



## Assessment of Human Activities on Sawmill Environments in Minna, Niger State, Nigeria

S. N. Jiya\*, Y.D. Liman and R.O. Sallau

Department of Geography, Ibrahim Badamasi Babangida University, Lapai, Nigeria

### ABSTRACT

The study was aimed at assessing the environmental impacts of sawmills in Minna, Niger State, Nigeria. Descriptive survey research design was adopted for the research. Random sampling technique was used to select 8 out of the 24 sawmills in Minna, Niger State. Systematic random sampling was used to select seventy-four households together in each of the identified sawmills which are surrounded by residential buildings for the administration of the questionnaire, house count was conducted within 150m radius from each of the three large sawmills and 50m from each of the five (5) small facilities. Semi structured questionnaires, individual interviews and personal observations were used to generate data from respondents, while field notes guide was used to record data in respect of participant. Data collected from the sawmills and their host communities / households were analyzed quantitatively and qualitatively using tables and pictorial illustrations and the Leopold matrix. The study revealed that there is only one (1) sawmill which is Niger State Development Company (NSDC) and twenty-five timber sheds out of which two were large timber sheds (soma timber shed and rock foundation timber shed) in Minna, Niger State, Nigeria. Furthermore, waste generated by timber sheds and sawmill in Minna Niger State. included sawdust, wood slabs/pieces, plane shavings, release of dust and smoke into the atmosphere, waste water from log and lumber yards and spent oil from machinery and vehicles; while only the NSDC sawmill generate bark strips because it is the only facility where logs are brought for conversion. The study also revealed that methods adopted for disposal of waste were purchase / packing by households surrounding all the eight industries studied, packing for use by poultry owners and packing for landfill to check erosion in the nearby residences, respectively. On the other hand, open burning was admitted to be in practice in only the Soma timber sheds. The operational processes and waste disposal methods of timber sheds and sawmill insignificantly impacted air, water and soil quality, flora & fauna; and socio-economic aspects of community health and noise negatively. The industries however averagely touched the lives of people positively through direct and indirect employment, income generation and indeed improvement in the standard of living of host communities. In view of the findings, it is recommended that burning of waste as was being practiced by Soma timber shed, should be stopped completely and such wastes can be put into beneficial uses as reported by most of the industries studied. There is need to relocate all the wood-based industries that are currently scattered in Minna to an industrial zone where they are remote from sensitive receptors such as residential premises so as to ensure that the separation distance is adequate enough to eliminate or reduce the nuisance from noise, dust or odour.

**Keywords:** Assessment, Saw mills, Dust and Pollution

### INTRODUCTION

Sawmill is reported to be as a wood processing industry equipped with various wood processing machines, which include band saw and circular saws and reported that the industry originated in Nigeria with the establishment of the first pit-sawing facility in 1782(Kukogho *et al.*, 2011). Since then, more sawmills have been established as the demand for Timber (Sawwood) continues to increase. Anonymous (1993) quoted in

(Kukogho *et al.*, 2011) indicated that as at 1991, there were about one thousand six hundred and seventeen (1,617) sawmills in Nigeria, majority of which are located in the forest-rich areas

Received 9 June, 2020

Accepted 28 July, 2020

Address Correspondence to:

[solojiya@yahoo.com](mailto:solojiya@yahoo.com)

including the Western part of the country. Sawmill industry in Nigeria is largely characterized by small size operators who usually process timber with the CD series of sawing machine (i.e. CD4, CD5, CD10, machines etc.) and large quantities of waste in form of slabs, sawdust and barks are regularly generated in sawmills(Kukogho *et al.*, 2011).A preliminary survey of sawmills and timber sheds in Minna, Niger State revealed that all the facilities that are functional generate some waste proportionately with their sizes, but like other sawmills around the country and as seen in some related literature, how these wastes are disposed of or managed could be in a manner that could harm the environment. Ogunbode ( 2013) generalised all of them as sawmills whereas most of them are small sized timber sheds.Further, the dynamics of development may have changed the way wastes from these facilities are disposed with lack of or inadequate information on current practices. It is in this context that this study attempted to assess the impact of sawmills and timber sheds on the environment in order to bridge the gap in available information and thus contribute to scientific knowledge on the subject matter.

