



EMPOWERING YOUNG ARTISANAL MINERS: SUSTAINABLE PRACTICES AND CLIMATE RESILIENCE

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Introduction

Artisanal mining is an important economic activity in Masvingo Province, Bhuka community, where young artisanal miners face several challenges, such as limited access to financial resources and equipment, environmental degradation, and exacerbating the impacts of climate change. The study aims to address the research questions: How can artisanal miners' resilience to climate change be enhanced? What sustainable practices can be implemented by artisanal miners? The aim of this study is to investigate the empowerment of young miners through sustainable practices and to identify ways that can upgrade their socio-economic conditions. The impact of this research rests in its potential to inform policy and community programs pointed at promoting sustainable artisanal mining, ultimately contributing to the well-being of young artisanal miners and the preservation of their environment. The research aims to provide actionable insights through the experiences and needs of these miners, which can foster a more sustainable and resilient mining sector in the region.

Abstract

The research investigates the empowerment of young artisanal miners in Masvingo Province, Zimbabwe, a case study of the Bhuka community. The major aim of the study is on sustainable mining practices and climate resilience. The research employed qualitative methodology to gather in-depth insights through focus group discussions and key informant interviews. Employing a qualitative approach helps to examine the experiences, challenges, and needs of young miners. The findings highlight meaningful problems related to environmental degradation, inadequate access to training, and the harmful impacts of climate change on mining activities. Through identifying effective strategies for enhancing sustainable practices and promoting the resilience of young miners, the study aims to present actionable knowledge that can inform policy and community initiatives. Additionally, the study pointed out the critical responsibility of education and community support in advancing sustainable practices among miners. The miners expressed a strong need for training and resources to enhance their mining techniques and environmental management. The fusion of traditional knowledge with modern practices is also emphasized as a vital strategy for enhancing sustainability. Finally, the study contributes to wider understanding of sustainable artisanal mining in the Bhuka community, emphasizing the importance of empowering young miners to foster environmental stewardship and socio-economic development while addressing the pressing challenges they face.

Literature review

Artisanal mining, as defined by Hinton et al. (2003), is a small-scale, informal mining activity characterized by low-technology and labour-intensive methods. These operations are often



unregulated and manifest in various forms, including alluvial gold mining, small-scale diamond extraction, and quarrying for construction materials. In Zimbabwe, this practice has become increasingly prevalent due to the economic challenges faced by formal sectors, compelling many individuals to seek alternative livelihoods through mining (Mawowa, 2013). While artisanal mining faces significant challenges such as safety risks, environmental degradation, and socio-economic issues stemming from its informal nature, the sector nonetheless plays a crucial role in local economies by providing income and employment, particularly for vulnerable groups like women and young artisanal miners. This research specifically aims to explore the underexplored experiences and needs of young miners within this context.

The local and national economies strongly benefit from mining operations. As postulated by the Chambers of Mines Zimbabwe (2019), the sector directly and indirectly employs over a million people, making it a critical economic lifeline for many households. In rural communities, where formal employment options are often scarce, artisanal mining frequently serves as one of the few viable economic endeavors. Beyond the miners themselves, companies supplying mining equipment, transportation, and independent vendors also profit from artisanal mining. This economic activity significantly enhances community development and boosts local economies. However, the full economic benefits of these activities are often underreported due to their informal nature, leading to a failure in national statistics and economic planning to fully account for them (Mawowa, 2013). This study seeks to fill the knowledge gap regarding the economic effects of artisanal mining, particularly concerning the involvement of young artisanal miners.

Despite its economic contributions, artisanal mining also carries significant negative environmental consequences, including deforestation, soil erosion, and water pollution resulting directly from mining operations. The use of hazardous chemicals, such as mercury for gold extraction in artisanal mining, poses detrimental effects to both humans and the environment (Mathe, 2020). Hinton et al. (2003) argue that the lack of adequate environmental management practices exacerbates the detrimental effects of artisanal mining on nearby ecosystems. For instance, unregulated mining activities can lead to habitat destruction, disruption of local water supplies, and biodiversity loss. These environmental impacts affect not only the miners themselves but also surrounding communities that depend on natural resources for their livelihoods. The research seeks to identify strategies that can lessen these effects, particularly for young miners.

