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(RESEARCH ARTICLE)



## Dynamics of artisanal gold mining in Gashaka local government area of Taraba State, Nigeria

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### Abstract

Despite the fact that gold has been mined in Gashaka, Taraba State for over a century and has continued to present day in the area, not much is known about this activity and its associated environmental impact in the state. This study therefore, examines the dynamics of artisanal small scale gold mining activities in Gashaka Local Government Area of Taraba State, Nigeria. The study adopted survey research design approach which involves the use of direct fieldwork observation and interview of key informants. The findings of the study reveals that alluvial gold is mined along the streams and farmlands on the floodplains in the area. The gold exists as alluvial gold dust and nugget gold. The artisanal gold mining activity is carried out with rudimentary materials such as pickaxes, diggers, shovels, spades, pans and water pumps. Some of the local mining communities are Gayam, Jamtari, Karamti, Serti, Goje, Bodel, Mayo Jim, Bashishir, Kurr and Garbabi. The 3 major methods employed by artisanal gold miners in the study area include panning method, use of locally constructed devices and picking of gold nuggets or crystals from dug pit on the floodplain. The artisanal gold miners use sulphuric acid and white mercury in purifying the collected gold. The miners do not use any protective gears such as face masks, rubber gloves, leather boots or head coverings in the mining process. All golds collected from the mining activities are sold in the town (Serti/Baruwa). There is a ready market with both local buyers residing in the town and distant buyers coming from different parts of the country. Artisanal gold mining is an important livelihood activity in the study area despite the fact that many of them are carried out illegally. Based on the findings, the study recommended the establishment of a goldsmith industry, improvement in security in the local communities and organizing the artisanal gold miners into cooperative organizations.

**Keywords:** Amalgam; Artisanal; Gashaka; Gold mining; Mercury; Small scale and Taraba State

### 1. Introduction

Gold mining is one of the oldest industry that have existed since the dawn of civilization. It has been observed that artisanal small scale mining makes up over 95% of mining activities carried out in Nigeria [1, 2]. The commonest minerals mined in the country through this small scale artisanal mining include gold, columbite, tin, tantalum, barite, gypsum, limestone, kaolin, rock aggregate, salt gemstones (such as emerald, aquamarine, and tourmaline), [3, 4].

Most of the artisanal small scale gold mining activities carried out in many developing countries such as Ghana, Indonesia and Brazil are known to still use mercury amalgamation methods, which is associated with mercury pollution of the soil, water and air thereby posing considerable risk to human health [5]. Unlike in Ghana, where many artisanal small scale gold mining exists in large number and operates side by side with large-scale multinational gold mining companies, most gold mining activities in Nigeria are artisanal in nature and are carried out by small scale miners often

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times using very old rudimentary equipment. Artisanal small scale gold mining is commonly situated near streams or rivers which provide process water and sites for mine water discharge [6].

Artisanal small scale gold mining (ASGM) is a type of gold mining activity carried out by individuals, families, or groups with little use of machines and often times illegal or informal in nature. Some of the features of ASGM include poor occupational safety and health care, inefficiency in gold recovery, exploitation of small deposits, lack of long-term mine planning, poor environmental considerations and low operational outputs that correspond to market price fluctuations.

The ASGM sector is typically undercapitalized, unorganized, and transient in nature [7]. ASGM is recorded from more than 70 countries but it mostly occurs in developing countries, where governments lack the technical and institutional capacity to provide adequate technical assistance or enforce compliance [8]. Due to the informal nature of ASGM, little is known about ASGM demography, exact production levels, inputs and outputs of operations but it is predicted that more than 15 million people are employed in the sector globally, with 100 million more directly or indirectly depending on the sector [9, 10].

Consequently, the artisanal small scale gold mining activity is getting more destructive and is now regarded as the second largest source of pollution after agriculture in Africa [11]. There are many diseases that can come from the pollutants that are released into the air and water during the mining activities. For example, during smelting operations, large volume of air pollutants, such as the suspended particulate matter. Arsenic particles and cadmium are released into the environment. Metals are usually emitted into the air as particulates [12]. There are also many occupational health hazards. Most of the miners suffer from various respiratory and skin diseases as a result of contact with some of the heavy chemicals associated with the mining activity.

