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EFFECTS OF ARTISANAL MINING ON LAND DEGRADATION IN ZAMFARA NORTH-WEST, NIGERIA

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Abstract

This paper analyzed the effects of artisanal mining on land degradation. It took critical look on both legal and illegal mining activities in the study areas and their level of devastated effects on land texture and structure over space. The method implored is both probability and non-probability approaches. The purposive targeted populations for the study were licensed and unlicensed small scale gold mining operators in the study areas, with a sample population of 100 person, and types of data used is both primary and secondary sources. Data was analyzed using descriptive statistic and frequency chart that indicated major challenges was illiteracy 31% and lack of coordination among miners 23%, major effect of land degradation was water pollution and deforestation had 30% and 23% respectively, and effects of artisanal mining on land degradation was degradation of arable land had 20% and exposing the soil to wind and chemical had 18%. It had a serious implication on ecosystem. The paper concluded that artisanal mining of mineral ores had caused serious damages on the land resources both soil and rivers. Therefore, to ensure sustainability in mining activities and to secure a quality environment, the following recommendations are hereby suggested, Educating local miners on the dangers of open cast mining and grinding of gold ore using the same

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grinder for grains to be consumed and Policy makers should avoid politicizing vital issues that will threaten peace and security of people in Zamfara and its environs.

Keywords: Effects, Licensed, Unlicensed Artisanal Mining, Land-degradation

INTRODUCTION

Nigeria is one of the countries in the sub-Saharan Africa where mining formed vast spring of export prior to oil boom in the 70s up to this present dispensation (Abel & Ponsak, 2024). It had been noted that a sustained solid mineral industry provides a pathway for the swift economic development of Nigeria through the generation of employment and improved national income earnings at levels higher than the petroleum industry (Onwuemenyi, 2016). Nigeria is endowed with mineral deposits across its geographic space which remains a major attraction for informal and conventional mining activities which is impeding the large scale exploration of the identified mineral resources. However, due to oil boom of 70s, national interests in mining started to decline causing sporadic informal, uncoordinated and unregulated mining activities across the length and breadth of the Nigeria (Edwards *et al.*, 2014). Artisanal mining is generally a small-scale practice where the basic tools and manual labor are generally used for excavation of minerals (Canavesio, 2014). Artisanal mining activities use informal mining procedure, which causes severe environmental disturbances. These informal mining activities are characterized by low productivity, inadequate of capital, poor technology, hazardous working conditions, land degradation and environmental pollution (Emel, *et al* 2011). In mining of minerals such as gold, limestone and iron ore, open cast method of mining is used in Zamfara, Nigeria. This destroys the top layer of the soil and the soil profile as well as ecosystem. This method also generates material debris called overburden which is filled on the land that reduces the quality of the land (Nosike, 2004). Also, the ecological problems emanate from the activities of artisanal and small scale mining types, the effects consist of toxic pollution of air, degradation of arable land, habitat loss, and contamination of water resources (Wulyer, 2011).

Artisanal mining in Zamfara is associated with a number of environmental effects. This include land degradation that involved cutting down of trees (deforestation) during land clearing operation, burrow pits on the land which poses grave threat to both man and

animals, heavy metals contamination of land (water and soil) and dust that pollute the air (Ako, 2014). Therefore, this paper analyzed the effects of artisanal small scale mining in Zamfara on land degradation.