**Study Area**

Minna, the study area is located between Latitude 9° 24’ and 9° 48’ north, and Longitude 6° 25’ and 6° 45’ east, it occupies the central portion of the Nigerian basement complex. The area comprises of meta-sedimentary and meta-igneous rocks which have undergone polyphase deformation and metamorphism. These rocks have been intruded by granitic rocks of Pan-African age (Alabi, 2011). In the present political zoning system, Minna is within the North Central Zone, and occupies an area of approximately 884 hectares. It is about 145 kilometers by road from Abuja, the Federal Capital of Nigeria. The metropolis has grown to engulf suburbs settlements such as Bosso, Maitumbi, Dutsen Kura, Kpakungu, Shango and Chanchaga. The city is presently widely dispersed along the main spine road from Chanchaga in the south to Maikunkele in the north, for a distance of about 20 kilometers. Figure 1 shows location map of the study area.

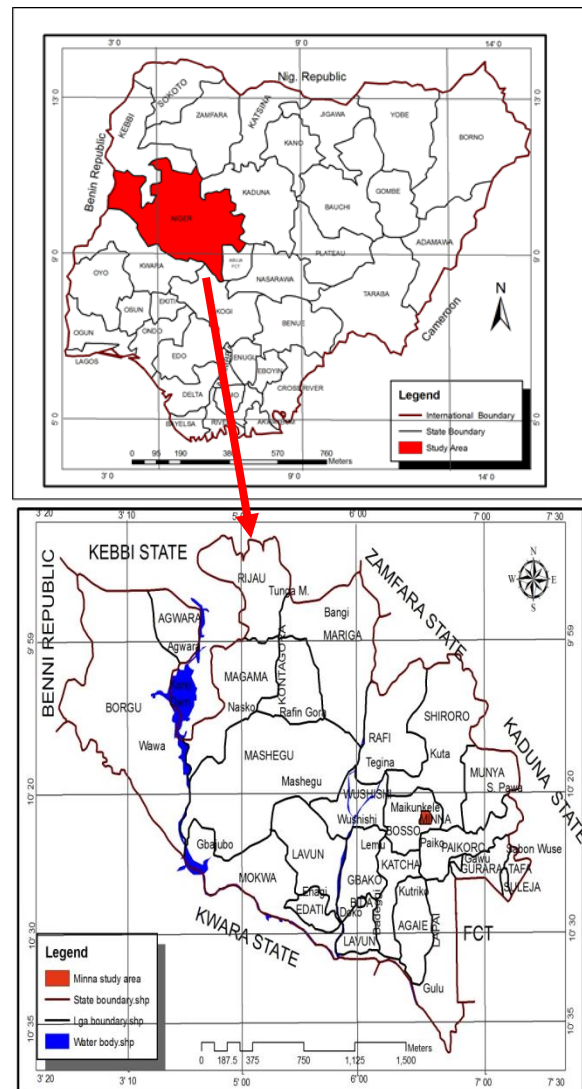


Fig 1: Location map of Minna, Niger State, Nigeria

**METHODOLOGY**

Descriptive survey research design was used for this study. According to (Li *et al.*, 2012)as quoted in (Funmbi, 2015), descriptive research design is best used to gather, organize, present and analyze data for the purpose of describing the occurrence of an event or phenomenon within a particular people or location. This method was found appropriate for the study because it enabled the environmental impact of sawmills and timber sheds to be identified and described adequately. The population of the study consisted of one(1) sawmill and twenty five (25) Sawmills in Minna, and 296 households within 150 meters radius of each of the industries.

