Opportunities for Value Chain Upgrading in Artisans and Small Scale Mining in Mwanza Region, Tanzania

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ABSTRACT

Gold mining plays a vital role in supporting the livelihood of the society along the Lake Victoria green stone belt. Value chain analysis can be a useful analytical tool for efficient allocation of resources and understanding the way in which supply chain participants participate in the national economy. This study assessed the artisanal and small-scale miners by identifying measures of upgrading mining products in the value chain. The study covers the selected artisans and small-scale miners in Mwanza, Tanzania. A purposive sample was chosen based on availability, proximity and the ability of getting relevant information. Data were collected from artisans and small-scale miners, brokers, dealers, and other key players along the chain. The findings indicate that artisans and small-scale miners face a number of constraints including poor investment in minerals beneficiation and value added activities. Also more than 70percent of the respondents confirmed that poor artisanal and small-scale miners' participation in social economic development is associated with lack of significant access to credit facilities, lack of equipment and technology, and lack of significant training. However, the formulation of financial lending institutions, training and collective emphasis on beneficiation and value addition activities could create more employment and advance miners/Government revenue.

Keywords: *Artisan and Small Scale Miners, Primary Mining License, Constraints, Opportunities*

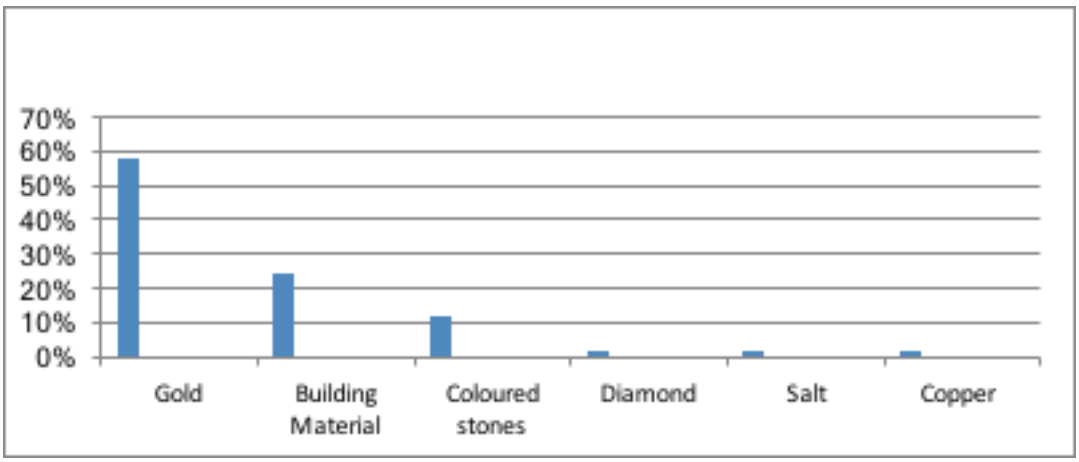
1. INTRODUCTION

Tanzania has a long history of artisan and small scale mining (ASSM) with an estimate of 1.5 million people directly involved, out of who around 27 percent are women (IGF, 2017; Tanzania Ministry of Energy and Minerals [MEM], 2011). Mining legislation in Tanzania does not directly define 'artisanal,' 'small-scale mining,' or 'artisanal and small-scale mining' but Section 4 of the Mining Act, 2010 defines a Primary Mining Licence (PML) as a licence for 'small-scale mining' operations, whose capital investment is less than USD 100,000 or its equivalent in Tanzanian

shillings (Tanzania Mining Act, 2010).

Emphasis was given to gold trading due to the fact that about two-thirds of Tanzanian ASSM are involved in gold extraction; other minerals mainly include gemstones (including diamonds), building materials, industrial minerals and metallic ores (copper) (MEM, 2012) as highlighted in Figure 1.

