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Small-scale Mining and Sustainable Rurality In the Atiwa District of Ghana

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Abstract

This paper examines the effects of artisanal and small-scale mining (ASM) activities on sustainable development in the Atiwa District of Ghana. It relies on data from 75 respondents from five communities in the District. Twenty-eight of them responded through face-to-face in-depth interviews while 47 responded through a survey questionnaire. This data is complemented by secondary sources, including literature on mining and sustainable development. Using this data, the paper deploys the three canons of sustainable development—economic, social and environmental—to investigate, the impact of ASM on rural communities. The result furthers the arguments of previous research that the ASM sector has both positive and negative impacts on the sustainability of local or rural economies. However, this paper adds that whether present rural communities will reap the full benefit of the sector, while not undermining the social, economic, and environmental livelihoods of future generations, would depend on government regulation and policy. Since most ASM activities occur in rural communities, which are primarily agrarian and subsistent in character, a lack of regulation of the sector not only contributes to the destruction of rural economies and environments, but it also unsettles current and future human ecology. In a country like Ghana—where many, if not most, citizens live in rural areas—making ASM sustainable to benefit present and future rural dwellers should be a legitimate national development concern. Thus, we use the concept of sustainable rurality to mean a case of governing the ASM to ensure that current rural and agrarian livelihoods are improved without jeopardizing the societies, economies and environment of future generations. We conclude that mandated institutions, regulatory agencies, and development stakeholders should work to tilt the balance of the sector in favor of sustainable rurality.

Keywords: small-scale mining, Atiwa District, Ghana, rural livelihoods, sustainable development

1.0 Introduction

Artisanal small-scale mining (ASM) is “low-tech, labour-intensive mineral extraction and processing” (Hilson & McQuilken, 2014, p. 104) and a lucrative industry in developing countries. Perceptions about ASM and the people who engage in it are divided. On the one hand, ASM is tagged as “dirty, dangerous, disruptive” (Wright, 2012, p. 93). The adverse impacts of the exploitation of natural resources are historically common across many Africa countries. In Sierra Leone, for example, diamond mining has been a source of (a) civil war and clashes between stakeholders (Prause, 2016), (b) environmental degradation (Castello & Macedo, 2016), and (c) health complications (Nakazawa et al., 2016). This negative impact of ASM has led to the deterioration of livelihoods, the environment, and life support systems. In Ghana, socio-political issues that impact livelihoods, security, and public safety (Hilson & Yakovleva, 2007) exist in many communities with ASM activities. The sector is also “associated with many negative social, environmental, and health impacts as well as armed conflict and human rights abuses” (Sturman et al, 2020). Thus, Le Billon (2013) and Mensah, Boakye-Danquah, Suleiman, Nutakor, and Dan Suleiman (2020) are of the view that mineral resources and mining, in general, have sustainability concerns which need addressing by government regulation.

These observations show that on the other hand, the sector “is profitable, productive, or simply the only way out of poverty” (Wright 2012, p. 93) for some people or in some contexts. Notably, it is estimated that about 20–30 million people are engaged in ASM in the world, and about three to five times that number depend on it for their livelihood (Buxton, 2013). In Ghana, over one million people are employed in the sector (McQuilken & Hilson, 2016). The sector provides jobs for millions of people in rural communities and contributes positively to the foreign exchange earning of developing countries (Hilson & McQuilken, 2014). In recognition of the potential of mining, several organizations have encouraged "mining companies of all sizes to incorporate relevant SDGs into their business and operations, contextualize and reframe current efforts and spark new ideas towards a multi-stakeholder dialogue and collaboration" (United Nations Development Programme, Columbia Center on Sustainable Investment, Sustainable Development Solutions Network, & World Economic Forum [2016], as cited in Sturman et al., 2020). Sturman et al. (2020) state that “in many African countries, ASM is an important economic activity and livelihood strategy for people in poor communities” (pp. 61–62). Accordingly, as Zvarivadza (2018) notes, when the mining sector is regulated or approached in a well-coordinated manner, it could provide far-reaching socio-economic and environmental benefits for the mining communities. The contribution of ASM to development cannot, therefore, be overlooked.

Since natural resources are mostly explored in less populated hinterlands, rural communities with agrarian livelihoods are mostly affected by ASM activities and mining in general. For such rural communities with agrarian livelihoods farmlands are the most critical livelihood resource, and this establishes a strong connection between sustainable rural development and potential adverse impacts of natural resource exploitation. How could the ASM sector be made beneficial to Ghana’s economy and, at the same time, ensure the sustainable development of rural communities is a question that should concern both researchers and policymakers. This paper, therefore, examines the effects of ASM activities on sustainable

development in the Atiwa District. It assesses the implications of ASM to proffer measures to promote sustainable practices in the sector.

The Atiwa District is in the forest zone of Ghana located in the Eastern Region of Ghana. The district is endowed with gold deposits and has seen the influx of numerous ASM operations in recent decades. While this has had various ramifications on social, economic, and environmental levels, there is minimal effort to systematically assess the local-level impacts of mining in many localities, including the Atiwa District. Such an assessment is, however, required as a basis to promote sustainable practices in the ASM sector. Our paper asks the following questions: How does ASM affect the economic conditions of people in the Atiwa District? What are the social implications of ASM in the Atiwa District? How does ASM affect the environment and natural resources in the Atiwa District? How could ASM activities be practiced to foster sustainable development in the Atiwa District?

Through these questions, the paper presents a holistic assessment of ASM and shows that improvement of the regulatory (political) framework for managing the sector is urgently required to enable ASM to be conducted more sustainably. This improvement, the paper argues, is particularly imperative for rural economies and livelihoods. Most people in rural communities earn meager incomes and hence are mostly below the poverty line (Anlimachie, 2015). Additionally, while water bodies are even more central to the livelihoods of rural communities on many levels—from economic growth and provision of food security hence poverty alleviation (Gariba & Amikuzuno, 2019)—current ASM activities destroy water resources.

