

Impacts of Organizational Dynamics in Artisanal gold mining on Community Livelihoods: Case of Nandi County, Kenya

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Abstract

Many studies on Artisanal Gold Mining have estimated that it employs an estimated 13 Million people worldwide, with another 80 to 100 million people directly or indirectly benefiting. In sub Saharan Africa it is viewed as an economic mainstay activity providing direct employment to over two million people. Artisanal gold mining uses rudimentary processes to extract valuable minerals from primary and secondary ore bodies, and is characterized by the lack of long-term mine planning. In Kenya, less is known on how different artisanal gold mining communities operate and it is organised. The artisanal gold mining has negative environmental effects and limited positive transformation on the livelihoods of the local communities involved in Nandi County. The objective of the study was to evaluate the impacts of artisanal gold mining organizational dynamics on community livelihoods. The study employed a descriptive research design and simple random sampling was used to select the respondents for interview. Primary data was obtained by use of questionnaires, interview schedules, focus group discussions guide, key informants guide, observations, and photography. Questionnaires were pretested before the actual field survey and the Information gathered during this pre-trial were used to modify the survey tools. Factor analysis upheld the construct validity of the instrument at 0.5 significance. Descriptive statistics and inferential statistics were used in the analysis of data and the results were presented by use of frequency tables. The findings showed that Artisanal gold mining activities were disorderly in nature thereby preventing improved livelihoods and environmental conservation. In conclusion artisanal gold mining activities in Nandi County were informal and unorganized in nature. The study recommends Artisanal miners be encouraged and assisted by relevant government agencies to form cooperatives in order to have a collective voice in their undertaking such as advocating for government assistance on technology and equipment, marketing and training.

Keywords: Artisanal gold mining, Organizational dynamics, Informal and formal

1. INTRODUCTION

Mining is a fundamental human development activity which creates wealth (Acheampong, 2004). In the year 2001, the mining industry produced over 6 billion tons of raw product valued

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at several trillion dollars. The USA, Canada, Australia, South Africa and Chile dominate the global mining scene in terms of mining exploration methods and technology (2004). Mining involves removal of ores from the earth's crust and selecting precious materials. It involves number activities with potential impacts on the environment, society, health and safety of mine workers depending on the proximity to mining operations.

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. It can be illegal or legal, formal or informal, encompassing individual gold panners to medium-scale operations employing thousands of people (Shen & Gunson, 2006).

In Zimbabwe, the definition of artisanal gold mining covers both legal and illegal operators, mechanized and semi-mechanized miners of varying sizes in terms of output, employment and capitalization, which are classified into four categories: mines operated by experienced individuals, those operated by unsophisticated groups, registered gold panners, and cooperative miners (Maponga & Ngorima, 2003). Artisanal gold mining covers a broad spectrum of activities which are principally characterized by exploitation of marginal or small gold deposits, lack of capital, labour intensive and poor access to markets and support services (IIED, 2002). Operations and organization of activities in artisanal mining adversely affect its productive capacity, capability and compliance with mining, safety and environmental regulations, causing threats to both mining communities and their environment.

In Ghana, unlicensed ASM miners are referred to as *galamsey*, a term that originated from the phrase 'gather and sell'. There are few differences organizationally or technologically between unregistered illegal and registered small-scale miners, with the exception that the latter have security of tenure, or legal entitlement to work a plot of land (Carson *et al.*, 2005). These illegal small-scale mining is certainly not only restricted to Ghana, because an ILO report in 1999 indicate that up to 80% of small-scale miners worldwide operate without formal authorization (Tschakert & Singha, 2007).

Geenen (2012) noted that ASM contributes to about 90% of mineral production and informal exports in Eastern Democratic Republic of Congo, while in Central Mozambique, 20,000 people are involved in ASM producing 480 to 600 Kg of gold annually of which 85 to 90% of this production remains in informal economy. This indicates that almost all of the minerals being mined can be categorized as ASM, however, all these ASM activities provide direct employment to the local while generating a substantial number of indirect jobs in other sectors in the economy (Amankwah & Anim-Sackey, 2003), however, the artisanal miners are often marginalized or operate on the peripheries of the society (Teschner, 2013).