Figure 1: *Percentage of ASSM engagement in some selected minerals*



Source: *Ministry of Energy and Minerals (2012)*

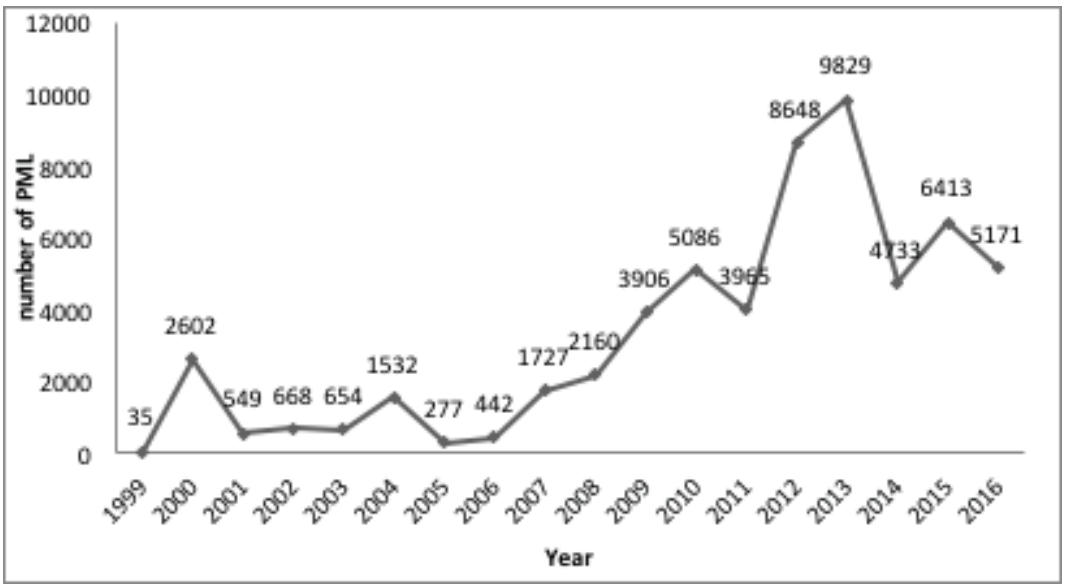
It is estimated that around 58 percent of all ASSM activities are engaged in gold extraction, 24 percent participate in extracting building materials, 12 percent are involved in coloured gemstone mining, and 2 percent of ASSM are involved in diamond, salt and copper mining. Mwanza is within the Lake Victoria Goldfield (Greenstone Belt), where a high proportion of gold mining activities are undertaken.

According to the report on ASSM (Mutagwaba et al, 2018) a number of PMLs has been increasing from 35 licences issued in 1999 to a total of 5,171 PMLs issued in 2016. The elevation experienced in 2011 to 2013, took place as a result of the Government initiatives and various campaigns in creating awareness on the importance of having a PML. In addition, the changes made in the Mining Act in 2010 led to the decentralization of PML issuance from the Commissioner for Minerals to Zonal Mines Officers located in the mining hot spot up country areas. The cancellation and cessation of renewal of dormant PMLs led to a decline in the number of PMLs observed in 2013-2014. Later on in 2017, more mining sites were designated for ASSM whereby a total of 36 areas were designated for mining by small scale miners with a total area of 2,438 km2, and a total of 8,800 PMLs were

issued in these designated areas [Tanzania Mining Commission (TMC), 2018].

In the study commissioned by the International Institute for Environment and Development (IIED) on interaction of ASSM and agriculture, it that the number of active ASSM participants in Tanzania is estimated around 1.5 million with 9 million people depending on the sub-sector for their livelihoods (Hilson, 2016). The trend of registered artisanal and small-scale miners from year 1996 to 2016 is highlighted in Figure 2.

Figure 2: Trends of PML issued between 1999 and 2016



Source: *Mutagwaba et al. (2018)*

In May 2018, 7,000 approved mining licences were dispatched to their respective Zonal Mining offices and over 70 percent of the approved licences are owned by local artisanal miners (TMC, 2018). Furthermore, during the sector meeting held in Dar es Salaam on 22nd January 2019 the president of the Federation of Miners Association of Tanzania (FEMATA) reported that currently there are more than 6 million ASSM operating in Tanzania, whereby this number included licensed and unlicensed miners.