**Sample and Sampling Procedure**

Eight sawmill / timber sheds out of the twenty four (24) industries in the study area were randomly selected for investigation. House count was conducted within 150m radius from each of the three large industries and 50m from each of the five (5) small facilities. This was achieved through reconnaissance survey of the

various industries locations. Twenty-five percent (25%) of the houses in each of the identified sawmill timber sheds industrial corridors were selected using systematic random sampling method after which the house hold head was picked in the selected residential buildings for the administration of the questionnaire. The distribution of households per industry is in table 1. below:

Table 1. Distribution of Households for Data Collection

S/ N	Sawmills / Timber Sheds	Location	No of Households Counted	No of Households Selected
1.	Soma Timber Shed	Shango	56	14
2.	Niger State Development Company (NSDC) Sawmill	Maitumbi	65	16
3.	Rock Foundation Timber Shed	Sayako	55	14
4.	Qudus Timber Shed	Kpakungu	28	7
5.	Al-Bashir Timber Shed	Gbeganu	20	5
6.	IsiyakaAlaba Timber Shed	Albishir	23	6
7.	Lakeside Wood Ventures Timber Shed	Sauka Kahuta	25	6
8	Almustapha Timber Shed	Dutsen-Kuran Gwari	24	6
			<b>296</b>	<b>74</b>

Therefore, a total number of seventy-four (74) questionnaires were administered on residents around the eight (8) industries. This method helped to reduce bias in the selection of the population that were part of the sample. This means participants selected were likely to generate useful data for the research project

because of their proximity to the target industries.

**RESULTS AND DISCUSSION**

Responses received from residents living around the wood based industries were analysed and the result is presented in table 6.1 below.

Table 2. Response Rate of Sawmills / Timber Shed Adjoining Residences

S/N	Sawmill / Timber Shed	Number of Questionnaires Served	Number of Questionnaires Returned	Response Rate (%)
1.	Soma Timber Shed	14	12	17.91
2.	Niger State Development Company (NSDC) Sawmill	16	13	19.40
3.	Rock Foundation Timber Shed	14	14	20.89
4.	Qudus Timber Shed	7	6	8.96
5.	Al-Bashir Timber Shed	5	5	7.46
6.	IsiyakaAlaba Timber Shed	6	6	8.96
7.	Lakeside Wood Ventures Timber Shed	6	5	7.46
8.	Almustapha Timber Shed	6	6	8.96
		<b>74</b>	<b>67</b>	<b>100</b>

Table 2. shows that out of the 74 questionnaires distributed among eight host communities in the industries corridors, 67 were returned duly completed and were all analysable. A breakdown of the response rate shows that households around Rock Foundation Timber Shed had the highest number of the returned questionnaires of 14 (20.89%) followed by Niger State Development Company (NSDC) Sawmill and Soma Timber Shed which returned 13 (19.40%) and 12 (17.91%) respectively. Three timber sheds; Qudus, Isiyaka Alaba and Almustapha had response rate of 6 (8.96%) each while the remaining two timber sheds of Al-Bashir and Lakeside venture returned 5 (7.46 %) each. The response rate of the residents was proportionate with the size of the industries and of course the size of the host communities.

**Data Analysis and Discussion**

The first part of the first research question sort to identify sawmills and timber sheds that are operational in Minna. List of sawmills and timber sheds identified is in table 3. below and shows that at the time of data collection there was only one sawmill and twenty-five timber sheds out of which two are large timber sheds

(Soma timber shed and rock foundation timber shed). This is because the second facility Soma Sawmill has been converted to a timber shed as a result of the removal of the band saw which was used for breakdown of logs. It is noteworthy that while sawmills are wood based industries that have the capability to breakdown logs into lumber using band saws, timber sheds comprise mostly of table of circular saws and other appliances for sawing lumber into smaller sizes as desired.

