



## ARTISANAL MINING PRACTICES: A STUDY OF SELECTED COUNTIES IN KENYA

Robert Arasa<sup>1</sup>, John Achuora<sup>2</sup>, Cornelius Okello<sup>3</sup>

<sup>1,2</sup>Department of Business Administration, School of Business and Economics, Machakos University

<sup>3</sup>Department of Environmental Sciences, School of Environment and Natural Resources, Machakos University

### Abstract

*Artisanal miners extract natural resources (mostly gold, copper, sand and quarry) from easily accessible deposits using the only very basic tools. It is undertaken in different forms - underground mining (below the surface), open surface (pit) mining, placer mining (by divers in rivers) and solution mining (drilled boreholes). In Kenya, these include mining of gold, gemstones, copper, quarry, sand among other minerals. In Kenya, these practices are commonly notable in Kakamega, Migori, Homa Bay, Kwale, Machakos, Kitui, Kajiado and Kisii Counties. This research project set out to examine artisanal mining practices within the selected counties in Kenya. A participatory survey approach was pursued to aid gathering of relevant and appropriate data. The study was confined to the five selected counties (Migori, Kakamega, Kisii, Kajiado and Kitui) where artisanal mining (ASM) activities take place. Respondents were drawn from relevant county government departments, miners and local leaders. Primary data was gathered through FGDs, KII and use of structured questionnaires. Descriptive technique was employed to analyze the collected data and information. The study findings revealed that 38.1 percent and 31.2 percent of the respondents practiced underground mining and open surface mining respectively. Less than one percent of the respondents practiced solution mining. Findings revealed that ASM provides a source of income to those involved. Many of those engaged in ASM are mainly the poor struggling to earn a living to support their basic needs, though the earnings raised still stand far from being adequate. The study revealed that there are numerous negative effects arising from ASM ranging from environmental degradation, health risks, landscape interference, accidents, interfering with quality of soil, water siltation among others. It was noted that most of the miners lack adequate knowledge and skills on safe and best mining practices. Further it was noted that the current regulatory framework for the sub-sector is either lacking or ineffective. The study recommendations include; fast-tracking on formalization of ASM, reviewing mining regulatory framework, encourages miners to form cooperatives, strengthen monitoring on adherence to mining regulations and guidelines, capacity building for miners in terms of knowledge and mining skills, ASM activities to be given more attention at county and national governments.*

**Key words:** Artisanal mining, underground mining, open surface, placer mining, solution mining



---

## **Introduction**

### **Background**

In many parts of the world, artisanal and small-scale mining (ASM) activities are at least as important as large-scale mining activities, particularly in terms of the numbers of people employed (Drechsler, 2001). Artisanal and small-scale mining (ASM) has experienced explosive growth in recent years due to the rising value of mineral prices and the increasing difficulty of earning a living from agriculture and other rural activities. An estimated 40.5 million people were directly engaged in ASM in 2017, up from 30 million in 2014, 13 million in 1999 and 6 million in 1993 (IGF, 2017). That compares with only 7 million people working in industrial mining in 2013. ASM is generally pursued as a route out of poverty or as an activity to complement insufficient income, especially in communities where alternative employment is hard to come by. Despite its low productivity, ASM is an important source of minerals and metals. It accounts for about 20 per cent of the global gold supply, 80 per cent of the global sapphire supply and 20 per cent of the global diamond supply (World Bank, 2013).

Artisanal miners extract natural resources (mostly gold, copper, quarry, and sand) from easily accessible deposits using the only very basic tools. It is undertaken in different forms - with screens on riverbanks, by divers in rivers, in pits and farm fields (Hilson & Gavin, 2002). It is highly labor-intensive. The ILO estimates that worldwide, 13 million people are directly engaged in ASM, and that the livelihoods of an additional 80-100 million people depend on it (Hentschel and Hruschka, 2002). In many developing countries, the activity functions as an unofficial “social safety net” for the poor (Hilson & Gavin, 2009). Despite its potential economic contributions, ASM has been associated with environmental destruction, criminality, the unsustainable plundering of resources, destruction of private property, destruction of farm lands, child labour, the inter-communal conflicts, and general social degradation. It has been hypothesized that communities characterized with these features are likely to experience food insecurity (Hilson & Gavin, 2009).

In developing countries, minerals are extracted by artisanal and small-scale mining (ASM). These activities are undertaken by people working with simple tools and equipment, usually in the informal sector, outside the legal and regulatory framework. Siegel, Shefa & Marcello (2009) refer to this as mining by individuals, groups, families or cooperatives with minimal or no mechanization, often in the informal (unregulated) sector of the market and mostly operate illegally. Despite many attempts, a common definition of ASM has yet to be established (Hentschel, Hruschka & Priester, 2002). In some countries, a distinction is made between ‘artisanal mining’ that is purely manual and on a very small scale, and ‘small-scale mining’ that has some mechanization and is on a larger scale. In some West African countries (for example, Mali), small-scale mining is differentiated from artisanal mining by the presence of permanent,



fixed installations that are established once an ore body is confirmed (Hentschel, Hruschka & Priester. 2002). In this study, however, the terms artisanal and small-scale mining are used interchangeably as supported by Hentschel, Hruschka & Priester (2002).