Moreover, the share of ASSM in total gold production grew from 3.2 percent in 1990 to nearly 28 percent in 2011. By 2013, small-scale mining was contributing about

1.4 million ounces of gold accounting for 34 percent of the total gold production [Tanzania Minerals Audit Agency (TMAA), 2015. By the end of 2018, it is estimated that ASSM annual production was around 10 percent of the total productions; however only 8 percent of the minerals produced by small-scale miners was officially declared and hence accounted for in the official minerals exports (Mutagwaba et al., 2018). According to the National Environmental Statistics Report (NESR) 2017, issued by the National Bureau of Statistics (NBS) currently, Tanzania is ranked fourth in gold production in Africa - with an average annual production of about 50 tonnes. The first ranked is South Africa with an average annual production of 190 tonnes, followed by Ghana with average annual production of 88.6 tonnes. Mali is the third country with average annual production of 51.9 tonnes, Guinea is the fifth with average annual production of about 16.9 tonnes (NESR, 2017).

Despite the fact that the number of ASSM is growing, it is not well linked in mining supply chain since most of them are operating inefficiently. The supply chain due to diligence has demonstrated that companies acting as partners along the supply chain can contribute to improving conditions of mineral extraction, providing wide range of opportunities to build inputs industries and to provide key mineral based feedstock into the rest of the economy (Jourdan, 2016). For example, in gold trading, ASSM mostly occurs in rural mining sites where it is sold through local traders and occasionally with the mine owner acting as an intermediary whereby traders and mine owners often also act as creditors for ASSM operations (Abbi Buxton, 2013). As a result, the supply chain is often subdivided into several segments. That is, a local gold trader may sell his gold to a larger regional counterpart, who then sells it on to national gold traders and exporters. However, due to the complexity and unclear nature of these trading activities in the gold business, artisanal and small scale miners are faced with the risks related to oppression, exploitation, smuggling and sometimes money laundering. Therefore, based on these risks, the Government established mineral markets, whereby all small-scale miners are required to sell their gold to authorized dealers offices in those markets, although not well followed in practice.

Moreover, despite the risks faced and inadequate institutional development, small-scale mining in Tanzania is gradually becoming better organized with access to reliable markets, and focusing on value addition activities. There is, however, a little understanding on the necessity of value addition activities on gold produced by ASSM regardless the pressure from the Government.

Conversely, the sector is still facing some constraints including,

- Limited technology and expertise,
- Lack of financial aid from financial institutions,
- Low level of integration with other sectors of the economy,
- Low level of minerals beneficiation and value addition activities, and Environmental degradation.

(Schoneveld *et al*., 2017)

As it has been reviewed by various scholars, it is evident that artisans and small-scale miners face a number of challenges that impede their efforts of maximizing income. In turn, it affects individuals, families and finally the entire community. This paper took a closer look at ASSM value chain, identifying possible gaps for innovation, upgrading, and or downsizing.

Literature review

Porter (1985) describes value chain as a full range of activities that firms and workers perform to bring a product from its conception to the end use and beyond. This includes activities such as design, production, marketing, distribution, and support to the final consumer. Power-dependency theory emphasizes the importance of understanding the buyer-seller relationships (Caniels and Gelderman, 2007). Furthermore, Maloni and Benton (2000) postulate that, the significance and expansive effects of power and dependence on inter firm relationships hold direct implications in the value chain. According to Gereffi, Humphrey, and Sturgeon (2005), value chain framework focuses on the nature and content of the inter-firm linkages, and the power that regulates value chain coordination in a number of tiers across the chain. The activities that comprise a value chain can be contained within a single entity or divided among different entities. Figure 3 shows a simplified supply chain for minerals.

