

ARTISANAL AND SMALL-SCALE MINING (ASM) AND SUSTAINABILITY, AND IMPROVED LIVELIHOODS.

A CASE STUDY OF EAST AFRICAN COUNTRIES (EAC)

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Abstract

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, in that regard the Mining Industry has contributed to the major sources of income and employment for the East African countries, especially the local people of Kenya. Artisanal and Small-Scale mining effects in were studied using structured questionnaires. This research draws on primary data collected from households and artisanal miners. The questionnaire was designed to answer the following questions about the socio-economic impacts of small-scale mining on local community livelihoods in East Africa Countries. Furthermore, the research employs of a descriptive survey design, to understand the effects of mining in the study region. Results indicate that overdependence on mining and poor diversification of livelihood options has hindered the development of rural communities in the region. The equitable distribution of employment opportunities and revenue from small-scale mining remains a challenge for sustainable local development.

Keywords: *Mining Industry (MI), Socio-Economic and Environmental (SEE), Artisanal and Small-Scale Mining (ASM)*

1. Introduction

Artisanal and Small-Scale Mining (ASM) refers to informal, small-scale mining activities that often lack formal regulations, impacting local communities and environments significantly (Mensah et al., 2020) [19]. Artisanal and small-scale mining (ASM) produces precious commodities such as gold, diamonds, strategic metals, and less valued minerals, including sand, clay, and coal. Miners are often poor individuals who rely on simple gear such as shovels, buckets, and pans to survive while mining shallow mineral deposits (Schwartz et al., 2021a) [26].

Artisanal and Small-Scale Mining (ASM) plays a crucial role in the socio-economic landscape of developing countries, yet it faces significant challenges.

The literature highlights both the potential benefits and the adverse impacts associated with ASM, emphasizing the need for effective policy reform and better regulation.

Socio-Economic Contributions

- ASM provides employment for millions, contributing to local economies and livelihoods (Sinding, 2005) [30].
- It can stimulate local markets and support ancillary industries, enhancing community resilience (G. Hilson, 2002a) [11].

Environmental and Health Concerns

- Poor mining practices lead to severe environmental degradation, affecting both ecosystems and community health (Scholz, 2017) [25].
- Health risks are exacerbated by inadequate safety standards and lack of knowledge among miners (Scholz, 2017) [25].

Regulatory Challenges

- A lack of geological and census data hampers effective regulation and support for ASM (G. Hilson & Maponga, 2004) [14].
- The informal nature of ASM often results in evasion of government oversight, complicating efforts for formalization (Scholz, 2017) [25].

While ASM has the potential to drive economic growth, its sustainability is threatened by environmental degradation and regulatory challenges. Addressing these issues through informed policy and community engagement is essential for the sector's future.

East African Region is endowed with abundant natural resources. The region has a tropical climate suitable for agricultural crop production and mineral resources (Olanrewaju et al., 2022) [22].

Despite the natural endowment of the region, the livelihood of the rural dwellers in the region has mainly been agro-centered. Still, the increasing population pressure on natural resources and shortage of farmlands has brought about a diversion into Artisanal and Small-Scale Mining (ASM) (Omotehinse & Ogunlade, 2022; Oruonye, 2015) [23, 24]. Hence, Artisanal and Small-Scale Miners (ASM) flocked to the state in search of these minerals. The mining sector is not significantly contributing to the economy because some mining revenues are not accounted for due to the artisanal nature of mining and are undocumented (Zabyelina & van Uhm, 2020) [32]; Hence, this is aimed at contributing to understanding the Socio- Economic and Environmental (SES) impact of Artisanal and Small-Scale Mining (ASM) of livelihoods in the East African community.

2. Literature Review and Conceptual Frameworks

While competent, high-level institutions recognized the positive socio-economic impacts of artisanal and small-scale mining (ASM), particularly income generation and employment creation in rural areas, concern arose in 2002 that 'the bulk of research has been devoted to analyzing the negative aspects of the industry (G. Hilson, 2002a, 2002b) [11, 12] As a result, the field had a poor understanding of ASM's economic role and gathered unfounded ideas and generalizations about the sector's activities to the extent that the ASM sector continues to occupy a marginal position in the economic development agenda (G. Hilson et al., 2021) [15].