Concept of Artisanal Mining methods in Zamfara, Nigeria

Mining is one of the oldest industries in Zamfara state, which started since 1945 by the German. It is one of the leading industries in the state, and has contributed a lot in the socio-economic development of the state. The state has high reserves of solid minerals including gold, copper, zinc etc. The Zamfara solid minerals deposits occur in alluvial and eluvia places and primary vein from several parts of the schist belt in the state. The most important occurrences are found in Maru and Anka areas. After the discovery of solids mineral deposits, many methods have been used to extract them. At the beginning open cast method was normally used. This method was the most destructive form of mining. In areas where it was extensively practiced, it left a present legacy of disturbed land. Since the inception of mining in Zamfara state, illegal mining has continued to dominate mining in the state as it accounts for 90% of solid minerals mining in the state. Minerals commonly mined include gold, limestone and gypsum. Many illegal mine sites have been identified in the state with several thousands of people directly involved. However, the artisanal miners in Zamfara extract the mineral ore using rudimentary tools like diggers, pick axes and hammers. The mineral ore is carried to the mineral processing site, where it is then crushed into smaller aggregates by mainly women and children using hammer or mortar and pestle. Also, the crushed lumps are then pulverized using a locally fabricated grinding mill (Fig.4). Gold is separated from other minerals/impurities in the sluice boxes (Fig.5). The gold concentrate collected from the sluice boxes is further re-concentrated by panning (Fig.6). Gold is then separated from this concentrate by amalgamation using Hg (Fig.7).

Fig. 2: Artisanal gold mining pit

Fig. 3: Breaking of gold mineral ore into pieces

Fig.4: Locally fabricated grinding mill

Fig.5: Panning of gold to reduce impurities

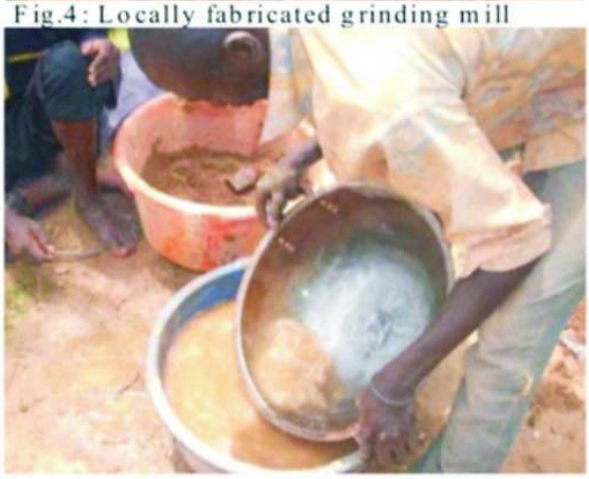


Fig.6: Separating techniques of gold after mercury amalgamation

Fig.7: Burning of mercury amalgam to evaporate mercury leaving gold nugget

Source: Author, 2024

MATERIAL AND METHODS

Zamfara state can be found in north western Nigeria on latitude of 12°18'44" N and longitude 6°23'76"E of Greenwich meridian. The state was created on the 1st October 1996 from Sokoto state. Zamfara has two major ethnic groups, Hausa and Fulani with an estimated population of 5,833,500 as at 2022 (National Bureau of Statistics, 2022).