In Kenya, Artisanal mining communities are more intertwined to their operations and cannot be influence to other interventions of achieving alternate livelihood needs same sentiments were noted by Banchirigah, (2008), Whose research showed that communities forever were connected to their innate operational activities such that any interventional activities such as formalization, alternative livelihood projects and military intervention advanced by the government to tackle its illegality have failed to meets the objective. Informality in the artisanal gold mining sector is the core of the problems faced by the artisanal miners. Widespread illegality in artisanal mining activities in Ghana and elsewhere in the world is being associated with risks, posing substantive challenges to new policy initiatives that aim to alleviate poverty (Childs, 2008). Kambani (2001) recorded that from a structural and technical perspective, ASGM is conducted on a very rudimentary level using basic tools such as picks, shovels, hoes, picks and wheelbarrows.

Accessibility to capital assets, value chain and organization which are dynamic in artisanal gold mining contribute to the poor performance in terms of environmental conservation and the livelihoods of the communities engaged within the sector.

According to Labonne (2003), ASGM is typically practiced in the poorest and most remote rural areas by a largely illiterate, poorly educated populace. The sector is highly labour intensive providing employment and incomes to large numbers of people who are generally uneducated, whose understanding of the importance of environment management is below par, poor and live in remote areas where no opportunities exist for formal employment (Shoko, 2003).

Artisanal gold mining is becoming increasingly popular with the African youth because of the diminishing employment prospects, a fact that is attributable to its structural dynamism, low entry barriers and its ability to finance new start-ups (Hilson & Osei, 2014). Increase in local unemployment and underemployment combined with a lack of a workable or enforceable legal framework, ineffective national policing, and a weak decentralized institutional capacity to implement policy and regulate the ASM sector have further exacerbated the problem of artisanal gold mining (D'Souza, 2005). Although, ASM is perceived negatively yet it is contributing much more in terms of public revenue, employment and localized development (Bloch & Owusu, 2012).

The failure of sector governance by the government authorities coupled with sectoral formalization exacerbates environmental degradation, health problems and resource conflicts (Childs, 2008). Geenen, (2012) suggested that fundamental to the legal framework is the basic condition that artisanal miners are given formal property rights.

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Studies on Artisanal gold mining have been carried out in many areas (Childs, 2008; Kambani; Geenen, 2012; D'Souza, 2005; Hilson & Osei, 2014; Teschner, 2013; Amankwah & Anim-Sackey, 2003; Carson *et al.*, 2005; Shen & Gunson, 2006 and Maponga & Ngorima, 2003). All of these studies have a detailed account of Artisanal gold mining. However, none of them have elaborated the Artisanal gold mining organizational dynamics which hinders mining communities from maximum utilization of the natural resource and sustainable management of the environment that have been poorly understood. In this paper, we evaluated the impacts of artisanal gold mining organizational dynamics on community livelihoods in Nandi County. The purpose of the study is to stimulate managers and policy makers to design management options that will be geared towards formalization of Artisanal gold mining through setting up technical, legal and operational aspects to enable mining communities obtain maximum utilization of the natural resource and sustainable management of the environment.

2. MATERIALS AND METHODS

2.1 Study area

Nandi County is in North Rift of Kenya, occupying an area of 2,884.4 Km². The County is bordered by Kakamega County to the west, Uasin Gishu County to the North East, Kericho County to the South East corner, Kisumu County to the South and Vihiga County to the South West. Geographically, the unique jug-shaped structure of Nandi County is bound by the Equator to the south and extends northwards to latitude 0°34'N. The Western boundary extends to Longitude 34°45'E, while the Eastern boundary reaches Longitude 35°25'E (ROK, 2002).