A lot has been written of the economic, social, and environmental impact and benefits of ASM in Ghana (e.g., Bedu-Addo, Palekhov, Smyth, & Schmidt, 2019). This paper, however, simultaneously applies the three canons of sustainable development – society, environment and economy (Government of Canada, 2016) – to bring some balance and coherence to the design and operationalization of ASM. Through this approach, the paper concludes that engaging in ASM and ensuring sustainable development are not mutually exclusive. However, since most ASM activities occur in rural communities, which are mainly agrarian and subsistent in character, a lack of regulation of the sector portends grave socioeconomic and environmental consequences. Not only will a lack of regulation contribute to the destruction of rural economies and environments, but it will also unsettle human ecology and jeopardizes livelihood opportunities for future generations. Thus, in an economy like Ghana, where many, if not most, citizens live in rural areas, ASM should focus on sustainable rurality. Sustainability here is “defined as a state of affairs where the sum of natural and man-made resources remains at least constant for the foreseeable future, in order that the well-being of future generations does not decline” (Kuhlman & Farrington, 2010, p. 3442). Rural is taken to connote “places of tradition rather than modernity, of agriculture rather than industry, of nature rather than culture, and changelessness rather than dynamism” (Ward & Brown [2009] p.1239; as cited in Chigbu, 2013). From these definitions, sustainable rurality is understood to mean a case of governing the ASM sector to ensure that current rural and agrarian livelihoods are not threatened but improved so as not to jeopardize the societies, economies, and environment of future rural generations.

To make the above arguments the rest of the paper is organized into four sections. After this introduction, the next section reviews the literature on small-scale mining and its effects on sustainable development. It also presents the paper’s conceptual framework. The next section after this presents the research methodology while a

third section presents the analysis and discussion of results followed by a final section which concludes the study.

2.0 Overview of the History of and Literature on ASM Management and Regulation in Ghana

ASM in Ghana is traceable to the pre-colonial era (Akabzaa & Darimani, 2001; Aryee, Budhwar, & Chen, 2002; Tsuma, 2010) when minerals mined on a small-scale during these periods were mainly gold and diamonds before the coming of the Europeans in Ghana (Aryee, 2001). Mining was done using rudimentary technologies such as chisels, shovels, and rock hammers (Ofei –Aboagye et al., 2004). Notably, the mining activities of the modern-day unregistered small-scale miner—which are known in local Ghanaian parlance as 'Galamsey'—are no different from that of their predecessors due to the continued adoption of mining techniques that were used in ancient Ghana (Hilson, 2001). After the fifteenth century, the rich nature of mining in Ghana attracted Europeans to venture into the Ghana mining sector. Thus, the Dutch, Portuguese, and English competed to have control over the gold trade in West Africa (Ofei-Aboagye et al., 2004).

However, between 1918 and 1929 there was a reduction in gold production due to the scarcity of labour. This reduction was caused by the booming cocoa and construction industries, the discovery of diamond and manganese, and many Ghanaians who preferred to work on their small-scale mines instead of working for Europeans (Akabzaa & Darimani, 2001). The decision by Ghanaians to work on their own mines led to the enactment of the Mercury Ordinance of 1932, preventing Ghanaians from using Mercury for mining (Akabzaa & Darimani, 2001; Hilson, 2001). After the Mercury Ordinance was passed in 1932, ASM activities were deleted from the good books of governmental bodies and for that matter received little or no attention at all from the government until the 1980s when the Economic Recovery Programme (ERP) was launched and implemented to revitalize the economy (Minerals Commission Ghana, 2015). Under ERP, the Government of Ghana decided to formalize the sector, taking into consideration the amount of revenues the country was losing through smuggling and illegal trading of gold (Hilson, 2001).

In 1989, the Small-scale Mining Law (Provisional National Defense Council Law 218) was enacted which empowered the Department of Minerals Commission to register and supervise the activities of the small-scale miners in the country (Teschner, 2012, p. 308), as part of the structural adjustment programs (SAPs) of the 1980s (Boatri, Verner, Kabat, & Kabutey, 2014). Through the SAPs, The Precious Minerals Marketing Corporation was also established to serve as the sole governmental agency mandated to buy the products of the small-scale miners in the country (Akabzaa & Darimani, 2001). The regularization of ASM marked the beginning of the sector's immense contribution to national mineral exports and foreign exchange earnings. Thus, between 1989 and 2000, ASM sector produced about 870,000 ounces of gold and 4.9 million carats of diamonds, contributing US\$ 280 million and US\$ 110 million respectively to Ghana's GDP (Aryee et al., 2002). However, the regularization of the ASM sector saw the emergence of two types of small-scale miners—the legal and illegal small-scale miners—as some miners sought to continue operation without having permits from the Mineral Commission. These illegal small-scale miners are popularly known as 'galamsey' miners and

operate on the concessions held by other companies (Amankwah & Anim-Sackey, 2003).

According to Hilson (2001), the effect of artisanal mining could be classified into two groups: social–environmental group and economic group. The social impacts of ASM relate to education, health, and culture. Despite the employment opportunities created by the ASM sector in rural communities, the educational standards have fallen astronomically in mining communities, and the sector's negative consequences on national development raise many concerns. Crawford et al. (2016) attributed this phenomenon to the 'quick money' mentality associated with people engaged in the ASM sector. This quick money mentality has prevented many people from going to school which, in turn, has caused a fall in enrolment in schools in most mining communities, including those in the primary schools.

Apart from education, ASM has devastating effects on the health of the people in the mining communities. The World Health Organization (WHO, 2016) concluded that the informal processes and rudimentary technologies used in ASM have negative health implications on the well-being of the miners, their families, and communities. Smith, Ali, Bofinger, and Collins (2016) assessed the health and safety risk facing the ASM sector and revealed that there are various health and safety risks associated with ASM. Indeed, mercury exposure was considered as the most dangerous health and safety risk to miners and the local communities (Smith et al., 2016). Other health effects of ASM include (a) respiratory diseases; (b) skin diseases; (c) outbreaks of malaria, tuberculosis, typhoid, and cholera (Arthur, Agyemang-Duah, Gyasi, Yeboah, & Otioku, 2016). However, economically even though the activities of the miners might be legal or illegal, the sector has significant impacts on the rural mining communities. The sector provides employment and serves as a source of income generation for people in mining communities, thereby reducing their poverty levels. A study has shown that the number of people employed in ASM is about ten times more than the number employed by the large-scale mining sector (Buxton, 2013).

Apart from the socio-economic impacts, the unregulated and informal characteristics of the ASM sector coupled with the rudimentary mining and processing techniques (Macdonald, Lund, Blanchette, & Mccullough, 2014) have caused the sector's negative environmental impacts to be so high that policy-makers and practitioners can no longer ignore them. It is important to note that most of the ASM activities take place at the banks of rivers, lakes, and streams because water is needed for the operations (Macdonald et al., 2014). ASM activities have polluted major rivers in mining communities that serve as the primary sources of water for domestic purposes. The release of liquid waste and mercury (Hg) into these water bodies during ASM operations are causing serious damage to these water bodies. Cobbina, Duwiejuah, Quansah, Obiri, and Bakobie (2015) found a significant amount of mercury content in drinking water sources in the ASM communities of Tanga and Nangodi in the Northern Region of Ghana. The mercury content was higher than the World Health Organization permitted level.