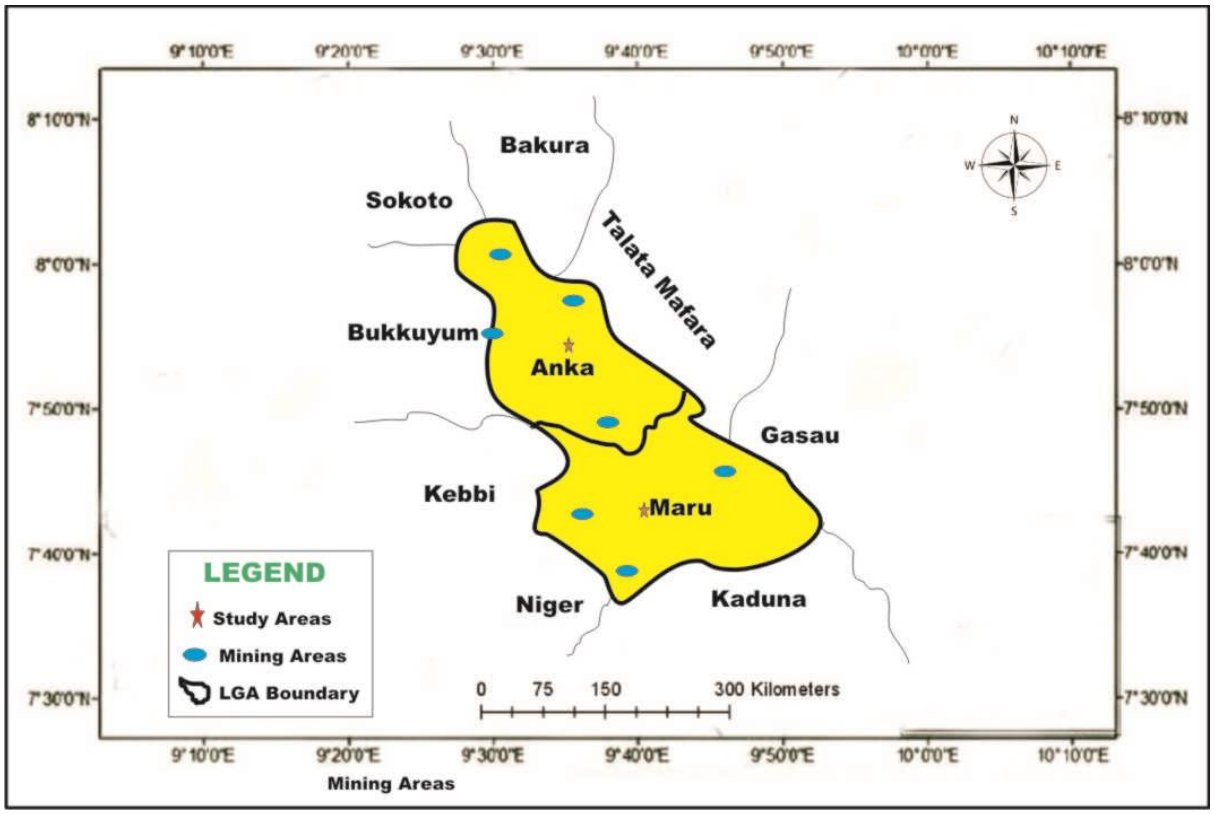


Figure 8: The Study Area, 2024

Using Nigeria population increase index of 1.8 births rate. The predominant religion is Islam. And the people are mostly farmers. Mineral resources: Iron ore, alluvial Gold, Chromate, Clay, Limestone, Quartz and Kaolin. Agricultural resources: Maize, Ground nut, Tobacco, Beans, Wheat, Rice, Cotton, Guinea corn, Livestock farming. The point of interest: Kiyawa city walls, Kalale Hippopotamus pond, Kuyanbana Game Reserve, Kwartarkwashi rock/ water spring, Sambo Dan Ashafa's tomb, Emir of Anka's palace, Ruins of Yargoge's court at Kuyanbana, and Zamfara state History bureau Museum.

