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THE SOCIO-ECONOMIC IMPACT OF ARTISANAL MINING IN KURU (NARAGUTA SHEET 168) PLATEAU STATE, NORTH CENTRAL NIGERIA

Stephen J. Mallo
Department of Geology and Mining, University of Jos. Email: drmallo@gmail.com

ABSTRACT

A study of the sub-surface (Loto) mining activities around Kuru Village- a suburb of Jos City revealed the activities of Artisanal Miners where mining is presently being carried out on an old mining lease belonging to Bisichi Jenta Ltd. This former British mining company carried out mining activities in the 1950's with intensity in area of coverage which suggests that the company stood out amongst its peers especially with regards to the effective deployment of mechanized mining using hydraulic mining equipments including the hydraulic Jigs, mine Dredges and large haulage machineries. The mining of cassiterite along two relatively adjacent steams in the Kuru area witnessed the exploitation of tin and Columbite initially in alluvial deposits in the downstream stream and graduating into elluvial and subsequently upstream to the primary source of decomposed granite. The hydraulic mining operation then concentrated in the mining of deposits with cut-off grades of more than 0.6g/ton. The present artisanal mining however, is engaged in mining of abandoned low grades (0.1g/ton) of tin and Columbite, which at the present economic value, still provides income to the artisanal miners. The mining activity involves the random sinking of mining pits for the exploitation of the tin mineral, with devastating effect on the environment as opened pits are not covered after mining. The activity which is rudimentary and non-regulated contributes to secondary devastation of the arable land with resultant effects on the land, ecosystem, and health threads to inhabitants. Although the sub-surface mining of tin and Columbite contributes to an average daily earnings of about N250, 000.00 accruing to a total population of about 1200 local miners, the overall after effect lives much to be desired in terms of environmental degradation, potential health hazards and ground water pollution amongst others. The individual average daily earning of about N 20,500 makes economic sense for these miners especially when viewed happening in a national economy with a per capita earning of less than $1 dollar(N165) per day. The artisanal miners by all means deserve a better social contract from government to ensure a better working condition through appropriate mining regulation in line with best practices.

KEYWORDS: Artisanal Mining; Sub-surface Mining; Tin and Columbite; Mine Devastation

INTRODUCTION

Kuru is a village in Jos South Local Government Area of Plateau State, North Central Nigeria, located on Naraguta SE, Sheet 168. The study area falls within the following coordinates latitude $9^0$40'N – N$9^0$44'N and longitude E$8^0$51' – E$8^0$53' (Fig 1). General Geology of the study area Kuru is generally characterized by the abundant occurrence of the Younger Granite rocks which were emplaced during the Jurassic era. The formation of the Younger Granite is associated with the hot spot magmatism. The rock bodies are massif occurring ring complexes. The Younger Granites are known for hosting tin and columbite within Jos Bukuru and environs.

The study area (Kuru) constitute of settlements like; Science School Kuru, Kuru Karama and Kuru Babba. Kuru is an ancient mining town boarded by some other mining town such as Bisichi in the Northeast and Bukuru- Rayfield to the north. It is essentially known for the mining of tin and columbite with other associate minerals such as tantalum and kaolin.

The brief history of mining for cassiterite and columbite in the Study area as narrated by Engr. D. T. Pwajok an erstwhile GM of the defunct Nigerian Mining Corporation shows that mining started in the area in 1920. Due to fluctuation of price of minerals in the global market, stock market; International Tin and Columbite Control (ITCC) was established to counter the fall in price whenever there is a fall in demand which is synonymous to OPEC. Sub-

Surface mining (Lotto) mining started way back from 1955, and then the minerals were mined at two pounds per-cubic feett (cut-off grade) and anything less than that was considered unprofitable. Presently the artisanal miners mine grades of ore as low as 0.2 per cubic feet. Mining activities were carried out by three (3) major companies on the plateau namely; the Amalgamated Tin Mining Company of Nigeria (ATMN) and Bisichi-Jenta (established by Jentu and Tabus from U.K who owned the mined then). The Sub-surface and surface mining activities in the study consists of deposits made up of primary (decomposed granite- found in place within the parent rock) and alluvial deposits (found long streams and old river channels). Other places with primary mineralization of cassiterite and columbite include Udegi – Nassarawa State, Kuru Jenta – Within the study area Rayfield – Jos South local government.

Within the study area are lots of mine dump this was due to the reason that in the 1960s, there was no restoration clause in the law so miners dumped their waste without restoring the mines which constitute lots of unclaimed mined ponds on the Jos Plateau today. Later on, the laws were amended stating that 80% of the mines must be restore after any mining can be re-issued again.