Land degradation and deforestation are other negative impacts of ASM. To Crawford et al. (2016), the introduction of modern technology and active participation of both Ghanaians and foreigners in the ASM sector has led to the destruction of large areas of fertile land, making them infertile for agricultural purposes. Akabzaa and Darimani (2001) observed that over 70% of the land area of Tarkwa had been cleared to pave the way for surface mining. They also noted that

by the end of mineral extraction, a mining company might have used between 40% to 60% of its concession for other mining-related activities such as (a) siting of mines, heap leach facilities, tailings dumps and open pits; (b) mine camps; (c) roads; and (d) resettlement for displaced communities. Indeed, the adverse effects of ASM activities in many communities in Ghana has provoked calls for the incorporation of sustainable practices in the sector to make its activities a blessing and not a curse. On this basis, Kumah (2006) concludes that the ASM sector in Ghana is not sustainable. In other words, the environmental, economic, and social damage of mining activities outweighs the benefits derived from the sector in ways that serve the interest of present and future generations. The recent decision by the Government of Ghana to place a ban on ASM until further notice was, for instance, partly due to the enormous public—mainly social media—outcry regarding the environmental impacts caused by the sector on major water bodies (Karikari, Castro-Sotomayor, & Asante, 2020, p. 240).

However, advocates of the ASM sector have argued that any policy initiative in the sector needs to adopt a balanced perspective because the sector has other beneficial dimensions. Further, they agree that although ASM is associated with severe environmental concerns, its positive socio-economic impacts on the livelihoods of people should not be ignored (McQuilken & Hilson, 2016; Verbrugge, 2016; Zvarivadza, 2018). Osei-Kojo, Asamoah, and Yeboah-Assiamah (2016) also examined the role of resources—funds, personnel, and logistics—in the implementation of ASM laws. They found that while these challenges of ASM are systemic, governmental action, or a lack thereof, could be blamed for why segments of the population emphasize the negative impacts of ASM. Given the benefits of ASM to local and national economies, the Government of Ghana’s decision in 2017 that summarily brought to a halt all activities of ASM in the country—partly because of environmental concerns and to the neglect of the sector’s economic and social benefit—was not a balanced national development decision, especially so when many researchers have attributed the problems of the ASM sector to law enforcement laxities, corruption, and inadequate political will (Mensah et al., 2020; Osei-Kojo et al., 2016; Kuma & Yendaw, 2010).

Thus, despite these problems on the social, economic, and environmental levels, the historical overview and preceding discussion of the ASM reveal that the sector has played significant roles in Ghana’s development. As such, instead of demonizing the sector, it would be better to objectively assess the challenges of the sector in a more holistic manner and consider how its practices could be made economically, socially, and environmentally sustainable in the medium and long-term for rural communities. For these rural communities, sustainable governmental action, or regulation to ensure their sustainable rurality is imperative. This is urgent, considering the importance of land resources to rural economies. The next section assesses the positive and negative aspects of ASM, focusing on the three canons of sustainable development—economic, social, and environmental.

3.0 Conceptual Framework: Sustainable Development

In any production activity, like that of ASM, emphasis should reflect what has come to be known as the Triple Bottom Line (TBL) which provides a level of relevance on each of the three canons of sustainable development and which helps to bring balance and coherence to the design and operationalization of the activity. These canons remain an essential index of sustainability practice, productive processes,

and the evolution of natural environmental phenomena which constitute major driving forces for all human economic production activity (Waddock & McIntosh, 2009). For analysis of the impact of ASM on local communities such as those in the Atiwa District, the environmental and social contexts are crucial in decision-making.

To be oblivious to either the natural or social environment of any production activity mostly results in myopic thinking which misleads people to engage in actions that pose threats to environmental, social, and economic spheres of people's lives. By way of a holistic assessment of the sustainability of the ASM sector, this paper adopted a framework from the Mining Sector Performance Report (Government of Canada, 2016), which delineates the vital components in the three canons of sustainable development (SD) and details the mechanisms, players, and drivers required to transit to sustainable mining. According to Strezov, Evans, and Evans (2017), an assessment of ASM using the SD framework should consider the extent to which mining activities promote intra- and inter-generational equity, prosperity, and sustainability at the economic, social, and environmental levels. To Weiss (1990), intergenerational equity refers to the idea that people hold natural and cultural environmental resources in trust for other members of society in both present and future generations. This implies that proceeds obtained from ASM should benefit current and unborn members of society.

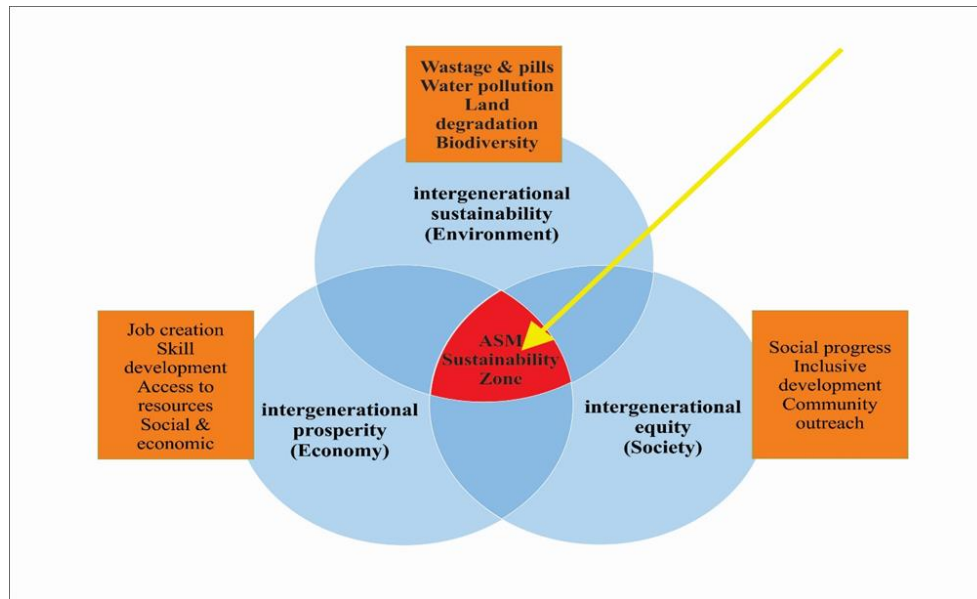
In Figure 1, sustainable development in the ASM sector is denoted by the common zone to which the yellow arrow points. It represents the right mix of the three key canons of SD. The economic canon entails the extent to which ASM translates into (a) job creation, (b) skills development, (c) access to productive resources by the local people, (d) economic empowerment and rural poverty alleviation. In other words, ASM needs to enhance the livelihoods of local people across generations (Hilson, 2016). Regarding the social canon, ASM should promote social progress and inclusive development and enhance community outreach to facilitate intergenerational equity. As far as the environment canon is concerned, ASM needs to reconsider the disposal of its waste substances and chemicals, and proper management of water bodies and the surrounding environment. These elements need to be adequately monitored, evaluated, and controlled to ensure economic, social, and environmental sustainability at the intra- and inter-generational levels. Accordingly, the methodology of our paper was to ask individual and institutional stakeholder views on the ASM in line with the three canons of sustainable development in five communities in the case of the Atiwa District of Ghana.

