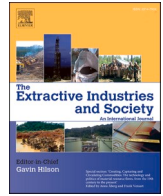




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Original article

Gender, livelihoods and local development in artisanal and small-scale mining areas: Evidence from gemstone production in Zambia and Tanzania

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ABSTRACT

This article uses data collected from male and female miners and gemstone traders in an amethyst production zone in Zambia and tanzanite production zone in Tanzania to explore the gendered dynamics of investment of artisanal and small-scale mining profits in local communities. We investigated payment arrangements at mining sites and variations between how men and women are paid; and asked how men and women use proceeds from mining. These research themes allow us to identify mining and non-mining investments made by miners and develop an assessment of the broader, rather than narrow, impacts of ASM on economic livelihood alternatives in the community.

1. Introduction

Since the early 2000s, there has been increased policy interest in the economic development opportunities of artisanal and small-scale mining (ASM). This is because it typically provides income exclusively for nationals of the ‘host country’ rather than foreign employees of multinational mining firms, and involves some redistribution of profits, especially when conducted in a cooperative model. Perks describes ASM’s “own trade chains and labour hierarchies”, which form “expansive networks” though which goods and services are exchanged and income is distributed (Perks, 2012: 7). Nevertheless, positive impacts of ASM for citizens in mining areas are overshadowed by reports of negative externalities. Adverse environmental and social impacts of ASM are experienced at local level (Kambani, 2003), with few visible material benefits around mine-sites. Negative impacts, which include potential illnesses and accidents suffered by miners themselves, are often associated with, “a vicious circle of poverty and vulnerability” (Vera et al., 2007: 78). Secondary economic activities that do emerge to service ASM sites (restaurants, kiosks, bars, rental housing units etc.) are sometimes dismissed on the basis that they are temporary and reflect a supposed preference for spending ASM proceeds on luxuries like alcohol. Moreover, expectations of local community members for local development may be unrealistic as imagine mining profits to be greater than they are in reality. Miners in Zambia for example reported that, “community

expectations from them were too high with demands for good roads, schools and clinics” (Phiri and Chileshe, 2015: 1228).

In recent years, some researchers have researched how ASM actors use their profits, and have emphasized differences between men and women in this regard (e.g., Brottem and Ba, 2019; Jønsson et al., 2019; Buss et al., 2017). Some studies have described miners remaining at the subsistence level and being trapped by ASM in a vicious cycle of poverty (Mlambo & Masiya, 2020; Mlambo et al., 2019); but others have identified miners who have increased their stock of durable household goods, movable assets (e.g., cars), and improved their food security. Despite positive examples, the simplistic idea persists that miners are opportunists lacking long term plans for their future, and that mine sites are places of exploitation, rather than economic opportunity, for women.

This research involved male and female miners (with various roles in gemstone exploitation) and gemstone traders in an amethyst production zone in Zambia and tanzanite production zone in Tanzania. We investigated payment arrangements at mining sites and variations between how men and women are paid; and asked how men and women use proceeds from mining. These research themes allow us to identify mining and non-mining investments made by miners and develop an assessment of the broader, rather than narrow, impacts of ASM on economic livelihood alternatives in the community. The paper is structured as follows: the next section contextualizes the study through a

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review of research on ASM, economic diversification and gender dynamics in that context. The third section describes the methodological approach; section four presents the findings from the study; section five discusses and compares those findings, and we draw conclusions in the final section.

2. Literature review

2.1. Livelihoods in ASM communities

ASM is increasingly recognized as critical to livelihoods, especially in rural areas, with 130–270 million people worldwide relying on it for incomes, including 60 million in rural sub-Saharan Africa (Girard & Molina-millán, 2022). The International Round-table on ASM in 1995 represented a watershed moment when international policy-makers accepted that ASM was primarily a poverty-driven activity taking place in contexts where alternative employment opportunities were limited (Barry, 1996; Noetstaller, 1995). However, although the Round-table participants implicitly accepted that income from the activity was spent on basic needs, discussions at the time focused on environmental, social, health and safety issues as well as ‘rogue entrepreneurs’ in the sector with a ‘get-rich-quick mentality’ that feeds into the vices and exploitation often observed in ASM sites. This focus on negative social and economic impacts has continued to limit support for the sector (Fisher et al., 2019).

The arguments linking ASM to livelihoods from the 1995 Round-table have, however, since been expanded upon by numerous other studies. While earlier studies highlighted how ‘rush type’ activities can disrupt community life, narrowly benefit miners (rather than members of adjacent communities) and have limited links to sustainable livelihoods (Hentschel et al., 2002); more recent studies have focused on ASM as a livelihood diversification strategy that sometimes replaces traditional farming. This was especially the case following the 1973 oil crisis and the Structural Adjustment Programmes of the 1990s that liberalized economies and diminished agricultural subsidies (Kwai and Hilson, 2010; Bryceson and Jønsson, 2010). More recently, others have noted that impacts of climate change are limiting agricultural productivity and necessitating expansion and diversification of livelihood options (Fisher et al., 2019). For example, Hilson (2016), found that in Mozambique, up to 30 per cent of ASM workers used their profits to supplement seasonal farming income, while Maconachie and Binns (2007) found that in Sierra Leone, miners become farmers during the rainy seasons but revert to mining during dry seasons.

Bryceson and Jønsson (2010) show how some rural communities have begun to move away from farming – a process they call “deagrarianization” - due to declining commodity prices and withdrawal of state support to small-holder farmers. ASM is not only an experimental, transient activity but has become a career for many people. This pattern of ASM as a diversification strategy has also been found in Liberia (Hilson, 2016), Ghana (Baffour-Kyei et al., 2021), Tanzania (Bryceson and Jønsson, 2010; Kwai & Hilson, 2010), Burkina Faso and Indonesia (Fisher et al., 2019), where ASM incomes feed into agricultural activity and vice versa. The Africa Mining Vision has recognized this trend, and (noting the finite nature of the mining sector) emphasized need for training and investment into diversified livelihoods (AU, 2009).