Rainfall and temperature

The hilly and undulating topographical features of Nandi County coincide with a spatial distribution of ecological zones that define the agricultural and overall economic development potential of the area. The Northern parts receive rainfall ranging from 1,300mm to 1,600mm per annum. The Southern half is affected by the lake basin atmospheric conditions receiving as high as 2,000mm per annum.

Generally, the County receives an average rainfall of about 1200mm to 2000mm per annum. The long rains start in early March and continue up to end of June while short rains start in mid-September and end in November. Only rarely is there a month without some rainfall. The dry spell is usually experienced from end of December to mid-March.

Most parts of the County experience mean temperatures between 18°C-22°C during the rainy season, but the part adjacent to the Nyando Escarpment at 1,300m above sea level experience temperatures as high as 26°C. During the dry months of December and January the temperatures are as high as 23°C and during the cold spell of July and August the night temperatures are as low as 14°C. The County in general has a moderate to warm climate with no cold and hot extremes throughout the year (ROK, 2002).

Topography

The Topographic of Nandi County is composed of four types of land terrain namely (Mountainous, Steep slopes, Rolling/Hilly land) and gentle slope. Steep slopes found on parts of Meteitei and Tinderet areas to the south-east; Kemeloi, Bonjoge, Kaptumek, Kapkures, Kapkerer areas to the South; and Kamwega and Soimining to the Northwest.

Steep Slopes includes parts of Chepterwai, Kipkaren Salient, Kabiemit, Ndalat, Sarora and Kabiyeet areas to the North and Kapkangani areas to the West. Afforestation is required on the hills. While, Rolling or Hilly Land include parts of Nandi Hills, Kaptel, Kaptumo and Kobujoi areas. Gentle to Moderate Slopes covers parts of Kilibwoni, Kaplamai, Kosirai, Mutwot, Lelmokwo and Itigo areas. The topography of this region has influenced the type and scale of economic activities in the region just as in other areas. Farming productivity is high due to high soil productivity and less capital injection towards soil conservation activities (ROK, 2002).

Vegetation

Forest area forms 12 percent of land cover. The North and South Nandi Forest Reserves are at an altitude below 1,900 meters above sea level, being a major contrast to North Tinderet Forest Reserve which lies between 2,300 meters to 2,500 meters above sea level. The Nandi Forest is an extension of the tropical Kakamega forest characterized by high rainfall and diverse species of trees. The forests are composed of mixed indigenous hardwoods, besides 2,635.8 Ha of exotic plantations at Kimondi and Serengonik forest stations (ROK, 2002).

2.2 Data collection and analysis

Data was collected from both primary and secondary sources. Primary data was obtained by using questionnaires, interview schedules, focus group discussions guide, key informants guide, observations, and photography. Questionnaires were pretested before the actual field survey and the information gathered during this pre-trial were used to modify the survey tools, while secondary data was obtained through literature sources. Descriptive and inferential statistics were used in the analysis of data. Factor analysis upheld the construct validity of the instrument with 0.5 significance

Inferential statistics

Factor Analysis

Table 1: Factor Analysis for ASM Organizational Dynamics

	Component		h ²
	1	2	
Buyers offer competitive prices		.857	.736
Familiarity with gold value chain		.859	.793
Familiarity with gold market procedures		.596	.702
Familiarity with final end product	.785		.823
Low barriers of entry	.905		.914
Sectoral economic marginalization	.887		.869
Informality of the sector	.904		.888
Mainstay economic activity	.707		.546
			Total
Sum of squares(eigen value)	3.945	2.326	6.271
Percentage of trace	49.307	29.076	78.383

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1468.494
	df	28
	Sig.	.000

Results in Table 1 shows that the Kaiser-Meyer-Olkin or KMO measure of sampling adequacy for the ASM organizational dynamics was 0.872 which exceeds the required 0.5 for factors analysis. The Bartlett's Test of sphericity, χ^2 (df = 28) = 1468.494, $p < 0.05$ indicate that significant relationship among the variables to proceed. Since the percentage of trace (the variance explained by the components) is 78.383% which is greater than 0.5(50%) and that all the loadings estimates are greater 0.5, then construct validity can be upheld.

