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Nexus between Artisanal Gold Mining and Community Livelihood in Nandi and West Pokot Mining Regions, Kenya

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Abstract

Many studies on Artisanal Gold Mining (ASM) have estimated that it employs an estimated 13 Million people worldwide, with another 80 to 100 million people directly or indirectly benefiting. With the increasing rate of ASM operations in Nandi and West Pokot Counties, the extent to which ASM affects livelihood of people in the community and contributes to livelihood enhancement is not well-indicated in empirical literature. Therefore, the present study was conducted to determine the connection between ASM and community livelihood in Nandi and West Pokot Mining Regions of Kenya. The study employed a descriptive research design. Simple random sampling was used to select the respondents for interview. Primary data was obtained by using questionnaires, interview schedules and focus group discussions guide. Findings from the study indicated that majority (67%) of the respondents in West Pokot participated in artisanal gold mining activity all year round. Majority of the respondents in West Pokot County participated in mining activity on a full time basis while majority in Nandi County participate on a part time basis. Results further showed that 62 % of respondents in Nandi County were earning KShs. 4,001 and above from mining activities. Significant effect ($p<0.05$) of mining activities on incomes was recorded within the two Counties. Furthermore, significant relationship ($p<0.05$) between artisanal gold mining and socio economic activities within the mining communities was recorded. Therefore, it is recommended that stakeholders should recast mineral policy to ensure concurrent environmental sustainability and socioeconomic development.

Keywords: Artisanal Gold Mining, Livelihood, Community

1.0 Introduction

Globally, countries that are endowed with mineral resources regularly extract and use them for the development of their economy for which Kenya is not an exception. A study conducted by MacDonald (2002) reported that mining exists and practiced in many countries. Artisanal gold mining is defined as the use of rudimentary processes to extract valuable minerals from primary and secondary ore bodies, and is characterized by the lack of long-term mine planning. Over the years, the extraction of precious minerals such as gold and diamond has led to a magnificent

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impact on the socioeconomic lives of people and communities involved directly or indirectly in the mining sector. Dorner et al. (2012) explained that artisanal mining represents a significant livelihood and source of income for rural communities and poverty-driven population in the world. According to a report by Hilson (2009), the Artisanal Gold Mining sector employs an estimated 13 Million people, with 80 to 100 million people worldwide being directly or indirectly engaged as a source of livelihood (Tschakert & Singha, 2007). In addition, a study by Saldarriaga-Isaza et al. (2013) recorded that ASGM is the main source of subsistence for millions of people living in developing countries and perhaps is the only livelihood alternative for those communities.

The geographical survey and assessment of minerals revealed that the ASGM industry in Kenya is quite small. The endowment of mineral is varied. However, ASM is hampered by poor accessibility to deposits, legal set ups, financial and technical requirements, lack of markets and lack of large mineral deposits to warrant major capital investments. The other issue with respect to ASGM in Kenya is about community participation in making important decisions relating to the ASGM activity. West Pokot County is one of the poorest counties in Kenya. The most affected group is the women whose ratio compared to the male are very high. Also another group which is affected is the youth, whose percentage stands at 20.4 % of the total population. With such a high number of youth competing for the limited employment opportunities, many youths engage in income generating activities which are not environmentally friendly (NEMA, 2007).

Faced with unreliable farming, many people in rural areas of Nandi and West Pokot counties look for other ways of earning a living so as to manage the high poverty levels within the area. These include selling firewood, charcoal, quarrying and artisanal and small scale mining which may lead to environmental degradation (NEMA, 2007).

Even though many people with various reasons of engagement in ASGM have benefited from it, the various vulnerability contexts of the ASM and critical assets in ASM are not being demonstrated and investigated by mining researchers. With the increasing rate of ASGM operations in Nandi and West Pokot Counties, the extent to which ASGM affects livelihood of people and the community and contributes to livelihood enhancement is not well-indicated in empirical literature. Therefore, the present study was conducted to fill this gap and add to knowledge by exploring the nexus between ASGM and livelihood in Nandi and West Pokot Counties, Kenya.