A few studies (Radley, 2022; Oramah et al., 2015) have investigated specifically how miners use incomes from ASM. Researchers note that earnings “vary widely and are inconsistent” (Moyo et al., 2022: 8). Bryceson and Jønsson (2010) noted that average monthly income amongst 108 small-scale miners in Tanzania was US\$150; but the income varied widely within the sample, from virtually \$0 to over US \$500; Bansah (2019) estimated that small-scale miners in Ghana earned around US\$250 per month, with reported earnings ranging from US \$163 to US\$1220 (both cited in Moyo et al., 2022). Households rely on ASM earnings to purchase essential goods such as food, pay for education, and support other livelihood activities, e.g. farming (Baffour-Kyei

et al., 2021; Fisher et al., 2019; Mkodzongi and Spiegel, 2019; Hilson et al., 2013, 2018). Some researchers argue that most ASM revenues are invested in the local community or region (Hinton, 2005, citing Jaques et al., 2002). For example, a ban on ASM in Ghana in 2017 led to youth unemployment and difficulty in meeting basic needs not only for those directly employed in ASM, but also those (mainly women) indirectly involved through sale of goods to miners (Osei et al. 2021). A mixed method study by Baffour-Kyei et al. (2021), similarly found that ASM had a positive impact on livelihoods of individuals in rural Southern Ghana (e.g. increased incomes and scale of goods and services traded at local markets) but negative impacts on their human, social, natural and physical assets (Baffour-Kyei et al., 2021). Other studies have emphasized that miners, who are often itinerant, send remittances to relatives (Makhetha, 2020). These studies do not, however, go into detail with regards to the use of ASM incomes or distinctions between male and female use of income and diversification strategies. Fisher et al. (2019) provides more detailed insights when they note that one third of ASM incomes in West Timor’s manganese mining is used for basic day-to-day needs such as food, clothing, soap; and other proportions for education; while about 10 % is used to support farming activity. A proportion of mining income also goes to a village tax that is used to fund projects around the village. Generally, the contribution of ASM to the local economy depends on factors including which commodity is exploited, whether the mining settlement is temporary or long-standing, the scale of revenues and how money is spent within communities (Hinton, 2005). Many studies fail to distinguish between how men and women utilize mining income.

Researchers have noted that although many communities near ASM sites are impoverished, ASM can potentially drive economic activities in remote and marginal communities (George et al., 2022). However, the issue is chronically under-researched. In Tanzania, for example, while it is known that ASM makes significant contributions and creates jobs (compared to the small number of opportunities in the LSM sector), there is a lack of good quality baseline data (Mwaiopopo et al., 2004). In addition to job creation, ASM’s contribution to community development has been assessed in terms of skills development, access to productive resources by local people to develop complementary economic activities (e.g. productive linkages), and poverty alleviation (Ahenkan et al., 2020). The issue of sustainability is often a question, especially given the finite nature of the mining sector. It is unclear whether ASM’s contributions to the community will persist beyond the life of mine sites themselves. Another key conceptual challenge is the definition of ‘community’. In some cases, entire settlements are classified as “ASM communities”, implying that livelihoods are entirely dependent on ASM, and that these communities could disappear when all minerals are exhausted. This simplification ignores connections between miners and non-miners, as well as multiple livelihood activities undertaken by individuals (AMDC, 2017). Hinton (2005) notes that ASM contributions to community development do not depend only on micro-level socio-economic and socio-political factors, but also, the macroeconomic and policy context that represents obstacles or opportunities for people practicing ASM as a rural livelihood so that, “marginalization of ASM by many governments is often a major factor in the presence and quality of public services” in mining-adjacent communities (pg 62).

Questions of how investment and livelihood diversification strategies are influenced by gender dynamics remain under-researched. The section below takes a closer look at how gender in ASM has been addressed in recent years.

2.2. Gender roles and livelihoods of women in ASM

Women’s participation in ASM has been largely overlooked in the literature (Hilson, 2016; Buss et al., 2017). Scholars such as Noetstaller (1995), Dreschler (2001) and Hinton et al. (2003), estimated that approximately 30 % of ASM actors were women. Exploratory works showed how women mostly undertook ‘ancillary’ or ‘subordinate’ roles

such as cleaning and cooking, and engaged in activities such as processing or transporting minerals, rather than mineral extraction itself (Noestaller, 1995; Dreschler, 2001; Hinton et al., 2003). Numerous other publications have documented the divergent experiences of women in the sector. Women face lower pay for similar work, tend to work longer hours than men and face the double burden of domestic duties and ASM activities (Buss et al., 2019; Fisher et al., 2019; Hinton et al., 2021).

Other studies also find that social norms may hinder participation by women in mining activities. Buss et al. (2017) find that women's involvement in mining may be seen locally as an inappropriate departure from rural gender norms, whereas agricultural activities are accepted as more appropriate. Married women in Rwanda, for example, were at times prohibited from engaging in ASM by their husbands and wider community. While some women groups have gone on to challenge these norms and participate in mining, their degree of participation may nevertheless be limited. Norms around domestic roles in the home, for instance, mean that while men can focus solely on mining, women must first complete chores in the home and agricultural activities before participating in mining activities, which limits their earning capacity and career progression. Women also tend to be less mobile, restricted to selling their minerals within mining areas where prices are lower, unlike men who sell their minerals beyond the mining area (Buss et al., 2017).

However, some gender stereotypes seem to benefit women. One study found that gemstone companies in Zambia preferred to employ women because they are "hard-working and trustworthy" (Phiri and Chileshe, 2015: 1228). Despite their typically lower-paid roles in mining operations, women often earn more from mining than they can from alternative livelihoods, as much as twice or three times as much (Buss et al. 2019; Stewart et al., 2020).

In Zambia, as elsewhere, men dominate the more profitable aspects of ASM in Zambia. An estimated 41 % of ASM workers are women (Tychsen et al., 2018) but only 6 % of artisanal mining licenses are held by women (Onditi, 2022). Obstacles for women in the Zambian gemstone sector include, "lack of education, training, gender discrimination and lack of effective representation" (Phiri and Chileshe, 2015: 1230). Several associations and organizations try to address legal, social and economic barriers that inhibit women's participation in ASM, including land rights systems and socio-cultural beliefs. Phiri and Chileshe (2015) found that traditional beliefs included the idea that menstruating women can make minerals 'disappear', as well as the common generalization that women are not sufficiently strong or determined to work underground. The Mineral Resources Development Policy (2013) aims to 'mainstream gender in the mining sector' through a variety of measures including: supporting gender equality in the mining sector through mining legislation; promoting participation of women in mineral sciences educational programmes; and providing support to ensure equal opportunities for both men and women participation in mining.