There are about 9 million ASM operators in Africa and about 54 million people whose livelihoods depend on the sector (Ledwaba & Nhlengetwa, 2016, Persaud et al., 2017). According to Hilson and McQuilken (2014), the number of people dependent on ASM activity in Africa was between four and 12 times the number of ASM operators in 2011. In Kenya, there is a fair documentation of the country's commercial mining and mineral processing operations. However, the country has undocumented number of artisanal miners mining gold, gemstones, copper, quarry, sand and other minerals spread across the country (Ollett, 2013). Some of the counties in Kenya where artisanal mining takes place are: Kakamega County, Migori County, Homa Bay County, Kwale County, Machakos County, Kitui County, Kajiado County and Kisii County. Since ASM does not operate within the formal set up and is not documented by the regulatory authority, it is hard to control or regulate with consequential impact on land, rivers, lake, ocean, vegetation and air (Abuya, 2013).

### **Study Rationale and Objectives**

Some of the characteristics shared by artisanal and small-scale miners include; they exploit marginal or small deposits, they lack capital, they are labor-intensive, with low rates of recovery, they have poor access to markets and support services, they have low standards of safety and health and they have a significant impact on the environment. It is expected that the results and recommendations of this study will inform and better identify and define the ASM practices in the county. This will facilitate the development and implementation of regulatory framework to govern and align activities within the sector with both the County and the National governments development goals. Therefore, the purpose of this study was to examine artisanal mining practices within the selected counties.

### **Literature Review**

Artisanal and Small-Scale Mining occurs in approximately 80 countries worldwide. There are approximately 100 million artisanal miners globally. Artisanal and small-scale production supply accounts for 80% of global sapphire, 20% of gold mining and up to 20% of diamond mining. It is widespread in developing countries in Africa, Asia, Oceania, and Central and South America (Appel and Jønsson, 2010). Though the informal nature and on the whole un-mechanized operation generally results in low productivity, the sector represents an important livelihood and income source for the poverty affected local population (Abbey, Nartey, Al-Hassan and Amankwah, 2014). It ensures the existence for millions of families in rural areas of developing countries. About 100 million people – workers and their families - depend on artisanal mining



compared to about 7 million people worldwide in industrial mining (Appel and Jønsson, 2010). According to Hentschel, (2003) various countries in Asia, Central and South America, Oceania and Africa practice various forms of artisanal mining. For example, alluvial diamonds are mined at the Deccan diamond fields of India, in Brazil, and in South Africa. The alluvial diggers in South Africa initially mined diamonds from claims along the banks of the Orange and Vaal rivers at places such as the Mission Station of Hebron, the kopje (hill) near the Klip-drif camp (later called BarkleyWest), and Pniel( Hentschel, 2003).

In Asia, the largest number of miners is found in China, Pakistan, Indonesia and the Philippines. ASM practices in Asia are in various forms depending on the nature of the mineral under extraction. For instance, in Bombona, Indonesia, Auger mining is used to recover coal (Basri, Sakakibara and Sera, 2017). Auger mining is a practice of recovering an additional coal from a seam located behind a high wall produced either by stripping or open-pit mining (Basri, Sakakibara and Sera, 2017). Auger mining is employed especially when contour strip mining has been exhausted and the removal of overburden to access additional coal no longer becomes economically feasible (Basri, Sakakibara and Sera, 2017). In Philippines and China, Surface Techniques and In-situ Leaching are used to recover copper, gold, silver, and uranium. Surface leaching generally employs heap (or dump) leaching of mineral values while In-situ mining specifically uses barren solution, introduced down by a set of well (Crawford Coleman, Gabriel, and Atinga, 2015).

In 2014, it was estimated that there were 1,442,700 ASM operators across 19 countries in Central and South America (Artisanal and Small-scale Mining Knowledge Sharing Archive, 2017). The largest number of ASM operators can be found in Brazil and Colombia. ASM activity in Colombia is significant, representing 72 per cent of the country's total gold production in 2013 (Álvarez Jessick, Palacio and Kolok, 2012). The Latin America ASM sector has strict regulations on informal operators and the use of certain substances, but has limited capacity to implement these regulations (Olivero-Verbel, Caballero-Gallardo, and Negrete-Marrugo, 2011). It is particularly difficult to control informal mining where there are large numbers of miners; such as in Colombia, where about 87 per cent of 4,134 Colombian gold mining operations are illegal and 95 percent of all the gold mines have no environmental permit (Olivero-Verbel *at al.*, 2011). Colombian ASM operators' use alluvial mining to recover gold, employ open-pit mining to remove hard rock ore (mostly metallic ore), quarrying to extract solid rock with a high degree of consolidation and density. Strip mining or open-cast mining" technique is used in Brazil to extract ore bodies that are near such coal (Álvarez Jessick, Palacio and Kolok, 2012).