4.0 Research design

This study employed a mixed-method and a case study research design to collect diverse information that provides the real picture of the impacts of ASM activities on sustainable development in rural communities. The study used both primary and secondary data. The secondary sources included reports on ASM by relevant government agencies, bulletins, newspaper and online reports on ASM and sustainable development, as well as articles relevant to ASM. Primary data was gathered from 75 respondents from five communities in the District. Twenty-eight of them responded through face-to-face in-depth interviews while 47 responded to a survey questionnaire. Together, the total of 75 respondents was comprised of members from institutions who are directly concerned by ASM activities in the community and people who are either engaged in or affected by ASM activities either directly or indirectly. The 28 respondents interviewed were people whose

scope or official jurisdictions are relevant to environment, ASM activities and regulations in the Atiwa District. They included (a) an officer from the Mineral Commission, (b) two officers from the Environmental Protection Agency, (c) an officer from the Forestry Commission, and (d) two officers from District Health Service. Two respondents were selected from the Atiwa District Assembly while another respondent was from a local non-governmental organization. We also interviewed a traditional leader, two assemblymen, and a Unit Committee member. A further 15 small-scale miners were interviewed. The 47 community members surveyed through questionnaires were from five communities: namely, Anyinam, Kwabeng, Bomaa, Akrofufu, and Ankaase.

Figure 1: Conceptual Framework: ASM and SD.

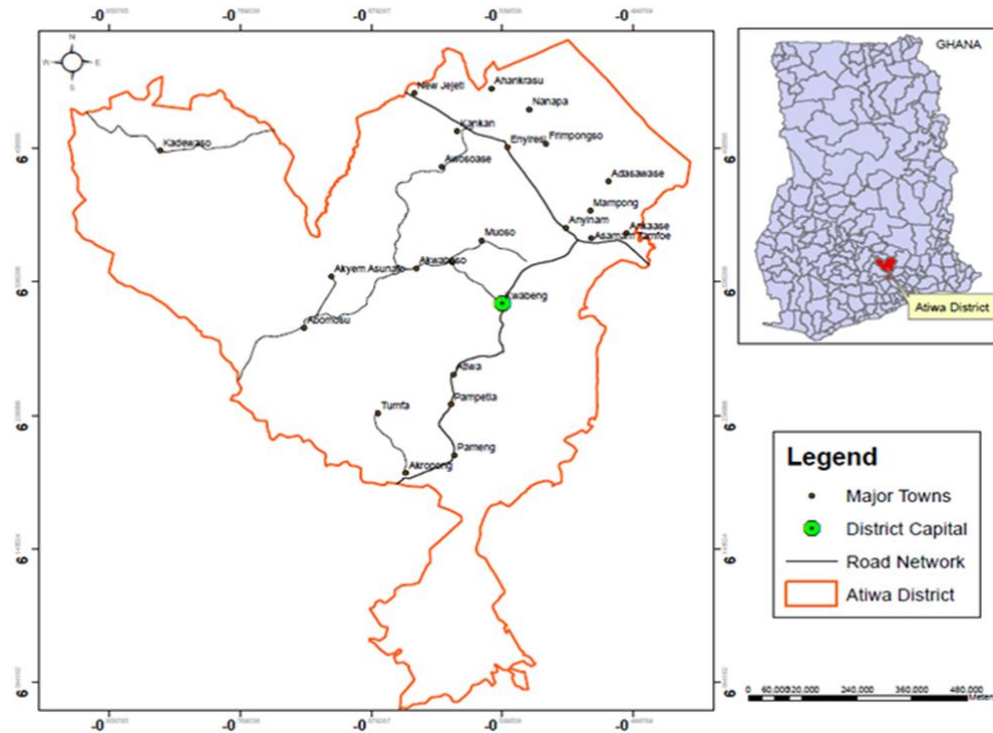


Source: Authors.

5.0 Study Area

Atiwa District is one of 26 Districts in the Eastern Region of Ghana (see Figure 2 below). The District was carved from East Akim District Assembly (currently East Akim Municipal Assembly), with Kwabeng as its Capital. Atiwa District shares boundaries with Kwabibrim District in the South, East Akim in the South-east, Birim North in the West, Kwahu West and Kwahu South Districts in the north part and Fanteakwa District in the North-east. Its land size is nearly 2,950 km². The district has a population of 110,622 constituting 4.2% of the total population of the Eastern Region of Ghana. According to the 2010 Population and Housing Census, the occupation of the people of Atiwa is predominantly farming, making up 57.2% of the people. The service and mining sectors employ about 34.4% and 6.6% of the total labor force in the district, respectively. Five communities were selected for the study, and they include, Kwabeng, Anyinam, Bomaa, Akrofufu, and Ankaase. These communities were selected due to continued and heightened ASM activities there for the past decades.

Figure 2: Map of Atiwa District



(Source: Ministry of Local Government and Rural Development, Ghana).

6.0 Analysis and Discussion of Results

Livelihood figures from the study area show that the majority of the people are into mainly subsistence farming (57.2%) with only 6.6% involved in the mining sector. The next section discusses the impact of ASM in the Atiwa District under the three canons of sustainable development.