3. Methodology

Tanzania and Zambia were selected for this research as they both have significant ASM gemstone sectors, are both in the same region (Southern Africa), and have both experienced significant state efforts to support and formalize the ASM sector.

3.1. Zambia

Research took place in gemstone mine-sites in Mapatizya Constituency, Zambia. Thirty-three semi-structured interviews were conducted with participants from four different ASM mine sites. Participants were selected through semi-purposive sampling to ensure representation of women and different kinds of ASM workers. Respondents included miners (diggers), sorters, hauliers, three mine-owners (Primary Mining License holders), security personnel, three local business-owners, six

community members and seven gemstone traders. In addition, two focus-group discussions (FGDs) were held with members of ASM associations (seven participants in each). Twelve of the total 33 participants were women; only two out of 14 miners interviewed were women but five traders of seven interviewed were women. Interview data were analyzed through content analysis techniques, using both inductive and deductive thematic 'codes'.

3.2. Tanzania

Fieldwork was conducted at mine sites in Merelani Controlled Area (MCA), in Mererani town, and two villages adjacent to the MCA. ASM workers and community members were randomly selected through transect walks in ASM areas. The overall number of research participants was 38 (24 men and 14 women). Twenty-seven interviews were conducted, eight short surveys were completed, and two FGDs were held (one with women and elderly men; another with community-members).

As the sample sizes in both countries are small, we do not present statistically significant quantitative data, but rather draw conclusions based on the combination of quantitative and qualitative data, triangulated with information from secondary sources.

4. Case studies

4.1. The ASM policy and legislative context in Zambia

Following independence in 1964, the government tried to diversify the Zambian economy away from large-scale copper mining towards industrial minerals and gemstones that would support rural development. The Kaunda government began small-scale emerald production through the state-owned Mineral Development Corporation (MINDECO) (Zwaan et al., 2005). In the 1970s, the government allocated ASM licenses of about one square kilometer each. Compared to other sub-Saharan African countries, ASM is extremely 'formalized', at least from the perspective of legal licenses, with a total of 241 artisanal mining rights, 468 small-scale exploration licenses, and 26 small-scale licenses in 2020 (Zambia EITI, 2021).¹ The World Bank ranked the extent to which ASM operates legally as 'very high' and the extent to which ASM takes place under formal procedures as 'High' (World Bank, 2016).

Mining including ASM is principally regulated through the Mines and Mineral Development Act No. 11 of 2015 ("the Mining Act") and guided by the Minerals Development Policy, 2013. Only citizens, or a cooperative composed of citizens, can own an artisanal license, which is restricted to one or two cadastral units, whereas small-scale mining is defined as between three and 120 cadastral units (Mining Act, 2015:189 – article 29). The Mining Act also provides for non-mining rights, such as mineral processing licenses, mineral trading permits, mineral import permits, and mineral export permits. Currently, royalties must be paid at 6 % of the gross value of the gemstones produced; frequent changes in tax rates have made it difficult for ASM operators and potential investors to plan. ASM operators are also subject to area charges under the Mining Act and payments to the Environmental Fund, PACRA, and other agencies.

The Mineral Resources Development Policy (MRDP) of 2013 is clearly pro-small-scale miner, with a multifaceted approach to providing support to the sector, from promotion of appropriate technology use, through research, facilitating access to finance, to building institutional capacity, and building capacity of miners themselves to mine sustainably. The policy further calls for value addition to minerals and marketing of gemstones through auctions to be held in-country. In 2013 the government banned emerald auctions abroad in an effort to curb capital

¹ Unlike small- and large-scale mining, artisanal mining does not require an exploration license.

flight. Gemstones firm Kagem held its first local auction in 2013, and local auctions have been held regularly since, albeit with accommodations for external sales too. However, informal traders have bypassed these measures. Competition and lack of coordination between gemstone traders allows buyers to drive down prices.

The Seventh National Development Plan (7NDP) 2017–2021, gave prominence to the ASM sector. According to Annual Progress Reports there were successes in getting ASM operators licensed and improving environmental management, however in 2020 only 40 % of targets were met, partly due to limited budgetary disbursements (MoFNP: Annual Progress Reports, 2017–20). The 8NDP (2022–26) includes amongst its 45 strategies, “promote mining of traditional and non-traditional minerals” (Ministry of Finance and National Planning, 2022). Emphasis is on local beneficiation and value addition through a national supplier development policy, encouraging formation of ASM cooperatives, improving ASM access to support services, and strengthening linkages to value chains. The 2020 Export Diversification Strategy for Gold and Gemstones aims to improve access to geological information, facilitate access to finance and build capacity for ASM, encourage small-scale mining to form larger groups. However, implementation of these is limited (PMRC, 2023). The 2023 budget included K50 million to support ASM with financing and equipment (PMRC, 2023), and reduced the income tax rate for lapidary and jewelry facilities to 25 % from 30 % (PMRC, 2023).

Zambian government support to the ASM sector has often focused training. While useful, it has been subject to elite capture (with a small number of individuals accessing opportunities time and again). More direct support, such as through provision of equipment, might be more useful. As banks are unwilling to provide loans to ASM, miners are forced to rely on their own funds, or turn to informal credit providers (“loan sharks”) (Siwale, 2018b). The Mining Sector Diversification Programme (MSDP) included a loans programme, but very few ASM operators were able to access loans due to conditionalities (Lungu and Shikwe, 2006). Increasingly, Chinese investors are involved in the amethyst sector, both as gemstone traders and as potential financiers, though the latter situation is rare (Siwale, 2018b: 95).

