Social and Environmental Impact Assessment of Bodija Plank Market, Southwest Nigeria

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ABSTRACT

This study investigated the social and environmental impact of Bodija plank market on the immediate environment. The study area comprises nine (9) zones; five (5) zones were selected randomly, and ten (10) respondents were selected randomly in each zone, making a total of fifty (50) respondents for the study. A well-structured questionnaire was administered for primary data collection from the respondents. Secondary data were obtained from existing literature. 90.0% of the respondents were male and were within the age bracket of 41-50 years (50.0%). 76.0% of the respondents were married, were of Yoruba origin (96.0%), and earned between ₦10,000 and ₦60,000 monthly (58.0%). 42.0% had secondary education, and 44.0% had been in the business for 6-10 years. Most of the respondents (70.0%) agreed that the forest and wildlife resources of the study area were rich in its early days, while 60.0% stated the presence of rare/endangered species peculiar to the area during that time. Additionally, 76.0% stated that deforestation activities occurred during the process of plank market establishment, and 72.0% noted the absence of Environmental Impact Assessment before establishing the study area. 60.0% of the respondents agreed that the mill has positive impacts on community development, while 64.0% disagreed that the mill's establishment negatively impacts community development. The study identified continued sourcing for raw materials, loss of biodiversity, noise pollution, atmospheric pollution, water pollution, soil pollution, and improper waste disposal as the major negative impacts of the study area and highlighted different mitigation measures for the negative impacts identified.

INTRODUCTION

The forestry sector contributes significantly to the Nigerian economy (Idumah *et al*., 2016; Idumah and Awe, 2017; Ibrahim *et al*., 2020). According to Uzuegbu (2022), forestry sector amassed about ₦52.02 billion in the fourth quarter of 2021, a 10.6% increase from the third quarter of 2021. Forest ecosystem provides ecosystem services for man in the form of provision (e.g., fuel wood, food, and genetic resources), regulation (e.g. seed dispersal, water purification and climate regulation), support (e.g. primary production, nutrient cycling, and water cycling), and cultural (e.g. spiritual values, recreation, and aesthetic values) (Millenium Ecosystem Assessment (MEA, 2005).

The rapid pace of urbanisation and economic development in Nigeria has led to significant transformations in its socioeconomic landscape, accompanied by positive developments and substantial environmental challenges (Jiboye and Ogunshakin, 2011; Abubakar and Dano, 2018). Among the urban spaces grappling with the complexities of development and sustainability is the Bodija plank market. Bodija plank market serves as a vital economic hub where timber merchants and sawn-wood marketers engage in trade activities, and it plays a significant role in generating income and enhancing the livelihoods of several groups of people (Ajewole and Fasoro, 2013).

Establishing plank markets involves activities that directly and indirectly impact the workers, residents, and immediate environment. These impacts are usually social or environmental (Azeez *et al*., 2022). The social impact could be in the form of employment generation, livelihood improvement, and improved infrastructure, among others, while the environmental impacts could be in the form of air pollution, noise pollution, and improper waste disposal. Environmental and Social Impact Assessment plays a crucial role in sustainable development by identifying impacts, informing decision-making, promoting stakeholder engagement, and ensuring the integration of environmental and social considerations of a project (Barasa, 2017; Ulibarri *et al*., 2019).

Several studies have been conducted in Bodija plank market. For instance, Ajewole and Fasoro (2013) assessed the market and marketing information, Aremu *et al*. (2015) assessed the socioeconomic characteristics of the market, Oladejo *et al*. (2020) studied the effect of air pollution from pedestrian traffic in the market and Bolarinwa (2018) and Sridhar and Omokhodion (2017) studied the noise level in the market. However, there is a dearth of information on the social and environmental impact of the market on the immediate environment, especially individuals who are directly involved in marketing activities. The necessity to assess the Social and Environmental Impact Assessment (SEIA) of Bodija plank market arises from recognising its multifaceted interactions with the human and natural environments. As urbanisation intensifies and demand for timber products escalates, the market's operations significantly stress local ecosystems, socio-cultural dynamics, and economic structures. Therefore, this study assessed the social and environmental impact of Bodija plank market to proffer sustainable mitigation measures for the identified impacts.

MATERIALS AND METHODS

Study Area

The study was conducted in Bodija plank market (established in 1970) in Ibadan North Local Government Area of Oyo State. It is geographically situated on Longitude $3^0$54'56" E and $3^0$55'12" E and Latitude $7^0$26'2" N and $7^0$26'16" N (Figure 1) and covers about 0.12 km^2 of land (Ajewole and Fasoro, 2013). It is divided into nine zones, with 144 sheds in each zone (Aremu *et al*., 2015). Ibadan has an average rainfall of about 1150-1250 mm with two notable seasons (wet and dry), an average daily temperature of about 25-35℃ and relative humidity of about 25% almost throughout the year (Aremu *et al*., 2015; Ugege *et al*., 2020; Salami *et al*., 2021).