6.1 Economic Implications of ASM on People in the Atiwa District

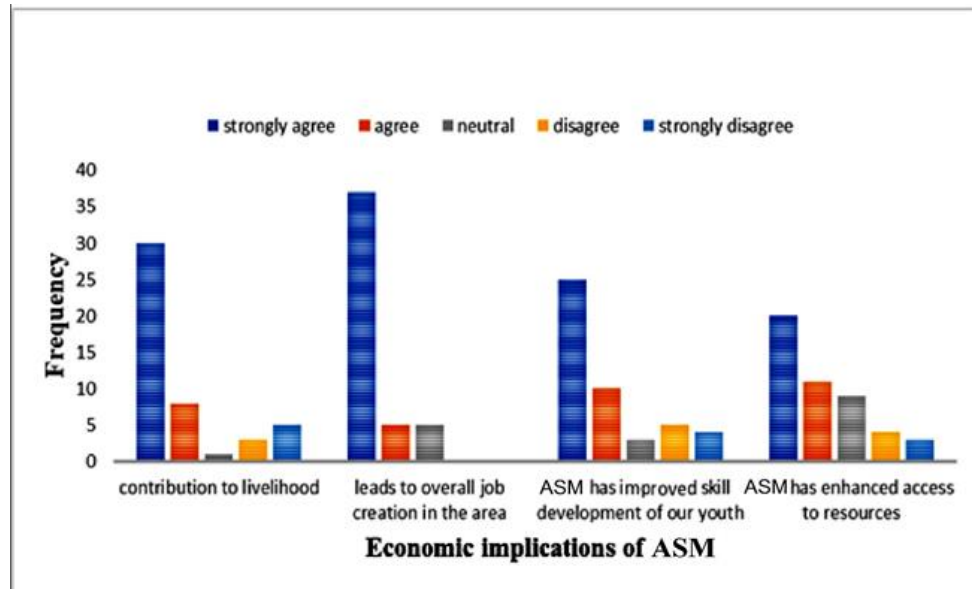
The first objective of our paper was to assess the economic implications of ASM in the Atiwa District and to determine how ASM enhances people's livelihoods in the District. An analysis of the responses solicited through survey questionnaires in selected mining communities indicated that mining activities has economically empowered the people, especially the youth, in terms of the contribution to livelihood, job creation, skill development, and access to resources. This is illustrated in Figure 3 below.

From a total of 47 respondents surveyed through a questionnaire, 38 (81%) indicated that ASM contributes positively to people's livelihoods in the Atiwa District. Only eight respondents (17%) disagreed, while 2% were undecided. On the question of how ASM contributes to overall job creation in the district, 42 respondents (89%) regarded ASM as a significant source of jobs creation while five respondents (11%) had no opinion.

On the issue of ASM and skills development of the youth, 35 respondents (74%) agreed that ASM has implications for enhancing the competencies of the youth. In contrast, nine of them (19%) indicated the contrary. Three respondents (6%)

remained neutral. Finally, regarding the question of whether ASM enhances access to resources, 31 respondents (66%) answered in the affirmative while seven respondents (15%) disagreed. Nine respondents (19%) remained neutral. Overall, the survey findings showed that the community perceives ASM has contributed to the economic improvement of Atiwa District, although significant negative impacts were noted.

Figure 3: Respondents views on the economic implications of ASM in Atiwa District.



(Source: Fieldwork, 2018).

The findings from the 28 face-to-face in-depth interviews provided meaningful narrations and a nuanced understanding of the economic impacts of ASM and complemented the responses from the questionnaire. A key finding was that ASM had become a major player in the economic viability of the District because it provided both direct and indirect employment opportunities. The respondents further revealed that mining activities cause a trickle-down effect on the overall economy and therefore enhances people’s ability to be productive. As one of the miners explained:

You can see it for yourself; we need not tell you. These are young and energetic youth who would have been wasted had it not been the existence of small-scale mining in this community. Many people are working here for their daily bread.

The interviews revealed that ASM, both legal and illegal, provides direct employment opportunities for many people in the district including excavator operators, trammel operators, washers, and security men who guard the mining sites to ensure that others do not encroach or trespass on concessions. There are secretaries and managers perform administrative functions, while pumping boys control and repair the pumps used to collect water from the river into the dam. Site foremen control the work on mining sites. One miner in the town of Kwarbeng stated that:

Currently, I have 50 workers, but previously I used to have 200 workers. I have small machines and about 15 people, and sometimes 20 people work on each of them. Also, I have six operators who run a shift, three operators in the morning and three (3) in the evening and each of them have two boys, I pay them and also give them Ghc200 chop money every day. There are also secretaries, foreman and security men I pay every week.

Some of the miners also indicated that apart from the people who are directly employed and are on the company's payroll, there are university students who work on a casual basis during vacations to get money for their school fees. This point brings in both social and economic dimensions of the benefits of the sector.

ASM also provides indirect jobs for most people in the community. The sector has contributed to a business boom in the district. For instance, the services of (a) food vendors, (b) water sellers, (c) fuel stations, (d) carpenters, and (e) spare parts dealers have increased due to the influx of migrant workers in the mining communities. The increase in demand for goods and services has led to an increase in employment and incomes. A food vendor explained how ASM benefits her as follows:

People benefit from ASM in many ways. For example, I do not do mining, but I benefit from it by selling food to miners and other people working in the sector. Initially, I was alone, but when ASM started in the community, many mineworkers come to buy from me. The work became too much for me, so I have employed 12 girls to assist me. I mark each of them GHC10.00 per day. So, other people in the community also benefit from ASM in different ways.

The findings above demonstrate that the ASM value chain has the potential to increase employment opportunities, reduce rural poverty, and improve the livelihoods of many people in the District both directly and indirectly. The findings of this study are in line with Verbrugge's (2016) observation that livelihood improvement and rural transformation are principal objectives of ASM. The sector has provided a means of livelihood for a greater number of people within mining communities the world over. Indeed, the sector's contribution to employment creation in the Ghanaian context makes it the primary source of livelihood in many communities (McQuilken & Hilson, 2016). The findings of this paper corroborate a similar observation by Arthur et al. (2016) in their study on the Prestea mining community which revealed that small-scale mining activities generate direct and indirect employment in the community.

6.2 The Social Impacts of ASM in the Atiwa District

The second objective was to examine the implications of ASM on social activities in the Atiwa District to ascertain how mining activities in the communities contribute to social progress and inclusive development. Here, the study also sought to examine the extent to which small-scale miners embark on community development projects according to the principle of giving back to the community.