Within the last years, life threatening mercury pollution has been identified in most developing countries where artisanal gold production is taking place. Moreover, panning and amalgamation are commonly done along rivers resulting in water pollution and destruction of riverbanks. The resulting siltation decreases quality of drinking water and affects all kind of aquatic life. Burning the gold bearing amalgam releases some hundred tons of mercury vapours every year into the atmosphere. Since they quickly return to the river ecosystem with rain, they add up to the mercury spillage occurring during amalgamation [11].

It is estimated that 13 million people across the globe are employed in ASGM industries and a further 80-100 million people's livelihoods are directly dependent upon or impacted by ASGM activities [11]. The method of gold extraction differs among ASGM groups around the world depending on characteristics of a deposit.

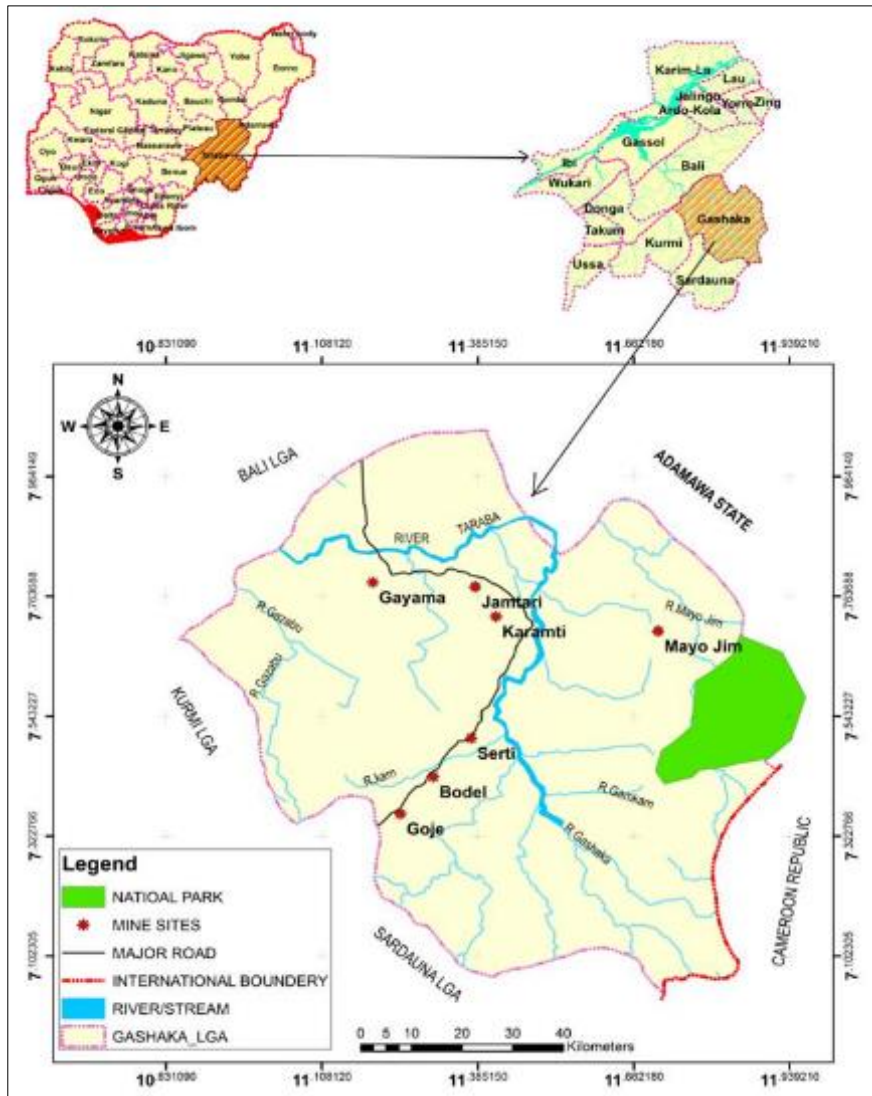
Although some small scale mining is legalized and regulated under the Small-Scale Gold Mining Law in Nigeria, the sector has a larger component of artisanal small scale mining which is highly labour intensive, produces erratically from locally identified and abandoned mining sites as the case is in Gashaka. Hence, the main environmental problems associated with ASGM activities in Nigeria are mercury pollution from gold processing, ecosystems destruction and environmental degradation [13].

