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Assessing the Social Risks of Small-Scale Mining in Affected Communities of Barangay Pawa, Boac, Marinduque

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ABSTRACT

This study examined the social and environmental risks associated with small-scale mining in Barangay Pawa, Boac, Marinduque, focusing on health, livelihood disruption, and community conflicts. Using a descriptive-correlational research design integrated with regression analysis, the study aimed to assess the socio-economic and environmental conditions of mining-affected communities. Data were collected through a structured questionnaire and semi-structured interviews with 285 respondents, including miners, local residents, government officials, and other stakeholders. The findings revealed significant health risks, including respiratory diseases and mercury poisoning, and highlighted severe disruptions to local livelihoods, particularly in agriculture and fishing. Environmental degradation, such as water contamination and deforestation, further exacerbates food and water security issues. The study identified a significant positive correlation between mining activities and social risks, emphasizing the need for stronger regulatory frameworks and community-based interventions to mitigate these adverse effects. Based on the findings, the study recommended the enforcement of stricter environmental regulations, the promotion of alternative livelihoods, and the implementation of comprehensive health and safety standards for mining operations.

Keywords: *Community Conflicts, Environmental Degradation, Health Risks, Livelihood Disruption, Small-Scale Mining*

INTRODUCTION

Small-scale mining has been a vital source of income for many communities in the Philippines, particularly in rural areas where economic opportunities are limited. In Barangay Pawa, Boac, Marinduque, small-scale mining provides livelihood opportunities but also brings numerous social and environmental risks. The unregulated nature of these mining activities often leads to severe consequences for local communities, including health hazards, economic instability, and environmental degradation. The persistence of these risks necessitates an in-depth assessment of small-scale mining's impact on affected communities to inform policy recommendations for sustainable mining practices (Santos & Rivera, 2022).

Globally, small-scale mining is a prevalent industry that employs millions of people, especially in developing countries. However, it is often associated with hazardous working conditions, environmental pollution, and community displacement. Studies show that informal mining operations frequently lack proper regulatory oversight, resulting in severe consequences for both miners and the environment. The United Nations Sustainable Development Goals (SDGs) emphasize the importance of responsible mining practices to mitigate social and environmental risks (Fernandez & Hutton, 2023). Despite international efforts, many countries struggle to implement effective regulations that balance economic benefits with the well-being of affected communities.

One major research gap in small-scale mining is the lack of localized studies on its socio-economic and environmental impacts, particularly in specific Philippine communities such as Barangay Pawa.

Existing studies often focus on large-scale mining operations, leaving the social risks associated with small-scale mining underexplored. Additionally, while there is some documentation of mining's economic benefits, there is limited data on how small-scale mining contributes to long-term social challenges, such as food insecurity and livelihood disruptions. Addressing these gaps is essential to understanding the broader implications of mining on affected populations (Garcia & Mendoza, 2021).

The legal framework governing small-scale mining in the Philippines includes the People's Small-Scale Mining Act of 1991 (RA 7076) and the Philippine Mining Act of 1995 (RA 7942). These laws mandate compliance with environmental and safety regulations to minimize mining-related risks. However, enforcement remains weak due to limited government resources and the prevalence of informal mining operations. In many cases, miners operate outside legal frameworks, avoiding necessary permits and environmental impact assessments. Strengthening regulatory compliance is crucial to mitigating the social and environmental costs of small-scale mining (Lopez & Castillo, 2023).

At the local level, Barangay Pawa has witnessed the expansion of small-scale mining as a primary source of livelihood for many residents. While the industry has contributed to economic activity, it has also led to concerns regarding health and safety practices, water pollution, and land degradation. Local authorities face challenges in monitoring mining activities and enforcing environmental regulations, leading to unsustainable practices that harm both miners and surrounding communities. Without proper intervention, the adverse effects of small-scale mining will continue to escalate (Ramirez & Cruz, 2022).