Data Collection and Analysis

Primary data were collected using a structured questionnaire administered to plank marketers in Bodija plank market. Five (5) zones were selected randomly out of the nine (9) zones that make up the area (Ajewole and Fasoro, 2013), ten (10) respondents were randomly selected in each zone. Thus, fifty questionnaires were administered. Secondary data were obtained from existing literature, such as peer-reviewed articles and reports. Data were analysed and summarised using descriptive statistics (percentages and charts).

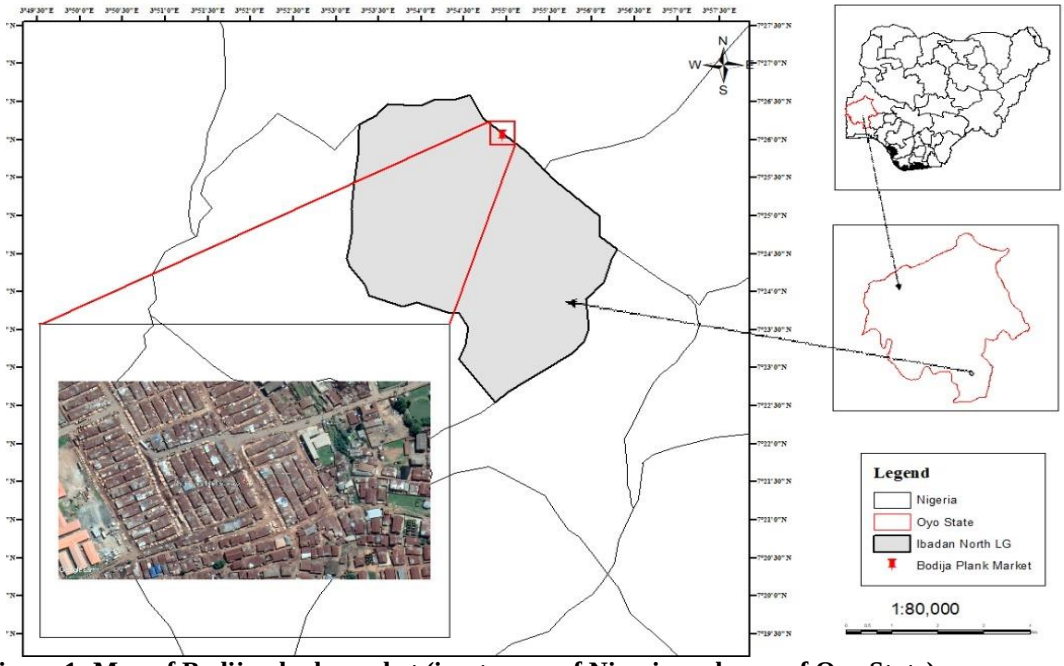

Figure 1: Map of Bodija plank market (inset: map of Nigeria and map of Oyo State)

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The socioeconomic characteristics of the respondents are presented in Table 1. Majority (90.0%) of the respondents were male, while just 10.0% were female. Most of the respondents (50.0%) were within the age bracket 41-50 years, 22.0% were within 31-40 years, 20.0% were within 20-30 years, while age bracket <20 and >50 years accounted for 4.0% each of the respondents. 76.0% of the respondents were married, while 14.0% were single, and 6.0% and 4.0% were widowed and divorced, respectively. The dominant religion was Islam, which accounted for 56.0% of the respondents. 36.0% practise Christianity, 6.0% practise African Traditional Religion (ATR), and 2.0% practise other religion(s). As for the household sizes of the respondents, 1-3 persons, 4- 6 persons, 7-9 persons and > 9 persons recorded 24.0%, 20.0%, 38.0% and 18.0% respectively. 96.0% were Yorubas, while just 4.0% were Igbos. Furthermore, 18.0% of the respondents had no formal education, 36.0% had primary school education, 42.0% had secondary education,and 4.0% studied up to the tertiary level. Also, 20.0% of the respondents have been in the sawing business for 1-5 years, 44.0% for 6-10 years, 24.0% for 11-20 years, and 12.0% of them have been in the business for over 20 years.