Jig was used for the mining of both tin and columbites, using their difference in specific gravity, the processes are; first blast the rock; Use the gravity pump to wash the minerals at the paddock phase to the jig where the minerals are sorted.

The study area is vegetated with shrubs and tony plants; there are occasionally tall trees, even though there are Community Forest seen at locations. There lost of grasses found within the study area but the irony there is within the mine zone there is virtually not plant growth, just bare brown soil indicating that the soil doesn't promote plant growth.

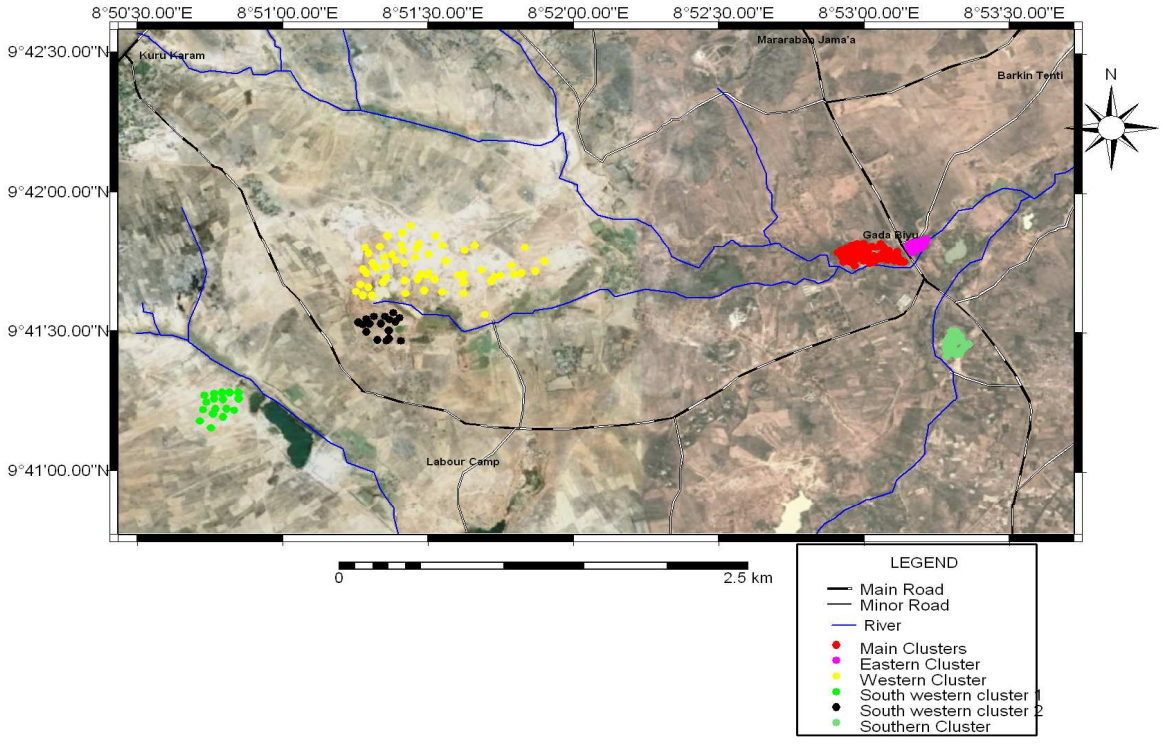

Fig.1. Satellite image showing mining clusters within Kuru and environs

MATERIALS AND METHODS

The methodology of research involved on the spot assessment and field measurements of the study area using various tools which include Global Positioning System (GPS), Compass, Tape, Camera, Field notebook and writing materials. The use of Google-Earth was employed in order to extract the map of the study area. The locations of the Mining Clusters were obtained from alluvial and primary deposits with the aid of GPS which was used to pick up the coordinates and then inserted on a Georeferenced map, using the software ILWIS 3.1 Academic. The digitized map was exported out of ILWIS 3.1 Academic into Microsoft word for further editing.

RESULTS AND DISCUSSION

The field work involved the study of six (6) Mining Clusters mainly, The Main Cluster, Eastern Cluster, Western Cluster(Primary deposit), South-Western Cluster 1, The South Western Cluster 2 and The Southern Cluster respectively all covering a total land area of 1.34km^2 (Table.1).