The current situation in Barangay Pawa highlights the urgency of addressing small-scale mining's social risks. Reports indicate rising cases of respiratory diseases, skin conditions, and other health issues linked to exposure to toxic substances used in mining processes. Furthermore, land displacement and resettlement issues have become more prevalent as mining activities encroach upon residential and agricultural areas. These challenges underscore the need for comprehensive research to develop effective mitigation strategies (Santiago & Torres, 2023).

This study aims to assess the extent of health risks faced by individuals involved in small-scale mining in Barangay Pawa. The exposure to harmful substances such as mercury and cyanide, combined with inadequate protective measures, poses significant threats to miners and local residents. Identifying the primary health risks associated with small-scale mining is critical to designing interventions that improve safety standards and health policies for affected populations (Cruz & Herrera, 2022).

Another objective of this research is to analyze the impact of small-scale mining on local livelihoods. While mining provides income, it also disrupts traditional means of sustenance such as farming and fishing. Soil degradation and water contamination have led to declining agricultural productivity, forcing many residents to rely solely on mining despite its long-term risks. Understanding the trade-offs between economic benefits and livelihood disruptions can help in crafting policies that promote economic diversification and sustainable development (Mendez & Villanueva, 2023).

This study also seeks to evaluate the displacement and resettlement challenges faced by communities due to mining expansion. Land conflicts often arise as mining areas encroach upon residential and farming zones, leading to forced displacement. Limited government assistance and inadequate relocation plans further worsen the situation, leaving affected families vulnerable to economic and social instability. Examining these issues can help formulate better resettlement strategies and land-use policies (Garcia & Santos, 2021).

Food and water security are critical concerns in small-scale mining communities, as mining operations frequently lead to pollution of water sources and loss of arable land. Contaminants from mining waste seep into rivers and groundwater, affecting drinking water supplies and agricultural irrigation. This

study aims to investigate the extent of these environmental impacts and their implications for food and water security in Barangay Pawa (Fernandez & Lopez, 2023).

Community conflicts arising from small-scale mining are another focus of this research. Disputes over land ownership, competition for resources, and unequal economic benefits contribute to tensions among residents. The lack of clear regulatory guidelines exacerbates these conflicts, leading to social unrest. By analyzing the root causes of these conflicts, the study aims to propose solutions for improving governance and conflict resolution in mining communities (Ramirez & Cruz, 2022).

The results of this study will contribute to the broader discourse on sustainable mining practices in the Philippines. By identifying key social risks, policymakers can develop targeted interventions to reduce the negative impacts of small-scale mining while promoting safer and more responsible mining methods. This research will also provide valuable data for local government units and non-governmental organizations working towards community development in mining-affected areas (Santos & Rivera, 2022).

Ultimately, this research underscores the importance of balancing economic growth with social and environmental sustainability. Small-scale mining remains a vital economic activity, but its adverse effects must be addressed through improved policies, community engagement, and stronger regulatory frameworks. By examining the experiences of affected communities in Barangay Pawa, this study will offer insights into best practices for minimizing mining-related social risks and fostering sustainable development (Mendez & Villanueva, 2023).

LITERATURE REVIEW

Small-scale mining (SSM) operations, particularly those in developing countries, present significant health risks to miners and surrounding communities due to toxic chemical exposure, poor working conditions, and inadequate healthcare access. A substantial body of research emphasizes the negative health impacts of small-scale mining, especially in relation to mercury contamination, respiratory diseases, and the broader socio-environmental consequences. These health risks are compounded by limited health infrastructure, underscoring the need for targeted interventions in mining-affected regions.

Artisanal gold mining, which often relies on mercury for gold extraction, is a significant health concern. Gonzalez & Santos (2022) highlight that exposure to mercury in such operations is linked to severe neurological disorders, particularly in vulnerable populations such as children and pregnant women. The neurotoxic effects of mercury, which can lead to developmental impairments and cognitive decline, are widely documented in small-scale mining contexts, raising urgent calls for stricter environmental controls and safer extraction practices.