Table 1: Socioeconomic characteristics of respondents at Bodija plank market

Demographic Characteristics	Frequency (n=50)	Percentage (%)
Sex		
Male	45	90.0
Female	5	10.0
Age		
<20 years	2	4.0
20 – 30 years	10	20.0
31 – 40 years	11	22.0
41 – 50 years	25	50.0
> 50 years	2	4.0
Marital Status		
Single	7	14.0
Married	38	76.0
Widowed	3	6.0
Divorced	2	4.0
Religion		
Islam	28	56.0
Christianity	18	36.0
ATR	3	6.0
Others	1	2.0
Household Size		
1-3 persons	12	24.0
4-6 persons	10	20.0
7-9 persons	19	38.0
> 9	9	18.0
Mother Tongue		
Yoruba	48	96.0
Igbo	2	4.0
Level of Education	9	18.0
No formal education	18	36.0
Primary education	21	42.0
Secondary education	2	4.0
Tertiary education	10	20.0
Number of Years in the Business	22	44.0
1-5	12	24.0
6-10	6	12.0
11-20		
>20		

Respondents response on Background Information of the study area

The respondents were asked to react to some statements to ascertain the study area's previous state before the plank market's establishment (Table 2). 70.0% of the respondents agreed that the forest resources of the study area were rich in its early days, while 30.0% were undecided. 70.0% and 30.0% agreed and were undecided respectively that the study area's wildlife resources were rich in its early days. When asked if rare/endangered species were peculiar to the area in its early days, 60.0% agreed, while 40.0% were undecided. 56.0% agreed that the area's climate before the sawmill establishment was normal, while 44.0% were undecided. 10.0% disagreed, 44.0% agreed, and 46.0% were undecided on if the nature of water bodies before plank market establishment was undisturbed. 76.0% and 24.0% agreed and were undecided that deforestation occurred

during the plank market establishment. The respondents were asked the types of animals and tree speciesfound in this area before its establishment. The animals mentioned were monkeys, giant rats, cane rats, snakes, and squirrels while the tree species were *Ficus exasperata*, *Terminalia ivorensis*, *Accacia* spp, *Ceiba pentandra, Treculia africana, Parkia biglobosa, Daniella oliveri, Vitellaria paradoxa* and *Azadirachta indica*.

Table 2: Response of respondents to some background statements regarding Bodija plank market

Statements	D (%)	UN (%)	A (%)
Forest resources of this community were rich in its early days	0(0.0)	15(30.0)	35(70.0)
Wildlife resources of this community were rich in its early days	0(0.0)	15(30.0)	35(70.0)
There were rare/endangered species peculiar to this area in its early days	0(0.0)	20(40.0)	30(60.0)
Climate nature of the area before the sawmill establishment is normal	0(0.0)	22(44.0)	28(56.0)
Nature of water bodies before sawmill establishment is undisturbed	5(10.0)	23(46.0)	22(44.0)
Deforestation activities took place in the process of sawmill establishment	0(0.0)	12(24.0)	38(76.0)

Note: D = Disagree; UN = Undecided; A = Agreed

Positive Impacts Identified

Employment Creation and Income Generation

The presence of the plank market in Bodija has generated a source of employment for hundreds of individuals directly or indirectly. The running of a plank market requires labour, usually provided by individuals living within the town. The buying and selling activities of plank and wood wastes have become a source of income for many. According to Alawode and Jimoh (2021), 58% of the respondents reported monthly earnings ranging from ₦10,000 to ₦60,000. Additionally, 31% indicated earnings between ₦60,001 and ₦110,000, while 7% reported incomes falling between ₦110,001 and ₦160,000. Only 4% of all respondents reported earnings above ₦160,000 monthly. The lowest monthly income recorded from sawn wood sales was ₦10,000, while some participants earned as much as ₦300,000, with the average income calculated at ₦69,830.

Socioeconomic Development

The plank market has paved the way for improved infrastructural development around Bodija area. Electricity, road network, schools, health centres and other infrastructures have improved. Olatunji *et al*. (2021) identified Bodija as one of the localities with the most facilities in Ibadan metropolis. Respondents' perception of the socioeconomic impact of the area is shown in Figure 2.

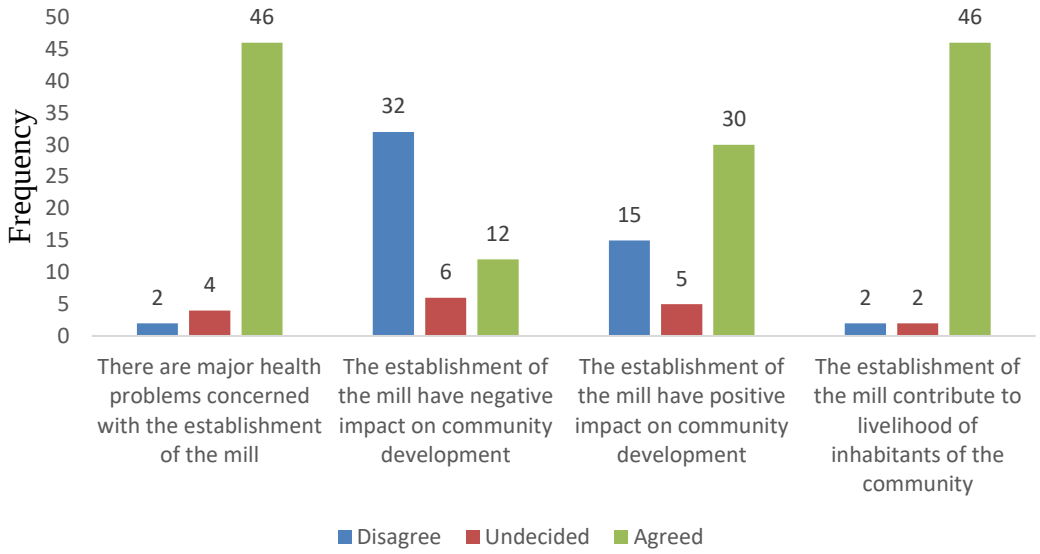

Figure 2: Respondents perception on the socioeconomic impacts of the market on the community