4.2. Research findings from Zambia

In Mapatizya, some ASM operations rely on handtools, but others hire mechanized excavators from companies in cities such as Choma or Lusaka, leading to loss of revenue from Mapatizya to these urban economies. Furthermore, some mine-owners live in cities, which leads to more loss of revenue from the local community. As in other countries, ASM is organized hierarchically. Some license-holders pay workers according to production (i.e. a financial amount/kg of amethyst produced) but many workers prefer fixed monthly salaries; both payment systems are evident in the fieldsite, Mapatizya. Furthermore, some mining is managed through Joint Production Arrangements (JPAs), in which miners work without regular payment and benefit from a pre-arranged share of the total production. JPAs may be associated with more migratory artisanal miners, rather than local inhabitants, as the highly informal nature of the joint production agreements facilitates flexibility and/or precarity. There are some ASM associations in Mapatizya. Kalomo Miners’ Association (KMA), founded in 1999, restricts its membership to mining license-holders (Siwale, 2018a). While KMA offers only limited direct benefits to its members (e.g. access to credit or training if donor funding is available) it has provided benefits to the broader community, such as support to a clinic, roads maintenance, and a borehole (Siwale, 2018a). One local small-scale mining Cooperative has applied for government grants under the Constituency Development Fund (CDF) women empowerment component, illustrating the role they might potentially play in providing opportunities for women.

Most gemstone traders have trading licenses, which cost K2,100 for 3 years. Some use a ‘group license’, for about k500 each, though its not clear that this is legal (it may be a group of people using one individual

license). Members of a local mining cooperative previously did not have licenses, leading authorities to confiscate 30 tonnes of their production. All members are now required to have licenses. However, outside of the cooperative, not all miners interviewed had licenses.

To measure the impact of ASM on mining income and livelihoods, it was important to first assess income generated from the sector. A third of the miners interviewed stated that they earned USD101– USD150 a month, while those in the USD51–100 bracket were the second largest group, with only two individuals earning USD151–200. The two women miners earned less than all their male colleagues did. The women were paid using the JPA, while the men were paid through JPA, salaries and cash. The two women sorters in the sample were paid the least, earning USD26–50 a month. The pattern of women earning less than men reflects national level patterns (Zambia Statistics Agency, 2020). However, wages in ASM also vary according to roles, with digging earning more than the less risky and physically-demanding sorting. Although this study has a small sample size and does not constitute a representative sample, it should be noted that the wages indicated by interviewees fall significantly below the national monthly average wage for rural areas which stood at ZMW3,980 (USD235) (Zambia Statistics Agency, 2020). Miners’ wages were also below the average monthly wage for non-agricultural rural workers, ZMW 5232 (USD308). However, it was higher than the average earning for informal rural workers, ZMW2131 (USD126) and skilled agricultural and fisheries workers, ZMW1552 (USD92). The COVID-19 pandemic had reduced the participants’ income by 25–50 %, or more, because fewer buyers journeyed to Mapatizya to purchase gemstones. The exception to this negative trend was a mine-owner with an agreement with a social enterprise that facilitates online sales (Virtu Gem). Nevertheless, ten artisanal miners believe that mining has improved their position or status at home and in the community, with three other miners saying that it has not changed compared to their previous employment.² Prior to becoming miners, they pursued informal careers (carpenter, farmer, fisherman, etc.) or formal careers (e.g. secretary, register clerk).

When asked if mining provides a higher income than other activities, participants gave mixed responses. Seven respondents felt that mining income was higher, while three felt that their previous work earned them higher earnings, and two others did not know. Only four of the seven traders stated what they earn. Two traders, a man and woman, earned between USD0 to USD100, and the other two, a man and woman, made USD100 to USD200. The sample size was too small to draw conclusions. Some miners and sorters raised concerns about the irregular manner in which they received their incomes and how this negatively affected their livelihoods and impacted their medium- or long-term livelihood strategies.

Of the three mine owners interviewed, one male mine-owner felt that mining had not yet brought him greater financial independence. This was in comparison to his previous employment as a mine manager at an LSM firm. The second male mine owner reasoned that financial independence varied with mining outputs and sales. The female mine-owner interviewed felt that the activity had brought her greater financial independence.

Members of local cooperatives indicated that miners and traders, even members of the same cooperative, use different methods to grade and scale their stones, which makes it difficult to set prices locally and benefit sellers. The buying price of amethyst also varies, resulting in those at the lower end of the spectrum struggling to make ends meet. They suggested that the government develop common grading and scaling scales and regulate the buying process.

Additionally, miners expressed disappointment that miners usually remained in their initial job position for years, with limited opportunities for promotion. This is even worse for women who are restricted to

² The remaining miner, a woman, was unsure of whether her socio-economic status has improved or not.

specific activities. Job progression, if possible, would contribute to increasing their incomes and improving their livelihoods.

4.2.1. Gender dimensions of ASM income

In Mapatizya some women feel they are better respected due to their involvement in mining. This is explained mainly by the fact that Mapatizya is not a farming community and so mining is a common livelihood. However, most women directly engaged in the sector are sorters, while other women participants are involved in stone trading and support services such as selling groceries and clothes. This highlights that women predominantly occupy 'ancillary roles'. For example, one participant noted that, "we women work with low grade [material] which is more difficult to sell" (female *gem* trader). Gemstone-trading women were mostly residents in Mapatizya and sold to buyers in Kalomo (100 km away) and Lusaka, but not internationally. Their main buyers are Chinese nationals, but these have also become their competitors, as Chinese buyers offer a higher buying price than local traders. Despite this competition, most traders still felt that stone trading provides them with a higher income than their previous employment. Half of the *gem* traders interviewed were widows. The married female stone trader said that she need her husband's approval to participate in the sector, and her decision to become a trader was influenced by tough economic conditions. The traders come from diverse backgrounds: alcohol salespersons, students, fish traders, and artisanal miners. Women traders maintained personal control over the proceeds of sales: most are channeled to household income and other revenue-generating schemes. This increases their status within the community, as they feel "more respected" (interview with female *gem* trader); "they respect you as a miner if you have workers and pay them on time" (interview with a female *gem* trader).

With regard to overall decision-making power in the home, there was a pattern of joint decision-making between husbands and wives. However, decision-making is not equal: women make financial decisions for day-to-day expenses while men dominate decisions pertaining to capital projects. Even the female mine-owner clarified that her husband provides 90 % of their household income and is the primary financial provider. Findings also revealed that most women used part of their mining income to invest in micro-level saving schemes such as village banking. Male traders maintained personal control over their profits which they invested into existing businesses, while some male traders shared profits with their wives to find more investment opportunities.