2.0 Research Methodology

2.1 Study Area

2.1.1 Geographical Scope of the West Pokot County

The county has four constituencies, 13 divisions, 61 locations and 222 sub locations. It covers an area of 9,169.4 Km^2.The county has four constituencies namely: Kapenguria, Kacheliba, Sigor and Pokot South and a total of twenty county wards. Kapenguria and Kacheliba constituencies have six wards, while Sigor and Pokot South have four wards each (GOK, 2009). The county is characterized by a variety of topographic features. On the Northern and North Eastern parts are the dry plains, with an altitude of less than 900 m above sea level. On the Southeastern part are Cherangani Hills with an altitude of 3,370 m above sea level. The population of the county is estimated at 631,231 persons as per 2013 projections. This population consists of 313,746 males and 317,484 females giving sex ratio of 100:101.

2.2.2 Geographical Scope of the Nandi County

Nandi County is in North Rift of Kenya, occupying an area of 2,884.4 Km^2. Geographically, the unique jug-shaped structure of Nandi County is bound by the Equator to the south and extends northwards to latitude $0^0$34'N. The Western boundary extends to Longitude $34^0$45'E, while the Eastern boundary reaches Longitude $35^0$25'E (GOK, 2009). The County has a population of 813,803 comprising of 406,907 males and 406,896 females (as per the 2012 projections).

2.2 Research Design

Descriptive research design portrays an accurate profile of persons, events or situations. It involved collections of quantitative information that was tabulated along a continuum in numerical form as scores on a test. The use of description in the study provided an explanation to phenomenon of interest (Saunders *et al.,* 2009). This study was carried out using the sociological survey undertaken in two counties in North rift region. This design was considered because it was possible to collect data from wider respondents.

2.3 Study Population and Sample Size

The population census of 2009 showed that there were 929 households with a projected increase of 10% as at 2015 within the study area. The projected figure was 1021 households in the study area. The sample size was determined through the use of the modified Cochran (year) formula. For large, populations, Cochran's formula (year) is used to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2}$$

$$n_0 = \frac{1.96^2(0.5)(0.5)}{0.05^2}$$

n_0 = 384 individuals

where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails (1 – α equals the desired confidence level, 95%) 1, e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. However, since this sample size exceeds 5% of the population (1021×0.05 = 51), Cochran's (year) correction formula was used to calculate the final sample size.

$$n = \frac{(n)}{(1 + n/\text{Population})} = \frac{(384)}{(1 + 384/1021)} = 279$$

The final sample size was 279 elements which were distributed proportionately as per the number of households in each cluster as shown in Table 1

Table 1: Sample size proportion

County	Division	Location	Number of individuals	Proportion	Sample size proportion
Nandi	Kapsaos	Kapsaos	219	0.214	60
		Kaborogin	179	0.175	49
West	Sekker	Sostin	423	0.414	115

Pokot	Takar	200	0.195	55
		1021	1	279

Source: (KNBS, 2009)

2.4 Sampling design and Study Participants

Random sampling technique was employed to select two locations in each wards for the study. They are namely Kapsaos and Kaborogin in Nandi County and in West Pokot are Sostin and Takar locations for the study. The two locations in each ward were reflective of artisanal gold mining and were selected for the study as clusters. Households were then selected at random to ensure randomization of the selection of respondents for the interview (Kirubi *et al.,* 2000). The respondent in each household was the father and in case of his absence the mother would respond. If both were absent any other mature person in the household would respond.

2.5 Research Instruments and Data Collection Process

The study used two data sources namely; primary data and secondary data. The primary data sources included the questionnaires, interviews schedules, key informants' guides, focus group's guides, non – participant observations and photography.

The primary data collected from the respondents were through face-to-face community-level interviewer-administered questionnaires, semi-structured in-depth interview, and focus group discussions (FGDs) serving as the main data collection instruments. A pilot study was conducted to help the testing of the reliability and validity of the instruments using SPSS Cronbach's reliability analysis and alpha value of 0.7 for the closed-ended questions which were meant for the quantification of the study results. This helped to reframe questions, clarify issues, and effect changes in the data.