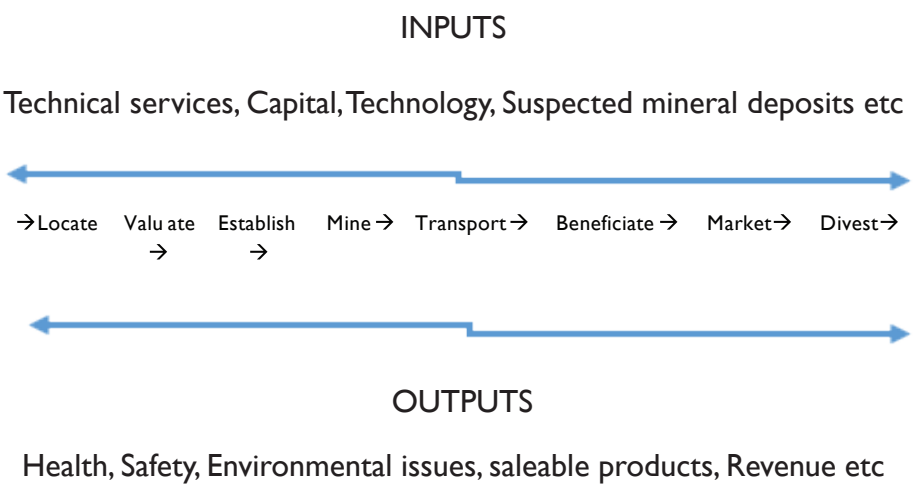


Figure 3: *Simplified mining value chain*

Source: *Vorster (2001)*

Field et al. (2006) in their study on value chain programmes suggest that local miners are often driven into ASSM by poverty and income they receive from it can improve their daily subsistence and reduce their impoverished status in their immediate term. However, the nature of the activity is such that it is labour intensive with less pay. It draws people away from other more sustainable activities such as fishing and agriculture, it does not produce long-term wealth for individuals, and it creates debt. Therefore, ASSM helps the society to move from extreme poverty to poverty. Moreover, Nyambe and Amunkete (2009), argue that many mines are not technically planned and developed because they operate in unauthorized areas such that no permanent infrastructure is established.

Lives of most artisans and small-scale miners involves daily struggle, with many of them operating at the margin of survival (Dieke, 2003). They also lack the requisites to run their businesses along modern technology and management principles (Neupert, Baughn and Dao, 2006; SanjayaLall, 2000). Due to their small size and limited resources, the ASSM are not well equipped to tackle the risks (Herrmann, 2003; Esteves et al., 2010) as it would have been the case with large-scale producers.

According to Gavin and Hilson, (2006), artisanal miners typically present a suite of factors that make them unattractive to lenders. They usually lack collateral and rarely have the capacity or expertise to be able to present a viable business plan that clearly states their capacity to repay loans. In addition, ASSM statistical

reports are rarely available and if available, they are not well-reported hindering risk analyses by creditors. Furthermore, there are other concerns for the health of communities around the mines that might impede effective ore extraction including exposure to chemicals and organic toxins in water supplies, inhalation of fumes, and the risks of explosions. Others include landslides or other crises associated with the destabilized terrain, increased levels of communicable diseases due to poor hygiene and lack of sanitation (Cross et al., 2010). A number of pits are left over after mining operations without following proper closure procedures resulting to environmental degradation and poor safety practices (Bryceson and Jonsson, 2012).

Taylor (2005) postulated that the objective of value chain analysis is to improve supply chain performance, and to achieve this objective Gereffi, Humphrey, and Sturgeon (2005) suggested that, one needs to understand the structure of specific value chain, to identify the characteristics of its leading firms, and the ways they might wish to incorporate local producers in these value chains. For the case of minerals, they pass through multiple channels of miners, brokers, wholesalers and other intermediaries before they are polished, processed, and introduced to the markets. At every stage of the mineral value chain, from the mine to the market, there are economic activities that generate income (Nyaugwa, 2009). Although it is argued that small scale miners make higher profit margins than large scale miners do, the matter is always on the quantity mined (Mziray, 2008). However, the opportunity for maximizing profit margins are able through collaborating with refining and fabrication operations (Mziray, 2008), and which can be possible through value addition processes (Kaplinsky, Schmitz and Humphrey, 2004). Therefore, this study is in line with the observation advanced by Kaplinsky, Schimitz and Humphrey (2004) that participation in the value chain may induce a firm to improve its efficiency in individual activities, change the mix of activities (within its link and perhaps to expand into other links), or to try to innovate by moving into another value chain.

2. METHODOLOGY

The study approach and design

Case study research strategy formed the core of this study. Given the descriptive nature of the study, qualitative research approach was used as the main research approach supported by quantitative techniques to some extent. The objective of employing qualitative research as the main research approach was to obtain a

deeper understanding on the issues connected to social economic development, which helped to identify the gaps in the local mining value chain. More specifically, the study employed a single case-embedded research design, carried out by means of interviews, structured and semi structured questionnaires. Other qualitative data were collected using key informants Interviews (KII) and Focus Group Discussions (FGD).