Provision of Market for Supply of Building Materials

The presence of Bodija plank market has made it possible to regularly supply large quantities of logs sourced locally within Ibadan metropolis. It is one of the biggest plank markets in Southwestern Nigeria. Aremu *et al*. (2015) noted that African teak (Milicia excelsa) is the major sawn wood sold in Bodija market. This was followed by white Afara (Terminalia superba). This implies that Bodija market is a complete sawn wood market where sawn wood buyers can get different types of sawn wood of several species they may want.

Livelihood Improvement

The presence of the plank mark*et al*lows for the improvement of the livelihoods of those generating income. A regular source of income helps them to have a better life. 24.0% of the respondents in this study had a household size of 1-3 persons, 20.0% had 4-6 persons, 38.0% had 7-9 persons, and 18.0% had above nine (9) persons. This implies that the business activities at Bodija plank market serve as an essential means of meeting family needs. This result conforms with the observation of Sekumade and Oluwatayo (2011), who noted that the wood-based industries have contributed to the economy of Nigeria and, by extension, the livelihood of many people.

Negative Impacts Identified

Continued Source of Raw Materials

The presence of the plank market implies the continuous exploitation of the forests within and outside Oyo State. The indiscriminate removal of trees from the environment has catastrophic consequences. The findings of Aremu *et al*. (2015) revealed that the six southwestern states of Nigeria are the major wood sources. This may be because of the abundance of rainfall and heavy forests throughout the year in all six states.

Loss of Biodiversity

Flora and fauna were lost during the study area's establishment. The existence of a plank market will automatically threaten the existence of many tree species. The respondents confirmed that deforestation occurred when the area was to be established and noted the presence of some flora and fauna species before establishing the area (Table 2). The results highlight significant environmental concerns associated with urban development and commercial activities. Several authors have mentioned that urban development is usually at the expense of environmental well-being (Antharvedi, 2007; Matlock and Lipsman, 2020; Tyagi *et al*., 2023).

Noise Pollution

The running of heavy machines and generators generates noise, which constitutes noise pollution. Sridhar and Omokhodion (2017) examined the noise levels in markets situated in Ibadan. They found that the plank section of Bodija market (the study area), the largest market in the city, exhibited the highest noise levels recorded at 88.13 dB. Additionally, the study noted that these noise levels surpassed the acceptable limits. The respondent's perception of the noise level in the study area is shown in Figure 3. All the respondents agreed that the plank market establishment contributes to the environment's internal and external noise levels. The majority also agreed that vibrations from the mill affect humans in the environment and disagreed that the noise from the sawmill is pleasing to the ear.