ASM is an important source of revenue for people living in rural contexts in Sub-Saharan African countries, where it is largely carried out as an informal and often illegal activity in about 23 countries (Alliance for Responsible Mining (ARM), 2017). For example, around 40-50 per cent of small-scale miners work illegally in Ghana in gold mines where concentrations of metals



such as gold, titanium, silver, tin and tungsten are washed from within an alluvial deposit through placer mining technique (Basu, Clarke, Green, Calys-Tagoe, et al, 2015). The gold is driven from reef, vein or lode-type gold deposits (Birimian System); auriferous and quartz-pebble conglomerates (Tarkwaian System) and from recent placer deposits (Basu, Clarke, Green, Calys-Tagoe, et al, 2015). Surface Techniques and In-situ Leaching are used for mineral values; copper, gold, silver, and uranium. Ampofo, (2014) noted that female gender participation in ASM mining in Ghana is 0.6 percent of the population compared to 2.0% for male gender. In Tanzania, where there are more than one million ASM operators, mostly gold miners (Aizawa, 2016). Open surface technique is employed to remove hard rock ore (mostly metallic ore) that is disseminated and/or located in deep seams. The ASM operators typically use shovels and truck equipment to extract gold, silver and copper, to name a few. Quarrying is used to recover stones and gravels for construction. Concentrations of metals such as gold, titanium, silver, tin and tungsten are recovered from alluvial deposits in rivers through placer mining (Aizawa, 2016). In the DRC, where about two million people directly depend on ASM, miners work mainly on gold, cassiterite, coltan and diamond extraction. In the eastern provinces, for example, North Kivu, South Kivu and in some parts of Katanga, artisanal and small-scale mining techniques (ASM) by civilians are the most common methods of obtaining minerals (Bryceson & Geenen, 2016). Working with a shovel and a pickaxe in the open pits, represents the most comfortable way of mining; most miners use their bare hands or inadequate tools such as hammers and chisels to extract the minerals through open pit and alluvial mining (Bryceson & Geenen, 2016).

Despite the massive benefits of ASM practices especially to people living in rural contexts, there are a number of ills associated with ASM activities (Nyame and Blocher, 2010). For instance, inhalation of toxic gases such as mercury and the fumes from explosive blasts, which can become lethal when combined with poorly ventilated environments, ASM-related accidents occur due to inadequate working conditions and equipment (Nyame, and Grant, 2012). A study shows that the Busia mining district in Tanzania experiences one to five deaths annually, and another looking at accidents and injuries in Ghana finds that fatality rates are 90 times higher than in large-scale mines (Aizawa, 2016). In South Africa, gold mines continue poisoning communities (Timothy Afful-Koomson and Kwabena, Eds). The Kabwe lead mine, closed over 20 years ago continue poisoning thousands of children in Zambia (Anon, 2017b).

Even though the information concerning ASM practices in the Sub-Saharan Africa is fairly documented in countries such as Ghana, South Africa, Nigeria, Tanzania and the Democratic Republic of Congo, Kenya lags behind in documenting ASM practices, sites and number of ASM operators within the county. This research project therefore sought to examine ASM practices in selected Counties in Kenya. In many countries, 70 to 80 per cent of small-scale miners are informal. Informality brings along damaging socioeconomic, health and environmental impacts, which trap the majority of miners and communities in cycles of poverty



and exclude them from legal protection and support (IGF), 2017). Despite this fact, artisanal and small-scale mining is recognized as a considerable source of revenue for millions of people in about 80 countries worldwide (World Gold Council, 2017; World Bank, 2013). Hilson and Garforth (2012) argue that the “get-rich-quick” perception of artisanal miners by policy-makers and donors has misinformed sector-specific legislation and extension programs.

In sub-Saharan Africa, ASM has traditionally been administered by policies designed for large-scale mining (LSM) and considered a subset of LSM (O'Faircheallaigh & Corbett, 2016). In Ghana, for instance, policies tend to be incentive-based—ASM is regulated to avoid child labour and to support miners in getting a fair price for the minerals they sell, equipment and so on (O'Faircheallaigh & Corbett, 2016). Ad hoc ASM policies are made at both the national and local levels. For instance, currently, the Ghanaian government has taken drastic action to eradicate illegal mining, banning a significant number of ASM operators. According to UN Environment (2017), policy and regulatory frameworks on EHS in ASM that also contribute to the local development do not fit miners' needs or are undeveloped, and the benefits of technical alternatives for miners are not well demonstrated. Barriers to further improvements include the lack of access to geological information, the lack of adequate management tools, the lack of capacity building, and restricted access to finance and appropriate technologies.