Another major health risk associated with small-scale mining is the exposure to silica dust. Prolonged inhalation of this dust increases the likelihood of developing respiratory diseases like silicosis and tuberculosis (Martinez & Lee, 2023). These conditions are particularly prevalent in mining areas where workers lack protective gear and are exposed to hazardous dust for extended periods. Research shows that respiratory diseases not only affect miners but also the broader population living in mining-adjacent areas, emphasizing the need for improved occupational health regulations and community-based interventions.

Access to healthcare in small-scale mining regions is often insufficient, exacerbating the health risks associated with mining activities. Hernandez & Wang (2023) assert that many mining communities, especially in rural areas, lack the necessary medical facilities and trained healthcare workers to diagnose and treat mining-related illnesses. This scarcity of healthcare services means that many

miners and their families suffer from untreated health issues, leading to long-term physical and mental health challenges. Effective community health programs, along with enhanced healthcare infrastructure, are critical to mitigating these risks.

Environmental degradation caused by mining activities contributes to the spread of vector-borne diseases such as malaria and dengue. Lopez & Torres (2024) discuss how deforestation and stagnant water from abandoned mining pits create ideal breeding grounds for mosquitoes, leading to increased rates of these diseases. The intersection of environmental destruction and public health necessitates integrated disease surveillance and environmental rehabilitation programs to reduce the transmission of these diseases in mining-affected regions.

The psychosocial impact of small-scale mining is another significant area of concern. The stress associated with poor health, economic insecurity, and environmental degradation exacerbates mental health issues within mining communities. Research suggests that stress from economic instability and the pressures of working in hazardous conditions often results in anxiety, depression, and other mental health disorders (Hernandez & Carter, 2021). Mental health support, along with broader community health interventions, is essential in improving overall well-being in mining regions.

The lack of regulatory oversight in small-scale mining contributes to poor health outcomes. Chen & Martinez (2022) note that many small-scale miners operate informally, without sufficient knowledge or access to safety protocols, which heightens exposure to harmful chemicals and dangerous working conditions. Weak enforcement of occupational health and safety regulations, combined with economic pressures, leads to preventable injuries and health issues. Strengthening regulatory frameworks and providing miners with safety training are crucial steps in reducing these health risks.

Economic hardship in mining communities also plays a role in exacerbating health risks. When local populations are economically marginalized, they are less likely to afford proper healthcare or preventive measures (Garcia & Santos, 2024). Livelihood disruptions caused by mining activities, such as land degradation and resource depletion, force individuals into more dangerous and unhealthy livelihoods, further compounding health risks.

Environmental contamination from mining activities affects not only the miners but also the surrounding communities. The contamination of water sources with heavy metals, including mercury and cyanide, poses long-term health risks to the broader population. Studies by Gonzalez & Carter (2021) have demonstrated the widespread impact of water pollution on the health of local communities, with increased incidences of waterborne diseases and chronic health conditions tied to the consumption of contaminated water.

To mitigate the health risks associated with small-scale mining, effective health interventions are necessary. These include the provision of healthcare services tailored to the needs of mining communities, such as mobile health clinics and community-based health education programs. Lopez & Wang (2023) advocate for community health initiatives that focus on preventive care, including awareness campaigns about the dangers of mercury exposure and respiratory diseases, alongside efforts to improve overall health infrastructure.

The health risks associated with small-scale mining are multifaceted, ranging from toxic chemical exposure to respiratory diseases, mental health challenges, and environmental contamination. Addressing these risks requires a combination of stronger regulatory oversight, enhanced healthcare services, and community-based health programs. The existing literature consistently calls for a more integrated approach to health and safety in mining regions, one that considers the unique socio-economic and environmental factors at play.

MATERIALS & METHODS

This study employed a descriptive-correlational research design integrated with regression analysis to examine the social risks associated with small-scale mining in Barangay Pawa, Boac, Marinduque. The descriptive component provided a comprehensive assessment of the socio-economic and environmental conditions in the community, focusing on mining operations, health and safety practices, environmental impacts, regulatory compliance, and economic contributions. It explored various social risks, including health hazards, livelihood disruption, displacement, food and water security, and community conflicts. The correlational aspect examined the relationships between mining activities and these social risks, seeking to quantify how factors such as exposure to toxic chemicals, unsafe working conditions, and land degradation contributed to adverse outcomes like respiratory diseases, economic instability, and social displacement. Regression analysis was used to determine the predictive relationship between mining variables and social consequences, providing insights into how regulatory measures could reduce these risks.