This appeared to change when the 53 member states of the African Union adopted the Africa Mining Vision in 2009 and expressed the vision of "a mining sector that harnesses the potential of artisanal and small-scale mining to stimulate local/national entrepreneurship, improve livelihoods and advance integrated rural social and economic development." (Shoko & Mwitwa, 2015) [29].

Various mining activities are carried out in East African Countries by a diverse group of people and mining companies. Most mining activities in the region are done by Artisanal and small-scale miners using simple and basic technology (D'souza, 2005) [9]. Artisanal and Small-Scale mining (ASM) refers to informal mining activities carried out using low technology or with minimal machinery. Artisanal and Small-scale mining is an essential source of income for millions of poor people worldwide. The past decade has seen increasing numbers of individuals and households turn to ASM, and this trend is likely to grow in the face of high mineral prices, population growth, poverty, and climate change (Merem et al., 2017) [20]. Because ASM activities contribute to poverty reduction in remote rural areas, efforts to eradicate the activity tend to fail. However, ASM tends to destroy and degrade forest ecosystems (through habitat destruction, toxic chemicals, pollution of waterways, etc.) and threatens the practices on which mining populations depend (for example, gathering firewood, bush meat hunting, timbering for construction, etc) (Ofosu et al., 2020) [21].

According to Hentschel et al. (2002) [10] the key features of Artisanal & Small-scale Mining (ASM) are often characterized by the following key features:

- Minimal machinery or technology used; instead, ASM mining relies on simple techniques and physical labor;
- Operates without legal mining titles (concession, claim) or a valid contract with the title holder;
- Low productivity since ASM often takes place in very small or marginal plots, is limited to surface or alluvial mining, and uses inefficient techniques. (However, total recovery is improved by repetitive scavenging & reprocessing);
- Lack of safety measures, health care, or environmental protections;
- May be practiced seasonally (e.g., to supplement farm incomes) or temporarily in response to high commodity prices; and
- Economic insecurity. Artisanal and Small-Scale Mining occurs in approximately 80 countries worldwide. There are roughly 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 (Arasa et al., 2020) [5]. It is widespread in developing countries in Africa, Asia, Oceania, and Central and South America.

Though the informal nature and overall un-mechanized operation generally result in low productivity, the sector represents an important livelihood and income source for the poverty-affected local population.

It ensures the existence of 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 (ACET, 2017; Schwartz et al., 2021b) [3, 27]. The East Africa Countries endowed with different types of minerals spread across the region.

These include fluor spar, titanium and zirconium, gold, oil, gas, cobalt and nickel, diamonds, copper, coal and iron ore, clay, silica sand, ilmenite, rutile, limestone, bitumen, lead/zinc, barites, gemstones, granite, limestone, marble, gypsum, talc, lithium and silver (Joseph Zotoo, 2018).

2.1 Impacts of ASM

2.1.1 Social impacts of ASM

Social factors in the mining sector concern the distribution of costs and benefits between the shareholders involved. Where mining is well-planned and all stakeholders are involved in the decision-making processes, it has the potential to spur development and contribute to poverty alleviation in host communities and regions. However, it is frequently associated with illegal activities and health risks, including exposure to hazardous materials (Cossa et al., 2021; G. M. Hilson, 2003) [8, 13].

2.1.2 Economic impacts of ASM

Artisanal and small-scale mining (ASM) operations significantly impact local communities and the environment, presenting both opportunities and challenges. While ASM can provide livelihoods, it often leads to adverse socio-economic and ecological consequences. ASM serves as a crucial income source for many in developing countries, contributing to local economies.

2.1.3 Environmental impacts of ASM

ASM operations are linked to severe environmental degradation, including deforestation and water contamination from metals and cyanides (Tarras-Wahlberg et al., 2000) (Hirons, 2011). Poor mining practices exacerbate these issues, leading to health risks for miners and surrounding communities (Scholz, 2017) [25]. The absence of comprehensive geological and demographic data hampers effective governance and support for ASM, perpetuating its informal status (Hilson & Maponga, 2004).

2.2 Diversification of Livelihood by rural communities in the East African Region

A livelihood comprises the capabilities, assets (including both material and social resources) and activities for a means of living (Scoones, 2009) [28]. This is the sufficiency of supply and flow of food and money to cover fundamental necessities is referred to as a livelihood. Livelihood diversification among rural communities is an essential strategy to mitigate risks and improve economic stability, particularly in vulnerable areas.