## Methodology

### **Research Project Design**

A participatory and collaborative approach was adopted to execute the project. The approach involved participation of selected staff of the institutions of interest for this study and community members including opinion leaders, farmers and miners. This approach aided in capturing the diverse data/information and opinions required to address the research objectives. A descriptive cross sectional research design was employed in this study. Yin, (2013) states that a descriptive cross sectional research design determines and reports the way things are at a point in time and it is used whenever the data being collected is to describe persons, organizations, settings or phenomena. Both qualitative and quantitative research methods were used. This study used interviews and observation as the main data collections methods. The study further employed the use of triangulation method in order to improve the validity of the data. This approach was appropriate in this study as it facilitated gathering of data on various ASM practices within the country.

### **Population and Sampling**

The target population of this study was miners in the respective study sites, staff from the selected counties and opinion leaders in the counties where artisanal mining takes place. Random and purposive sampling procedures were employed in selecting the target respondents.



---

## **Data Collection and analysis**

Questionnaires and interview guides for Key Informants Interviews (KII) and Focus Group Discussions guides were utilized as the main data collection tools. These different data collection instruments were constructed and structured in such a manner that the items/questions were able to aid capturing of the information appropriate for responding to the project objectives. The evaluation team comprised of researchers and evaluation assistants. Evaluation assistants mainly consisted of research associates and postgraduate students. The evaluation teams were divided into sub-teams to cover the respective clusters based on the administration units in each County.

The instruments were pilot tested on a small sample of five farmers, five miners from one county, two officials from one county government, two opinion leaders. This provided a trial run for the data collection and acted as a check for validity and reliability of the instruments. Adequate consultation amongst the expert evaluation team members was done to check on content, construct and face validity among others in helping to examine the items in the questionnaires, interview guides and document analysis guides to ascertain the adequacy and appropriateness of the items for the study. The survey responses were analyzed and reported using descriptive statistics (use of frequency, means and standard deviation). Data analysis and interpretation were done with the aid of the STATA and MS Excel Platform.

## **Study Findings**

This study was conducted mainly to establish the ASM practices in selected Counties in Kenya (Kakamega, Migori, Kajiado, Kitui and Kisii). Out of the total targeted respondents of 250 for questionnaire interviews, a response rate of 97 percent was achieved. This was in addition to the FGDs with persons/officers from relevant government departments in the five counties.

### **Demographic information of respondents**

Most of the respondents were of the male gender (65.17 percent) whereas about 34.83 percent were of female gender. This implies that males dominate artisanal mining activities. This supports Ampofo, (2014) study which reports a clear dominance of male gender in the Ghanaian ASM sector where female gender participation in ASM mining stood at 0.6 percent of the population compared to 2.0% for males. This dominance of male in the ASM sector has been reported in Philippines, Indonesia (Basri, Sakakibara and Sera, 2017) and Zambia (Anon, 2017b). In terms of the respondents' family size, 56.5 percent fall in the category of household size of between 1 and 4 members, 35.2 percent in the category of household size of 5 to 8 members and only 8 percent reported that they have over 8 members. This finding implies that majority of ASM community falls with the country's average household size of 3.9 (RoK, 2019).



In terms of the age of those responding, 48.8 percent were aged between 31-45 years followed by those aged between 18 and 30 years and 3.3 percent were below 18 years. This finding implies that most active and productive age is involved in artisanal mining activities. Further, it was noted that some children (about 3 percent) below the age of 18 years participated in artisanal mining. Of those who responded, majority (60.7 percent) had completed primary school education, 34.8 percent had completed secondary education while only 4.5 percent have undergone through post-secondary education. This implies that most of those engaged in small scale mining comprise school drop outs at primary and secondary levels. Of those who responded, 75 percent had informal training on ASM, whereas 25 percent had formal training. This may imply that most of those who participate in these activities learnt from either close family members or friends. 57 percent of the respondents indicated that they practiced artisanal mining as their main occupation while 40 percent had farming as their main occupation. This implies that majority of the respondents have not given adequate attention to other economic engagements. The findings confirm ASM trend in sub-sahara Africa, Asia, Central and South America where according to Basri, Sakakibara and Sera, (2017); Crawford Coleman, Gabriel, and Atinga, (2015); García et al., (2015); Bryceson and Geenen, (2016); Aizawa, (2016); Basu, Clarke, Green, Calys-Tagoe, et al, (2015) majority of participants in ASM are young, energetic, uneducated, unskilled, section of the populace of which ASM is a full time occupation.

The study sought to investigate the size of land owned by the respondents (or the households). 82 percent of the respondents reported to own land between 1 acre and 5 acres while 15.9 percent owned land of about 6 acres to 10 acres. Less than 3 percent of the respondents owned land of above 10 acres. This means that there is adequate land for alternative economic activities including farming. The study revealed that 54.9 percent had 1-3 acreage under mining, while 45 percent had allocated 4 and above acres to mining. This implies that much of the land use is dedicated to mining activities within the study sites. Ampofo, (2014) study which reports that ASM activities occupy much of the land in mining regions of Ghana is supported by these findings of the study.