The study was conducted in Barangay Pawa, a rural community where small-scale mining, particularly gold extraction, played a significant role in local livelihoods. The community faced environmental degradation, such as water contamination and deforestation, due to unregulated mining activities. This research focused on how these mining activities affected community health, food and water security, livelihood stability, and social conflicts. The study also analyzed how local governance and regulatory frameworks influenced mining operations and their social and environmental consequences. Interviews with key stakeholders, including local government officials, health officers, miners, and residents, complemented survey data to provide a deeper understanding of the challenges faced by the community.

Using a stratified random sampling method, the study surveyed 285 respondents from various groups, including small-scale miners, community residents, local government officials, health officers, civil society representatives, and business owners. The sampling approach ensured balanced representation of perspectives on mining's social risks. The study used a structured questionnaire with Likert-scale questions to gather quantitative data on perceptions of mining's impact, complemented by qualitative interviews to gather contextual insights. Statistical methods such as descriptive statistics, t-tests, ANOVA, Pearson correlation, and regression analysis were applied to analyze the data. This mixed-method approach allowed the study to triangulate data from different sources and perspectives, ensuring a comprehensive assessment of the social risks associated with small-scale mining in Barangay Pawa.

RESULTS AND DISCUSSION

1. What is the demographic profile of respondents in terms of:

1.1 Sex;
1.2 Age;
1.3 Civil Status; and
1.4 Education?

Table 1 shows the frequency and percentage distribution of the demographic profile of the respondents in terms of sex. The data reveal that 49.1% of respondents are male, and 50.9% are female. This indicates a balanced gender representation within the sample, allowing for an inclusive assessment of both male and female perspectives on mining activities. Gender may influence the way respondents perceive the environmental, economic, and social implications of mining. The balanced representation ensures that the findings reflect a broader community sentiment, which is consistent with studies by Sánchez et al. (2021), who noted that gender influences environmental engagement and risk

perceptions. Policymakers should consider this gender balance when crafting inclusive, community-wide mining policies.

Table 1
The Frequency and Percentage Distribution of the Demographic Profile of Respondents in terms of Sex

Sex	***Frequency***	***Percentage***
Male	140	49.1
Female	145	50.9
Total	***285***	***100***

Table 2 shows the frequency and percentage distribution of the demographic profile of the respondents in terms of age. The data shows that most respondents (45.3%) are aged 30 and above, followed by 23.2% in the 26 to 29 age group, and 18.9% in the 22 to 25 age group. The smallest group consists of individuals aged 18 to 21, representing only 12.6% of the respondents. This age distribution suggests that the majority of the respondents belong to the older, more experienced age group, which may provide more informed perspectives on the impacts of small-scale mining. This demographic structure suggests that initiatives targeting younger populations may be necessary to bridge any generational gaps in mining awareness and engagement, as supported by studies such as those by Pérez et al. (2020), which highlighted generational differences in environmental responsibility.

Table 2
The Frequency and Percentage Distribution of the Demographic Profile of Respondents in terms of Age

Sex	**Frequency**	**Percentage**
18 to 21	36	12.6
22 to 25	54	18.9
26 to 29	66	23.2
30 and above	129	45.3
Total	**285**	**100**

Table 3 shows the frequency and percentage distribution of the demographic profile of the respondents in terms of civil status. The data shows that 54% of respondents are married, while 46% are single. The larger percentage of married respondents suggests that the views represented in this study may reflect a more family-oriented perspective, which may have different concerns regarding mining operations, such as health risks or livelihood stability. This finding is consistent with research by Wang et al. (2022), who found that married individuals are often more concerned with environmental impacts due to their family responsibilities and long-term well-being.