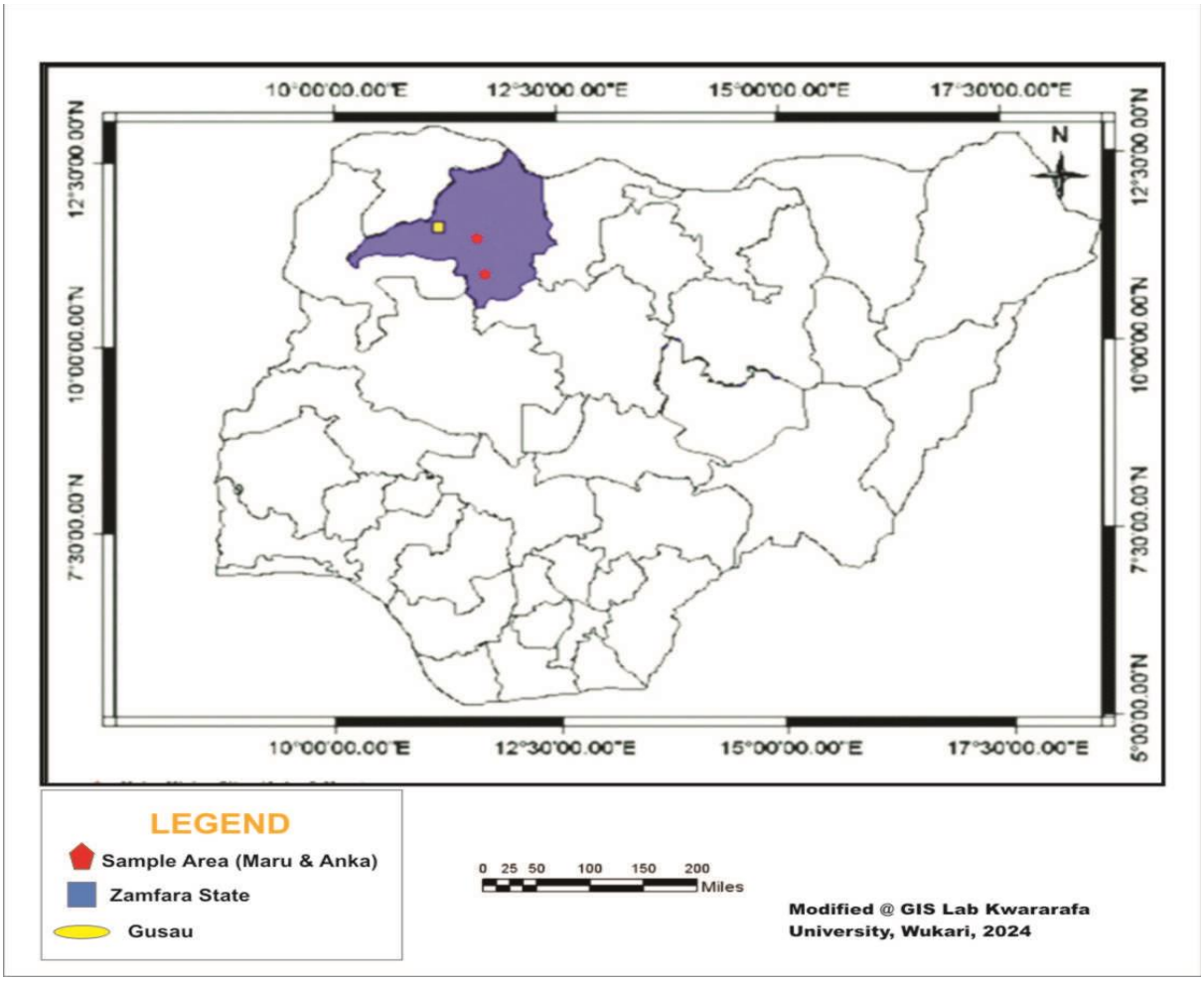


Figure.9: Map of Nigeria showing Zamfara State

The case study approach was adopted for this study with both probability and non-probability approaches. According to DTM R2 list of wards assessed report, Zamfara (Anka and Maru) has a number of individuals of 30,651. Purposive targeted populations for the study were licensed and unlicensed small scale gold mining operators in the Maru and Anka areas of Zamfara state. The total population of 10 licensed small scale miners was taken as potential respondents and 90 unlicensed miners were identified for the interview and focus group discussion. The illegal nature of some activities of the miners made a larger sample size impossible. Although 100 potential respondents agreed to participate in the interview the response rates of, licensed and unlicensed units turned out to be 10 % and 90 % respectively. This is not surprising as the unlicensed units are usually suspicious of visitors by virtue of the fact that they operate undercover. After identifying the leaders of the legal and illegal units, snowballing approach was applied for data collection.

