wood waste generated from sawmill industries operated by smallholders has now become a problem to the local environment. Even though part of the waste is used as domestic fire wood for household needs and brick making industries, a large part of the wood wastes like log-ends, bark, and majorly sawdust remains unused in sawmill requires disposal. In order to clean up the factory area, most sawmills just burn and or dump the wood waste to the earth. Open Dumping and burning the wood waste eventually causes the emission of Green House gas (GHG) especially methane (CH_4) and carbon monoxide due to decomposition and combustion respectively (Tillman, 1978). For 100 kg wood waste dumped, there would be approximately 8 kg of CH_4 emission to the atmosphere (National Technical Experts, 2004).

Fuwape, (1998) succinctly put it that sawmill industry accounts for 93.32% of the total number of wood based industries in Nigeria in 1997. Though these mills are concentrated in the south-western part of the country with Ondo, Ogun and Lagos states having the largest numbers. The Lumber recovery factor in most sawmills varies between 45 and 50% (Alviar, 1983 and Fuwape, 1989). This implies that about 50 to 55% of log input into sawmills are left as wood residues.

This study aims at assessing the management of sawmill wastes in Minna metropolis. In achieving this aim therefore, the following specific objectives were set:

- To examine the distribution of sawmill in Minna
- To assess the method of disposal and treatment of waste generated at the sawmills.
- To assess the instituted pattern for the training of the workers in sawmills waste management in Minna

RESEARCH METHODOLOGY

The population of the study was made up of sawmill workers, Niger State Development Company and Environmental Protection Agency Board, Building professionals involved in the wood Timber usage, sawmill and sawmill waste managers. Initially a list of all the waste generated in the sawmill and management and disposal system was drawn up from literature for the purpose of adjudging those available in the study environment. Structured questionnaires were designed and administered on the study population. Eight (8) major sawmills in Minna, Niger State, Nigeria were sampled. Personal interviews and physical observations were also done. The major focus of the various methods used is the type of wastes generated by the sawmills, quantity of wastes in relation to level of customers' patronage, numbers of employees and the frequency with which the wastes are

disposed, treatment and disposal methods used, the level of involvement of the government authorities in saw mill waste management, level of awareness, protection and personal hygiene by the waste handlers, interest in waste management seminars and researches and suggestions by the sawmills managers on various aspect of sawmill wastes management.

RESULTS AND DISCUSSION

The study reveals that the sawmills in minna are located along the major highways in minna town. The study shows that eights (8) major sawmills of different scales are operational in minna. They range from small, medium to large scale sawmills (Table 2 and Figure 1).

The composition of sawmill wastes generated in various sawmills in Minna are similar though there are differences in quantities generated as shown in Table 1. The wastes comprise sawdust, wood off-cuts and bark of log of woods.

During the study, It was observed that after a whole day's job, the various saw mills produce wastes of average 44 bags (50kg) of sawdust which is equivalent to 264 bags weekly respectively (Table 1), depending on patronage and stability of power supply, this large quantity of wood wastes generated by the sawmill are sold to surrounding community as firewood for cooking and the sawdust used by poultry owners for Bedding and landfill. Also, in order to dispose the ever-produced sawdust waste and due to the absence of proper disposal methods of the waste in Minna, 96% of the sawmill in Minna engaged the open air burning in three locations which are along Paiko road, Maitunbi, and Soka-kahuta area of Minna, Niger State as means of discarding the resulting sawmill waste, as a result, contributing to air pollution which is a cause to climate change and global warming (Table 3 and 4).

From sawmills visited, it was observed that waste disposal remains one of the biggest challenges facing the sawmill industry in Minna, Nigeria.

It was also observed that there are no training programmes for sawmill personnel on waste management and as a result, safety wares such as nose guide and safety glasses are not worn always, even when they are aware of the need to do so (Table 5). Most sawmill in Minna are not complying with the guidelines for the disposal and treatment of sawmill waste. This may be due to the fact that the government agencies charged with the responsibilities of enforcing laws governing the disposal and treatment of sawmill waste have not been active. For instance, it was gathered that sanitary inspectors and Environmental Regulatory agencies do not visit sawmills at all. This is why the Nigeria Environmental Study/Action Team, NEST (1991) put it that Laws and legislations are often set in Nigeria but enforcement of the laws becomes difficult.

Authorities and workers of sawmill point out that, there is a need for seminars and workshops that will help them to manage properly the sawmill waste they generate. They also suggested that researches should be undertaken by higher institutions and research bodies in the country on handling and recycling of sawmill waste locally.