3. Results and Discussion

Impacts of Artisanal Gold Mining Organizational Dynamics on community livelihoods

The study sought to find out impacts of artisanal gold mining organization dynamics on community livelihoods as shown in Table 1 below.

Table 2: ASM Organizational Dynamics

	N	Mean	Std. Deviation
Low barriers of entry	212	1.6509	1.02613
Sectoral economic marginalization	212	1.6919	1.09757
Informality of the sector	212	1.6812	1.07703
Mainstay economic activity	212	2.0566	1.30497

Findings on organizational dynamics in artisanal gold mining shown in Table 2 above indicates that mining communities who consider ASM do have low entry barriers (Mean = 1.65, SD = 1.02). This result implies that artisanal gold mining is an activity engaged by those with low education level and no initial capital for investment. The respondents have no restrictions when joining the activity of artisanal mining to earn a livelihood. This is attributed to an activity which does not require any skills and therefore those who have low education levels or basic can enter into that sector. The initial investments such as the need for simple rudimentary tools and effort to get into gold mining activity may be considered low. The mining communities need the basic and rudimentary tools and no specialised skills required to participate when compared to other economic activities including the allure of higher returns drives individuals to artisanal gold mining.

Organizational dynamics in artisanal gold mining findings shown in Table 2, where sectoral marginalization was reported (Mean = 1.96, SD = 1.09). This result implies that Marginalization of artisanal mining is attributed to political class, the policy drivers on policies to do with management and exploitation of natural resources. The miners are far from the centre due to political marginalization and at policy making level thus unable to influence policymakers. This makes the sector contribute to environmental degradation and little contribution to community livelihoods. This is attributable to government institutions and policy makers who do not consider artisanal gold mining activity as a source of income and employment. This is due to lack of advocacy for appropriate incentives and capacity for miners to carry on their mining activities in a more environmentally sensitive manner. This conforms to (Hruschka & Echavarria, 2011) who noted that geographic isolation and lack of political influence means ASM activities and their structural challenges often poorly understood are not well translated into public policy and development interventions. ASM's marginalization within the mining industry primarily stems from much government believing that large-scale mining should be prioritized whenever possible over ASM, their marginal tax revenue contributions and the obscurity of the gold trade. It means also that Artisanal Miners operate in remote areas with poor communication suffering geographical marginalization that makes them less able to access markets and technologies.

Further results on Organizational dynamics in artisanal gold mining shown in Table 1, indicate informality of the sector was recorded (Mean = 1.68, SD = 1.07). This result implies that artisanal gold mining is informal an indication of government failure to properly set and implement appropriate laws. It means that respondents exploited this natural resource without formal permits therefore non-committal to environmental conservation. The result further implies that artisanal mining activities are not integrated into legal, economic, and institutional framework. Formalization is one of the factors which play a role in environmental problems in artisanal mining and community livelihoods. This has been noted by (Lovitz, 2006) that the major obstacles in adopting mercury-free technologies in artisanal mining are the historical structure and lack of planning, miner's organization, government capacity, organization and corruption.

The result implies further that the government is deprived of important financial resources and prevents the sector from delivering on important social objective formal employment, improved quality of life for mining communities and environmental degradation. Informality implies that artisanal mining will not benefit Miners by being given support to invest in safer and more

efficient productive mining practices which would increase community's income and less negative environmental effects. The promotion of artisanal mining as an important driver of local development require a wide range of efforts including technical support and training, facilitating access to the market access to finances and protection of the environment, linking up with other development programs (Midende, 2010). The idea of bringing artisanal miners under a legal framework that will have greater support, incentives, and resources to improve their operations, develop safer mining practices, obtain greater profits, and potentially scale up their operations to the level of small and medium-scale mining (Hruschka, 2011).