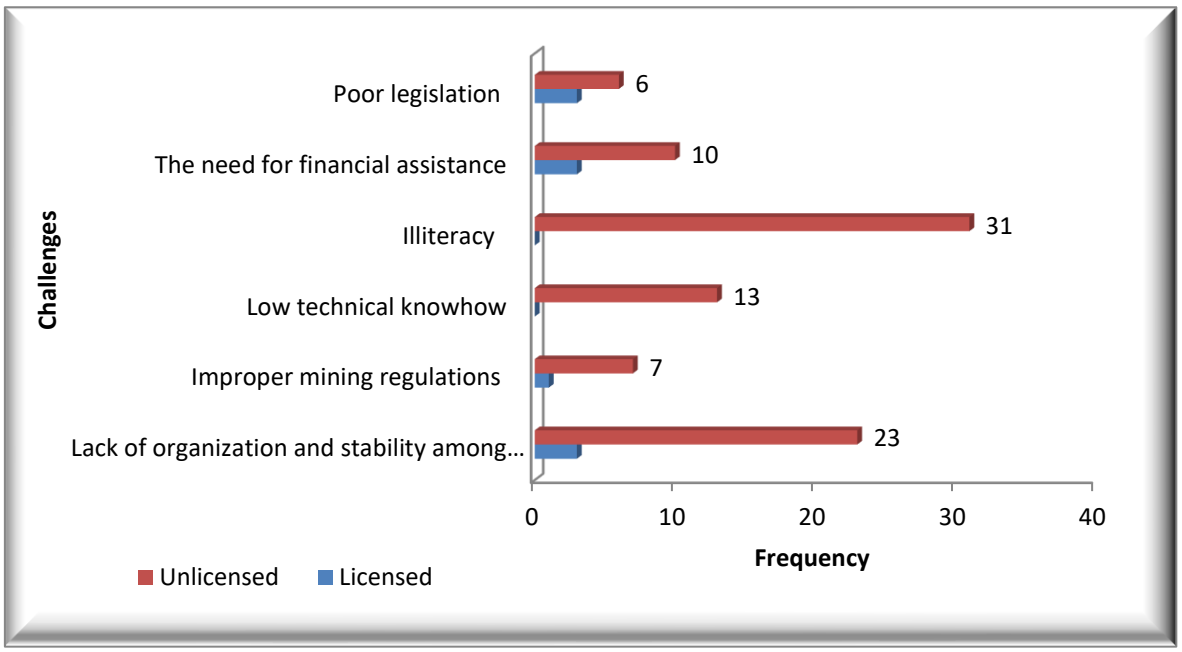
However, most of the documented information on the effects of the artisanal mining activities in zamfara was on human health hazard (UNEP/OCHA 2010; Azubike, 2011; Galadima and Garba, 2012; Majiya *et al.*, 2015; Mustapha, 2018).

RESULTS AND DISCUSSION

Mining is undertaken by legal and illegal miners also known as "Galamsey" operators. The former pertains to licensed mining firms that have acquiescence from the State to function as miners. The ends do not have any authorize to operate as miners, so they mine undercover. Usually they are the center of State crackdown maneuvers which have not succeeded in receiving them out of work.

Challenges of Licensed and Unlicensed Miners

There are both male and female licensed miners interviewed, comprising 9% and 1% respectively and unlicensed miners, comprising 85% and 5% respectively. This implies that mining is a male dominated in all the enterprise. In terms of illiteracy level unlicensed made up 31% of the miners, lack of stability and challenges are 23% and the least is improper mining regulation with 8%. All this constitutes some major challenges in the study areas as shown in figure 9 below.