### **Artisanal mining practices**

The objective of this study was to examine the artisanal mining practices employed by miners within the selected counties. Interviews, field observations and focused group discussions provided inputs for purposes of addressing this objective. The study applied descriptive statistics, content analysis and observation reports to address this objective.

Across the selected study sites, the study findings revealed that a majority of 38.1 percent of the respondent practiced underground mining. This finding supports O'Callaghan, Terry and Geordan (2017) study which reports that underground mining is commonly used in Asia to extract petroleum, coal, iron, manganese, tin, tungsten, antimony, copper, lead, zinc, aluminum,



gold, silver, mica and precious stone. The same is reported to be prevalent in Ghana’s gold fields (Ampofo, 2014). Similarly, Güiza, (2013) reports that underground mining processes such as drilling and blasting are the most rampant in Chile, Mexico and Brazil.

Further, the study established that the second highest ASM practice across the selected mining counties in Kenya is open surface with 31.2 percent of the respondents practicing it. This supports Basri, Sakakibara and Sera, (2017) study which report heavy reliant in the practice by ASM operators in in Bombona, Indonesia to recover coal. Ampofo, (2014) established extensive use of open surface mining to extract gold in Ghana which supports this study finding. Similarly, the study finding is corroborated by Bryceson & Geenen, (2016) study which reports prevalent use of open surface mining in North Kivu, South Kivu and in some parts of Katanga of the Democratic Republic of Congo.

In number three is the placer mining. The study established that 27.8 percent of the respondents practice placer mining. This concurs with Hentschel, (2003) which identifies alluvial mining as a fairly common mining practice in South Africa where its used to claim diamonds and golds from alluvial deposits along the banks of the Orange and Vaal rivers at places such as the Mission Station of Hebron, the kopje (hill) near the Klip-drif camp (later called BarkleyWest), and Pniel. Additionally, the study finding is supported by Ampofo, (2014) which reports significant use of placer mining at Bonsa River valley, near the town of Tarkwa, and the Birim River valley, mainly between the towns of Akwatia and Oda.

The study however found that less than one percent of the respondents practiced solution mining. This is in agreement with Crawford Coleman, Gabriel, and Atinga, (2015) contention that solution mining is out of the purview of majority of ASM operators due to technical skills and capital necessary to undertake it in contrast to ASM operations which are generally labor intensive, low-tech, receive limited investment, and require less expertise. This findings are presented in table 1:

**Table 1: Mining Practices across the Selected Counties**

<b>Mining practices</b>	<b>Frequency</b>	<b>Per cent</b>
<b>Underground mining</b>	78	38.1
<b>Open surface mining</b>	64	31.2
<b>Placer mining</b>	57	27.8
<b>Solution mining</b>	2	0.98

<b>Other type(s) of mining</b>	4	1.95
<b>Total</b>	205	100.00

**Source: Fieldwork, 2019**

***Artisanal mining practices in Kajiado County***

Many residents in Kajiado County have resorted to Quarrying, which is the commonly practiced ASM activity in the area where stones are dug for the purpose of being used in building, making roads through cutting, digging or blasting & Sand Harvesting. Quarrying is a huge supporter of local economic development as the use of extracted material enhances trade, creating jobs for most people who depend on this for their livelihoods aside from other economic activities. Quarrying activity in Kajiado County is an important activity because it provides much of the materials used in traditional hard flooring, such as limestone, marble, sandstone, slate and even just clay to make ceramic tiles.

Generally, ASMs are poverty motivated and situated mostly in the rural areas of Kajiado County. The miners are basically unskilled and earn little from the activity since most of them are simply laborers. Furthermore, a greater percentage of these miners are operating illegally and therefore they do not benefit from any training to improve their businesses unlike their registered and legalized counterparts.



**Figure 1: Open-pit/placer mining in Kajiado East (Hardcore and Sand harvesting)**

**Source: Fieldwork, 2019**



ASM in Kajiado County has gained increasing importance as more and more locals turn to mining as their source of income. A significant number of youth work in mines scattered all across the marble and limestone belt and this is their main, if not only, source of income. Most miners are uneducated or have low literacy levels and therefore cannot seek formal employment. However, there is a great individual number of polluters, which causes adverse environmental effects to the local communities. Environmental violations or lacking enforcement of relevant regulations is notable. Accidents due to ASM is a serious concern to the locals mainly attributed to rock falls, lack of ventilation, effects vibration, lack of knowledge, lack of training, violation of regulations, and lacking safety equipment or unsafe working practices.