2.6 Ethical Consideration

Researchers are usually faced with ethical problems and cannot carry out research that involves people without any informed consent. With regard to this, various ethical issues were considered and addressed before the field survey started. Verbal and informed consent was obtained from the study participants. The participants in the communities were briefly informed about the purpose of the research and guaranteed the anonymity of the information they provided.

2.7 Data Analysis

The obtained data was analysed by the use of statistical package for the social sciences (SPSS) and draw frequency table proportion (percentages) mode or frequency distribution. Interval and ratio scaled data was analysed through the use of measures of central tendencies for instance means and standard deviation. The relationship between AGM and livelihood was determined using Chi Square test at 95% confidence level.

3.0 Results and Discussion

3.1 Demographic and Socioeconomic Characteristics of Study Participants

The respondents who responded were 212 translating to 75% return rates. Gender of the respondents indicated that 67.9 % of the respondents were male while only 32.1 % were female.

In Nandi county, majority of the respondents (70.2%) were males 42.2% were females. In West Pokot, 58.8% and 29.8% were females and males respectively. This result implies that males dominate mining in Nandi County while in West Pokot County, both genders participate in mining. Significant relationship between gender participation and the county was reported in the present study, χ^2 (df=1, N = 208 = 14.923, p <0.05). Majority of the respondents (78.3%) were married, 17.5% single, 78.3%, 0.9% widowed while 3.35% did not disclose their marital status. This result implies that majority of the respondents in both Nandi and West Pokot were married thus they have to cater for their families. These findings are contrary to a study done in Ghana where single individuals comprised over 50% of the miners (Tschakert & Singha, 2007).

The results indicate that respondents who had no formal education were 36%, primary level were 49.1%, secondary level were 11.8%, technical level were 1.4% and tertiary level 1.4%. This result implies that those who participated in artisanal gold mining in both counties had either no formal education or had basic education. This agrees with Hilson (2002d) who describes many Ghanaian artisanal gold miners as having low educational levels and low technical know-how.

3.2 Information on Mining Communities

The information on mining communities relate to the characteristics of the ASM mining communities and included, the roles played by the individuals, methods of mining used at the locality, number of years in mining, gold sales and earnings derived from mining.

Table 2: Roles in the mining community

Role played in mining	County of origin		Total
	Nandi	West Pokot	
Mine owner	5(100.0%)	0(0.0%)	5(2.4%)
Mine worker	124(59.9%)	83(40.1%)	207(97.6%)
Total	129(60.8%)	83(39.2%)	212(100.0%)
Chi-Square			
Pearson χ^2	Value	df	p-value
	3.852	1	0. 000

Findings indicated that majority of the respondents (97.6 %) were mine workers while only 2.4 % were mine owners. This result implies that artisanal gold mining is fundamental rent seeking activity, thus there are very few owners and the majority of individuals seeking to draw out a living from the activity without owning it.

Table 3: Number of years in mining activities

Mining experience	County of origin		Total
	Nandi	West Pokot	
Less than a year	1(100.0%)	0(0.0%)	1(0.5%)
1 to 5 years	78(78.0%)	22(22.0%)	100(47.2%)
6 to 10 years	29(56.9%)	22(43.1%)	51(24.1%)
11 to 15 years	8(38.1%)	13(62.9%)	21(9.9%)
16 to 20 years	9(81.8%)	2(28.2%)	11(5.2%)
Above 21 years	4(14.2%)	24(85.8%)	28(13.2%)
Total	129(60.8%)	83(39.2%)	212(100.0%)