A household can have steady employment with sufficient compensation, ownership of land, animals, or trees, the right to graze, fish, hunt, or collect, or a variety of other means can all help them achieve sustainable livelihood stability (Aalders & Moellering, 2011; Abbas & Jaber, 2020; Ulukan et al., 2022)

The diversification of livelihoods to artisanal and small-scale mining (ASM) has become an essential strategy for many rural communities, particularly in regions like sub-Saharan Africa. ASM offers low barriers to entry and provides immediate economic benefits such as employment, income generation, and asset accumulation. In Kenya, for instance, the informal mining sector, has significantly contributed to local economies despite its negative environmental and social consequences.

Research highlights that ASM can lead to enhanced livelihoods for miners but can also exacerbate rural poverty for non-mining households by intensifying competition for resources like arable land (Baddianaah et al., 2023). ASM's rise in these areas often results in three livelihood trajectories: Consolidation for miners, fluctuation for part-time miners, and marginalization for those who cannot transition into mining, reflecting the varied impact on rural communities (Adranyi et al., 2023).

While ASM can provide critical livelihood support, it often operates in the informal economy, with little regulatory oversight, which leads to both socio-economic opportunities and risks, such as environmental degradation and entrenched

inequalities (Maconachie, 2022).

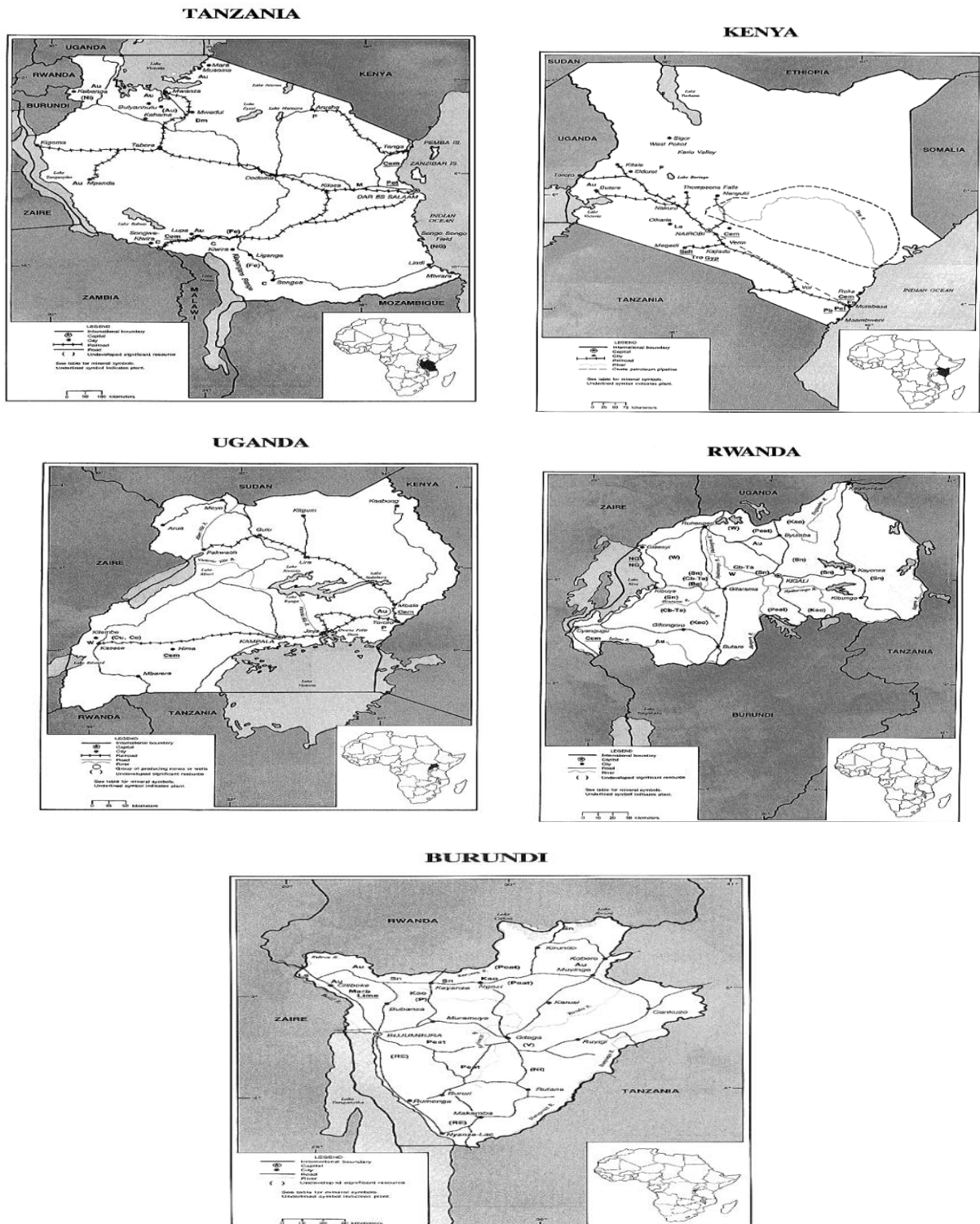
Therefore, policies aiming to formalize ASM and integrate it with sustainable agricultural practices are crucial to balancing economic benefits with long-term rural development.