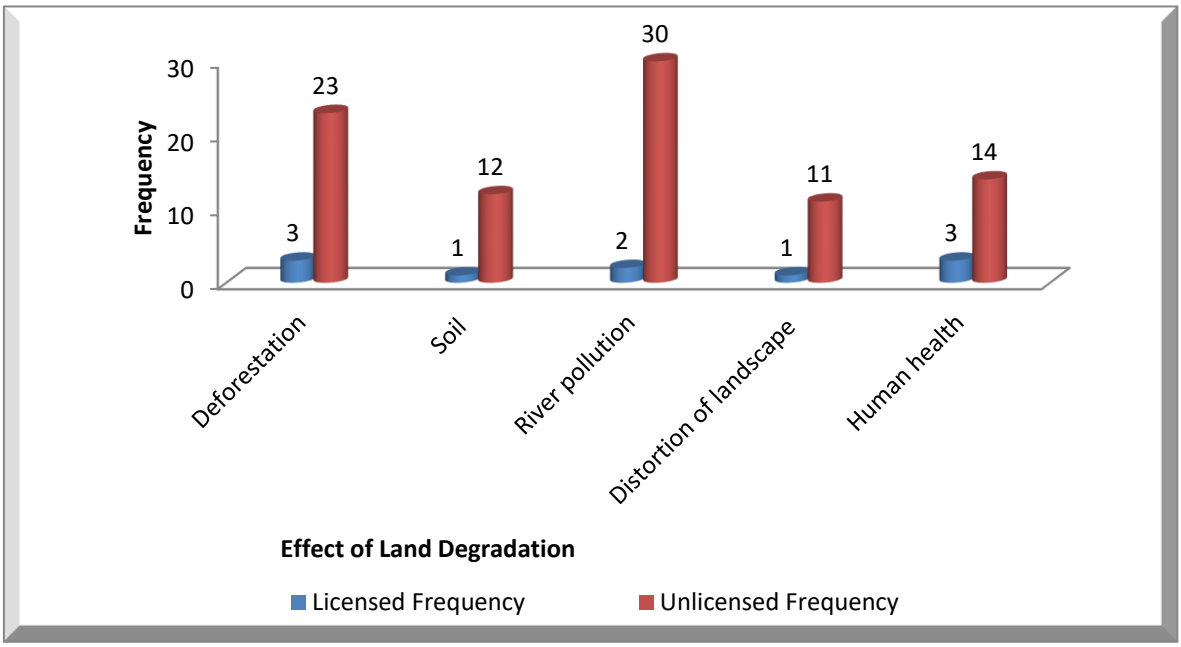


Source: Author, 2024

The above challenges implies that both government and NGO's should come together and restructure the system through involving all parties and support them financially and modern mechanism to easy the workforce and minimized clashes between licensed and unlicensed miners.

Land Degradation of Licensed and Unlicensed Miners

Figure 10 below show that water pollution was the major problem in the study area. This constitute 32% of the devastated effect on land, followed by deforestation activities with 26% and least was distortion of landscape with 12% as shown below.



Source: Author, 2024

The clearing of the site for mining activities has resulted in deforestation. Large amount of vegetation has been destroyed and this exposes the soil to erosion and renders it unfit for crop production (Figure 11a). The degree of deforestation can be evaluated if compared to the adjacent area which was not affected by the mining activities (Figure 11b). Aigbedion and Iyayi (2007), have reported a similar situation in which large amount of vegetation was stripped due to the open cast mining in Jos Plateau. This virtually changed the landscape of the area, which is today vast open grassland. Also, Tolulope (2004) reported a similar case of vegetation loss particularly in the Niger Delta areas where oil spillage has equally

affected the growth of vegetation. In the affected areas, the removal of vegetation caused the elimination of some plants and the exodus of some animals that feed on such plants or depend on them for cover.