**Identification of Waste Generated by Sawmill and Timber Sheds in Minna**

Sawmill waste constitute a major source of environmental pollution with consequent effects. The research questions are set to identify the wastes generated by sawmills and timber sheds in Minna and to effectively do this, sawmill /timber shed workers were asked to identify the types of wastes generated in their various industries and the quantity of such wastes. Responses are contained in table 3 below:

Table 3: Wastes Generated by Sawmill and Timber Sheds in Minna, Niger State

Name of Sawmill	Responses						
	Sawdust	Plane Shavings	Waste Water	Bark Strips	Wood Pieces	Spent Oil	Emission /SPM
Soma Timber Shed	√	√	√	-	√	√	√
Niger State Development Company (NSDC) Sawmill	√	√	√	√	√	√	√
Rock Foundation Timber Shed	√	√	√	-	√	√	√
Qudus Timber Shed	√	-	√	-	√	√	√
Al-Bashir Timber Shed	√	√	√	-	√	√	√
Isiyaka Alaba Timber Shed	√	-	√	-	√	√	√
Lakeside Wood Ventures Timber Shed	√	-	√	-	√	√	√
Almustapha Timber Shed	√	√	√	-	√	√	√

All the industries sampled produce sawdust, wood slabs/pieces as wastes generated through their various activities. Again, responses from interview of the workers showed that all of the facilities admit that their machinery release CO<sub>2</sub> and other gaseous substances including Suspended Particulate Matter (SPM) into the atmosphere. The gaseous emissions are largely attributable to the erratic power supply which compels the saw mill and timber sheds to resort to the use of alternative power sources which invariably contributes greatly to the release of CO<sub>2</sub> and consequently contributing to global warming. From the above findings, it is revealed that the commonest wastes generated by all the eight industries include saw dust, wood slabs/pieces and gaseous emissions/SPM waste water in the rainy season and spent oil. This is

because both saw mill and timber sheds whether large or small make use of some basic machines which generate these kinds of specific wastes listed above. These machines include, table saw and generators among others.

**Methods of Waste Disposal by Sawmills and Timber Sheds in Minna**

The method of waste disposal by any sawmill contributes to either positive or negative impacts of such wastes on the environment. Thus the second research question examined the waste disposal practices of sawmills and timber sheds in Minna. Responses received from the seven sawmills/timber sheds workers studied are summarized in table 3.

Table 4 Methods of Wastes Disposal Adopted by Sawmills in Minna

Name of Sawmills / Timber Sheds	Responses			
	Open burning	Packing by nearby residents	Packing by poultry owners	Used for landfill
Soma Timber Shed	√	√	-	√
Niger State Development Company (NSDC) Sawmill	-	√	√	√
Rock Foundation Timber Shed	-	√	√	√
Qudus Timber Shed	-	√	√	-
Al-Bashir Timber Shed	-	√	√	-
IsiyakaAlaba Timber Shed	-	√	-	√
Lakeside Wood Ventures Timber Shed	-	√	-	√
Almustapha Timber Shed		√	√	-

Table 4. shows responses to interviews of the industries workers indicated that wastes is usually collected packed by households for domestic uses surrounding all the eight industries under study, while responses from five facilities (62.5%) showed that disposal was through packing for use by poultry owners and landfill to check erosion in the nearby residences, respectively. On the other hand, open burning was admitted to be in practice in only the Soma timber shed.

**Analysis of the socio economic impact of timber sheds and sawmills in Minna**

Table 4 shows that responses in respect of perception of all the host communities indicate that noise and dust (particulate matter in the atmosphere) generated by the wood based industries in their domain constitute some nuisance to them, most especially to the very proximate residence. However, the level of nuisance is more very near the facilities as evidence in the low resident's response of 20 (29.85%) and 10 (14.93%) in respect of noise and dust constituting nuisance to them respectively. On the other hand, the residents are

of the views that the industries present opportunities for skilled and semi-skilled jobs and indeed small scale wood based and other types of businesses that enhance income of the community members. This perception is supported by the responses of the residence as follows: 50 (74.63%) of the 67 residents agree that the timber sheds and sawmill are source of employment, while 44 (65.67%) of them also agree that the facilities are source of income generation. The finding of this study agrees with (Olawuni & Okunola, 2014) whose study revealed that the presence of sawmills in two

locations in Ile-Ife, Ondo State, provided employment to the people of the areas while it also contributed to infrastructural developments such as well, access roads, electricity among others. The sawmill and timber shed activities were the production process and waste disposal methods, while the five (5) environmental parameters considered included air quality, water quality, soil, flora and fauna, and socio economic factors particularly employment. The result of the evaluation is presented in tables 5 (A) and (B) below.