Table 3
The Frequency and Percentage Distribution of the Demographic Profile of Respondents in terms of Civil Status

Sex	**Frequency**	**Percentage**
Single	131	46
Married	154	54
Total	**285**	**100**

Table 4 shows the frequency and percentage distribution of the demographic profile of the respondents in terms of education. The data reveal that most respondents (39.6%) have completed high school, followed by 33.7% with a college education, and 20.4% with an elementary education. Only a small

percentage (6.3%) holds a post-graduate degree. This education distribution indicates a lower level of formal higher education among respondents, which may impact their understanding of technical aspects of mining, such as regulatory compliance or environmental risks. Educational initiatives targeting both high school and college graduates could enhance awareness and improve community engagement, aligning with findings from Tan et al. (2021), who stressed the importance of educational interventions in shaping environmental attitudes.

Table 4
The Frequency and Percentage Distribution of the Demographic Profile of Respondents in terms of Education

Sex	Frequency	Percentage
Elementary	58	20.4
High School	113	39.6
College	96	33.7
Post Graduate	18	6.3
Total	**285**	**100**

2. How do local stakeholders assess the impact of small-scale mining activities in terms of:
2.1 Mining Operations;
2.2 Environmental Impact;
2.3 Health and Safety Practices;
2.4 Regulatory Compliance; and
2.5 Economic Contribution?

Table 5 presents the local stakeholders' assessment of the impact of small-scale mining activities in terms of mining operations. The overall mean score of 2.43 and standard deviation of 0.96 suggest that respondents generally disagree with the assertion that small-scale mining activities are well-managed in Barangay Pawa. This suggests moderate negative impacts, particularly in aspects such as excavation methods and communication between miners and the local community. The data indicate that respondents view the mining operations as suboptimal, with inefficiencies in resource management and community coordination. While some positive economic impacts from mining may exist, stakeholders express concerns about the operational practices that could lead to further environmental damage. Mathews et al. (2021) argue that poorly managed mining operations can lead to long-term ecological and social consequences, further emphasizing the need for improved operational standards and community engagement.

The highest mean score of 2.50 regarding employment opportunities suggests that small-scale mining provides some positive benefits, such as creating jobs for residents. This score reflects moderate agreement that the mining activities contribute to the local economy through employment generation. The standard deviation of 0.96 suggests a reasonable level of consistency in responses, although some respondents may have slightly different views on the economic benefits. Employment generation from mining is an essential factor, as it can support local households and provide economic stability. However, the moderate agreement also reflects that respondents recognize the negative aspects of mining operations despite the creation of jobs. González et al. (2021) emphasize that the economic benefits of small-scale mining need to be balanced with sustainable practices and social responsibility to ensure long-term community prosperity.

The lowest mean score of 2.37, related to communication between miners and the local community, indicates that stakeholders perceive a lack of effective communication, leading to misunderstandings and conflict. The standard deviation of 0.96 highlights some variability in responses, but the overall trend suggests that communication efforts are insufficient. Poor communication can hinder

collaborative efforts, undermine trust, and exacerbate tensions between miners and residents. This finding stresses the importance of establishing more transparent and frequent communication channels between all stakeholders. To resolve this issue, it is crucial to create spaces for dialogue and ensure that local communities are well-informed about mining operations. Paredes et al. (2022) suggest that improving communication mechanisms can significantly enhance the relationship between mining operators and the local community, fostering more collaborative and sustainable practices.

Table 5
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities in terms of Mining Operations

Indicators	Mean	Std. Deviation	Response	Interpretation
Small-scale mining activities in Barangay Pawa are properly managed.	2.41	0.97	Disagree	Moderate Negative Impact
The mining operations provide adequate employment opportunities to the locals.	2.50	0.96	Disagree	Moderate Negative Impact
There is effective communication between miners and the local community.	2.37	0.96	Disagree	Moderate Negative Impact
Mining operations follow systematic excavation methods.	2.39	0.98	Disagree	Moderate Negative Impact
There are measures in place to prevent land degradation.	2.48	0.94	Disagree	Moderate Negative Impact
Overall	**2.43**	**0.96**	**Disagree**	**Moderate Negative Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Negative Impact/Strong Compliance), 1.76-2.50 Disagree(Moderate Negative Impact/Moderate Compliance), 2.51-3.25 Agree(High Negative Impact/Weak Compliance), and 3.26-4.00 Strongly Agree(Very High Negative Impact/Very Weak Compliance)