Promoting sustainable mining practices is increasingly vital given these environmental impacts. Such practices aim to maximize economic benefits while simultaneously minimizing negative environmental effects (MMSD, 2002). This includes rehabilitating mined lands,



implementing effective waste management, and utilizing environmentally less harmful extraction methods. Several interventions have been implemented to enhance sustainability in artisanal mining. The World Bank (2013), for instance, emphasizes the significance of training miners in sustainable practices, such as proper waste disposal and the use of eco-friendly technologies. The goal of these initiatives is to reduce the ecological footprint of mining activities without compromising miners' ability to earn a livelihood.

Advancing sustainable practices and climate change resilience, particularly among young artisanal miners, critically depends on their empowerment through access to resources, participation in decision-making, and education (UNESCO, 2014). It is indisputable that a lack of access to relevant education and knowledge on sustainable mining methods, as highlighted by the Zimbabwe Environmental Law Association (ZELA, 2021), severely limits miners' capacity to implement eco-friendly practices. Providing targeted training and information can undoubtedly enhance miners' overall socio-economic situation and their capacity to engage in more responsible mining.

However, while education is essential, this research acknowledges that its impact is often mitigated by the pressing livelihood challenges faced by young miners. Their limited choices, driven by immediate economic necessity, can often compel them to prioritize survival over adopting new, potentially more time-consuming or less immediately profitable sustainable practices, even with training. Therefore, while education is a vital component, it must be coupled with tangible solutions to structural livelihood barriers to significantly change dynamics. This study specifically aims to explore the obstacles young miners face in accessing and effectively leveraging education and training opportunities, within the broader context of their economic realities.

Furthermore, fostering community involvement is essential for developing a truly sustainable environment among young miners. Engaging them in local decision-making processes can significantly improve resource management and heighten environmental awareness. This engagement not only empowers young miners but also fosters a crucial sense of environmental responsibility and ownership (Mawowa, 2013). The dynamics of community engagement and its impact on the practices of young miners will be examined in this research.

Artisanal mining communities are increasingly vulnerable to the consequences of climate change, including resource scarcity, extreme weather events, and changing environmental conditions (IPCC, 2014). Long-term sustainability and resilience for these communities critically depend on proactive measures. One key strategy to increase resilience and address livelihood pressures is diversifying revenue streams. By establishing viable alternative livelihoods, such as ecotourism or sustainable agriculture, miners can reduce their sole



dependency on mining, thereby lessening the impetus for unsustainable practices and increasing their capacity to withstand climate change impacts. Moreover, integrating environmentally friendly practices and technologies directly into mining activities can further mitigate climate change's adverse effects (IPCC, 2014). This study aims to bridge the current literature gap by identifying comprehensive solutions, appropriate for the specific situation of young miners in Bhuka, that integrate both targeted education and viable livelihood diversification strategies.

Methodology

I used qualitative methods to understand the socioeconomic empowerment of young artisanal miners, focusing on climate adaptive resilience and sustainability in the Bhuka community of Masvingo Province in Zimbabwe. Interactions through WhatsApp and phone calls enriched the dialogue and made it easier and more comfortable for the respondents. I used purposive sampling to select respondents who had enough knowledge and experience in artisanal mining. I included community leaders, government officials, and young miners, bringing the total sample to 40 respondents. This sample was diverse enough to capture the community's and key respondent's perspectives. Also, I used snowball sampling through which initial participants referred other participants. This method aided in reaching people who would be hard to find using other sampling techniques (Patton, 2015), thereby enriching the data collected.

I gathered data using semi-structured interviews, key informant interviews (KIIs), and focus group discussions (FGDs). I held two focus group discussions, each with 6 to 12 participants, who actively engaged in discussions on climate change and sustainable mining. I did two key informant interviews with the community leader and a government official from the Environmental Management Agency (EMA). To collect data on pertinent issues, I sent semi-structured interview guides to young miners, enabling them to share their insights. I did twenty interviews with young miners over WhatsApp because the participants were not available to meet during the day.

Following Braun and Clarke's guidelines (2006), I used thematic analysis to identify and analyze the patterns within the qualitative data from the semi-structured interviews, key informant interviews, and focus group discussions. I ensured accuracy by transcribing data verbatim, which allowed me to engage in multiple readings to the data in order to become thoroughly familiarized with the content. To capture central features reflective of the research questions, I generated initial codes. I subsequently organized the codes into possible themes that captured the more overarching patterns in the participants' experiences. I iteratively refined the themes to ensure that they were representative of the voices and realities of the



participants, all the while weaving the participants' truths into the thematic narratives. I placed careful attention to the importance and frequency of the themes, especially in relation to sustainability and climate resilience. I crafted a narrative that incorporate the themes which focused on the overwhelming challenges and resilience of young artisanal miners. This approach sharpened my analysis of the socio-cultural dynamics in question. In the end, it significantly enhanced the aims of my research by providing insight into the challenges of community empowerment.