Chi-Square			
Pearson χ^2	Value	Df	p-value
	47.799	5	0. 000

Number of years in mining activities by respondents are shown on Table 3. and indicate that in Nandi County 63.3% had been involved in mining activity for less than1year, 22.5 % 6 - 10 year,5%11-15 years,16-20 years 5.8% and above 21 years 2.5%. In West Pokot County those who had participated in artisanal mining for between 1-5 years' duration were 26.5 %, 6 - 10 year 26.5per cent, 11-15 years 15.7% 16-20 years 2.4%and above 21 years 28.9%. According to this result majority of respondents in Nandi County had participate in the artisanal gold mining for less than 10 years and this tallies up with the findings from a study by Tschakert & Singha (2007) which indicated that the time spent by men varied from 0.5 to 10 years while women typically spent 0.1 to 5 years with an average of 7.1±6.2 years for men and 1.2±1.3 years for women. This result implies that respondents in Nandi County have alternative sources of livelihood and their participation in artisanal gold mining is only for a shorter periods of time before the lure of instant riches fizzles out. This is attributed to the dangers and physical demand in underground mining, hence the older people tend to plan to exit and quit artisanal gold mining activities. It is further attributed to money which was not always flowing in as expected fluctuating and affecting their incomes and obligations to meet their daily basic needs.

In West Pokot respondents participated in artisanal gold mining activity for longer periods of time before quitting and this was attributable to a phenomenon of lack of alternative livelihoods particularly being a marginalized area with limited economic alternatives. It was more so with economic hardships which increased unemployment and reduced rural livelihood choices. These is exacerbated by droughts and conflicts such as cattle rustling, competition for resources like water and pastures in west pokot. The idea of a possibility of getting gold and life transformation to the better and escape poverty make miners to stay longer in mining.

The relation between the duration period of engagement and the county was significant, χ^2 (Df= 5, N = 212) = 47.799, $p < 0.05$. These indicates that individuals in Nandi County participate in artisanal gold mining for shorter period of time of less than 10 years than individuals in West Pokot county who participate for longer periods of upto over 21years.

Table 4: Preoccupation with mining activity

Seasons of mining activity	County of origin		Total
	Nandi	West Pokot	
All year round	35(32.1%)	74(67.8%)	109(51.4%)
Seasonal	81(90.0%)	9(10.0%)	90(42.5%)
Temporary	13(100.0%)	0(0.0%)	13(6.1%)
Total	129(60.8%)	83(39.2%)	212(100.0%)

Chi-Square

Pearson χ^2	Value	Df	p-value
	76.750	2	0.000

Preoccupation with mining activity is shown on Table 4. In West Pokot County, 89.2 % of the respondents participate in mining all year round and 10.8% were involved on a seasonal basis. In Nandi County, 27 % of the respondents were preoccupied with mining all year round, 64.8 % were on a seasonal basis and 8.2 % preoccupied on a temporary basis.

This result implies that those who have limited sources of livelihood participate in artisanal mining all year round or on a full time basis while those with other sources of livelihood participate on seasonal or temporary basis. The implication of these results were that communities in West Pokot who have limited source of livelihoods tend to participate in artisanal mining activity on a full time basis while in Nandi with diversified source of livelihoods participate on a part time basis due to the belief of higher earnings to supplement their incomes. Yakovleva, (2007) indicated that ASM is extensively practised as an alternative economic activity in times of economic stress and takes the following categories (a) gold rush; (b) temporary operations fuelled by economic recessions; (c) isolated and remote operations with little or no involvement with nearby communities; (d) seasonal ASM activities within an agricultural cycle and (e) traditional year around activities that are generally associated with stable communities.

The relationship between the seasons of engagement in mining activity and the county was significant, χ^2 (Df=2, N = 212) = 76.750, p <0.01. It indicates that individuals in West Pokot County participate in artisanal gold mining as a whole year round activity than individuals in Nandi county who participate on a seasonal or temporary basis. In West Pokot County which is arid and semi-arid land, miners participate in mining activity along the river on a full time basis or all year round and this is attributed to limited access to alternative livelihood activities. With diversified source of livelihoods in Nandi County they participate in artisanal gold mining on a part time basis or seasonally due to the belief that earnings from mining complement their incomes. As Maponga & Ngorima, (2003) noted panning in Zimbabwe in the 1980s and 1990s was primarily done during droughts/dry season and served as an alternative source of livelihood, but in the last decade it has evolved into a year-round activity and has become a primary source of livelihood in many rural communities.