The study area and Sampling

Rwamgasa in Geita and Ishokela-Hela in Mwanza region were purposely selected as study areas to represent diverse ASSM as over 80 percent of small-scale mining activities are carried in regions along Lake Victoria society. Mwanza is located within the Lake Victoria Goldfield/Green stone belt whereby a high proportion of gold mining activities take place (NESR, 2017). Systematic random sampling technique was used to select a sample of small-scale miners from a list of registered PML owners. The mine owners were interviewed assisted by a prepared interview guide and questionnaire sets. A total of 46 small-scale miners were selected and interviewed. Furthermore, FGDs were carried out among small-scale miners. Purposive sampling procedure was used in selecting the intermediaries along the value chain. A purposive sample of 17 participants was chosen from dealers, brokers, and mining practitioners depending on the accessibility of required information

Data collection techniques and analysis

The study employed multiple data collection methods using both quantitative and qualitative techniques. Questionnaire was used as the main tool for data collection in the first group of ASSM society. Other methods used included structured and semi structured interviews, administered to the second group of intermediaries along the chain. Quantitative data analysis methods were used in the study. Qualitative data obtained from interviews were further analysed descriptively, while quantitative data were analysed through computation of frequencies, histograms, cross tabulation tables, and correlation function.

3. FINDINGS AND DISCUSSION

Minerals beneficiation and value addition activities for small scale miners

Minerals are a depreciating resource; thus, one has to consider whether they are

exploited responsibly. Most of the interviewed small-scale miners, reported a range of constraints associated with low integration and concern in mineral beneficiation and value addition activities as displayed in Figure 4, and these include,

i. Urgency need of cash to sustain basic needs,

ii. The belief among miners that engaging in value addition activities is capital tie up,

iii. Relatively high cost of foreign labour to train the local ASSM, and

iv. Lack of training opportunities in value added activities.

For instance during focus group discussion held in Rwamgasa – Geita, it was reported that, hiring a trainer from some countries that have advanced in mineral value addition activities such as India, China, and America, is pretty costly; and most mining associations cannot afford. It was reported further mining stakeholders rarely offer training opportunities and these do not accommodate a substantial number of practitioners thus impeding the initiatives of expanding the revenue obtained from value addition activities.

About 85-95 percent of gold produced by ASSM is of very low quality (purity) to be sold to earn sufficient profit; thus, value addition processing for lower grade material may generate and double the ASSM income. Most mine owners reported that people are less interested in engaging in beneficiation and value addition due to misconception of a tied up capital. Thus, when a small amount of gold is obtained, it is sold immediately to upstream parties along the chain in order to acquire cash to pay labourers, to bear operating cost such as food, and to meet basic family needs. Poor ornament jewellery making is a serious problem with most of the goldsmiths in towns. Thus, world-class décor, which finally could be used as a source of tourist attraction (mineral tourism), cannot be produced