The ease of access to hard-to-reach populations through purposive and snowballing sampling methods greatly enhanced the relevance and quality of the findings. My study seeks to enhance the understanding of the phenomenon of the sociological and psychological empowerment of young miners through the statistical trends and personal narratives that shape the miners' experiences. There are many advantages to utilising qualitative techniques, especially in light of the intricate details of the participants' lived experiences. This enables an understanding of the underlying socio-cultural relations and challenges facing young artisanal miners that are often ignored by quantitative approaches (Cresswell, 2014).

Findings and discussions

The results underscored considerable levels of awareness concerning the environmental issues surrounding artisanal mining. Participants demonstrated considerable awareness of sustainable mining practices such as using green mining technologies, waste management, and land reclamation. Such knowledge demonstrates awareness concerning the nexus of sustainability and mining. "We are aware of the importance of taking care of the environment and the consequences of failing to protect it. This is why we try to use environmentally friendly mining methods and practices in order to take care of our environment," as shared by one participant. This awareness provides them stronger environmental agency and community ownership to preserve natural assets. Furthermore, it allows artisanal miners to promote community sustainability by raising awareness and mobilizing community behavioral change. Ultimately, strengthening community attitudes provides an important basis to formulate more sophisticated policies that align sustainable mining and community planning.

The comprehension among miners is more than just theoretical; it is based on the lived experiences of miners who are exposed to environmental degradation. Participants noted numerous landscape changes such as soil erosion and deforestation and water pollution, which the participants linked to mining. These impressions are critical to understanding the adoption of social responsibility because the participants can see how their actions and inaction affect the environment as well as the community's collective well-being. Moreover, the firsthand observations strengthen the miners' advocacy for the adoption of sustainable mining



because their decisions have immediate consequences. There is, however, a greater challenge of advocacy, which is more than understanding the problem. This is particularly the case when there are economic incentives and limited resources to adopt such measures.

The focus on socio-economic issues has prevented the wider adoption of sustainable mining practices. Participants noted facing economic burdens which led them to focus on short-term financial rewards instead of planning for the future. Artisanal miners practice unsustainable mining methods because of the pressing need to make a living to support their families. One participant best described this by saying, “As young people with a lot of responsibilities, we have limited choice but to mine as much as we can to put food on the table, even when it causes harm to the environment.” Statements such as these capture the overwhelming necessity for economic survival juxtaposed with the ecological burdens it imposes – as is the case for much of the population involved in artisanal mining. In addition, the lack of easily accessible and affordable sustainable technologies multiplies this problem because miners have to stick to more harmful traditional mining practices. Consequently, many young miners become desperate because it seems as though day-to-day survival will forever take priority over ecological issues, rendering impossible the idea of a future where sustainable practices are commonplace. This serves as a powerful reminder of the need for more comprehensive initiatives that address both economic constraints and the burden of limited resources that enable the adoption of more responsible mining practices.

The results emphasized that education as well as training seems to be the most important factor in fostering sustainable practices in the region. The members of the mining community expressed an interest in sustainable mining techniques as well as training and education aimed at effective environmental management. There is a gap in education that, if addressed, would improve the ability to engage in responsible mining practices. The participants pointed out that the local NGOs and government departments have the greatest potential to provide workshops and materials to fill the gap. There is potential to develop, with the collaboration of a variety of actors and the mining community, training that would meet urgent local needs. This comprehensive model not only equips young miners with the necessary skills and knowledge, but also fosters an environment that makes it possible for sustainable mining practices to be adopted and implemented.

The need for education is not limited to the Bhuka community, as it was also noted for the artisanal mining industry. Hinton et al. (2003) argued that education and training shape the behaviours and practices of artisanal miners to a considerable degree, and education also contributes to environmental protection. Stakeholders can accelerate the sustainable mining transition by providing education and training to the miners. This is advantageous for the



community as well as the miners. Furthermore, education can empower miners to advocate for their interests and engage policymakers to ensure their participation in regulations concerning mining and environmental protection. Granting miners education can drive the community to a greater sense of proactive sustainability whereby miners become leading advocates for environmental protection, championing better mining practices not just for themselves, but also encouraging their communities to adopt these changes.