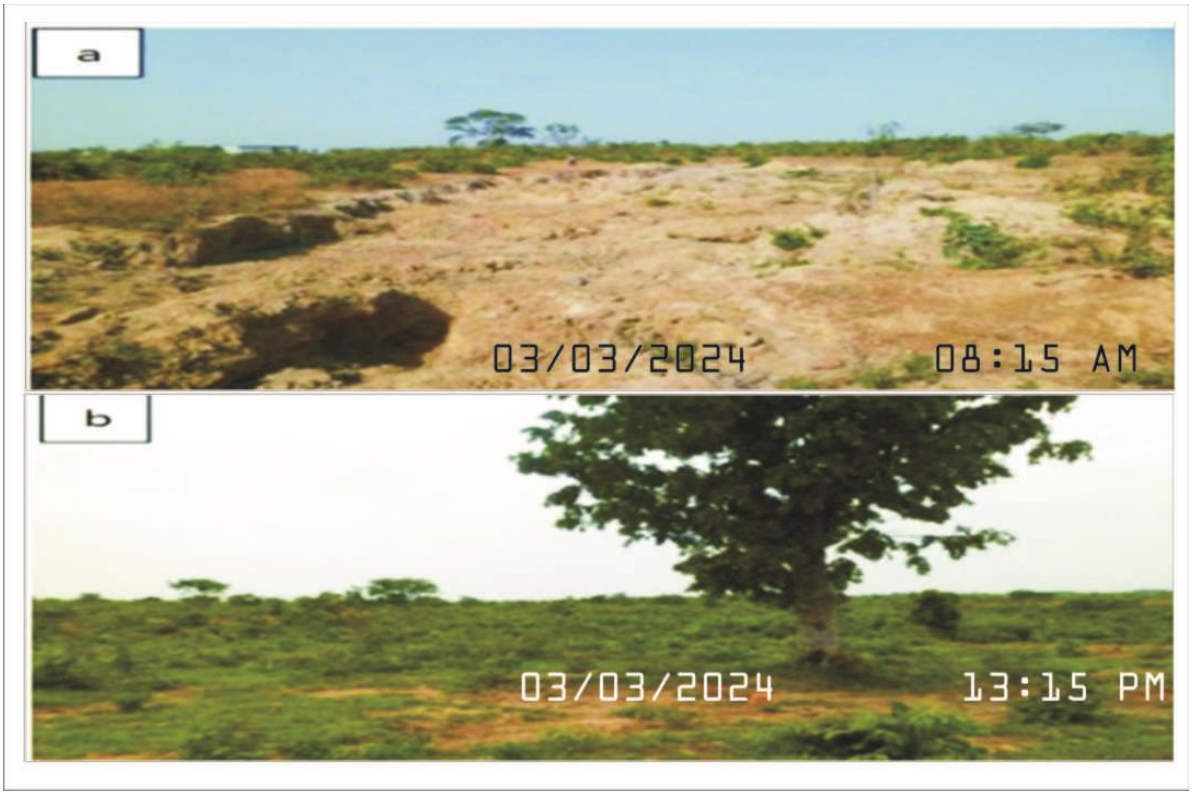
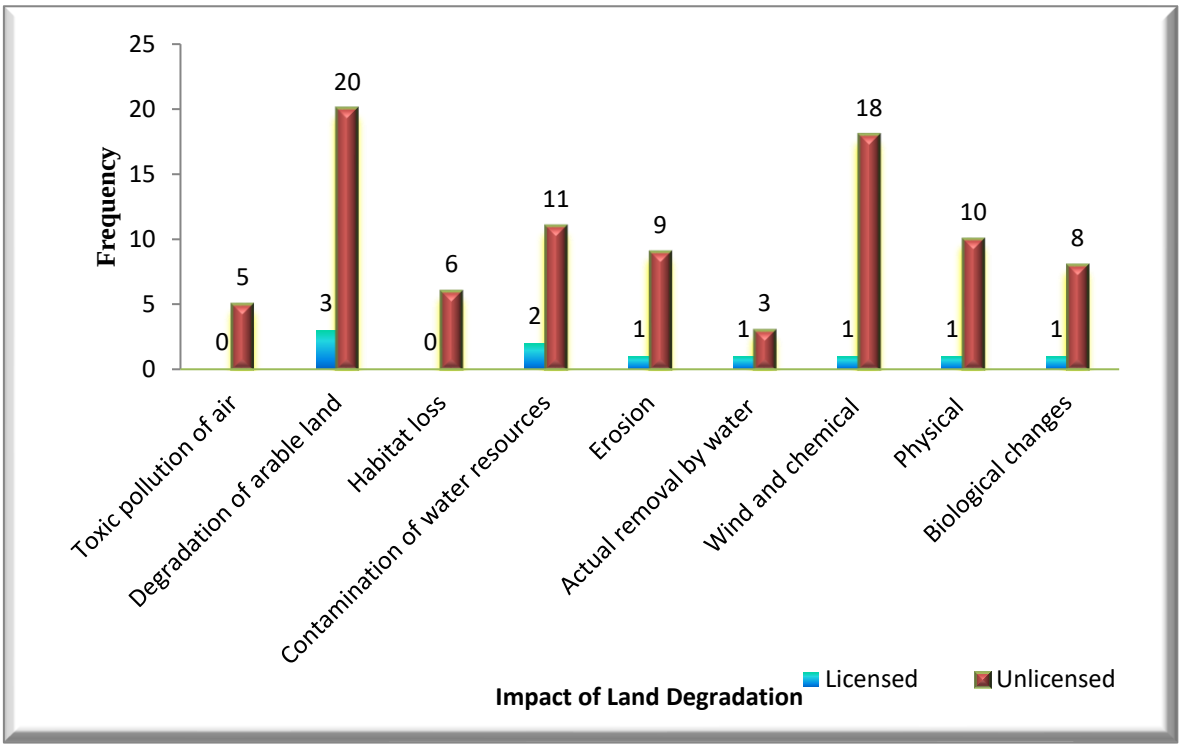