Table 1. Locations of Mining Clusters

S/No.	Clusters	GPS Coordinates	Area of Devastation
1	Main Cluster	$9^0$41'46.91"N $8^0$53'00.55"E	0.334 km^2
2	Eastern Cluster	$9^0$41'49.37"N $8^0$53'11.62"E	0.075 km^2
3	Western (Primary Deposit)Cluster	$9^0$41'43.69"N $8^0$51'30.40"E	0.600 km^2
4.	Southern Cluster	$9^0$41'26.37"N $8^0$53'18.76"E	0.194 km^2
5	South-western cluster 1	$9^0$41'13.93"N $8^0$53'18.76"E	0.064 km^2
6	South-western cluster 2	$9^0$41'31.11"N $8^0$51'20.03"E	0.074 km^2

Location 1: The Main Mining Cluster (Gada Biyu) (N09^{0}41'50.1"; E 08^0 52'01.4"and Elevation: 1236m) (Fig.1). Artisanal mining started in Gada Biyu 2006, it was located on the opposite side of the present Gada Biyu (across the road), the mine site was later abandoned because cut-off grade of the ore was not favourable then, the miners therefore relocated to Gero, Bisichi and Barkin Ladi mining areas of Plateau State.

Location 2: Primary Columbite Paddock (PCP) otherwise known as the primary deposit (Latitude N 09^{0}41'30.2"Longitude E08051'20.0" & Elevation: 1260m). This large mine site is being reworked in search of Tin and Columbite. The deposit is from a primary source (decomposed granite) which was mined around 1950s' and left un-reclaimed. The mine site cannot be restored to more than 2% as no amount of dump can be used to fill the largely excavated area (Fig.3). Abandoned mining pits litter the area. Despite its devastated nature and threat to human lives and livestock, farmers were seen using the ponds for irrigation purposes (vegetable like pepper, tomato and beans) were being plant on the higher plains. Reworking of the old mine and opening up of new mine-faces from the existing one was seen currently going on by artisanal miners.

Locations 3, 4, 5 &6. These comprise of the Eastern; Southern, South-Western 1; and the South-Western2 Clusters. The Eastern and Southern Clusters are located in alluvial deposits while the South-Western 1 and 2 Clusters are located on decomposed granite deposits. At these locations several active and non-active mining pits were sighted with several artisanal miners on duty.

Mine Development/ Extraction: Mine Development is accomplished through a series of vertical pits (shafts) (Fig.2 &3) while the extraction of mineral is done using diggers and shovels. In the study area and specifically on the Main Cluster, twenty five (25) active mining pits and twelve (12) active sluice boxes were sighted (Fig.2 in-set). The non-active mine pits which by far outnumber the active ones, were found to be 67 in numbers. The tables provide the exact locations and elevations of active mine pits and ground sluice boxes which can serve as reference data for future geo-technical study of the sub-surface soil/rock structures. The development and extraction of minerals is

accomplished through the mine syndicate system consisting of about ten team members. The mine syndicate is further divided into two, such that while about three (3) people are developing new shafts, seven (7) members would be involved in extraction and processing. Women are primarily involved in the haulage of ore to the ground sluice boxes. The major mining functions are as follows:

- Digging – digging extends to depth of between 30ft – 50ft, the shallowest pits being about 30ft with a diameter of 2.5 – 3ft., tools used include digger, shovel, torch light and wheel and bucket. When the wash (ore) is hit, the thickness is determined and the mining is accomplished along the strike.
- Extraction-Excavation of horizontal openings is carried out along the trend of mineralization. Horizontal opening can extent to about 60ft, depending on the extent of mineralization or availability of oxygen within the sub-surface.
- De-watering – A water pump machine is used to extract water out of the mine pit into neighbouring pit otherwise known as the 'cotonia'. Two types of water pumps are used which are; the 2-inch inlet and outlet pump and 3-inch water inlet and outlet pump. The 2-inch water pump is considered to be more efficient because of its higher water pumping height.
- Haulages – the use of wheel and bucket to extract the wash from the well to the surface is employed by the miners while women further haul the mineral ore in head pans to the ground sluice boxes locations..
- Processing – They use rudimentary method in the absence of mechanized method. Ground sluicing boxes are designed in a manner that the wash passes through several stages pushed by flowing water delivered by water pumps. The lighter materials float pass while the denser materials (those with higher specific gravity) tin, columbite and iron trailing behind.
- Mine illumination/Ventilation-Candles and torchlight are used for illumination within the shaft, though torches are more preferable because it reduces competition of air consumption between the individual and candles as well as reduces heat generation within the hole. There was no evidence of any mine ventilation with miners sweating profusely.
- Mine reclamation: The evidence of any mine reclamation in the area is only through sporadic dumping of mine spoils and dumping of domestic waste from the village(Fig. 4)