Table 1: System *of Sawmill Wastes.*

Sawmill	Types Of Sawmill	Average Number Of Customers Per Day	Average Quantity Of Wastes Generated Per Day (Bags)	Frequency Of Waste Disposal
Shango sawmill	Large	250	100	Weekly
White heart sawmill	Small	25	30	Weekly
Saiko Sawmill	Large	300	100	Weekly
Maitunbi Sawmill	Large	150	80	Weekly
Trust Sawmill	Small	20	10	Weekly
Nyikangbe Sawmill	Small	20	10	Weekly
Bosso Sawmill	Small	20	10	Weekly
Mawo Sawmill	Small	20	10	Weekly

Table 2: Distribution of Sawmill Wastes in Minna.

S/N	Area/Location	Scale	Description of the Area
1	Shango sawmill	Large	Paiko – Road
2	White sawmill	Small	Bida Road
3	Saiko Sawmill	Large	Kuta Road
4	Maitunbi Sawmill	Large	Kuta Road
5	Trust Sawmill	Small	Bida Road
6	Nyikangbe Sawmill	Small	Bida Road
7	Bosso Sawmill	Small	Minna-Zungeru Road Minna
8	Mawo Sawmill	Small	Western bye pass Minna

Authors' field work (2010)

Table 3 shows that 60% are disposed by open dumping by bagging. 10% packing are packed by household users for domestic cooking, 16% was acquire by poultry farmers and 14% was used for Land filling outside the town.

Table 4 reveals that 96% treated the waste through open burning, and4% incinerates

Table 3: Method for Disposal of Sawmill Wastes.

Method	*Frequency*	*Percentage (%)*
i. Open dumping by bagging	*30*	*60*
ii. Packing by Households	5	10
iii Packing by Poultry owners	8	16
iv. Landfill	7	14
	50	100

Authors' field work (2010)

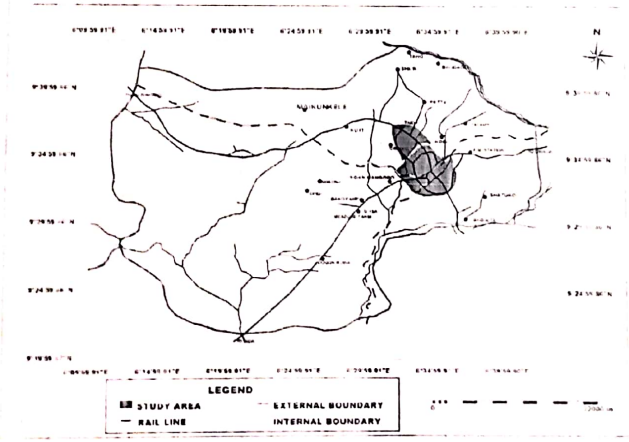

Figure 2: Map Showing Various Sawmills Location in Minna.

Table 4: Treatment of Sawmill Wastes

Treatment	Frequency	Percentage (%)
Open air burning	48	96
Incineration	2	4
Pyrolysis	0	0
	50	**100**

Authors' field work (2010)

Table 5: Level of *Awareness of Guidelines and Training of Personnel*

PARAMETER	NUMBER OF SAWMILLS
b. **Awareness of Guidelines**	
i. Aware	4
ii. Not Aware	0
iii. Not Specified	0
a. **Training in Waste Management**	
i. Train Personnel	0
ii. Do not train personnel	4
c. **Use of Safety Wares**	
i. Always	0
ii. Sometimes	4
iii. Not specified	0