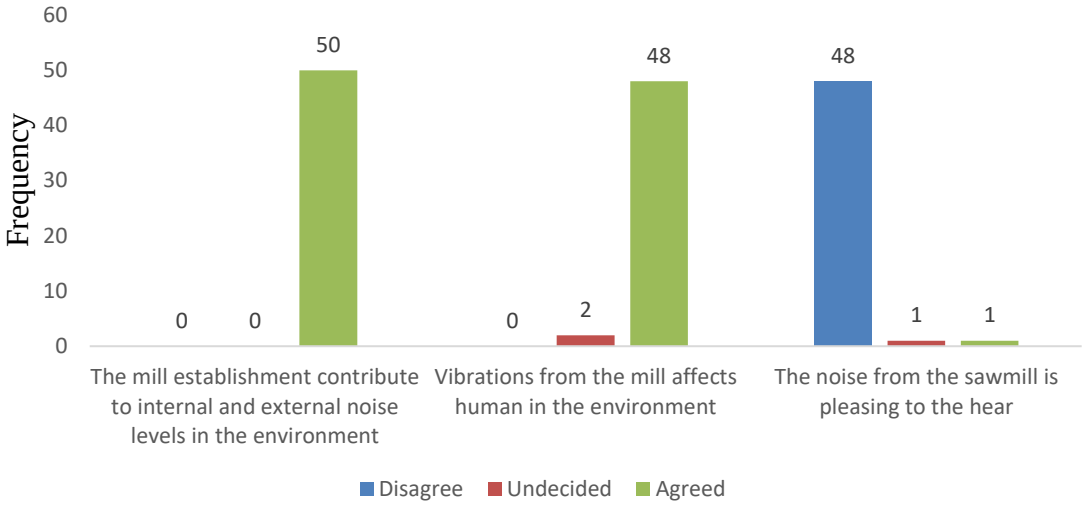

Figure 3: Respondents perception on the noise level in the study area

Atmospheric Pollution

The release of harmful gases like carbon monoxide from machinery exhaust contributes to air pollution, leading to a decline in air quality in the vicinity. According to a study by Oladejo *et al*. (2020) on air quality in Bodija, variations in PM2.5 levels between dry and wet seasons were noted. During the dry season, PM2.5 concentrations exceeded World Health Organization (WHO) and National Ambient Air Quality Standards (NAAQS) standards, ranging from 47.9µg/m^3 to 231.88µg/m^3 in the morning and 65.17µg/m^3 to 1806.33µg/m^3 in the afternoon. Elevated PM2.5 levels observed in the market area adversely affect the health of workers and pedestrians, causing symptoms like sneezing, eye and throat irritation, headaches, and potential internal organ damage from prolonged exposure. Figure 4 illustrates respondents' perceptions of atmospheric pollution.

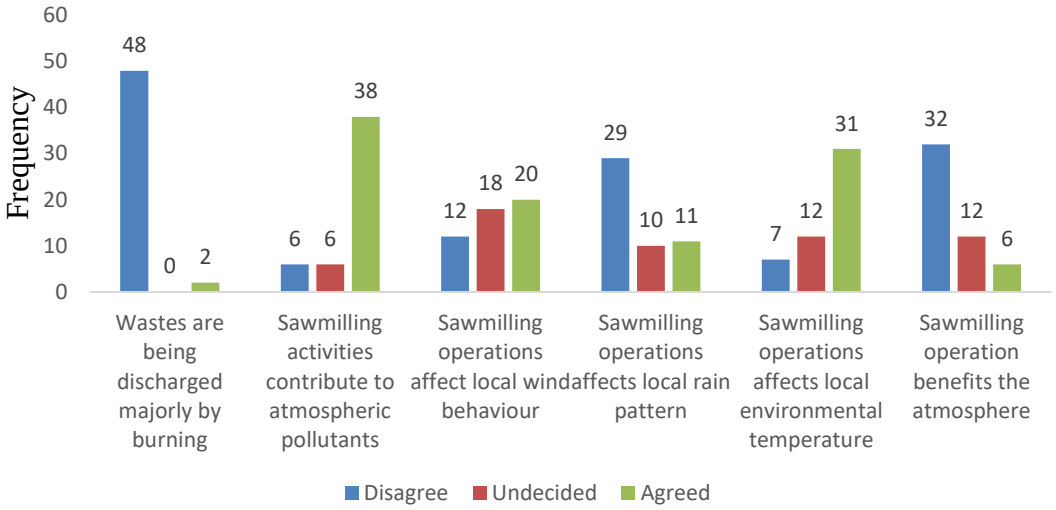

Figure 4: Respondents' perception of atmospheric pollution in the study area

Water Pollution

In the study area, liquid and solid waste are being disposed into nearby water channels. Figure 5 shows the respondents' perception of water pollution in the study area. The majority agreed that wastes are being discharged into water bodies, the structure and its operation affect the quality and quantity of water bodies, and the structure and operation affect the existing water surface. In contrast, the majority disagreed that structure and operation contribute positively to water bodies. This shows significant environmental concerns and potential health hazards for the community and ecosystem. Respondents' perception underscores a general awareness of the adverse effects of waste disposal on water quality and quantity. Such pollution can lead to the contamination of water sources, affecting aquatic life and endangering the health of individuals who rely on these resources for drinking, cooking, and other daily activities (Pandey, 2006; Bashir *et al*., 2020).