Artisanal gold mining activities have been carried out in so many communities in Gashaka LGA since 1940s by Europeans [14, 15]. The gold mining provides opportunities for earning living and meeting individual basic needs in the face of growing unemployment and poverty in the State and local communities. Despite the fact that gold has been mined in the study area for over a century and has continued to present day in the area, not much is known about this activity and its associated environmental impact in the state. No work has been done to appraise the dynamics of the artisanal gold mining activities in the area, the process of mining and resultant impact on the physical environment. This study examined the dynamics of artisanal gold mining in Gashaka communities in Taraba state, Nigeria.

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## 2. Description of the Study Area

Gashaka LGA is located between latitude 6°51'N to 8°00'N and longitude 10°56'E to 11°57'E. It has a landmass of 8,521km<sup>2</sup> and is the second largest LGA in Taraba State after Bali LGA. It is located in the South Eastern part of Taraba State. Gashaka LGA is bordered to the North and East by Bali LGA, North East by Adamawa State, South West by Kurmi LGA, South by Sardauna LGA and to the East and South East by the Republic of Cameroon (Fig. 1). Gashaka LGA is located at the foot of the Mambilla plateau.



**Figure 1** Map of Study Area showing Mining Sites

The main drainage system consists of River Taraba, Gashaka and Mayo Kam. Taraba River rises from the Jombi mountains. Its sources comprise of two minor catchment basins, Upper Selbe and Upper Kam [16], and stretches North Westward covering a distance of 265km before entering the Benue River [17]. The geology of the study area consists of undifferentiated Basement Complex rocks comprising of gneisses, migmatites, phyllites, schists and pegmatites which covers a greater part of the Basement Complex area. The undifferentiated Basement Complex rocks, particularly the migmatites, generally vary from coarsely mixed gneisses to diffused textured rocks of variable grain size and are frequently porphyroclastic [18].

The vegetation of the study area is the mixed leguminous wooded savannah type marked mainly by forest and tall grass. The boundary between the mixed leguminous savanna and wooded savanna type corresponds fairly closely with the 1400mm mean annual rainfall isohyet [14]. The mixed leguminous wooded savanna provides dry season grazing land for the Fulani cattle. The mountain forest and grassland vegetation are found mainly on the few mountains in the LGA.

Gashaka LGA has a population of 87,781 (48,911 males and 38,870 females) according to the 2006 national census. The LGA is one of the least populated LGA with population density of 10 persons per km<sup>2</sup>. The ethnic groups in Gashaka LGA are dominated by the Jibu, Dakka, Ndoro, Tigon, Gbaya, Tiv, Mambilla, Kaka, and Fulani; whilst the tribes in the Toungo region include the Chamba, Kutim, Potopore, Fulani, Dakka, Nyamnyam and Kona. The major occupation in the study area is farming, artisanal mining, hunting, livestock rearing and petty trading. Crops cultivated include, rice, cassava, maize, yam, cocoa, palm oil etc. Gashaka LGA headquarter, Serti / Baruwa is also the administrative headquarter of the Gashaka-Gumti National Park, the largest National park in Nigeria.

### 3. Material and methods

The study adopted survey research design which involves the use of direct fieldwork observation and interview of key informants. Primary and secondary data were used. Primary data was generated from field work observation and interviews of key informants. Secondary data was obtained from existing sources such as journals, books, newspapers, websites, publications, archival records of government ministries and departments. The data collected from fieldwork was analyzed using descriptive statistics. This was done with Statistical Package for Social Sciences (SPSS) package. The results were presented using frequency tables and percentages. Content analysis method was used in the analysis of data collected through interview.