Source: *Authors' field work (2010)*

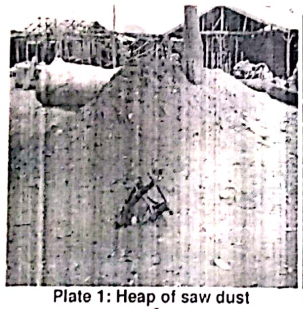

Plate 1: Heap of saw dust

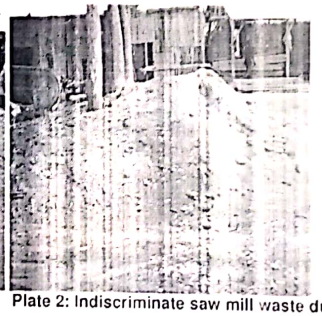

Plate 2: Indiscriminate saw mill waste dump

Plate 3: Face of a sawmill

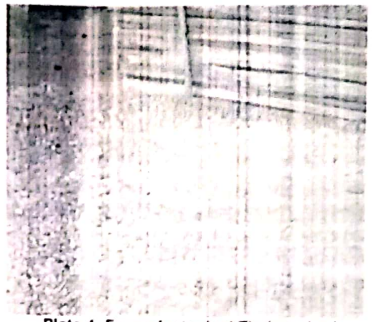

Plate 4: Face of a typical Timber shed

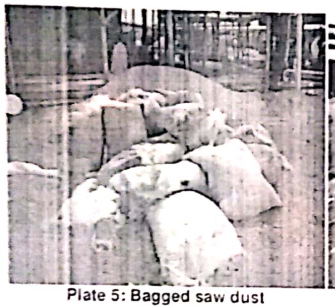

Plate 5: Bagged saw dust

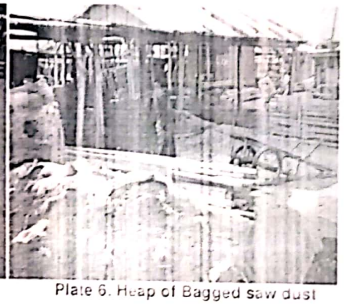

Plate 6. Heap of Bagged saw dust

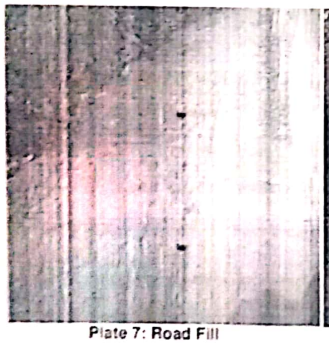

Plate 7: Road Fill

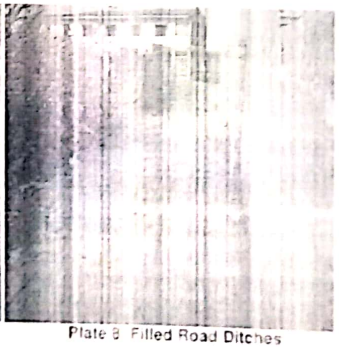

Plate 8 Filled Road Ditches

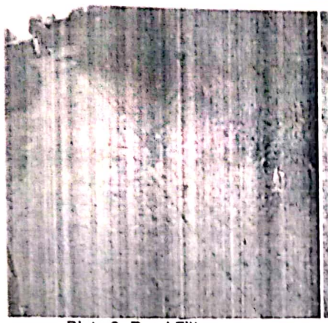

Plate 9: Road Fill

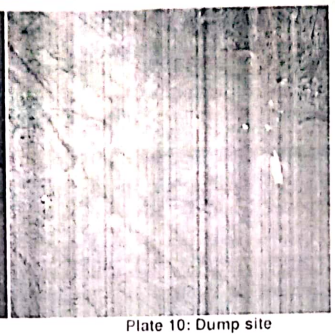

Plate 10: Dump site

CONCLUSIONS AND RECOMMENDATIONS

Large quantity of sawmill wastes are being generated in Minna and the magnitude of the problem posed by sawmills that operate in Minna, Niger State Nigeria has been identified and enumerated. Since, sawmills by nature generate a lot of wastes, proper disposal methods must be identified and implemented. Otherwise the contamination of Minna open spaces and adjoining air will become uncontrollable. The problems of wood waste provide adequate opportunity to creatively manage the environment of the city. Some of these suggestions are recommended for immediate adoption to stem the imminent damage to the health of the population in the city. Also, based on the study conducted, we conclude that the amount of wood waste generated by sawmills visited can always be managed without burning it and rendering the climate and humans in danger.

The treatment of sawmill waste in Minna is done by open burning. The burning of the wastes cannot be totally ruled out, because burning is often the easiest means of disposal, therefore, it is necessary to recommend that:

i) Burning should not be done in the late afternoon or evening, as the air will be stable. Since they are a ground level source of pollution, the burning should be confined to sunny hours around the middle of the day so that there will be adequate upward dispersal thus keeping the ground-level air clean.
ii) Wastes should not be burnt on very windy days because the smoke will be carried to a large horizontal distance before it rises clear of buildings.
iii) Wastes should not be allowed to smoulder: in the early stages, they should be ignited with fuel that will burn with a hot flame. All the wastes to be burnt should be as dry as possible and should be placed in the fire in small quantities so as to avoid the production of smoke.
iv) Wet wastes should not be burnt because of their high moisture contents.
v) There are many possible solutions to managing the waste generated from sawmills, however the researcher strongly recommend that Utilizing the wood wastes for direct electricity generation should be of prior importance to the sawmills and that immediate steps should be taken to make this a reality in the shortest possible time.
vi) More so, Government can help the industries by providing certain incentives. Since the volume of waste generated is enormous, and the industries are more concerned with their economic activities, the government can offer to cart away the wastes to land fill sites and incinerators at subsidised rates.
vii) Government can also encourage cottage industries that will utilize the wastes. This will empower the people economically and create jobs as well.
viii) Well-designed incinerators should be built in the vicinity of these mills. This can serve as an incentive to entrepreneurs in the industry as well. Public enlightenment campaign will also sensitise all stakeholders in the community to the impending dangers of a badly managed environment.

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