Figure 4 illustrates the results of the survey on the social impacts of mining based on three key indicators: contribution to social progress, generation of inclusive development, and miners giving back to the community. On the contribution to social progress, 31 respondents, representing 66%, agreed that ASM contributes to social progress while 14 respondents (30%) disagreed. Two respondents (4%) remained neutral. Regarding whether ASM generates inclusive development to the entire community, a total of 25 respondents (53%) agreed that ASM encourages inclusive development, but 18 respondents (38%) disagreed, while four (9%) remained neutral. The study also sought to ascertain the extent to which small scale-miners undertake community development as a way of giving back to the community. Here, 30 respondents, constituting 64%, agreed that ASM activities have appreciable implications on social inclusiveness and progress while 16 (34%) disagreed and one (2%) remained neutral. In addition to the information obtained from the survey, the findings from the interviews provided a deeper understanding of the contribution of mining to social progress. For instance, 18 out of 28 respondents were of the view that ASM contributes to social progress. One informant stated that:

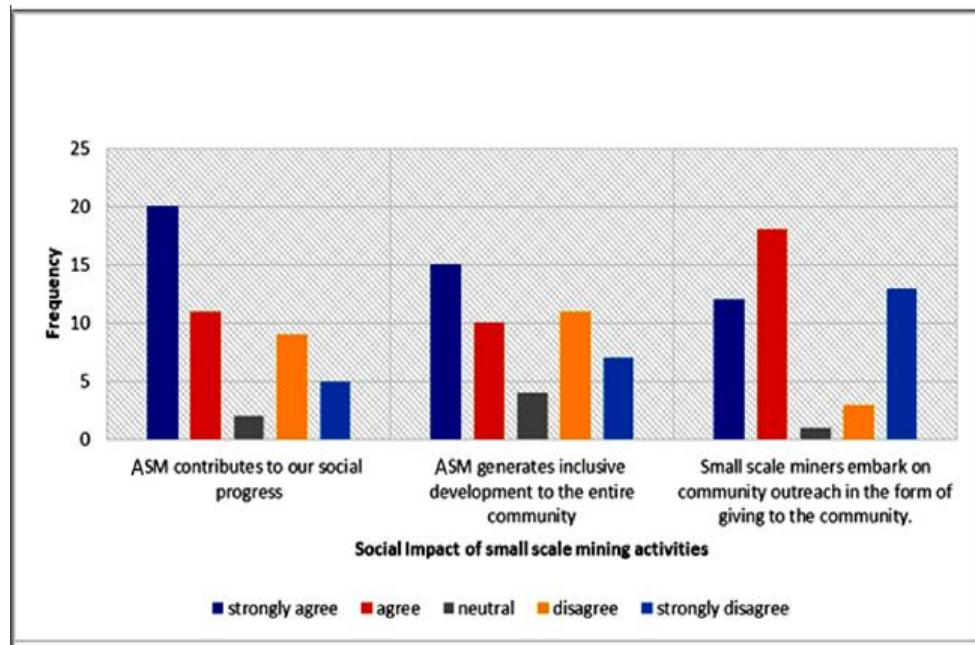
When we go to a community to do mining, we first sit down with the chiefs and we agree on what they want us to do for them. Sometimes they ask us to provide things like public toilets, markets, funeral grounds, hospitals (chip compounds), schools, boreholes, and community library for the community. All these are sort of infrastructural developments.

Ten respondents, however, did not agree that ASM has enhanced social progress. To these participants, ASM contributes negatively to social progress in many ways, including the deterioration of education of the youth, teenage pregnancy, social degeneration, and outbreak of many diseases. For instance, varying disease conditions in the mining communities have affected the health of people. Miners are directly prone to acute respiratory and cancerous health conditions and the entire community become susceptible to many water and airborne diseases (Bansah, Yalley, & Dumakor-Dupey, 2016; Armah, Boamah, Quansah, Obiri, & Luginaah, 2016). According to the respondents, the increasing activities of ASM in the communities lure many youths into the venture and leads many to drop out of school to engage in ASM for ‘quick money’. An opinion leader in the community of Bomaa corroborated the impacts of mining on education in this way:

What I want to say is that most young girls between the ages of 13- 19 are dropping out of school because of teenage pregnancy, so that is an issue at stake. The boys also want quick money and tend to leave classrooms to go to mining sites

From these observations, although ASM has positive economic implications for the livelihoods of people the sector also causes negative impacts on the livelihoods of rural communities.

Figure 4: Social impact of ASM in the Atiwa District.



Source: Fieldwork, 2018.

In an interview with the assembly member of Akrofufu, who was also a cocoa farmer, we found that ASM also affects agricultural production, a conclusion that is corroborated by Boateng, Codjoe, and Ofori (2014). One of the leaders complained that after failing to buy the cocoa farm of local farmers, ASM operatives would buy all the land surrounding the farm for mining. Over time, any farmer who refused to sell her or his farm finds it challenging to access the farm because of the risks posed by mining pits and mud surrounding the farm. Ultimately, these dangers force farmers to relinquish their farms to ASM operators. Here, it is important to understand the importance of cocoa farming to rural dwellers. Cocoa is Ghana's major agricultural export which is primarily produced by rural communities (Boateng et al., 2014). Thus, of the 47 community members surveyed 40% were cocoa farmers. While all agreed that ASM activities harms agriculture in general, three of them indicated that ASM activities are a significant threat to cocoa production and the economy of Ghana.

The field data also shows that ASM activities have caused varying disease conditions in the mining communities. Apart from the fact that those who directly engage in these activities are prone to acute respiratory and cancerous health conditions, the entire community is also vulnerable to many water and airborne diseases due to the ASM activities. A disease control officer of the District Health Service confirmed this:

Our investigations show that there are traces of the chemicals (mercury) the miners use to wash the gold in the blood of the people in the community, and another problem is almighty malaria. This is because when the pits are dug, and they did not fill it, it creates room for mosquitoes to breed, and the place becomes an endemic place for malaria or malaria-prone area.

The findings of this paper also buttress those of a study undertaken by Basu et al. (2014) on ASM health impacts in Ghana. These authors argued that poorly implemented and regulated ASM activities pose far-reaching health risks to workers and community members at large. The findings of this paper also support those of Paly City of Indonesia where mercury vapour around artisanal small-scale gold mining areas caused significant health risks for people in the surrounding communities (Nakazawa et al., 2016). The findings provide support to existing reports that individuals who work in or stay near these mining facilities are highly susceptible to exposure to elemental mercury vapour and is often beyond World Health Organization's recommended limits (United Nations Environment Programme, 2012).

An important inference from the results of the data analysis is that, on the one hand, ASM holds the potential for rural empowerment, income generation, and people's access to resources. Yet, on the other, if ASM activities are left unchecked they could pose far-reaching adverse consequences on the very social livelihoods of people. The study overwhelmingly observed how ASM activities promote both direct and indirect employment. Therefore, regulatory mechanisms should be put in place to enable ASM activities to spark economic progress through improved purchasing power and high demand. This calls for relevant actors to organize stakeholders together to pool resources towards effective regulations and monitoring of illegal mining activities.