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### 4. Result of the Findings

#### 4.1. Gold mining in the Study Area

Gold has been mined at Gashaka since the time of colonial rule by the Europeans in the 19<sup>th</sup> century. Some of the miners of alluvial gold that were interviewed, maintained that they started artisanal gold mining in Bali LGA in 2008. There are several mining villages (communities) in the LGA but most active gold mining activities is in Gashaka LGA and Gashaka-Gumti National Park. Some of the gold mining communities in Gashaka LGA include: Gayam, Jamtari, Karamti, Serti, Goje, Bodel, Mayo Jim (at the boundary of the Park), Bashishir, Kurr and Garbabi. The main mining sites are located some 10 km away from surrounding village. The villages population varies from 350 to 560 inhabitants. The gold mining sites has huge potential that has attracted local and distant artisanal miners. Access to the mining sites is by foot path through trekking along the forest and GGNP park. Most times, people access the sites using motor bikes. The main economic activity in the localities is AGM with more than two- third of the population involved either as part-time or full time. The rest of the population engaged in subsistence farming.

The local miners interviewed traced the alluvial gold from Bali LGA to Gashaka LGA. They suspected the gold vein to be located in Gashaka-Gumti National Park (GGNP). The Germans according to one of the key informants still visit the National Park and are aware of the gold mining sites and activities in the Park. The gold in the study area exists as:

- Alluvial gold dust – which is a wash out gold particles in stream sediments from uphill.
- Nugget gold – exist as gold crystals, larger in size like quartz. They are found on the flood plain, mainly farmlands. The artisanal goldminers normally dug the pit and remove the gold crystals which they called gold nugget. The gold nugget has more karat (measure of value).

The rivers in the study area from which gold mining activity is carried out include – *Kogin Babab* and *Kogin pompo* (in local language) which are distributaries of River Taraba (Plates 1a & b). The study area consists of mountainous landscape and forest vegetation, the major one known as *Dogon Daji*. This is the main site of the artisanal gold mining activity in the area. The *Dogon Daji* forest is a hideout also for armed robbers.

Most of the artisanal gold miners and traders usually bode bike at Mayo Kam as high as ₦5,000. This high cost is as a result of the distance of the mine site and security challenges in the area. The distance of the gold mine site from the settlements ranges from 1000m, to 2km, 5km, and 10km as the case maybe.

The ethnic group involved in the artisanal mining of gold in the area are mostly the Hausa migrants from Zamfara and Niger states and other neighbouring states. The local communities initially do not pay attention to the gold mining work but in recent times, they have joined the mining work in large numbers, mostly as labourers. The population of these mine labourers directly involved in mining of the gold ranges between 100 to 200 persons depending on the sites and availability of the gold. The artisanal gold mining activity is carried out with rudimentary materials such as pickaxes, diggers, shovels, spades, pans and water pumps. The activity does not respect age and gender and in some households both the parents and children are involved. Men are generally involved in heavy manual tasks like digging while women act as panners (washers) and food vendors at the mining sites.



**Plate 1a and 1b** Mining of alluvial gold along stream in the study area

Some of the gold mines are found on existing farmlands. The mining usually destroys the farmlands and renders it unfit for any other uses. There are signs employed in local prospecting for the gold in the area known as the pathfinders. These are signs of the presence of gold in a place. They include;

- The presence of certain vegetation such as the shea butter tree (*kadanya*).
- Presence of Volcanic pumice (rocks with small holes in it)
- A particular type of soil called *Teli* in local language.

#### 4.2. Local Methods of Artisanal Gold Mining in the Study area

There are 3 major methods the artisanal gold miners employed in the study area, namely;

- Panning method – this involves the use of pan to collect the alluvial sediments containing the alluvial gold dust from the washout along the stream or river (plate 2a). They will wash them and extract the gold particles.
- Locally constructed devices that slopes down using Mercedes car carpets and maize stalks.
- Picking of gold nuggets or crystals from dug pit on the floodplain.