3. Research Methodology

3.1 Study Region

East African Countries ranging from Kenya, Uganda, Tanzania, DR Congo, Rwanda, Burundi and South Sudan. Kenya is a country in East Africa. The region is endowed with rich mineral resources, such as tantalite, topaz, quartzite, Khashin, tin, mica, kaolin, tourmalines, feldspar, etc. Efforts are being intensified to exploit these minerals on a commercial basis. Also, the LGA is a largely agrarian population producing cash crops such as cocoa, Kolanuts, coffee, and timber. Food crops such as yams, cocoyam, cassava, pepper, tomatoes, and plantains are also produced in large quantities.

Map of East African Countries Studied Regions



3.2 Material & Methods

A qualitative approach in the form of a descriptive survey research design was adopted, in which purposive systematic sampling was used and qualitative data was generated. Semi-structured questionnaires were used to collect data from tourmaline miners in the study area.

The sample size was necessitated by the spatial extent of the area, the spread of the mines, and because the study area has a sparsely distributed population. The focus of data collection was on miners instead of the entire population.

The socio-economic variables that were assessed were the economic contribution of ASM, employment creation, health and education infrastructure, literacy levels, improvement in incomes, employment, and access to livelihood assets. Community perceptions of ASM's impact on the environment were also assessed.

The effects of Artisanal and Small-Scale mining on the various countries in the region was carried out by structured questionnaires, oral interviews, and personal observations. Information on possible remedial action was factored into the questionnaire and administered to the miners, community leaders, and service providers in the mining region, health officials, and environmentalists. The questionnaire was designed to answer the following questions: Approximate number of people involved in ASM, common causes of fatalities in mine sites, marketing of mined minerals and what the money earned is mainly used for, payment of taxes or other forms of payments to government or communities, dangers/threats posed to the communities close to the mine sites, forms of ASM whether working for self, company or cooperative society and impacts of ASM on the social and economic aspects of the East African Region. Other methods used for this paper is by the study of documents which provided large amounts of data for the work. These documents helped the researchers to familiarize themselves with existing practices in the study region. Furthermore, a face- to-face interview techniques and focused-group discussions were also used during the course of this work. A semi- structured interview was also employed to acquire in-depth information from key informants. The data collected from these sources were primary and supplementary evidence. In summary, multiple data collection techniques, including documentation, questionnaire, interview and informal discussion, observation, and field notes, were employed for this work. However, the whole process of empirical data generation is led by the survey questionnaire and the semi- structured interviews.

4. Discussion of Results

4.1 Socio-Economic Impact of ASM

4.1.1 Socio-Economic Profile of Miners (Income and Livelihood)

Below Fig1 Shows that all respondents agreed that mining had impacted their livelihood, while Fig 2 shows the average income of miners. The analysis shows that some miners earn less than KES 100,000 while some miners earn over KES 500,000 per annum.