Fig.2: Rudimentary Haulage and tin Processing Technique

Fig. 3: Land devastation at Primary Deposit

Fig.4: Reclamation of an abandoned mine site using domestic waste

Marketing: In a lotto where there is a sufficient quantity of ore, one pit can produce one wheel yield of 19kg of tin, columbite and other accessory minerals. One (1) bucket wheel of hauled ore represents one (1) bucket wheel yield consisting of 19kg of tin with specific gravity 5 and 28.8kg of Columbite with a usual specific gravity 7. Accessory minerals associated with the tin ore include zircon, iron and monazite with less than 1% total. Presently, a bucket wheel will yield at least 3cups of the tin concentrate after processing. On the average in a day, the artisanal miners can deliver to the surface about 15 bucket wheels, which translates to 45cups of tin daily.

On extraction of the material, it is buretted, the purity (grade) is scaled at 18.0. This is the highest grade and is sold at about N4200 per kg. If the burette value falls between 18.6 and 19.2, then it is sold between N3500 – N4000 per kg, any burette value greater than 19.2 is considered to be low grade.

In 2006, the market situation was more favourable as one (1) bucket wheel yielded one (1) bag of Columbite, with tin and iron then considered as accessory minerals. At present however given the same production rate (15 bucket wheel per/day) and at the cost of 1cup standing at N1000 – N2300 depending on the grade of the wash the daily revenue accrual per production pit (N2000 x 45 cups) is N90,000. The tin concentrates is sold to middle men who in turn either resale or process same for export. The tin processing Sheds include: Kingsley – At Anguldi Jos; Spectrum – At Industrial estate Old airport road (Main Exported); Gidan Kumar – At Dadin Kowa Jos (Main export), Gidan Emma – At Dadin Kowa Jos; Chike Mills – Bukuru (Exporter), Gidan Ayara – Anguldi, and Gidan D. B. Zang. The dressed minerals are not smelted but exported raw (Mallo, Aluwong, 2012).

The mining activity is of great economic and social significance. As it currently exists, artisanal mining in Kuru is high risk activity. The activity is practiced on a small scale by people who are often poor, and although educated, they lack other employment opportunities. It is a highly unregulated sector and subject to harsh working conditions. That the artisanal miners are not trained, they often do not realize that the un-supported and / or un-reclaimed pits of sub-surface mining methods they use to mine minerals are devastating their environment and their health with potential fatal consequences. In regulated mining the mined out area is expected to be reclamation, this involves filling the excavated area with mine spoils. This is followed by restoration which involves putting the area into use once again after exploitation for activities such as fish farming, dry season farming of assorted vegetables such as pepper, beans and potatoes. Around the study area, Community Forest Area (CFA) was spotted within the mining area these are relics of reclamation activities carried out at the advent of the mining law of 1946 by the Mine operators (Mallo, 2000). The forest was subsequently handed over and managed by the community (traditional rulers). The forest is harvested within a period of ten years interval and proceeds (revenue) from the forest are

converted into community use and development. The reclamation activities by the natives using assorted waste and domestic materials portend future danger to the sub-surface water quality and human health. Mining operations normally upset the equilibrium in the geological environment, which may trigger off certain geological hazards such as landslide, subsidence, flooding and erosion together with their secondary effects. Since land is a non-renewable resource at a human time scale, some adverse effects of these degradation processes on the land quality of Kuru are irreversible. The productivity of some lands of these areas have declined by 50% due to soil erosion and poor crop yield. Land degradation is a decline in land quality caused by human activities which in Kuru's case, it had been mining.

This un-scientific method of mining lives behind devastated land area with abandoned pits and mine dumps littering the environment. This artisanal mining activity although constitutes a menace to the environment as the mined out pits are not reclaimed through adequate re-filling to forestall roof collapse leading to land subsidence, provide a formidable source of income to the miners.

CONCLUSION

The rudimentary sub-surface methods of mining being deployed which is un-supported, un-illuminated and un-ventilated portends serious dangers to the miners in terms of accidental roof collapses, suffocation and other forms of health hazards. This calls for some urgent need for regulation and effective monitoring by the appropriate Agencies of the Federal Government in line with best practices. For the fact that the mining activity is a formidable source of earnings supporting a large population of miners in the locality, requires that the miners should be entitled to a better social contract by the government to ensure a more scientific approach that guarantees better earnings and healthier and safer working conditions and sustainable environment.

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