Figure 12: Photograph showing the effect of loss of vegetation on land (a) as compared to an adjacent area that was not affected by the mining activities (b)

Effects of Artisanal Mining on Land Degradation in Zamfara

Artisanal mining impose detrimental effects on the land; because the activities of these miners can be viewed negatively by governments and environmentalists, because of its potential for bringing about destruction on the land (Opafunso, 2011). Some of these menaces are: soil pollution, water pollution, loss of natural vegetation and air pollution. Most artisanal miners work in difficult and often very hazardous conditions in the absence of the required safe mining regulations to safeguard the operations (Veiga, 2003). However, Figure 12 below shows the effects on land degradation in the study areas, which degradation of arable land is the highest scores of 23 % effects, followed by wind and chemical toxication of 19 % and least is actual removal of water with 4 % effects. The

analysis had a serious effects on agricultural produce as well as human health in the areas as shown below.



Source: Author, 2024

Also, another serious effect of artisanal and small scale mining is the destruction of natural landscape of the area as result of erosion (Figure 13).

Figure 13: Photograph showing how natural landscape has been destroyed due to mining in Anka

The heaps of rock wastes and tailings generated as a result of the mining activity cannot be easily disposed of and this also leads to the destruction of the natural landscape (Figure 14). Large pits were also created as a result of the mining activity. These pits can be dead traps to both man and animals. It could also become dangerous habitat for reptiles such as snakes which can cause harm to man. Ogezi (2005), reported that on Jos Plateau where tin and columbites mining took place has resulted in the destruction of landscape and left behind over a thousand water ponds, lakes, alluvial heaps and widespread erosion. Humans and animals get drowned in such abandoned mineponds. Similarly, Salati *et al.* (2011) reported that devastation of over 1000 hectares of suitable farm lands and flooding of abandoned pits have become death traps due to artisanal mining.

Figure 14: Heaps of rock wastes and tailings generated as a result of the mining activities in Maru.

CONCLUSION

This study has discovered that artisanal mining of mineral ores in Zamfara has caused serious damages on their land resources (soil and rivers) and not only the adverse effects of mining on human health problems in zamfara that has been widely reported. Therefore, to ensure sustainability in mining activities and to secure a quality environment, for good health and well-being of the communities in the mining districts in Zamfara mitigation measures must be put in place.

Recommendations

This paper has opened up very critical issues affecting land in zamfara state as a result of artisanal mining. In view of this, the following recommendations are hereby suggested:-

1. Educating local miners on the dangers of open cast mining and grinding of gold ore using the same grinder for grains to be consumed.

2. There should be provision of alternative means of livelihood as artisanal mining have replaced farming and livestock rearing in this communities in the state.

3. Environmental protection agencies should be involve in saving the ecosystem and provision of new environmental friendly techniques to alleviate the lives of the communities affected

4. Policy makers should avoid politicizing vital issues that will threaten peace and security of people in Zamfara and its environs.

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