The one other particularly important concern that came to light was how mining operations are affected by climate change. Cold weather and hotter than average temperatures are common to obtain. These changes impact not only the extraction works, but also the future of young miners. One of the miners pointed out that the rains had produced torrents that washed away some of the pits which resulted into loss of income and reduced productivity. Additionally, these obstacles with the changing climate have forced miners to change the way they do things, which is making operational hazards and uncertainties increase. This underscores the necessity for devising adaptive coping strategies that enhance resilience in miners to the changing climate.

Artisanal miners have been observed to be vulnerable to climate-related risks, as highlighted in various studies which state that small-scale operations are more sensitive to environmental changes (Schwerdtle et al., 2018). This finding underscores the importance of proactive climate-mining adaptive plans that incorporate changes to the climate. The participants voiced an unequivocal demand for the appropriate climate change adaptation training. One of them put it bluntly, saying, "We need to know how to change our mining practices so we can survive in the climate we expect to have." The discussions, however, also underscored the overwhelming young miners' cope with the immediacy of livelihood stresses. Easily accessible education and training, as necessary as they are in the quest for adaptive capacity and change for sustainability, are at the bottom of the hierarchy of what young miners have to grapple economically the quest for daily survival, as earners among an over-employed population. This reality embodies the striking paradox where the power of education to transform individual and collective futures is critically dependent upon the structural livelihood context in which that education is to be applied. There is, therefore, the urgent need to close the knowledge gap through education, but equally the economic confines of the application of such education.

In addition, reframing adaptive strategies could mean diversifying mining methods alongside adopting sustainable land use practices that consider changing weather conditions. Educating miners to manage these changes can support stakeholders in safeguarding both environmental resources and the economic opportunities that can be derived from these



resources. Above all, integrating climate adaptation strategies is not only imperative but centers on sustainable development in the context of artisanal mining societies.

In the context of climate adaptation, integrating climate resilience into mining practices helps not only in securing the miners' livelihoods, but environmental sustainability on a wider scale. There is a call to action for all stakeholders to come together to design and implement solutions that will assist in these young miners' future relative to the effects of climate change. Such collaborations can be initiated by local governments and non-profit organizations along with schools and universities to develop and implement training programs on adaptive strategic frameworks. Moreover, integrating other communities that face similar difficulties and have devised solutions can further develop the local perspective on problem-solving. With an improvement in these factors, along with addressing the climate challenges, young miners will not only be empowered to withstand shifts in climate but also on a broader scale, to enhance community resilience.

The discussions highlighted the critical role of community engagement and collaboration in achieving sustainability. Numerous participants underscored the importance of collaboration in the sharing of knowledge, resources, and experiences. Community-organized initiatives like cleanup and tree planting activities were mentioned as useful in cultivating environmental awareness and responsibility among younger miners. One community participant captured the discussion nicely: "When we come together as a community, we can make a bigger impact. It's about working together for our future." Such participation fosters social cohesion as well as collective environmental stewardship. Active participation in these initiatives, young miners are able to acquire useful skills and consolidate their commitment to sustainable practices that support their economic activities and the broader environmental ecosystem.

The need for community support attests that young miners empowerment is a practice that is multifaceted and is more so holistic in approach. Communities working together can further add value towards achieving sustainability because, with adequate shared information and resources, there can be a more pronounced effect. This goes on to support what Ostrom (1990) noted, that the need for collectiveness is vital. In the same vein, the community working together to solve environmental issues provides them with a strong platform to advocate to the lawmakers. This approach can help in developing a culture in which miners can practice and learn from each other to advance the adoption of new sustainable practices. All in all, this cooperative network is important to promote significant transformation in artisanal mining operations and encourage sustainable practices.

Furthermore, support from the community helps promote a form of social responsibility among miners, aiding in the promotion of sustainability. Young miners who participate in collective



activities tend to feel more responsible, which reinforces their commitment to practice responsible mining. This ownership serves to encourage responsible mining as well as foster a sense of pride in his or her work, resulting in a desire to conserve natural resources. Furthermore, there is a possibility that as a result of seeing the impacts of their collective efforts, miners may go out of their way to support sustainability in their communities. The study found an urgent gap for local and national government policies. Frustration over the absence of supportive policies and clear regulations alongside artisanal mining was prevalent among the participants. There were calls for policies that both foster sustainable approaches and provide economic support to the miners. Participants called for financial encouragement towards environmentally sustainable practices alongside easier resource access. Furthermore, there is a gap for policies that support the establishment of sustainable training, teaching, and technical assistance frameworks that would allow miners to sustainably change their practices. With the right policies, governments can give the necessary support to artisanal miners, allowing for sustainable self-help strategies that improve their livelihoods.