Table 5. (A): Leopold Matrix for Quantification of Environmental Impact of Sawmills and Timber Sheds in Minna, Niger State

Environmental Parameter	Sawmill / Timber Shed Activity							
	Soma T/Shed		NSDC Sawmill		Rock Foundation T/Shed		Qudus T/Shed	
	Prod Process	Waste Disposal	Prod Process	Waste Disposal	Prod Process	Waste Disposal	Prod Process	Waste Disposal
<b>Air Quality</b>								
Particulates	-3/2	-3/3	-3/2	-	-3/3	-	-3/2	-
Gaseous Emission	-2/2	-4/3	-3/2	-	-3/3	-	-3/2	-
<b>Soils</b>								
Soil Microorganism	-2/2	-3/2	-2/2	-	-2/1	-	-1/1	-
Soil Quality	-2/2	-3/2	-3/2	-3/2	-3/3	-2/2	-2/2	-2/2
Water Quality								
TDS/TSS	-	-3/2	-	-3/2	-	-3/3	-	-
Turbidity	-	-2/2	-	-2/2	-	-2/2	-	-1/1
<b>Flora / Fauna</b>								
Animals	-	-2/2	-	-	-	-	-	-
Plants	-1/1	-1/1	-2/1	-2/2	-1/1	-1/1	-2/1	-1/1
<b>Socio Economics</b>								
Employment / Income	+4/3	-2/2	+4/3	+3/2	+3/3	+4/3	+3/2	-
Settlement	+2/2	-	+2/2	-	+2/1	-	+2/1	-
Noise	-3/3	-	-3/2	-	-3/2	-	-2/2	-
Community Health Issues	-	-3/2	-	-	-2/2	-	-	-

Table 5 (B): Leopold Matrix for Assessment of Environmental Impact of Sawmills and Timber Sheds in Minna

Environmental Parameter	Al-Bashir Timber Shed		IsyakaAlaba Timber Shed		Lakeside Wood Ventures T/Shed		Almustapha Timber Shed	
	Prod Process	Waste Disposal	Prod Process	Waste Disposal	Prod Process	Waste Disposal	Prod Process	Waste Disposal
Air Quality								
Particulates	-2/2	-2/3	-1/2	-	-1/1	-	-1/1	-
Gaseous Emission	-2/2	-2/1	-1/2	-	-2/2	-	-1/1	-
Soils								
Soil Micro Organism	-2/2	-3/2	-2/2	-	-2/1	-	-2/1	-
Soil Quality	-2/2	-2/1	-2/2	-2/2	-1/3	-2/2	-3/3	-2/2
Water Quality								
TDS/TSS	-	-1/1	-	-1/2	-	-1/1	-	-1/1
Turbidity	-	-1/1	-	-2/2	-	-1/1	-	-1/1
Flora / Fauna								
Animals	-	-2/2	-	-	-	-	-	-
Plants	-1/1	-1/1	-2/1	-2/2	-1/1	-1/1	-1/1	-1/1
Socio Economics								
Employment / Income	+2/2	+1/1	+1/2	+1/1	+2/2	+2/1	+2/2	+2/1
Settlement	-	-	-	-	+2/1	-	+2/1	-
Noise	-1/1	-	-1/2	-	-1/1	-	-1/1	-
Community Health Issues	-2/1	-	-2/2	-	-	-	-	-

Based on the description of the use of the Leopold matrix for assessment of environmental impacts of an activity by Glasson et al (2005) tables 5. (A) and (B) above were developed for all the eight sites. Thus, in each appropriate cell, two numbers were recorded. The number in the top left-hand corner represents the impact's magnitude, from +10 (very positive) to -10 (very negative), while that in the bottom right-hand corner represents the impact's significance, from 10 (very significant) to 1 (insignificant); indicating there is no negative significance. A summary of the findings of the quantification of impacts above are presented below:

**Socio-Economic Impact**

Tables 5. (A) and (B) above shows a mix scenario of negative and positive impacts. The minimum impacts of the industries on socio economics aspects of community health and nuisance from noise was -1/1 while the maximum was -3/3. On the other hand, impacts of the industries on socio economics aspects of settlement, employment and income ranged between +1/1 and +4/3. This implies that the operation processes and waste disposal methods of timber sheds and sawmill insignificantly impacted socio economic aspects of community health and noise negatively. The industries however averagely touched the lives of people positively through employment generation,

income and indeed improvement in the standard of living of host communities. Therefore, while efforts should be made to mitigate the negative impacts, the positive ones should be enhanced.

### **Summary, Conclusion and Recommendations**

#### **Summary**

This study was specifically set out to identify sawmills and timber sheds in Minna, Niger State and the wastes generated by them, how the wastes are disposed of and the associated environmental impacts of the industries. The Research method adopted for the study was descriptive/survey research. Semi structured questionnaires, interview guide and observation techniques and environmental assessment using Leopold Matrix were employed for gathering data. While the questionnaires were used to elicit information from the residents within host communities of timber sheds and sawmill, the interview guides were used to sample opinions of the timber sheds and sawmill workers. The questionnaire used for residents of host communities were distributed to household members within 40m to 150m radius of the industries. The data collected for the study were presented and analysed using both descriptive and quantitative statistics. Frequency distribution tables and percentages were used for the descriptive statistics while, Leopold matrix was used to identify and quantify the environmental impacts of the eight industries.

#### **Conclusion**

Based on the conditions under which the study was carried out, it is hereby concluded that there was only one sawmill and twenty-five timber sheds in Minna Niger State whose operational processes generate sawdust, wood slabs/pieces, plane shavings bark strips. Others include dust and smoke released into the atmosphere, while waste water from log and lumber yards and spent oil from machinery and vehicles are released into the soil. Further, it was obvious that waste disposal methods of timber sheds and sawmill insignificantly impacted air, water and soil quality, flora & fauna; and socio economic aspects of community health and noise negatively. The industries however averagely touched the lives of people positively through employment, provision of sources of income and indeed improvement in the standard of living of host communities.

#### **Recommendations**

In order to mitigate key environmental issues that have emerged from this study, the following recommendations are made:

- i. Burning of waste as was being practiced by Soma timber shed, should be stopped completely and such wastes can be put into beneficial uses as reported by most of the industries studied.
- ii. There is need to relocate all the wood based industries that are currently scattered in Minna to an industrial zone where they are remote from sensitive receptors such as residential premises so as to ensure that the separation distance is adequate enough to eliminate or reduce the nuisance from noise, dust or odour.
- iii. Extracted sawdust must be efficiently collected using an appropriate dust collector to prevent the small sized dust particles from escaping into the atmosphere and impact air quality negatively.

#### **REFERENCES**

- Funmbi, A. C. (2015). Influence of Sawmill Industries on the Health of Sawmill Workers and Inhabitant of the Environment in Ondo State Nigeria. *Journal of Educational and Social Research*, 5(2), 299.
- Kukogho, J. Aghimien, E. Ojo, M.O, Adams, B.A.& Akinbosoye, B.S. (2011). Assessment of wood waste generated in some selected sawmills in Kajola Local Government area of Oyo State. *Contin. J. Agricultural Econ*, 5(2), 8-16.
- Li, Y., Adeyeye, J. O, Murrugarra, D., Aguilar, B., & Laubenbacher, R. (2012). Boolean nested canalizing functions: A comprehensive analysis. *arXiv preprint arXiv:1204.5203*.
- Olawuni, P. O., & Okunola, O. H. (2014). Socioeconomic impacts of sawmill industry on residents. A case study of Ile-Ife, Nigeria. *Journal of Economics*, 2(3), 167-176.