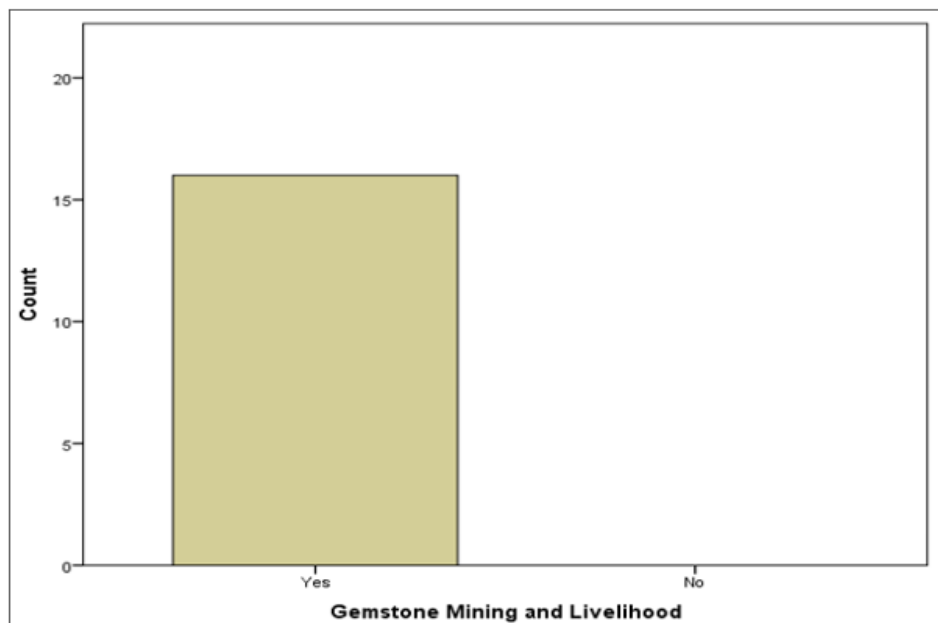


Fig 1: Gemstone Mining and Livelihood

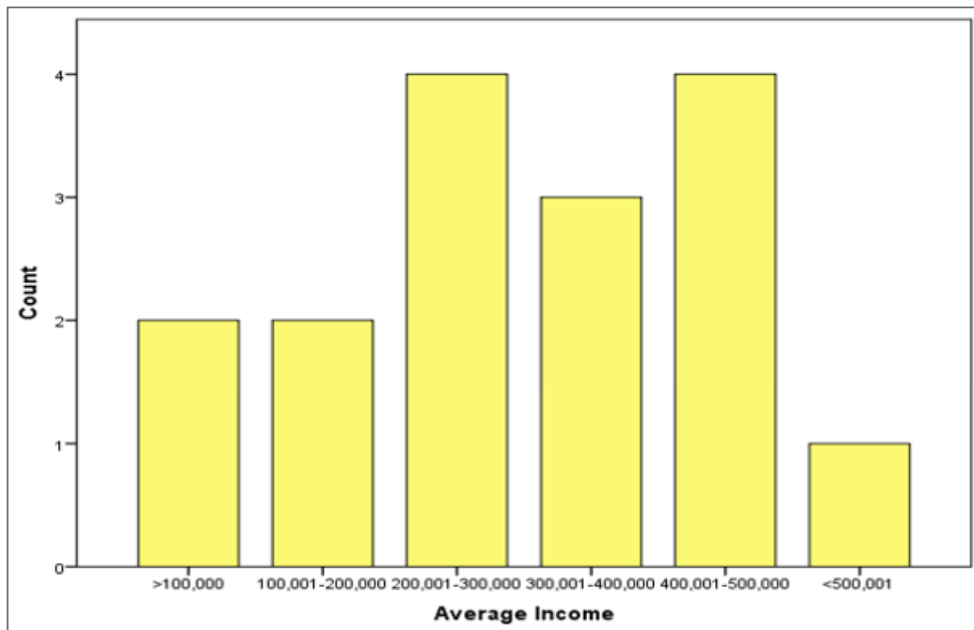


Fig 2: Average income of miners per annum



Fig 3: Other sources of income

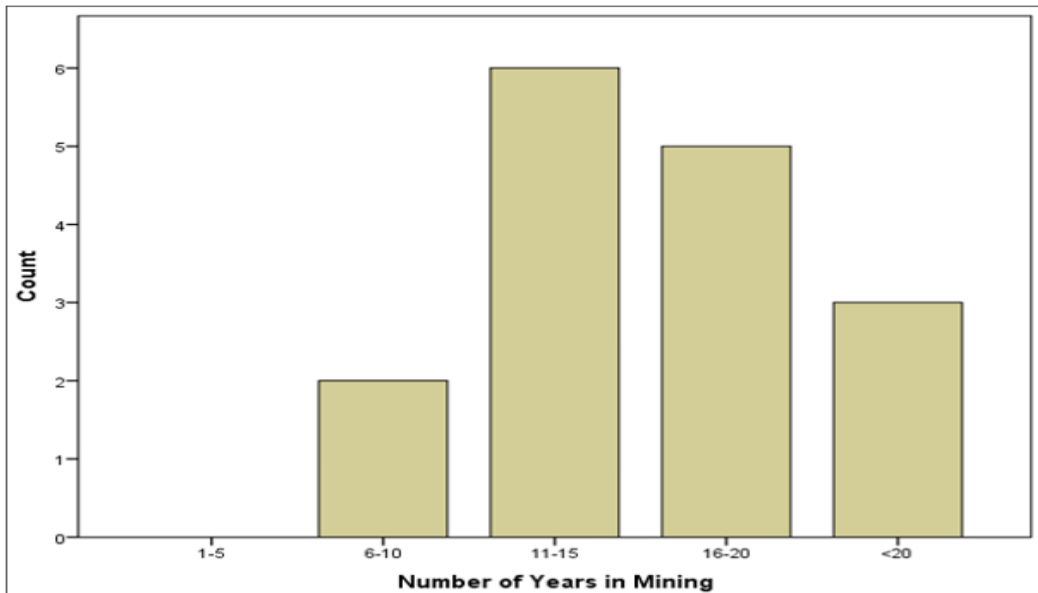


Fig 4: Number of years' miners have used in East African Countries

Fig3, shows that the miners are also involved in business and agriculture. Fig 4: Numbers show the number of years' miners have used the site, from the figure above it shows that the average years miners have spent on the mining site is 15 years.

Correlations					
			Average Income	Other sources of Income	Improvement on livelihood
Spearman's rho	Average Income	Correlation Coefficient	1.000	.845*	.825*
		Sig. (2-tailed)	.	.761*	.901*
		N	16	16	16
	Other sources of Income	Correlation Coefficient	.845*	1.000	.847*
		Sig. (2-tailed)	.761*	.	.886*
		N	16	16	16
	Improvement on livelihood	Correlation Coefficient	.825*	.847*	1.000
		Sig. (2-tailed)	.901*	.886*	.
		N	16	16	16

Asterisk (*) indicates that the correlation result is significant at $p < 0.05$

Fig 5: Correlation between Average income and Other Incomes

The statistics above in Fig 5 there is the strong relationship it shows that there is a strong relationship between Average income, Other sources of income, and the improvement of the livelihood of miners in the East African Region.

Environmental

The plate below shows the various activity of ASM of mining in the study region.



Plate 1: Showing Various Mining Activities at East African Regions

5. Discussion, Conclusion and Recommendations