The literature on artisanal mining highlights the need for regulatory frameworks that integrate the developmental and environmental dimensions of sustainability (World Bank, 2013). Respondents underscored that young miners struggle to engage with sustainable practices without adequate policy frameworks. As one of the miners noted, “If the government could help us, it would make a huge difference. We want to do the right thing, but we need support.” This comment illustrates the need for miners and decision-makers to strike a balanced approach to developing regulations that ensure sustainable mining. In addition, outlined frameworks and adequate infrastructure can empower young miners to embrace sustainability while protecting their livelihoods. Overall, collaboration between the government and artisanal miners is necessary to cultivate a green future for the industry.

This study underscores the importance of policymakers in providing opportunities for young artisanal miners to adopt sustainable methods and mitigate the effects of climate change. Policy initiatives should focus on creating appropriate laws that tackle both sustainable mining and the socio-economic problems which artisanal miners face. All the participants drew attention to a critical aspect which runs contrary to the idea that providing education and training opportunities would enable skill diversification: the immediate financial demands of their families. Because a significant number of young miners work to support their families, they abandon the pursuit of formal education or other vocational training toward more sustainable career options. Therefore, our analysis shows that while education and training will form part of a long-term solution, they cannot tackle the immediate structural livelihood challenges that so many young people face. We argue that these structural barriers provide obstacles to enduring sustainable practices. Responsibly-designed policy can strengthen the



miners' capacity to make beneficial choices for their income and the ecosystem, which damages the ecosystem. In addition, policies that address education, financial aid, and access to sustainable technologies can greatly enhance the ability of miners to cope with changing circumstances. This not only elevates the economy but also encourages environmentally responsible behavior over time in mining communities. In artisanal mining, the policies analyzed demonstrate greater intervention is needed to achieve sustainability.

Finally, young miners in the study have strong motivations to shift from destructive practices to harmful ones, which demonstrates innovative thinking. They have expressed willingness to utilize traditional practices, which is coupled with modern principles, thus contributing to the improvement of sustainable mining. Incorporating traditional practices into modern sustainability strategies not only aids to the effectiveness of sustainability initiatives, but also ensures that the principles of eco-friendliness are upheld. With these strategies, participants believe that sustainable development in artisanal mining can be attained.

The combination of traditional practices with contemporary techniques improves the efficacy of sustainability initiatives while preserving cultural heritage. It also reflects the notions of participatory development which features the use of local knowledge to solve community problems (Chambers, 1994). Through the acknowledgment of traditional practices, stakeholders have the potential to enable junior miners and cultivate identity and ownership in the environmental stewardship activities. In addition, this collaboration can lead to culturally appropriate, eco-friendly innovative solutions towards the development of sustainable, community-driven mining. It can be said that the incorporation of these knowledge systems can help junior miners to become more culturally and environmentally resilient.

Moreover, the merger of traditional knowledge can result in problem-solving approaches that are appropriate for the region. Younger miners are often knowledgeable about the ecological features surrounding them, and this knowledge can also make their practices more sustainable. As one of the participants said, "We have learned from our elders about respecting the land. Combining that knowledge with new methods could help us be more sustainable." This combination of knowledge offers a distinct possibility to encourage young miners and, at the same time, make sure that sustainable practices are appropriate to the culture and functional. Furthermore, communities can encourage a market of ideas that enables collective and agile learning and responsive change by collaboration between older and younger miners. In the end, this integration could make a considerable impact in artisanal mining, as well as the environment and cultural heritage of the community.



Conclusion

In conclusion, the study on empowering young artisanal miners in the Bhuka community highlights the critical need for a multifaceted approach that addresses their awareness of environmental issues, socio-economic challenges, and the impacts of climate change. While young miners demonstrate a strong understanding of sustainable practices, the pressures of economic survival often hinder implementation. Education and training, community collaboration, and supportive policies are essential to foster resilience and promote responsible mining. Additionally, integrating traditional knowledge with modern practices can enhance sustainability while preserving cultural heritage. Ultimately, a collective effort from stakeholders is vital to empower these young miners, ensuring their livelihoods and the health of their environment for future generations.

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