The nature of the harsh climate in the arid and semi-arid of West Pokot pushes the community to artisanal gold mining activity in search for a livelihood, an activity that they engage themselves throughout the year. Dreschler (2001) argued that development of artisanal gold mining has been further aggravated by poor agricultural yields due to erratic rainfall patterns. Artisanal gold mining therefore presents an opportunity for alternative in an area that offers limited livelihood

opportunities to rural households. Artisanal gold mining in west Pokot should be viewed as an alternative source of livelihood to rural household.

Table 5: Occupation with mining

Occupation in mining	County of origin		Total
	Nandi	West Pokot	
Fulltime	0(0.0%)	79(100.0%)	79(37.3%)
Part time	129(97.0%)	4(3.0%)	133(62.7%)
Total	129(60.8%)	83(39.2%)	212(100.0%)

Chi-Square			
	Value	df	p-value
Pearson χ^2	191.837	1	0.000
Likelihood ratio	244.147	1	0.000
Continuity correction	187.818	1	0.000

Results on occupation with mining are shown in Table 5. approximately 37.3% of the respondents engaged in mining on a full time and 62.7% did it on a part time basis. Majority of the respondents in West Pokot County participate in mining activity on a full time basis while majority in Nandi County participate on a part time basis. The implication is that those respondents who have limited alternative sources of livelihood participate in the mining activity on a full – time basis while those who have other source of livelihood participate on a part time due to the allure of higher and complimentary incomes. Mining is not considered a major economic activity to the local people in Geita district, Tanzania but rather a complimentary source of income (Kitula, 2006).

The chi-square statistic reported a significant relationship between the occupation with mining in the county χ^2 (Df=1; N = 212; $p < 0.01$). This indicated that individuals from West Pokot county would be involved in mining activity on a full time basis while individuals from Nandi County would be involved on a part – time basis. Mining communities within Nandi County engaged in artisanal mining on a part time basis either seasonally or temporarily alongside other formal economic activities. During the dry season, when farming requires much less work, many individuals engage in mining activities.

Artisanal gold mining complements the activities of agriculture seasonality by engaging in farming during the rainy season when it is planting season. Rainy season is not conducive to mining due to interference of water inside the tunnel which calls for increased pumping out of water making the mining operations more, risk and expensive. Mining activities are reduced during planting season for maize and harvesting of maize and coffee. It implied that Artisanal mining in Nandi County is not a livelihood alternative but a livelihood complement. Artisanal gold mining gives opportunity to the communities in Nandi County a chance to complement their livelihood activities. This has been described by (Hilson, 2010) that Livelihood diversification into the artisanal mining sector in rural areas is generally pursued with the intention of miners to branch out into the nonfarm economy because they believe they can earn more money from doing so.

3.3 Effects of ASM on Household Income

Table 6: Earnings from mining activities

Earnings from mining activities	County of origin		Total
	Nandi	West Pokot	
Below Kshs. 1,000	13(20.6%)	50(80.4%)	63(29.7%)
Kshs. 1,001 to Kshs. 2,000	16(69.6%)	7(30.1%)	23(10.8%)
Kshs. 2,001 to Kshs. 3,000	15(57.7%)	11(42.3%)	26(12.3%)
Kshs. 3,001 to Kshs. 4,000	7(100.0%)	0(0.0%)	7(3.3%)
Above Kshs. 4,001	78(83.9%)	15(16.1%)	93(43.9%)
Total	129(60.8%)	83(39.2%)	212 (100.0%)