**Plate 2a and 2b** Processing of alluvial gold in the study area

#### 4.3. Purifying of Gold in the study area

The artisanal gold miners in the area use sulphuric acid and white mercury in purifying the collected gold. Mercury is used in purifying the alluvial gold resulting in weight loss in the gold dust. The careless handling of mercury was seen during visits to some of the small scale gold mining sites in Gashaka, where most gold miners are seen to be using mercury without appropriate respiratory and skin protection. The miners do not use any protective gears such as face masks, rubber gloves, leather boots or head coverings in the mining process. Many of them drank the water from the stream or river where they are mining the alluvial gold. Most of them are illiterates. When they were asked if they know the dangers associated with drinking the water, they claimed that they don't know. They argued that they have been drinking the water for years and nothing happened to them. They claimed that whatever happened to them is an act of God and there is nothing they can do than to accept it in good faith. The artisanal gold miners are careful in handling mercury to drop on the ground because that would amount to loss to them. Some of the miners had good knowledge of the effect of the mercury on their health but majority don't know the effects. They mercury is very expensive that most of the artisanal gold miners cannot afford it except the traders. A litre of mercury cost over one million naira (₦1,000,000). Also, the artisanal gold miners (labourers) would not allow any buyer to use the mercury on their gold dust because it will lead to weight loss and less money as the mercury will remove all the impurities. The usually store the mercury in plastic seal covered procaine bottles.



**Plate 3a and 3b** Plastic bottles used in storing gold dust and measuring meter

Most of the mining communities have either borehole or well for their domestic water needs. Some fetch water from the streams and rivers containing the alluvial gold. Most of the respondents claimed that alluvial gold is found everywhere in their communities. Whenever the youths are cash trapped, they will go to the stream and fetch some sediments and sieve it for gold to get cash.

#### 4.4. Marketing of Collected Alluvial Gold in the study area

All golds collected from the mining activities are sold as gold dust and nugget in the town (Serti/Baruwa). The artisanal gold miners have association which helps them to organize their activities to maximize their gains from the local gold mining activities. The BIPEM is one of such association of the gold traders. It has its office at Serti/Baruwa, the LGA headquarter. The artisanal gold mine labourers also have their association with elected executive but no officially registered name. They have their meeting ground. Usually, on Thursdays, the miners come out of the interior mining location in the bush to the town because Friday is the market day of Serti, the main town. It affords them the opportunity to sell whatever quantity of alluvial and nugget gold they have collected in the past days. They will use the money to buy food stuff and drop for their families in town and make preparations to return back to the mine site over the weekend.

There is a ready market with the buyers residing in the town. The buyers in turn resell to distant gold merchant coming from different parts of the country. According to one of the key informants, there is no goldsmith in the whole of Taraba State. Goldsmith are found in Kano and Maiduguri towns.

There is some traditional belief associated with the artisanal mining of gold in the area. According to some of the respondents, the Mumuye's believe that the site of mineral deposits is the suitable location for their idols (shrine), while the Fulani's believe the mineral sites are suitable for grazing of their livestock. But as soon as the minerals are being dug out, they will relocate because they assumed that the water might be poisonous to their livestock.



**Plate 4a and b** Rivers from where artisanal gold mining activity take place in the study area



**Plate 5a and b** Artisanal gold mining communities in the study area

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## 5. Conclusion

This study has examined the dynamics of artisanal gold mining activities in Gashaka Local Government Area of Taraba State, Nigeria. The findings of the study reveals that gold has been mined in many rural communities in Gashaka LGA since the time of colonial rule by the Europeans in the 19<sup>th</sup> century. The gold which exist as alluvial gold dust and nugget is mined using simple traditional implements such as pickaxes, diggers, shovels, spades, pans and water pumps. The gold is mined along the streams and farmlands on the floodplain. There is a ready market for the mined gold as buyers reside in the town and distant gold traders come from different parts of the country to buy the golds. Artisanal gold mining is a very important livelihood activity in the study area despite the fact that many of them are carried out illegally. This provides alternative source of rural livelihood for the local communities in the study area.

### *Recommendations*

Based on the findings, the study recommended the following;

- Establishment of goldsmith within the state can go a long way in encouraging gold mining activities in the state.
- Improvement in security in the state and local communities can help in encouraging gold mining activity in the state.
- Government can help to organize the artisanal gold miners into forming cooperative organizations and officially registering the activities. This will help the government to monitor their activities and its effect on the environment.

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### **Compliance with ethical standards**

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#### *Disclosure of conflict of interest*

The authors hereby declared that there is no conflicting interest in the paper.

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