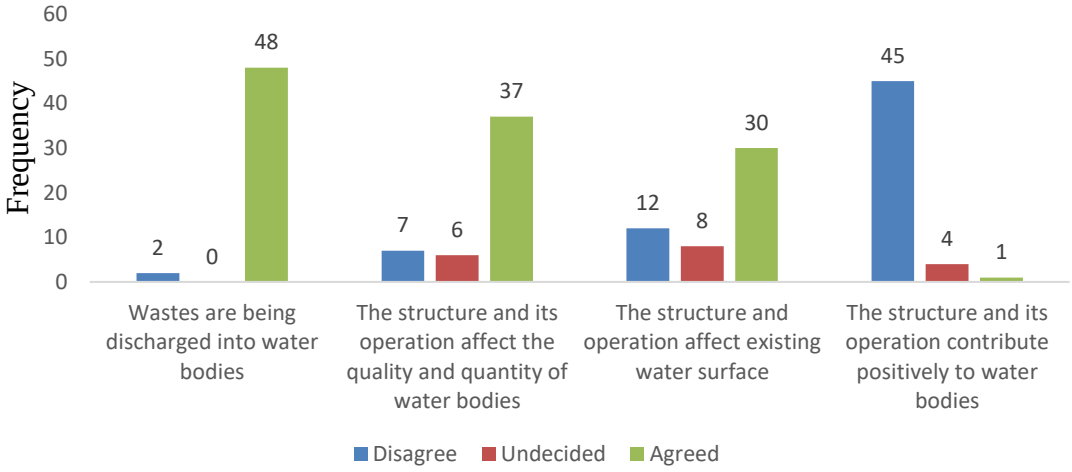

Figure 5: Respondents' perception of water pollution in the study area

Soil Pollution

The infiltration of heavy chemicals from machinery into the soil constitutes a significant source of soil pollution in the study area. The respondents' view on soil impact in the study area is shown in Figure 6. The findings highlight the urgent need for effective soil management practices to mitigate pollution and safeguard environmental and human health. Soil pollution can have far-reaching consequences, including contamination of groundwater resources and adverse effects on biodiversity (Gupta *et al*., 2019). Most respondents' recognition of soil pollution highlights the importance of integrating environmental education and awareness campaigns into local initiatives to promote sustainable development. Empowering community members with knowledge about the sources and impacts of soil pollution can foster a sense of responsibility and encourage participation in efforts to address environmental challenges. Contaminated soil risks public health by accumulating toxins in food crops and residents' potential exposure to harmful substances (Okoronkwo *et al*., 2011).

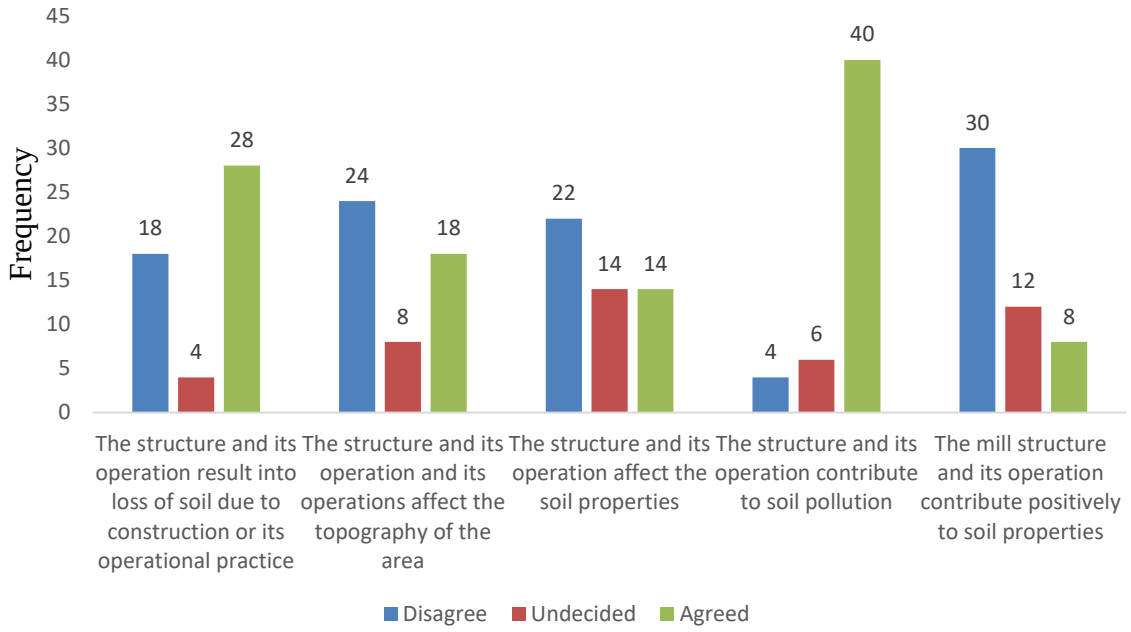

Figure 6: Respondents' perception of soil impacts in the study area

Improper Waste Disposal

Solid and liquid wastes are not properly disposed of in the study area. However, there have been improvements in the method of waste disposal. In the past, sawdust used to be burnt, which constituted severe atmospheric pollution. A nearby primary school petitioned the Oyo State Ministry of Environment, eventually banning the study area from burning sawdust. Sawdust is now being sold, but some are still disposed of improperly. Improper disposal pollutes water sources and contributes to soil contamination and the proliferation of disease vectors (Pedley and Howard, 1997). A report by the World Health Organization (WHO, 2018) highlights the adverse effects of improper waste management on public health, citing increased risks of waterborne diseases, respiratory ailments, and exposure to hazardous chemicals. The accumulation of organic and inorganic waste materials in the market area degrades environmental quality and poses occupational hazards to market vendors and residents.