### ***Artisanal mining practices in Kitui County***

Kitui County is endowed with enormous deposits of limestone, coal, iron ore, industrial clay, gypsum, malachite, chalk limestone, variety of gemstones, sand for construction and building stones among many others. If these minerals are mined and utilized properly they can transform Kitui County to be among the top richest Counties in Kenya. The study indicated that sand and stone mining are the main income-generating activity in the sub-counties surveyed with men constituting 92% of the extraction workforce while women constitute 62% of the mineral processing (crushing, milling, sluicing, amalgamation) workforce. The following were revealed as artisanal mining practices within the county; quarrying (ballast, building stones), sand harvest (along the rivers) and coal (Mui-Zombe Basin, across Mwingi Central, Kitui East and Kitui Central Sub- Counties).

It was noted that sand harvesting is a commercial activity that has continued to be practiced despite being banned, amidst the rapidly growing populations in urban areas and upcoming construction industry. This has largely contributed to an unprecedented demand for sand to meet the ever-rising needs of the building and construction industry. It is the most ASM practice within Kitui County. It involves sand harvesting along seasonal rivers (Tiva River, Tyaa River, Kalundu River, Mutisyano River and Nzau Rivers among others).



**Figure 2: Sand Harvesting along River Tiva and Ballast Crushing along Kwa Vonza**

**Source: Fieldwork, 2019**

Artisanal and small-scale mining (ASM) activities within Kitui County have been a significant source of employment for the many locals, playing a critical role in poverty reduction and rural development. Non-metallic and construction minerals sector employ 70% of the people (quarries: 20%, sand: 50%), of which approximately 75% are artisanal and small-scale miners. Thus, the ASM sector provides primary livelihood employment for an estimated 140,000 ASM miners. Both men and women engage in mining. However, the contribution of artisanal mining to household income is minimal compared to other economic practices within the county. It is also noted that ASM activities have resulted to cutting down of indigenous trees and shrubs, removal of top soil and soil erosion, abandoned pits and trenches, undocumented accidents among other negative effects.

***Artisanal mining practices in Migori County***

Underground (Gold and Copper), open surface (pit) (Gold, sand and rocks) and placer mining (Gold and sand) are evident in Migori County. Open surface mining and underground are the most common mining methods within the county. The main ASM zones are: Osiri, Masara, Nyatike, Macalder, Lorgierian, Number Kodero, Luanda Konyango, Karungu and Owich.



**Figure 3: Gold and copper mining in Macalder**

**Source: Fieldwork, 2019**

ASM forms one of the main sources of employment to the local community households living in the mining areas. Earnings from mining activities go to meeting the basic needs such as food, education and medical. Those involved in ASM revealed that too much effort is put on mining with minimal return which cannot support the families adequately. It was also revealed that miners and locals are exposed to health risks from mining chemicals such as mercury and also accidents (e.g. underground mining).

### *Artisanal mining practices in Kisii County*

Artisanal Mining activities in the county are either individual owned, family owned or community owned. In some situations it involves land owners leasing their pieces of land to others for purposes of undertaking small mining. The following were revealed as artisanal mining practices within the county; Quarrying (ballast, stones), Carvings (soapstone), Sand harvest (along the rivers), Gold (along/near border with Migori County) and Open surface (people's farms).

The areas characterized with ASM practices include Tabaka and Ikoba (sculptures, soapstone), Gensonso (ballast), Getare (ballast, murrum), South Mugirango - Kamagambo (mining for gold, mining for granite), Nyamataro, Nyakoe, Nyabigena. Quarry in Kisii county is very important because it provides materials used in different areas such as Terrazo for making floors and granite for making tiles



**Figure 4: Crushing of Stones in Kisii County (Nyamataro area)**

**Source: Fieldwork, 2019**

The mining of Tabaka soapstone in Kisii County is an important economic activity in the county since it is a source of income for 7,000 people. This mineral is mainly used in making of curving which are sold abroad. However, miners indicated that middle men who undertake to link them to the markets for their products normally exploit them. Further most of them lack the appropriate mining skills.

### *Artisanal mining practices in Kakamega County*

Artisanal mining activities in the county are carried out mostly by individuals who are now getting organized into cooperatives for licensing purposes. Gold is the most mined commodity in the county with the activities being observed in Ikolomani, Khwisero, Shinyalu and Lurambi sub-counties. Other than gold, sand and marram is also harvested heavily in the county. Small scale mining, especially of gold, is done along the rivers, by the roadside and on farms.



**Figure 5: Gold Mines of Bushiangala in Ikolomani Constituency**

**Source: Fieldwork, 2019**

ASM supports many residents' livelihoods as their primary source of income. Income earned from ASM is channeled back into farming activities and/or used to meet basic needs (food, education, medicine). It was established that many locals are turning to mining as it is seen as a quick way to earn money. It was difficult to establish exactly how much miners earned from their sells as they were hesitant to release this information to the government for fear of being taxed. However, it was noted that the brokers and middlemen take advantage and benefit more from the activities. Some of the noted negative effects of ASM include air pollution, loss of vegetation, noise pollution, water contamination, destroying landscape and accidents.