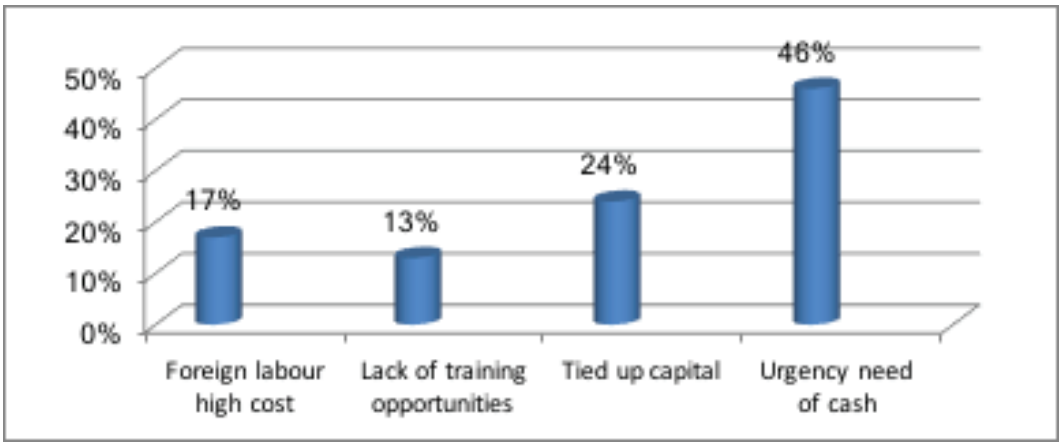


Figure 4: *Constraints for ASSM value addition activities*

Nature of engagement in ASSM

The advancement of ASSM activities is linear linked with improvement in technology, equipment and other resources so that mineral extraction can be treated as a permanent routine activity on areas with abundant mineral deposits. ASSM is sometimes taken up as a sudden "rush" activity following the discovery of new mineral reserves, such as gold nugget or diamond rushes during which thousands of people hope to make fortune. ASSM at this time is seen as a seasonal activity and the occurrence of rush attracts a lot of people in mining activities since artisanal mining has less risk, less labour intensive, less capital intensive, and sometimes one could acquire large output with minimal input. In such circumstances ASSM is rarely treated as a full time activity in which 10.8 percent of the respondents revealed that, in some cases, miners were driven to engage in ASSM as a full time activity normally due to lack of alternative income generating activities.

Furthermore, 28.27 percent of the interviewed miners reported that ASSM is linked to ethnic community tradition. Miners often come from communities that have a long time tradition of small-scale mining and have strong cultural ties with the areas in which they mine. Communities from these areas perceive mining as a family activity inherited from their ancestors. It is this type of mining that creates absolute poverty since it requires many inputs without knowing exactly what will be earned. Table 1 summarizes the results of 46 interviewed respondents responding to the nature of engagement in ASSM activities. Some of the interviewees responded to more than one option.

Table 1: *Nature and scale of engagement in ASSM*

Nature of engagement in ASSM activities	Percentage (%)
Full time	10.8
Part time	19.6
Seasonal/Rush	54.35
Traditional	28.27

ASSM Constraints

ASSM face a number of constraints in their daily operation that, are linked either directly or indirectly with their prevailing poor social economic status. In Rwamgasa for example, local miners cited lack of access to credit facilities, lack of appropriate equipment and infrastructure, lack of training and non-use of geological data normally issued by Geological Survey of Tanzania (GST) as some of the constraints encountered. Frequency codes used in Likert scale and its interpretation are further displayed in Table 2.

Table 2: *Frequency code used in Likert scale and its interpretation*

Serial No.	Likert scale Description	Frequency code	Interpretation
1.	Strongly agree	5	Very high correlation
2.	Agree	4	High correlation
3.	Not sure	3	Moderate correlation
4.	Disagree	2	Low correlation
5.	Strongly disagree	1	Very low correlation

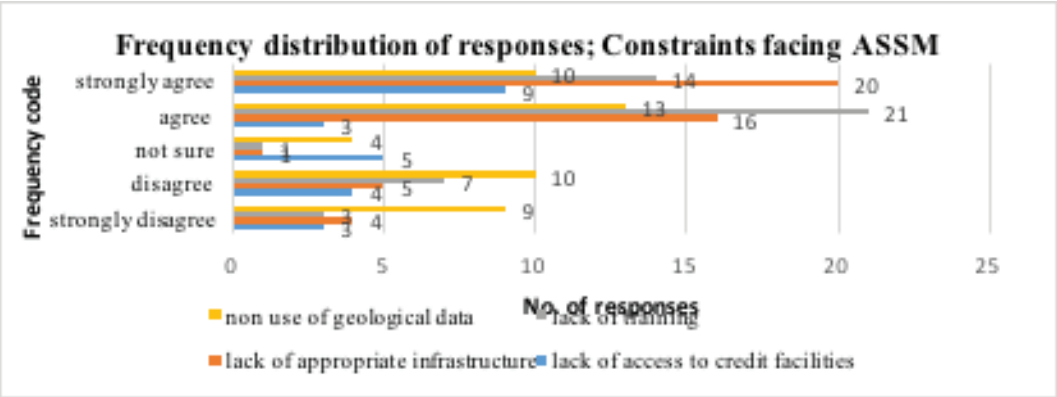
Correlation coefficient [a value between -1 and 1 inclusive, ($-1 \leq x \leq 1$)] was used to determine how strong two variables (anticipated ASSM constraints v/s ASSM constraints) are related to each other. As a correlation coefficient approaches +1 it indicates a perfect positive correlation, implying that the variables are directly proportional related to each other.