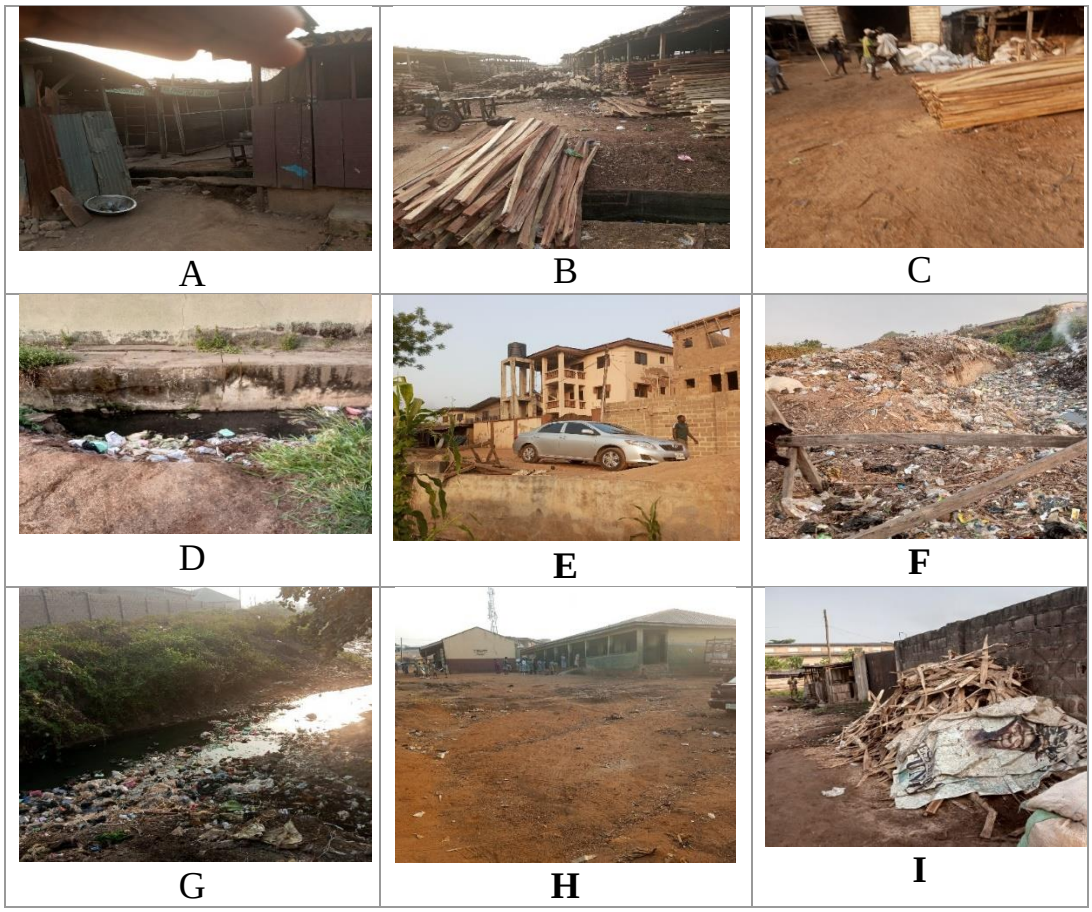

Plate 1: A – a food canteen at Bodija plank market; B – planks of different dimensions at Bodija plank market; C – bagged sawdust for sale/disposal at Bodija plank market; D - stagnant and contaminated water at Bodija plank market; E – residential buildings close to Bodija plank market; F – improper waste disposal at Bodija plank market; G – a contaminated water channel near Bodija plank market; H – a primary/basic school near Bodija plank market; I – wood offcuts for sale/disposal at Bodija plank market.

Mitigation Measures to the Negative Impacts

Mitigative measures refer to the strategic process of identifying, assessing, and addressing the negative effects of a project, activity, or development on social and environmental aspects (Marshal, 2001). In other words, mitigative measures are essential to sustainable development, emphasising the need to balance economic growth, social equity, and environmental conservation (Sathaye *et al*., 2007). In the Bodija plank market context, mitigative measures aim to preserve the community's well-being while safeguarding the environment against detrimental effects from plank market operations. The following mitigation measures for the identified negative impacts are thus provided:

Continued Source of Raw Materials

The impacts of continued source of raw materials associated with Bodija plank market can be mitigated in the following ways:

- Promoting sustainable forestry practices and responsible sourcing of timber is paramount.
- Implementing strict regulations and monitoring mechanisms to ensure that timber comes from sustainably managed forests can help reduce the market's ecological footprint.

- Encouraging the adoption of alternative materials such as bamboo or recycled wood products can diversify sourcing options and lessen dependence on traditional timber.
- Investing in community-based forestry initiatives and agroforestry programmes can provide alternative livelihoods while conserving forest resources.