### **Conclusion and Recommendations**

#### **Conclusion**

It is observed that there exist ASM activities in the selected counties. These mining practices are notably quite informal and although in some cases they form the main support to the livelihoods of those involved, they also come with their negatives ranging from social ills, diverting useful manpower for other economic engagements, health and environmental hazards. Further, it is revealed that artisanal and small scale mining across the counties suffer from a number of constraints including lack of basic knowledge, safety precautions, poor working conditions, low socio-economic status, lack of clear quarrying legislation and environmental degradation that call for special attention. There has been growing public dissatisfaction in the manner in which these mining activities are being undertaken across the counties.



---

## Recommendations

**Formalization of ASM, legislation and regulations:** Currently there are no regulations governing the small scale mining in the country. Based on the study findings, we recommend that like elsewhere, the government of Kenya (at national and county levels) needs to support formalization of the sub-sector and improve social and environmental practices in the sub-sector. For smooth actualization formalization, miners' views are important for effective monitoring and enforcing regulation. Further, the legal framework so put in place should be that which remove barriers to formalization and are supportive and accessible rather than punitive. Licensing processes should be reviewed and streamlined, making the process easy and cost-effective. Feedbacks from across the counties indicated that group licensing could be the way forward for now. There is also need to developed/review and funded adequately policies and programmes on land rehabilitation and afforestation in ASM areas.

**Cooperatives and partnerships:** To move towards sustainable ASM, there is need for deliberate efforts on encouraging miners to form cooperatives and associations. This will facilitate access to financing, negotiating better prices, hence avoiding the exploitative middlemen. This is also seen as a way of helping the small scale miners embrace the culture of savings and investments of their earnings and provide a platform through which miners can gain improved access to efficient and cleaner technologies. Strengthened collaboration and integrated approach between government agencies and with other partners will form a significant step towards checking the ills of engaging in small scale mining practices and advancing best practices.

**ASM to be among County government development agendas:** The county government should view the artisanal and small-scale mining sector as a potential vehicle for poverty alleviation. It should regard it as a key part of rural development programmes and accord it greater priority in resource allocation. ASM assistance projects need to be included in local development programmes. By so doing, it will be increasing the ability of ASM in general to make a better contribution to sustainable development.

**Mitigating against negative environmental and social impacts of ASM:** ASM activities are associated with environmental degradation, various social ills and also impacts on human health. Many environmental, health and safety interventions should focus on incentives and training rather than on traditional monitoring and enforcement systems. It is important to show how protecting the environment or health can produce more benefits than costs. Hence the government (national and county), other concerned organs and institutions should put efforts and expend resources towards capacity building and general awareness on environmental friendly and modern mining practices.



**ASM Documentation:** The national and county governments should take the necessary steps towards assembling all relevant data and information on ASM activities in the country.

## REFERENCES

- Abbey, C.E., Nartey, R.S., Al-Hassan, S., and Amankwah, R.K. (2014). Direct smelting of gold concentrates, a safer alternative to mercury amalgamation in small-scale gold mining operations. *American International Journal of Research in Science, Technology, Engineering and Mathematics* 7, 74–179.
- Abuya, W.O. (2013). What is in a Coconut? An Ethno-ecological Analysis of Mining, Social Displacement, Vulnerability, and Development in Rural Kenya. *African Studies Quarterly*, 14, 1 & 2.
- Aizawa, Y (2016). Artisanal and small-scale mining as an informal safety net: evidence from Tanzania. *Journal of International Development* 28(7), 1029–1049.
- Alliance for Responsible Mining (ARM). (2017, February 4). Africa: Successful completion of PRECASEM and UNIDO projects. Retrieved from [www.responsiblemines.org/en/news/africa-successful-completion-of-precasem-and-unido-projects/](http://www.responsiblemines.org/en/news/africa-successful-completion-of-precasem-and-unido-projects/)
- Álvarez S, Jessick A, Palacio J, Kolok A (2012) Methylmercury Concentrations in Six Fish Species from Two Colombian Rivers. *Bulletin of Environmental Contamination and Toxicology* 88:65-68
- Ampofo, A. A. (2014). *Gender and society in Africa: An introduction*. Accra: Sub-Saharan Publishers
- Anon. (2017b), “Underground mine ventilation”, [www.wikipedia.org](http://www.wikipedia.org), Accessed: July, 30, 2017.
- Appel, P. W. and Jønsson, J. B. (2010). Borax – an alternative to mercury for gold extraction by smallscale miners: introducing the method in Tanzania. *Geological Survey of Denmark and Greenland Bulletin*, 20, 87–90.
- Basri, Sakakibara, M., and Sera, K. (2017). Current mercury exposure from artisanal and small-scale gold mining in Bombana, Southeast Sulawesi, Indonesia—Future significant health risks. *Toxics*, 5(1), 7. Retrieved from <http://doi.org/10.3390/toxics5010007>
- Basu N, Clarke E, Green A, Calys-Tagoe B, Chan L, Dzodzomenyo M, Fobil JN, Long RN, Neitzel RL, Obiri S, Odei E, Ovadje L, Quansah R, Rajae M and Wilson ML (2015), “Integrated Assessment of Artisanal and Small-Scale Gold Mining in Ghana”, *International Journal of Environmental Research and Public*