Table 3 summarizes the results of calculated non-parametric coefficient of correlation of 46 responses regarding key constraints facing ASSM; the frequencies are further displayed in Figure 5.

Table 3: *Key constraints facing ASSM*

S/N	Constraints facing ASSM	Frequency code					Correlation coefficient
		1	2	3	4	5	
		No. of respondents					
1.	Lack of access to credit facilities	3	4	2	15	22	0.87
2.	Lack of appropriate infrastructure	4	5	1	16	20	0.82
3.	Lack of training	3	7	1	21	14	0.69
4.	Non-use of geological data	9	10	4	13	10	0.24

Figure 5: *Frequency distribution of responses regarding constraints facing ASSM*



Lack of credit facilities

From Table 3, lack of credit facilities with a correlation coefficient of 0.87 ($-1 \leq$ correlation coefficient≤ 1) implies a high correlation that lack of credit facilities could be the key constraint facing ASSM. The majority of ASSM lack access to credit facilities including banks, financial institutions for loans and grants. The respondents cited many reasons associated with this situation including lack of legally binding documents such as mining licenses, lack of economically feasible business plan identifying how loans would be recovered and lack of collaterals to apply for loans. Many financial institutions avoid dealing with ASSM because small-scale mining is associated with high risk such that there is no sufficient proof of returns on investment.

Lack of appropriate infrastructure

In Lake Victoria Zone, small-scale miners (predominantly gold-diggers and panners) - are highly nomadic and rarely spend more than two years in one particular mining or panning area. Consequently, they do not develop permanent infrastructure such as houses, water supplies, permanent production system, nor sanitation services. The condition leads to poor production; exposures to diseases associated with poor hygienic services, making mining activities become risky ventures.

Training

Through FGDs respondents reported lack of opportunities for training on mining rules, laws, procedures, technical training, organizational and business as well as administration and labour management skills, making ASSM more labour intensive with less output, risky, and unreliable. Financial management skills are required in order to enable the ASSM society to control inflows and outflows of expenses to maximize revenue and maintain capital. Through discussions with various small-scale miners during FGD conducted in Geita, some of the miners reported that mining activities are shrouded with traditional myth of using animal sacrifices to acquire sufficient output.

Areas for value chain upgrading in ASSM

Mineral beneficiation and value addition activities

The Government has insisted on mineral value addition activities and has provided the guidelines that no mineral less than 5gm shall be exported raw. Awareness campaign followed by training is required for effective implementation of the sanction to enable ASSM society engage in value addition activities to create employment, raise the value of minerals, and finally raise individuals as well as Government revenue.

In order to create and strengthen value addition activities, Tanzania Gemmological Centre (TGC) and the Mineral Resources Institute (MRI) under the Ministry of Minerals need to be more incapacitated in order to provide mobile practical trainings in mining areas. The sector has few technicians in value adding activities. TGC, MRI, Vocational Educational and Training Authority (VETA), and other technical Institutions could have short term and long term plans to increase students' enrolment in value addition courses as well provide a variety of courses relating to mineral value addition activities.

Effective use of newly established minerals markets

Most of small-scale miners are reported to be more dependent on the prices fixed by local buyers and intermediaries than global market prices. They also sell their products in black markets thus subject themselves to exploitative practices of intermediaries or traders and thus rarely get fair prices. The prices received by miners also depend on the number of intermediaries involved in the entire business chain, the greater the number of intermediaries, the lower the price for the miners.

The Government has established minerals market in various minerals hotspot areas with the aim of eliminating intermediaries along the chain, and who always pay low prices. Trading with formal dealers in mineral markets will minimize mineral smuggling, enhance stable market with stable global prices and will finally enhance effective control of the sector and improve revenue collection. Awareness must be created among ASSM society on the advantages of using the established minerals markets where the prevailing global mineral prices are always indicated.

Collective integration with other sectors of economy

Since Tanzania has been blessed with abundant mineral resources, the sector can expand its horizon, and integrate other sectors of the economy such as tourism and develop tourism related to mineral trading (mineral tourism). This can be done collectively for metal and non-metallic minerals including gemstones. In addition, the sector can establish rolling international mineral trade fairs across the country; the event would create a platform whereby mineral practitioners, miners, buyers, bankers, equipment manufacturers could meet and share opportunities/challenges and do business. Various activities involved in mineral value chain could be a source of tourism and thus create employment and raise revenue. The sector can also integrate sectors such as agriculture, health and others with the aim of enhancing economic diversification.