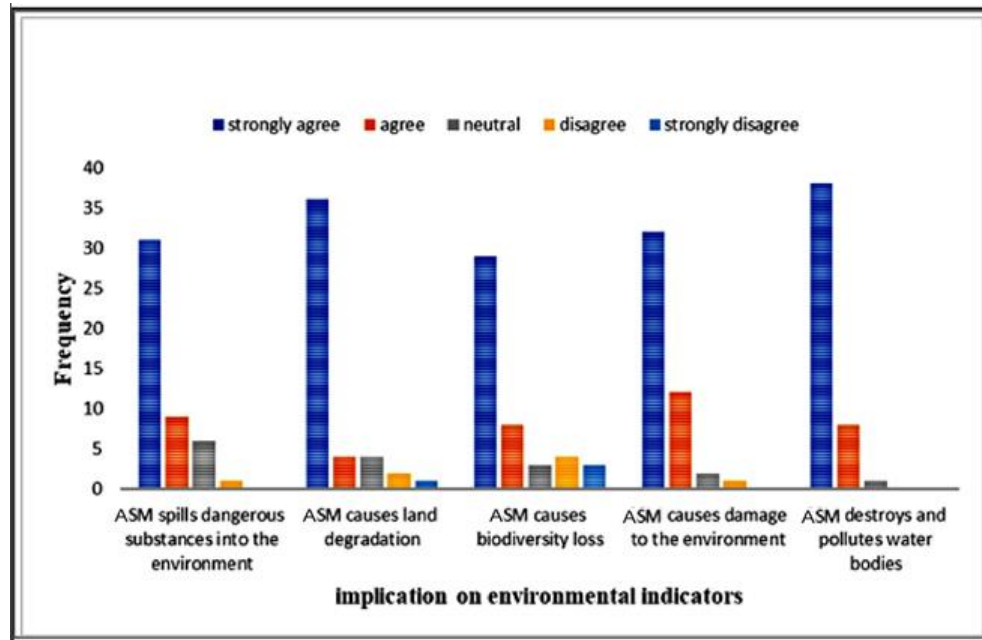
6.3 Environmental effects of ASM

A third objective of this paper was to examine the environmental impacts of ASM activities in the Atiwa District. Data for analyzing this objective was gathered through survey questionnaires, in-depth interviews, and personal observations. We focused on the following questions: Does ASM spill dangerous substances into the environment? Does ASM cause land degradation? Does ASM cause biodiversity loss? Does ASM damage the environment in general? Does ASM destroy water bodies?

During the survey questionnaire, the 47 respondents indicated that ASM activities affect the environment and its resources in several ways (see Figure 5).

Forty respondents representing 85% agreed that ASM causes waste spillage into the environment; one (2%) disagreed and six (13%) remained neutral. Forty respondents representing 85% also ascribed land degradation to ASM activities while three (6%) disagreed with four (9%) remained neutral. Regarding biodiversity loss, 37 respondents representing 79% agreed that ASM causes biodiversity loss. Seven of them, forming 15%, disagreed while three respondents, representing 6%, remained neutral. In addition to this, 44 respondents representing 94% agreed that the sector causes damage to the environment and natural resources, while one respondent forming 2% disagreed and two respondents forming 4% remained neutral. Regarding ASM implications on water bodies and natural resources, 46 respondents through the questionnaire, representing 98%, agreed that ASM pollutes water bodies in local communities. None of the respondents disagreed with one respondent (2%) remaining neutral.

Figure 5: Environmental impact of ASM in the Atiwa District.



(Source: Fieldwork, 2018).

The survey's findings were confirmed during in-depth interviews with key informants who explained in detail the extent to which ASM impacts the rural environment and natural resources. A major aspect of environmental damage caused by ASM activities is water pollution. To most of the participating key informants, ASM greatly affected water bodies, especially rivers and even underground water. A respondent at Akrofufu narrated the following:

The dirty water that is used to wash the gold together with mercury is poured back into the rivers. The miners also divert the river and often destroy the river banks. There are also Chinese miners who mine in the river. They have a machine that flows on the river and another machine called Changfan which is used to drill deep down the river to collect the gravels under the river and wash them to find gold. So, because these activities are done on the river, the sand after washing is heaped in the river, the water then becomes yellowish, and the community members are unable to use it again.

An Assembly Member in the area expressed his frustration on the deterioration of water bodies caused by ASM in the communities thus:

Water bodies are polluted. The rivers have been diverted; you cannot drink Birim water because it is muddy. That is why we have stood up; three rivers take their root from Atiwa Forest - Birim, Ayensu and Densu. Except for River Densu, which supplies water to Accra, the rest are polluted. So, if we allow River Densu also to be polluted, then where are we going to?

In addition to the threat posed by ASM to cocoa farming elucidated earlier, ASM activities also destroy the topsoil and this undermines agricultural activities. Given the subsistence and agrarian nature of communities in which ASM activities take place, one would think that the miners would prudently engage in land reclamation to ensure that the topsoil continues to support agricultural production on a sustainable basis. However, most pits are left uncovered and even the few which get covered are done haphazardly and do not support plant growth. Indeed, an officer from District Forestry Commission opined the following:

During mining, the miners dig the pits, but the proper thing to do is first to collect the top soil and save it at a different place before the clay is dug out. So, after mining when reclamation is being done, the clay and the gravels are used to fill the pit, and the topsoil is used to cover the pit, so the land becomes normal again. However, this is not what is pertaining in Atiwa. There is no separation of the topsoil and clay, so when they do the reclamation, the place becomes like desert and infertile. So, productive agriculture in the community becomes impossible.

The effect of the using Changfan—a crushing machine for drilling deep into rivers to collect gravels and wash for gold—on pollution is the destruction of aquatic life and exposure of people to health risks. This finding corroborates a similar observation by a recent study in the Dunkwa-on-Offin District of Central Region of Ghana where gold mining activities caused heavy metal pollution in soil and water in some (Kpan, Opoku, & Gloria, 2014). Castello and Macedo (2015) also observed a similar outcome in Amazonia where dredging of river basins for minerals caused large-scale degradation of freshwater ecosystems.

6.4 Promoting sustainable practices in ASM

The participants of the field survey recognized that ASM is essential to the well-being of rural people and therefore recommended that effective measures should be found to minimize ASM's negative impacts and ensure its sustainability. The Assembly Member for Wintini Ase Electoral Area stressed this point thus:

Small-scale mining has been on-going long time ago in this community. I was then a schoolboy. I completed the O-Level in 1976. However, small-scale mining in this community is more harmful than good. But you know whatever happens the gold must be extracted because the minerals have no value if they are down there.