Loss of Biodiversity

The impacts of biodiversity loss associated with Bodija plank market can be mitigated in the following ways:

- Promoting habitat conservation and restoration efforts in collaboration with local communities and conservation organisations to help restore degraded areas and create wildlife corridors.
- Implementing strict regulations against illegal logging and unsustainable harvesting practices is crucial to prevent further habitat destruction.
- Encouraging the use of certified sustainable timber and promoting the adoption of alternative materials can reduce pressure on natural habitats.
- Raising awareness among market stakeholders about the importance of biodiversity conservation and their role in preserving ecosystems is essential.

Noise Pollution

To mitigate the effects of noise pollution in Bodija plank market, the following strategies can be implemented:

- Installing sound barriers or acoustic panels around the market perimeter can help contain noise within the premises and minimise its propagation to surrounding areas.
- Implementing regulations restricting noisy activities during certain hours or designing specific zones for loud machinery can help mitigate noise disturbances.
- Investing in noise-reducing technologies for machinery and equipment used within the market can significantly lower overall noise levels.
- Encouraging traders to use quieter equipment and providing incentives for adopting noise mitigation measures can promote voluntary compliance.
- Raising awareness among market stakeholders about the harmful effects of noise pollution and the importance of sound management practices is essential.
- Establishing a mechanism for regular monitoring and enforcement of noise regulations can ensure compliance and effectiveness of mitigation measures.

Atmospheric Pollution

The effects of atmospheric pollution in Bodija plank market can be mitigated in the following ways:

- Implementing emission control technologies on machinery such as particulate filters and catalytic converters can significantly reduce pollutant emissions.
- Promoting cleaner-burning fuels or alternative energy sources, such as natural gas or solar power, for powering machinery and equipment can further mitigate atmospheric pollution.
- Enforcing regulations to limit the use of high-polluting equipment and incentivising adoption of environmentally friendly practices can also contribute to pollution reduction efforts.
- Conducting regular maintenance and tuning of machinery to optimise performance and minimise emissions is essential.
- Implementing monitoring systems to track air quality levels within and around the market can provide valuable data for assessing mitigation measures' effectiveness and identifying improvement areas.

- Educating market stakeholders about the health impacts of atmospheric pollution and the importance of pollution control measures is crucial for fostering a culture of environmental responsibility.
- Engaging with local authorities and environmental agencies to develop and enforce air quality standards can ensure compliance and accountability.

Water Pollution

To mitigate the effects of water pollution in Bodija plank market, the following strategies can be adopted:

- Implementing proper waste management practices within the market can help capture pollutants before they enter waterways.
- Enforcing regulations to prevent the direct disposal of waste materials into drains or water bodies and promoting proper waste disposals techniques, such as recycling and adequate landfilling, can significantly reduce the risk of water contamination.
- Promoting eco-friendly alternatives to hazardous chemicals and adopting best management practices among market vendors can minimise the risk of water pollution.
- Educating market stakeholders about the importance of protecting water resources and the potential consequences of water pollution is essential for fostering a culture of environmental stewardship.
- Collaborating with local authorities, environmental agencies, and community organisations to develop and implement water quality management plans can ensure a coordinated approach to pollution prevention and response.

Soil Pollution

To mitigate soil pollution, the following proactive measures can be adopted:

- Implementing proper waste management practices within the market, including segregating waste streams and establishing designated disposal areas, can help prevent soil contamination.
- Enforcing regulations to prevent the indiscriminate dumping of waste materials and promoting the use of environmentally friendly packaging materials can minimise soil pollution risk.
- Promoting the use of organic waste composting and recycling programmes within the market can help reduce the generation of waste materials and prevent the accumulation of organic matter in the soil.
- Educating market stakeholders about the importance of soil conservation and the potential consequences of soil pollution is essential for fostering a culture of environmental responsibility.

Improper Waste Disposal

To mitigate improper waste disposal, the following measures are essential:

- Implementing waste segregation at the source within the market premises can facilitate the separation of recyclable materials, organic waste, and hazardous substances from general waste streams.
- Providing adequate waste collection infrastructure, including bins for different waste categories and regular collection services, can help ensure proper disposal and prevent littering within the market area. Educating market vendors and patrons about the potential environmental and health impacts of responsible waste management practices and improper disposal is crucial for fostering behaviour change.
- Establishing partnerships with local waste management authorities or private waste collection services to facilitate proper disposal and recycling of waste materials can help improve overall waste management efficiency.

- Implementing penalties or fines for littering and improper waste disposal can deter and encourage compliance with waste management regulations.

CONCLUSION

The study area has impacted the environment positively and negatively. It has impacted the environment from both the ecological and socioeconomic points of view. The activities in the study area significantly impact the area's socioeconomic development and the people's livelihoods. On the other hand, it has led to noise, air, water, and soil pollution, among others. If the mitigation measures are implemented, the study area's negative impact will be drastically reduced.

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