4.2.2. ASM's contribution to local economic activities

Some local businesses in Mapatizya (groceries, clothing shops and bars) service ASM sites. Six local business owners were interviewed (three men and three women). They estimated that on average, over 50 % of their customers were ASM workers and over 50 % of revenues also derived from ASM operators. The estimated percentage of female customers was 10–80 % with an average estimate of 48 % female customers. Local business owners felt that ASM increases cash flow into the local economy through purchase of consumer goods. Most retailers felt that disruptions in ASM production negatively affect their businesses. Interviews with health and education workers in the community suggests that miners have a high social status in their community.

While ASM has contributed to the stimulation of the local economy there are few forward and backward linkages to other industries. Some shop owners, however, also trade in amethyst and there is a small degree of value-addition to amethyst by mine owners and some traders through basic cutting and polishing. Training opportunities in cutting and polishing have been offered to some association members through the Gemstone Processing and Lapidary Training Centre in Ndola, but value-addition remains limited.

Income generated from ASM is used to purchase food, education, healthcare, transport, and other day-to-day costs. Most residents of Mapatizya have built mud houses and so do not pay rent. Most income is devoted to essential expenditures. Less than half of respondents

indicated allocations of income to leisure. Most participants had long-term plans of owning land for livestock-keeping or home construction. However, some traders want to move their families out of Mapatizya into urban areas for better prospects, especially education. Most miners want to invest in non-mining sectors. Those who want to continue in the sector would like to become traders, own their mines or increase their mining productivity.

Only female mine owners said that ASM provides them with greater financial independence. Mine-owners reinvest the most in mining activity through hiring mechanical excavators. A previous study found that it cost, K100,000 (USD 3711) for a round trip to transport an excavator and bulldozer to Mapatizya, plus the hire cost of K10,000 per day, plus K18,000 daily for fuel (PMRC, 2023). The purchase of machinery is often a medium term aspiration. Mine owners have also invested in building mining infrastructure and in livestock production. One mine-owner emphasized the need to invest in hiring expert geologists and sorters and graders for improved production.

Among *gem* traders, a few intend to purchase a vehicle to facilitate transportation of amethyst. In most cases, their focus was on non-mining investment, such as in small grocery stores within their communities.

4.3. ASM in Tanzania

ASM provides employment to 600,000 - 1.5 million people in Tanzania (see Marwa and Warioba, 2015; Hruschka 2015, UNECA 2011). In 2011 an estimated 27.6 % of ASM workers were women (UN Women, 2016). As in Zambia, customary beliefs and gender norms hinder women's access to certain kinds of mining work, particularly underground work. Indeed, "women have been forbidden to enter" mines *that they themselves own* by local officials, "because of safety concerns" (Kondo, 2023).

For decades, ASM was largely ignored by policy-makers in favour of LSM. However, as frustration with LSM increased amongst mining-adjacent communities in the early 2000s, the government gradually changed its policies. Under the 2010 Mining Act, designated areas for ASM increased to 2438 km² and applications for Primary Mining Licenses (PML), required to own and operate an artisanal or small-scale mine site, were processed more quickly. The number of PML rose from only 35 licenses in 1999 to 5171 in 2016 (Kinyondo and Huggins, 2019). Under the late President Magufuli (2015–2021), there was further support for ASM, including introduction of royalty rates specific to ASM-produced minerals, lower than rates for LSM-produced minerals; abolition and reduction of various taxes and levies for ASM; establishment of training 'centres of excellence' in mineral processing; and construction of more than 30 mineral markets for gold and other commodities across the country (Kinyondo & Huggins, 2020). In 2017 the government banned the export of all raw minerals and gemstones, in an effort to ensure value-addition (cutting and polishing) in-country. However, little capacity exists for value-addition in Tanzania and in early 2019 the government permitted exports of raw gemstones of up to 10 carats.

Tanzanite is found only in a small area, known as Mirerani or Mererani in Simanjiro District, Manyara Region. This is a semi-arid area, inhabited largely by Maasai communities. "Before tanzanite was discovered, Mererani ward was predominately agro-pastoral. Mererani is now the largest town in Simanjiro District" (Sachedina, 2008: 235). Nevertheless, studies have noted that, "Mererani has poor infrastructure overall, particularly the roads" (UN Women, 2016). Most mine workers originate from outside of the area, as "among Maasai, mining is heavily stigmatized because of the hazardous, filthy working conditions," (Smith, 2012: 3) and, social problems which include, "sexual harassment, transactional sex and alcoholism" (UN Women, 2016).

Tanzanite represents a large proportion of gemstone exports e.g. more than 58 % value of Tanzanian gemstones exported in 2014 (Yager, 2018). However, huge amounts of tanzanite have been sold informally, particularly through neighboring Kenya, thus depriving the government

of tax and royalties. After 9/11, journalists alleged that tanzanite was a source of finance for the Al Qaeda terrorist group (Schroeder, 2010). In response to this accusation, tanzanite dealers and miners' associations, the Tanzanian Government, and other stakeholders agreed to a Tanzanite Protocol in 2002. The agreement proposed to enact a second-party certification scheme; to erect a fence around the tanzanite mining area; to require miners to obtain official identity cards; and to improve sales documentation (Nkwame, 2017). The Merelani Controlled Area (MCA) was created, which was subject to particular laws, restricting land-uses and other activities. However, these measures did not stop informal trade in Tanzanite. In 2010 the government banned exports of unprocessed tanzanite weighing more than one gram, to maximize domestic gains through local cutting of gemstones (Helliesen, 2012). There is some local capacity for cutting gemstones, for example, in some independent jewelers (Denoncourt, 2022) and through the state-owned Tanzania Gemology Centre (TGC) in Arusha, but it remains limited. Following the ban, export value rose from USD 21.7 million in 2010 to USD 36.8 million in 2013 (Mbowe et al., 2016). This seems to have been due to a steep increase in exports of 'bead cut' tanzanite, an intermediary form of cut which allows further cutting later (Mbowe et al., 2016). Obstacles to development of lapidary capacity include lack of access to finance, multiple high taxes, inadequate market connections, lack of skilled personnel, insufficient amounts of appropriate gemstones, erratic power supply, and insecurity (Mbowe et al., 2016).