Thus, a final objective of the study was to find out key measures for adopting sustainable practices in the ASM sector to mitigate potential adverse social, economic, and environmental consequences. The analysis of the information gathered from the field survey pointed to several strategies that can help to make ASM sustainable and beneficial to local communities and the economy of Ghana. To begin with, respondents proposed strict regulation and enforcement of laws on the extraction of natural resources. They observed that although some rules and

regulations govern ASM in the country, their enforcement is poor. This is supported by Osei-Kojo et al. (2016), who found that gold buyers from the Precious Minerals Marketing Company (PMMC) make no distinction between legal and illegal gold dealers. They enjoy the same competitive prices in the gold market, and this attitude remains a significant factor fueling unsustainable ASM practices in the country.

The above suggests that the appropriate state agencies such as the Minerals Commission (MC), Ghana's Environmental Protection Agency (EPA) and the District Assemblies (DAs) should step up their monitoring and supervision roles relating to ASM. The miners themselves also have an essential role to play to make ASM socially sustainable. For instance, to mitigate the impact of mining on social decadence and school dropout, most miners practiced self-regulation, as explained by one experienced miner:

Oh at my site, even though I do not look at educational background before I employ workers, however, if I see that you are a minor and you have not completed school I will not employ you. I allow those who are 20 years and above and have money problems to work. If you go to school and you are between 15 and 16 years, I will not allow you to work at my site. In fact, the law does not allow us to employ such minors to work...

Clearly, to make ASM socially sustainable requires that law enforcers such as the police, EPA, MC and the DAs should be well equipped to monitor the sector's operations. Indeed, the ability of local communities to exploit their natural resources to satisfy their needs is shaped by the political, social, and regulatory environments at the national and local levels. Government's commitment to ensuring that local communities benefit from mineral resources without far-reaching negative economic, social and environmental consequences is vital.

Another strategy for ensuring the sustainability of ASM is to decentralize the process of granting mining licenses. The centralized and cumbersome bureaucratic processes cause long delays in people obtaining mining permits, and this leads many to resort to illegal operations that result in detrimental social and environmental consequences. An opinion leader in one of the mining communities explained the license saga in the following words:

The processing of documents and issuing licenses should not be in Accra. We have assemblies, and these tasks should be decentralized so that the districts can do the documentation and grant licenses to miners. When that happens, the district can easily monitor the activities of the miners and so if any miner leaves any mine pit uncovered it could be easily detected.

Another miner stated:

It is because of the long process we go through before we get the land. Sometimes you can chase a document for four years, but you will not get the land, but if someone who has more money than you comes along, the

officers will divert the land you have discovered to him. So, before you go through the lengthy process of documentation, he has already extracted the minerals and left. And because they have no permit and license, you cannot trace them.

Teschner's (2012) research corroborates this finding. He argued that unsustainable practices emanating from regulatory challenges stem from the loopholes in the law itself, which manifest in more political leniency and corruption in the enforcement of small-scale mining laws. Corruption in the regulatory regime, therefore, produces the chance for miners to operate illegally and unsustainably.

It is essential to mention that many individuals engaged in ASM are conscious of the associated adverse impacts of most of their practices on the socio-economic and environmental spheres, and who have taken or are willing to implement mitigating measures. Over time, as most of the negative impact became evident, some miners resort to the use of other substances to wash the gold instead of mercury. This suggests that miners are committed to reducing the negative impacts of their operations. Hence, the strategy of adequate training of the miners and monitoring their operations is critical.

7.0 Conclusions

This paper investigated the contribution of artisanal small-scale mining (ASM) to sustainable development in the Atiwa District of Ghana's Eastern Region. It sought answers to four questions: How does ASM impact the economic dimension of sustainable development of the people of the Atiwa District? What are the social implications of ASM in the district? How does ASM affect the environmental resources in the district? How could SSM activities be practiced to foster sustainable development in the district?

From the above results, we can discern that economic and social benefits of ASM in the Atiwa District outweigh its negative economic and social impacts, although a larger number of respondents admitted to economic benefits more than they did social benefits. This means more people see negative social impacts than they see negative economic impact. However, an overwhelming majority of respondents attested to the negative environmental consequences of ASM with negligible number disagreeing or remaining neutral.

Importantly, the results from the data showed that engaging in ASM and ensuring sustainable development are not mutually exclusive. However, environmental sustainability in the ASM sector in rural communities is urgently required. Since most ASM activities occur in rural communities, which are primarily agrarian and subsistent in character, a lack of regulation of the sector not only contributes to the destruction of rural economies and environments, but it also unsettled human ecology. In an economy like Ghana, where most citizens live in rural areas, making ASM sustainable to benefit rural dwellers should be a legitimate national development concern. The future of the sector should therefore focus on sustainable rurality—governing the ASM sector to ensure that current rural agrarian livelihoods are improved while not jeopardizing the ongoing benefits of rural societies, economies and environment for future rural generations.

To make ASM sustainable requires regulation at the local and national levels. Locally, there is a need to organize local artisanal miners into cooperatives, regularize their activities, and closely monitor their operations. At the national level, the roles and actions of regulatory agencies such as EPA, the Police Service and DAs should be placed within a national strategy and effectively coordinated. These levels of regulatory actions must, of course, take place within a national strategy which incorporates ASM into the agenda of rural development. The laxity of enforcement of laws and regulation pertaining to ASM has fostered illegalities and unsustainable practices in the sector. Thus, without a comprehensive programme for monitoring and controlling each stage of the mining value chain, ASM will not be able to contribute significantly to the sustainable development and sustainable rurality of rural communities and Ghana. At best, it will benefit a few people, impoverish the majority and destroy the environment and life support systems.

Based on our paper's findings and the above arguments, the commitment of governments at the local, regional and national levels to implement specific policies and regulations will determine whether ASM would either negatively or positively affect the livelihoods of rural communities. Thus, tilting the balance in favour or against sustainable rurality would depend on the actions, or a lack thereof, of mandated government institutions, regulatory agencies and development stakeholders. This paper, therefore, calls for the highest level of commitment by the governments and relevant agencies to monitor ASM to deliver the expected economic, social, and environmental benefits to rural communities and the country in general. Beyond these arguments and the conception of sustainable rurality, this paper adds to the literature by applying the three canons of sustainable development (social, economic, environment), and brings some balance and coherence to the design and operationalization of ASM activities in Ghana.

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