- Health, 2015, 12, 5143-5176; doi:10.3390/ijerph120505143.
- Bryceson, D.F. and Geenen, S. (2016). Artisanal frontier mining of gold in Africa: labour transformation in Tanzania and the Democratic Republic of Congo. *African Affairs*, 115(459), 296–317.
- Crawford, G, Coleman, A., Gabriel, B. and Atinga, M. (2015). The impact of Chinese involvement in small-scale gold mining in Ghana (Report E-33110-GHA-1). International Growth Centre, London. Retrieved from <https://www.theigc.org/wp-content/uploads/2016/08/Crawford-et-al-2015-Final-Report-1.pdf>
- Drechsler, B (2001) ‘*Small-Scale Mining and Sustainable Development within the SADC Region*’. MMSD, London
- Hentschel, T., Hruschka, F., Priester. (2002). M. Mining, Minerals and Sustainable
- Hilson, Gavin. (2002). An Overview over Land Use Conflict in Mining Communities. *Land Use Policy*, 19, 65-73.
- Hilson, Gavin. (2009). Small-scale Mining, Poverty and Economic Development in Sub-Saharan Africa: an Overview. *Resources Policy*, 34, 1–5.
- Hilson, G. and McQuilken, J. (2014). Four decades of support for artisanal and small-scale mining in sub- Saharan Africa: a critical review. *The Extractive Industries and Society*, 1(1), 104–118.
- IGF (2017), *Global Trends in Artisanal and Small-Scale Mining (ASM): A review of key numbers and issues*. Winnipeg: IISD.
- Ledwaba, P. and Nhlengetwa, K. (2016). When policy is not enough: prospects and challenges of artisanal and small-scale mining in South Africa. *Journal of Sustainable Development Law and Policy*, 7(1), 25–42.
- Nyame, F. K. and Blocher, J. (2010), “Influence of land tenure practices on artisanal mining
- Nyame, F. K. and Grant, J. A. (2012), “From carats to karats: explaining the shift from diamond to gold mining by artisanal miners in Ghana”, *Journal of Cleaner Production* No. 29-30, pp. 163-172. activity in Ghana”, *Resources Policy* No. 35, pp. 47–53.
- O’Callaghan, Terry; Graetz, Geordan (2017). *Mining in the Asia-Pacific: Risks, Challenges and Opportunities*. Springer. ISBN 9783319613956
- Olivero-Verbel J, Caballero-Gallardo K, Negrete-Marrugo J (2011) *Relationship Between*



---

Localization of Gold Mining Areas and Hair Mercury Levels in People from Bolivar, North of Colombia. *Biological Trace Element Research* 144:118-132

Ollett, John, (2013). Green hills of Africa not as important as its sandy beaches: *Industrial Minerals*, no. 547, April, p. 29–36.

O' Faircheallaigh, C. and Corbett, T. (2016). Understanding and improving policy and regulatory responses to artisanal and small scale mining. *The Extractive Industries and Society*, 3(4), 961–971.

Persaud, A.W., Telmer, K.H., Costa, M. and Moore, M.L. (2017). Artisanal and small-scale gold mining in Senegal: livelihoods, customary authority, and formalization. *Society and Natural Resources*, 30(8), 980–993.

UN Environment. (2017b). *Building capacity for environmental sustainability in artisanal and small-scale mining in Africa*. Retrieved from <https://www.uneca.org/publications/building-capacity-environmental-sustainability-artisanal-and-small-scale-mining-africa>

Siegel S. and Marcello M.V, (2009). Artisanal and Small-scale Mining as an extra-legal Economy: DeSoto and the Redefinition of 'Formalization'. *Resources Policy*, 34, 51 Publications.

Timothy Afful-Koomson and Kwabena Owusu Asubonteng, Eds. “Collaborative Governance in Extractive Industries in Africa”, *United Nations University for Natural Resources in Africa* (UNU-IRNA), pp. 102-120.

World Bank (2013). *Artisanal and small-scale mining*. Retrieved from [www.worldbank.org/en/topic/extractive-industries/brief/artisanal-and-small-scale-mining](http://www.worldbank.org/en/topic/extractive-industries/brief/artisanal-and-small-scale-mining).

World Gold Council. (2017). *Artisanal and small-scale mining*. Retrieved from [www.gold.org/gold-mining/responsible-mining/artisanal-and-small-scale-mining](http://www.gold.org/gold-mining/responsible-mining/artisanal-and-small-scale-mining)