The limited capacity became clear when in 2017 new legislation banned the export of all raw minerals and gemstones, which constrained exports. In 2019 the government backtracked, permitting exports of raw gemstones of up to 2 g (Huggins and Kinyondo, 2019). However, beneficiation remains a policy goal: tax rates remain lower for cut and polished gems than for raw gems (1 % of value instead of 5 %) (UNECA, 2023) and the TGC was allocated 19million Tshs by the government in early 2023. In 2016 Tanzania held the first of several public auctions of rough and cut tanzanite, but informal sales of tanzanite continued. In 2017, a Tanzanian parliamentary committee reported that 80 % of tanzanite was sold informally, and recommended that tanzanite trading be centralized to eliminate corruption (Huggins and Kinyondo, 2019).

In September 2017, the late President Magufuli ordered the military to build a wall around the entire tanzanite mining area to restrict informal sales (Huggins and Kinyondo, 2019). The 24 km wall, which has only a single entrance/exit, cost US \$2.9 million – 3.5 million (Kidanka & Olingo, 2018). The MCA is managed by the MCA management committee which includes the District Commissioner, the Regional Mining Officer, Town Executive Officer (TEO), Divisional secretary, Chairperson of Naisinyai village, a military commander, Mirerani Police commander, a representative of MAREMA, amongst others. Sales of tanzanite now occur inside the wall, under the control of the Tanzanian Central Bank. Entry and exit are tightly controlled by the military, and vehicles are not allowed in and out, so any vehicle used for mining has to be permanently kept within the walls. To trade in Tanzanite, one must either be a registered miner, or apply for a dealer's or broker's license. Dealers are large-scale commercial actors who can export Tanzanite and have to have a physical office address, significant capital, and the capacity for lapidary (cutting or polishing gemstones) (URT, 2010). Brokers are smaller-scale actors, permitted only to trade Tanzanite domestically. While there were only 17 registered brokers in 2014, there are many more unregistered brokers (Mbowe, 2016). According to some estimates, there are around 5000 brokers in Arusha, many of them Maasai who have developed expertise in the Tanzanite business through family connections. According to government figures, there are about 600,000 mineral brokers nationwide (Anonymous, 2019a).

The town of Arusha, 50 km from Mererani, is an established gem trading area, with a major new Mineral Centre opening in July 2019. Research has attributed "the mushrooming of real estate in Arusha city to tanzanite fortune" (Mbowe et al., 2016:246). However the Government announced in 2021 that an auction centre would be built in Mererani, where all tanzanite sales should occur. The Mererani auction

centre is still under construction at the time of writing.

Most brokers and traders are men. Mererani is traditionally a Maasai area, and Maasai people have become heavily involved in the tanzanite trade. Maasai custom generally prevents women from trading, but there are some women brokers, Maasai and (more commonly) non-Maasai (Daley et al., 2018; pers. obs., Arusha). Brokers have in the past operated in informal groups, 'sharing' a single broker's license. This approach was not in accordance with regulations but was tolerated. However, regulations are now being strictly enforced and each broker is required to have their own individual license. In interviews, dealers also stated that they had been prevented from entering the MCA if they were not resident in the Mererani area, reportedly on the orders of the Regional Commissioner. Despite these efforts, rumours of smuggling have been reported recently in the Tanzanian media (Ubwani, 2023).

4.4. Organization and financing of Tanzanite mining

Tanzanite production involves hard-rock mining at significant depths. For this reason, even smallest-scale mines use equipment such as explosives, generators, air compressors, and motorized elevators and/or waste-rock removal systems (winches). Mine sites are owned and financed by relatively wealthy business-people, and there is very little artisanal production. Most mines would fit the small-scale mining (SSM) category, while some are medium-scale and Fronone (previously TanzaniteOne) is large-scale. There is significant socio-economic differentiation between mine workers and the mine-owners, due to the need for significant capitalization of mining operations. Unlike some other forms of ASM, it is difficult to transition from a position of mine worker to mine owner. Most of the mine-owners live or originate from other areas. Many of them are based in nearby towns such as Arusha or Moshi. By contrast, about 25 % or 30 % of the mine-workers are 'locals', with 70–75 % migrating from other areas, according to multiple participants.

In most small-scale mines, there may be a few people on salary (e.g. mine manager) but most mine workers have a JPA. Mine workers estimate that mine-owners keep about 90 % of production (some of which will pay salaries, cover expenses disbursed such as fuel, food and supplies for mine workers, etc.), while mine workers divide the remaining 10 %. However this is difficult to verify. According to several respondents, miners also attempt to smuggle out gems without the knowledge of the mine-owner (i.e. steal them)(interview with male community member). The large number of community members mentioning that they purchased gems directly from miners also suggests some smuggling. When the wall was built, there were attempts to restrict entry to those miners with formal contracts (Huggins and Kinyondo, 2019), but this is no longer enforced.

The exception to these labour practices is secondary processing of waste material (donated by mining operators) for small fragments of tanzanite (*kuchekecha/machekacho*). The proceeds from this women-dominated activity, which requires zero equipment or capital, are low.

There are some cooperatives and associations involved in the tanzanite sector. These include, for example, Tanzania Women Miners Association (TAWOMA), Manyara Women Mining Network, Manyara Region Mining Association (MAREMA), and Tanzania Mineral Dealer's Association (TAMIDA). Most of these organizations operate through policy advocacy (e.g. TAMIDA, TAWOMA), self-help financial activities (Manyara Women Mining Network) and dispute resolution (MAREMA). These organizations are not directly involved in organizing labour at minesites. There are informal also associations involved in organizing women's labour in terms of washing and re-processing tailings (called *kuchekecha* in Kiswahili). These are poorly capitalized and do not enjoy the access to policy-makers as larger organizations such as MAREMA and TAMIDA. They do engage in negotiations with local mining operators, to maintain access to material for processing. One participant, a leader of a women's mining association, estimated that there were about 100 such workers, organized in four different groups.