Chi-Square			
Pearson χ^2	Value	Df	p-value
	68.925	4	0.000

Earnings from mining as per county are shown in Table 6. Results indicate that 60 % of respondents in West Pokot County were earning KShs. 1,000 and below, 8 % were earning between Kshs. 1,001 and Kshs. 2,000, 13 % were earning between Kshs. 2,001 and Kshs. 3,000, and 18 % earning Kshs. 4,001 and above. In Nandi County, 62 % of respondents were earning KShs. 4,001 and above, 4% were earning between Kshs. 3,001 and Kshs. 4,000, 11 % were earning between Kshs. 2,001 and Kshs. 3,000, 12 % were earning between Kshs. 1,001 and Kshs. 2,000, while 10 % earning below Kshs. 1,000. This result implies that respondents from Nandi County were earning more from their gold due to more accessibility to the market. West pokot is more marginalised in terms of the market to the point where middlemen are fewer than in Nandi County.

The earnings would translate to a minimum of about USD 10.00 to USD 40.00 per week, significant amounts to those who are unemployed, while in Tanzania, individuals involved in mining activities, mining earn about 66% or USD 361.50/year of the total household income with agriculture contributing 16% or USD 88.30 with other activities contributing 18% or USD 96.40 (Kitula, 2006). In Ghana, women are paid various daily rates for their work at different camps— the rates are estimated to range between 15,000 and 30,000 cedis (approximately USD 1.66–3.33).

The relationship between earnings distribution and the county was significant, χ^2 (Df= 4; N = 212; $p < 0.01$). This finding indicates that inhabitants from Nandi County were having a higher income than those of West Pokot County. This could be attributed to closeness to the markets and the robustness of the economic activities prevailing in the locality.

3.4 Socio – Economic Effects of ASM

Findings mining contributes to poverty reduction (Mean = 2.42, SD = 1.17). This implies that artisanal gold Mining does not contribute to positive socio economic effects within the mining communities.

Table 7: Socio – Economic Effects of ASM

Variables	N	Mean	Std. Dev
Mining supplemented/replaced farming/agriculture	212	1.4903	1.02999
Mining provide work to individuals in the community	212	2.3333	1.21480
Mining contributes poverty reduction	212	2.4293	1.17620
Mining contributes to community dependence on gold	212	2.3065	1.17527
Mining contributes to improvement in household economy	212	3.3962	1.24816
Mining contributes to improvement in advanced needs	212	1.8066	1.12083

This is attributable to the availability of alternative income generating activities in other communities or no alternative in those communities (like in West Pokot County). The engagement of respondents to artisanal gold mining is pegged on the short-term gains. Miserendino *et al.* (2013) conclude that artisanal gold mining is the main source of subsistence for millions of people living in developing countries and perhaps is the only livelihood alternative for those communities.

Mining contributes to community dependence on gold (Mean = 2.30, SD = 1.17). The result implies that mining has neither contributed to or does not contribute to community dependence on gold mining as an economic activity. Some respondents are highly dependent on gold mined as an income generating activity whereas others do not. This finding resonates with empirical evidence by Fisher *et al.* (2009) which suggest that individual working in mining or related services are less likely to be poor than those with other occupations in that the income derived from mining helps reduce poverty and buffer individuals from livelihood shocks but does not confer the same individual with the capacity to progress economically.

Mining contributes to improvement in household economy (Mean = 3.39, SD = 1.24). This implies Mining as an income generating activity has improved the household economy in terms of basic necessities to the respondents. This is attributable to the income generated by the gold produced and was noted by UNECA & AUC (2011) that artisanal gold mining makes a positive contribution to African economies and more particularly, to sustaining rural. Evidence from Senegal demonstrates that ASGM has become an important source of income for many traditionally agricultural rural populations (Persaud *et al.*, 2017). Mining contributes to improvement in advanced needs (Mean = 1.80, SD = 1.12). This means mining does not contribute to elevation of the consumption power of the community, a fact that is attributable to the un sustainability of the low income generated from the ASM.

Conclusion

Majority of the respondents in West Pokot County participated in mining activity on a full time basis while majority in Nandi County participate on a part time basis. Furthermore, 62 % of respondents in Nandi County were earning KShs. 4,001 and above from mining activities. Significant effect of mining activities on socio economic activities within the mining communities was recorded

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