Establishment of ASSM financial support institutions

ASSM face many financial constraints in achieving their objectives. Through discussions with miners, it was revealed for example, that sometimes one could secure a location with abundant mineral deposit but face a challenge of how to mine it, and thus just ending up securing deposits close to the earth surface. Lack of capital to invest in high capacity equipment and technology is among the major reasons for them to produce less regardless of the abundance of mineral deposits.

The Government and the ASSM society through their associations such as FEMATA could strive to formulate a financial lending institution that would assist the ASSM society by providing loans with minimum interest to miners. To implement the activity successfully, the ASSM society should transform from routine mining to establishing mining sites based on geological findings and data. The fees for geological data need to be rated at an affordable rate and obtained with minimum bureaucracy such that small-scale miners could afford.

4. CONCLUSION AND RECOMMENDATIONS

Conclusion

From the findings, it can be concluded that, the major constraints facing ASSM emanate from multiple parties along the chain including the miners and, to some extent, Government agencies. The findings revealed further that, value addition activity is not a priority in ASSM. Improving the mineral quality, purity, and grading is critical for miners to fetch better prices; international buyers are interested in quality and not quantity. It was also noted that the ASSM community is often engaged in mining activities as an alternative economic activity in recession periods or in rush, or as a traditional activity of the family; geological data is rarely used by the ASSM which might assist in securing economically feasible mineral deposits. ASSM community faces many constraints including lack of access to credit facilities, lack of appropriate equipment, lack of permanent infrastructure, and lack of technical training. Other exposed external obstacles include ASSM environmental impact and safety; small-scale mining is associated with massive environmental degradation and pollution, destruction of arable land, water toxicities by chemicals and explosives. Awareness needs to be raised among ASSM to use effectively the established mineral markets in order to eliminate unfair chain due to a link of unnecessary intermediaries existing across the value chain.

Recommendations

Basing on the research findings and discussions, recommendations are given to the Government as an overseer and the ASSM community in order to upgrade the value chain.

For ASSM to acquire better mineral prices, non-economically viable value chain intermediaries should be eliminated by emphasizing the use of mineral markets by addressing its advantages. In this respect, miners will have the opportunity of meeting different buyers. It would also minimize mineral smuggling, control black

market sale, minimize counterfeit mineral business by unfaithful dealers/miners, and would enable the Government earn more revenue as the escape loopholes would be minimized.

The Government should reinforce on the acquisition of PML by providing training to ASSM on the necessity of acquiring licenses. Upon legalization, ASSM shall possess a mining title (concession, claim etc.) that would enable them to obtain valid contracts with a concession holder, registration of the company with mining authorities, and payment of taxes (royalties, company taxes etc). Since the small-scale miners have been formalized and given permanent mining locations, it is easier for the authorities gradually to reinforce environmental, health and safety procedures; ASSM can now be included in routine mining inspections to ensure conformity and compliance to the healthy, environmental, and safety guidelines.

Effective registration and issuance of PMLs to ASSM will reduce conflicts over land ownership and reduce nomadic nature of ASSM community and thus enabling them to qualify for loans. The Bank of Tanzania being the overall controller of financial institutions should guide the Banks on how to assist the ASSM by providing loans with simplified conditions and minimum interest rate to qualified small-scale miners in fair dealings. This should include financial loans, technology, machinery and equipment loans.

Encouraging value addition within the production chain provides a means of enabling small-scale miners to generate additional income and thus creating more jobs within the local economy. Other means of adding value include transforming gold into jewellery.

Priority should be given to seeking ways of stabilizing business environment through developing other employment opportunities and ensuring that mining operations are integrated with other existing local economic activities. Ideally, mining should serve as a catalyst and anchor for other productive activities stimulating complementary and alternative productive ventures.

Priorities should be to find better ways of integrating the sector into the rest of the economy and encouraging mining communities to invest their revenues in other forms of economic activities and other communal services such as education (schools), agricultural activities and health services.

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