Many small-scale gemstone brokers operate informally: "only those

few who own the business license are full time, are about 30 % of the broker population, whereas the rest are mostly part-time brokers” (interview with male broker). Brokers may switch to other businesses during the tourist season, and some miners move into brokering (Ng, 2013). Research including a sample of 28 brokers found that 74 % of them had primary school education, whereas dealers and jewelers were better educated (39 % secondary school, 33 % diploma or certificate) (Mbowe et al., 2016). The same research found that all brokers relied on their own or family finances for their business, whereas 23 % of dealers/jewelers used bank financing. Brokering is therefore an accessible occupation for those without much education or access to credit. Another study found that constraints for brokers include unpredictable demand, insufficient market information, lack of experience/formal training, insufficient capital, and difficulty in sourcing gemstones (Ng, 2013). Brokers also complain that they don’t receive government support (Ng, 2013). The price for tanzanite is more likely to be imposed by buyers on miners who are selling it whereas brokers and dealers are better able to negotiate (Mbowe et al., 2016) because of information asymmetries and other power relations.

In order to raise capital for gemstone purchases, people coordinate to finance a single individual to make deals. The profits are then split equally among the group. This system is particularly common amongst Maasai brokers, who dominate the local gemstone trade. One local broker commented that, “a person can be even entrusted 30 million to 1 billion shillings [\$12,400 – 400,000 US] for conducting such business provided that you report back on the production of the day.” Smith (2012) describes how this ensures that an individual can profit, transfers skills between members of a ‘mob’, and ensures safety in a business vulnerable to robberies. As mentioned above, the ‘mob’ system is gendered: women are unable to participate.

4.5. Contributions to community development in Tanzania

The construction of the wall has had a negative impact on the livelihoods of the people of Naisinyai village, who lost access to village land (e.g. for grazing) but were not compensated. Prior to the construction of the wall, the quality of land in parts of the village had been compromised by mining activities (Kakoko, 2018). Contributions to community development from SSM are mostly indirect, through market processes. SSM workers are customers for local businesses and also trade gemstones with local businesspeople. Several participants lamented that although local authorities (e.g. Village Councils) called meetings between themselves and SSM operators, the SSM actors did not attend. “Village leaders and Wards councilors plan a meeting with miners, but they do not show up, and the most of them live outside Mererani, while the others work inside the wall, making it difficult to find them” (interview with male community member). Another male community member said, “[only] about 5 % of the miners respect the government advice” about supporting community development projects.

There were a few exceptions to this, including a small-scale mine-owner who was credited with distributing various forms of assistance. In addition, local NGO TAWOMA (Tanzania Women Miners Association) has provided some financial assistance to vulnerable people in nearby communities, such as widows and orphans. Further, one participant mentioned that, “Some [miners] contribute some money to the women income generating activities”.

Medium-scale mining or large-scale mining companies provided funding for projects in the past (Kokoko, 2018). However, many participants complained that financial support provided in previous years, which was used for construction of schools, clinics and provision of other community services, had ended since the wall was constructed. Several participants felt that the wall acted as a barrier for effective communication with mining operators: “Local Government has no access to get inside the wall. So its difficult to tell them [miners] to contribute to the community development” (interview with male community member).

Miners are significant both as customers and as investors in local businesses. One miner said that mining, “is just hand to mouth stuff”, emphasizing the interpretation of mining as a ‘survival strategy’, while another participant mentioned that, “sometimes back people hadn’t minerals and had to sell the roof sheets off of their houses after the sale of other things in the house” (interview with a male broker). However, most participants stated that miners tend to make more money than non-miners. As mentioned above, many miners are migrants, and rent rooms from local landlords. They are the main consumers of local goods and services. One female small-business owner said, “in case there are no miners, then the businesses collapse because, there will be no money for running the service.” Participants did *not* mention miners spending money only on the stereotypical activities such as drinking, drugs and commercial sex. Nevertheless, many of the business mentioned were bars and licensed restaurants, suggesting that alcohol consumption is economically significant.

The demand for services around the MCA (particularly in Mererani town) has resulted in the construction of infrastructure, such as a borehole, and availability of electricity supply, which are generally lacking in settlements further from the MCA. Those who originate from the area have often built bigger, more permanent houses. In terms of investment, miners have, “built shops, hotels, bars and guest houses. These investments also benefit other community members”. Other livelihood activities pursued by miners include selling second-hand clothing and purchasing motorbikes for a ‘boda-boda’ (motorcycle taxi) business. In addition, many, especially those from the area, invest in livestock (cattle, sheep and goats). There is some investment in agriculture, but as the area is very vulnerable to drought, it relies on access to water for irrigation. Agriculture is to some extent a marginal occupation. This means that many miners are involved in multiple livelihoods, and may either work on a non-mining business part-time, or have some employees to manage secondary business ventures for them. One woman who ran a milk-supply business commented that, “sometimes I engage myself in the [gemstone] broker business in order to add more capital for the running of milk work”. In addition to paying in cash, some miners either pay business owners in gems, or sell gems to local non-miners (who are not registered as brokers). Thus local businesspeople may informally deal in small amounts of tanzanite on an occasional basis.

4.6. Gender dimensions of tanzanite mining

Women are very rarely directly involved in tanzanite mining. Participants described the mining work as “hard” and commented that women are involved in “soft” work such as reprocessing waste material. There is one documented example of a woman disguising herself as a man in order to work in an underground tanzanite mine, but this is an exception to the norm (Kisambe, 2017). Instead, women are involved in the role of re-processing waste material (*machekecho*). They are loosely organized in groups, which are often informal and poorly capitalized. They had limited access to waste material, and NGOs have intervened to encourage mining firms to provide more (CSP, 2023).

In addition, women predominate in supplying food, water, and firewood to the mine sites. However, since the wall was built, the cost of transport within the mining area increased, and according to a local NGO, “40 % of women stopped their economic activities due to high operation costs related to transportation facilities” (CSP, 2023). The NGO facilitated negotiations which reportedly reduced the cost of *boda-boda* transportation within the walls (CSP, 2023).