Organizational dynamics in artisanal gold mining are shown in Table 2 and show that the mainstay economic activity (Mean = 2.05, SD = 1.30).The result implies that artisanal gold mining is not considered to be the mainstay economic activity in Nandi County with primary economic activities such as agriculture.

Artisanal gold mining is a practice and a subsistence livelihood based on whoever finds a mineral has the right to exploit. There is laxity on control and access to mining sites which are open enabling the rural poor to exploit the natural resource without formal permits or leases. The organization of the sector prevents it from realizing improvement of quality life for the mining communities and environmental conservation. Unorganized artisanal gold mining deprives the government collection of revenue in terms of taxes which is an important financial resource to the state. It brings about poor environmental, health and safety technical and trading conditions to mining communities. The organization dynamics in the artisanal gold mining sector is an obstacle to competitiveness, productivity and social development in mining areas. At its best artisanal gold sector follow organizational form of family structure where the head of the family retains and manages income generated.

Correlation statistics**Table 3: Correlation statistics**

	Income effect	Indirect effect	Non-scalable assets	Scalable assets	ASM Value chain	Organizational dynamics	ICT usage	Regulatory aspects	Enforcement aspects
Income effect	1								
Indirect effect	.496**	1							
Non-scalable assets	-.090	.043	1						
Scalable assets	.218**	.072	-.223**	1					
ASM Value chain	.313**	.046	-.151*	.312**	1				
Organizational dynamics	.293**	.140*	-.072	.112	.485**	1			
ICT usage	.031	.005	-.019	.017	.051	-.003	1		
Regulatory aspects	.310**	.092	-.248**	.141	.278**	.257**	-.052	1	
Enforcement aspects	.129	.094	-.106	-.058	.084	.283**	-.120	.549**	1

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

The correlation statistics in Table 3 recorded significant relationship between the variables. The statistics show income earned by the miners significantly correlate with scalable assets ($r = 0.218$, $p < 0.01$), ASM gold value chain ($r = 0.313$, $p < 0.01$), ASM organizational dynamics ($r = 0.293$, $p < 0.01$) and regulatory aspects ($r = 0.310$, $p < 0.01$).

The results show that a number of the variables including scalable assets, ASM gold value chain and organizational dynamics associate with the income effects such that a significant increase in these factors would have a corresponding increase in income earned by the miners.

Hypothesis testing

H_0 : ASM organizational dynamics no significant impacts on community livelihoods

The Table 3 shows the coefficient for ASM organizational dynamics, 0.191 ($t = 2.50$, $p < 0.05$) is statistically significant, it indicates that ASM organizational dynamics determines the income earned by the ASM community.

4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

The study findings showed that artisanal gold mining activities in Nandi County were informal and unorganized in nature because of the relative ease with which the activity presented itself. Respondents lacked any form of mining or prospecting licences in order to operate, thus they were operating informally. This informality prevented the sector from delivering on important social objective of improved quality of life for mining communities and environmental degradation. Informality further implied that the authorities cannot enforce effectively regulation contributing to the problems in environmental degradation.

4.2. Recommendations

The study recommends that artisanal miners should be encouraged and assisted by relevant government agencies to form cooperatives in order to have a collective voice in their undertaking such as advocating for government assistance on technology and equipment, marketing and training. Miners will be able to access financial credits from the banks than being an individual and from savings and credit societies. Miners are disadvantage for they do not operate in groups or associations and it is difficult to address their concerns individually.

The researcher recommends that the Kenya government review further the current mining policy specifically focusing on management of artisanal mining. The policy should consider EIA be carried out collectively for groups of miners or mining areas before obtaining the Artisanal Mining License. The assumption of the approach is that mining processes in the same area has similar environmental and social impacts and therefore the need for same environmental management plans. This approach will help miners afford to fulfil the environmental requirement of carrying out the EIA by pooling finances together. It will reduce financial costs which could be high if they could have conducted individual environmental assessment resulting to non-conformity of the requirement which is critical in social and environmental sustainability and thus reduce environmental degradation at the mine sites which is uncontrolled.

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