This study has analyzed the impacts of artisanal small-scale mining (ASM) on livelihood in the mining community East African Countries. A mixed-methods approach was used in the study. The livelihood options, and perceptions of the respondents on ASM activities, as well as the impact analyses relied on both quantitative and qualitative data. Analyzing participation in ASM and its related impacts on livelihood assets from a policy perspective is useful in formulating sustainable policies that ensure an effective and integrated regulatory framework that would fine-tune the activities of ASM in the study area and other mineral-rich countries in Africa.

Findings regarding the economic impacts of mining activities indicate that not much is being done to improve incomes, infrastructure, benefit distribution as well as human well-being in the study region. The study provides evidence that participation in ASM is a viable economic activity and a livelihood strategy that impacts positively shown by some studies that hazardous conduct of some

ASM activities causes threats to people's health in the mining areas (Bansah et al., 2016) [7]. Formalization of the sector is therefore crucial in ensuring the security of land tenure systems that encourage artisanal miners to invest in their mining activities while also improving other essential assets for the development of sustainable livelihoods. This assertion agrees with the submission of some other scholars that the formalization of ASM activities could provide a framework for regularizing operations of the miners to resolve social and environmental assets associated with ASM activities toward sustainable livelihood development. These observations also reflect the inadequacy of policy frameworks and implementations toward appropriate formalization of ASM activities (Maconachie & Hilson, 2018) [18].

6. References

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