Security has improved in the MCA since the wall was constructed. Previously, women were vulnerable to robbery and sexual violence, but according to participants, these crimes have diminished. Nevertheless, local NGOs report that crimes, particularly against women, occur. As many women cannot afford the cost of a boda-boda, they walk long distances and are vulnerable to assault. The police station within the MCA had not functioned for five years, making people vulnerable to crime in the mining zone. The police station was re-opened with the

support of a local NGO in 2023 (CSP, 2023).

The wall has posed a physical barrier to the MCA, especially for people living far from the entry-gate. One participant mentioned, “increased hardships in accessing the mining sites for the local communities... particularly for the women group who don’t actually go to the mining sites early the morning due to other domestic responsibilities” (interview with woman community member). Women were strip-searched on leaving the MCA, though this has reportedly been stopped after recent NGO intervention (CSP, 2023).

5. Discussion: artisanal and small-scale gemstone production’s contributions to community development in Mererani, Tanzania and Mapatizya, Zambia

The main contributions to community development from ASM in both Merelani and Mapatizya are markets for goods and services (shops, restaurants, etc.). ASM is linked to economic development on an individualistic and market-based model. This is supported by other studies; e.g. Shadrack & Warsanga (2020) found that markets for micro-enterprises in Mererani are greatly reduced when tanzanite production is low.

In Tanzania there are however prominent examples of small-scale mining operators providing financial and non-financial support to communities, or to sub-populations in communities (i.e. vulnerable households or individuals). This finding is echoed in some of the literature. For example, Smith (2012) describes a wealthy Maasai gemstone dealer who makes, “generous contributions to development projects within his village” (pg 75). Many such contributions likely occur in the home villages of migrant miners or brokers, rather than adjacent to the mining area. In Mapatizya, previous studies found that, “three small-scale mines have assisted in community work such as rehabilitation of roads, schools, clinics and provision of learning materials and bursaries to deserving students” (Phiri and Chileshe, 2015: 1230). In both countries, local government administrators can play an important role in facilitating and monitoring community development efforts by mine operators.

In both countries, the government has supported beneficiation. In Zambia, the government funds the Gemstone Processing and Lapidary Training Centre in Ndola; however its success has been limited due to fears of potential fraud (Siwale, 2018b). There is minimal value-addition in Mapatizya, limiting the potential economic impact of downstream processing. Zambia Chamber of Mines has lobbied government to permanently remove export duties on gemstones (Hancock, 2022) but a sliding scale for duties, encouraging domestic cutting and polishing, may be useful. Low levels of trust between local actors, such as gemstone traders, prevents collective action in price setting and value-addition. Mining associations have also had limited impact in facilitating collective action or stimulating greater productivity (Siwale, 2018). In Tanzania, lapidary is possible in Arusha, but long-term investment in capacity-building and technological improvements are needed to compete with foreign competitors. The Tanzanian experience shows that blanket bans on exports of uncut gems are a blunt policy instrument which do not automatically stimulate value-addition.

Both countries have tried to centralize gemstone auctions, with Tanzania centralizing them at the point of gemstone extraction. This is partly to create economic benefits for the local community, and partly to further restrict informal sales. It is not popular with *gem* dealers who are based in Arusha, but time will tell if it benefits mining-adjacent communities.

The construction of the Mererani wall has brought benefits as well as disadvantages to members of local communities. Benefits include improved security, particularly for women. Disadvantages include the increased distances between communities and mines. The wall represents both a physical and psychological barrier between the ASM operators and the miners, preventing local people from easily communicating with mine-owners to negotiate forms of community

support.

The physical distance between the villages and the minesites is also an obstacle to the mining-based livelihoods of the most marginalized ASM actors: women and the elderly. As there is only one entrance gate, people living in villages have to travel to the gate and then within the MCA to reach the piles of waste material to practice the sorting (*machekecho*). The marginal nature of this livelihood option, as well as the domestic responsibilities of many women (collecting firewood and water, preparing food, etc.) which may result in time poverty, make this increased distance a significant impediment. Although the women are organized into groups, these are extremely informal groups with very little capital or political influence.

Currently, engagement between the Tanzanian government and mine workers largely consists of, “meetings in the form of seminars and workshops whereby the discussion is around issues of mining and other basic needs. For instance, investments, education, social aspects like marriages, family issues, spread of diseases, financial support and religious aspects” (interview with government worker in the mining sector). One local government participant mentioned that higher-level officials are not sufficiently supportive of their efforts to call on miners to contribute to community development efforts.

6. Conclusion

The results demonstrate the significance of ASM to local communities as well as for towns and villages outside of the mining areas. Indeed, the tanzanite sector has had a transformative impact on the livelihoods of young Maasai men in the surrounding region. In both countries, some individuals play multiple roles in ASM, for example as miners and as brokers or gemstone traders. In Zambia participants suggested that the government develop common grading and scaling scales and regulate the buying process to formalize stone trading. Such approaches, if carefully designed, could result in benefits for both ASM workers and local-level gemstone traders. Both countries have planned for government-run marketing centres, although local gemstone exchange centres have yet to be established in Zambia. In Tanzania, government attempts at controlling the tanzanite trade have resulted in increases on government tax revenues but it is unclear to what extent they benefit local communities.

Potential policy improvements in both countries include developing a policy document specifically for ASM, as well as ensuring that regimes for fees, taxes and royalties differentiate between ASM and LSM. Our research demonstrates that women appreciate the economic benefits of ASM, even if they face discrimination and various gendered barriers. It is particularly difficult for women to reach profitable positions, such as mine-ownership. Other researchers have recommended, “specific quota allocation towards the issuance of mining rights”, in Zambia, to parallel the National Lands policy (2021) which reserves 50 % of available land for women (PMRC, 2023: 14), but such policy- and legal-responses may not be sufficient, given the financial constraints that women face. In the tanzanite sector particularly, the relatively high capital investment costs are a significant barrier for most women. Nevertheless women play significant roles in the artisanal and small-scale gemstone sector in both countries, and interventions such as training and marketing centres should be as gender-inclusive as possible.

CRedit authorship contribution statement

Chris Huggins: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Agatha Siwale-Mulenga:** Writing – original draft, Investigation, Formal analysis, Data curation. **Saitoti Parmelo:** Investigation, Data curation.

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