Table 6 presents the local stakeholders' assessment of the environmental impact of small-scale mining activities. The overall mean score of 3.02 and standard deviation of 1.03 indicate a general agreement that mining operations have a high negative impact on the environment. The highest mean scores, ranging from 3.00 to 3.09, reflect strong concerns about the environmental degradation caused by mining, including deforestation, soil erosion, and disruption of water sources. This score shows that stakeholders view mining as a significant threat to local ecosystems, affecting water quality, air pollution, and biodiversity. The variability in responses, as indicated by the standard deviation of 1.03, suggests that while many respondents acknowledge the negative environmental effects, some may have differing perceptions. Dávila et al. (2022) stress that the lack of environmental safeguards in small-scale mining operations leads to long-term ecological damage, requiring urgent reforms.

The highest mean score of 3.09, regarding water contamination, emphasizes the severe concern over the pollution of local water sources. This finding highlights the importance of protecting water resources from mining-induced contamination, as these sources are essential for the community's drinking water and agricultural activities. The standard deviation of 1.06 shows significant variability in the responses, which may be attributed to differing experiences with water quality in the area. This result calls for immediate actions to prevent further water contamination and restore affected water bodies. García et al. (2020) argue that water pollution from mining is one of the most critical environmental issues, often leading to health problems and loss of livelihoods for communities that rely on clean water sources. Implementing water management strategies and enforcing pollution control measures will be key in mitigating the environmental impacts of mining.

The lowest mean score of 2.91, regarding deforestation, reveals that respondents still perceive a considerable negative impact on forested areas, although not as severe as other environmental issues. The standard deviation of 1.05 suggests some variation in how respondents view the deforestation caused by mining, but the consensus points to significant ecological damage. Deforestation contributes

to habitat loss, disrupts local wildlife, and increases soil erosion, further compounding the environmental challenges in the area. This finding underscores the need for comprehensive reforestation programs and stricter mining regulations to prevent further loss of forest cover. As noted by Hernández et al. (2021), minimizing deforestation is critical for maintaining ecological balance and safeguarding biodiversity. Strengthening land reclamation efforts and ensuring sustainable forest management practices are essential for mitigating the negative impacts of mining on local ecosystems.

Table 6
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities in terms of Environmental Impact

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining operations have led to deforestation in Barangay Pawa.	2.91	1.05	Agree	High Negative Impact
Water sources in the community are affected by mining activities.	3.09	0.97	Agree	High Negative Impact
Air pollution from mining activities is a concern in the area.	3.00	1.04	Agree	High Negative Impact
Mining activities contribute to soil erosion in the locality.	3.04	1.00	Agree	High Negative Impact
Wildlife habitats have been disrupted due to mining operations.	3.08	1.06	Agree	High Negative Impact
Overall	**3.02**	**1.03**	**Agree**	**High Negative Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Negative Impact/Strong Compliance), 1.76-2.50 Disagree(Moderate Negative Impact/Moderate Compliance), 2.51-3.25 Agree(High Negative Impact/Weak Compliance), and 3.26-4.00 Strongly Agree(Very High Negative Impact/Very Weak Compliance)

Table 7 presents the local stakeholders' assessment of health and safety practices in small-scale mining operations. The overall mean score of 2.52 and standard deviation of 1.04 indicate a general agreement that health and safety practices are insufficient, with high negative impacts on workers' health. This suggests that while some protective measures may be in place, they are not adequate to safeguard miners from health risks. The relatively low mean scores, ranging from 2.42 to 2.49, highlight significant concerns about respiratory risks, lack of medical assistance, and the absence of emergency response teams in the mining operations. Jara et al. (2020) emphasize that the poor implementation of health and safety measures in small-scale mining exposes workers to long-term health issues, including respiratory diseases, skin conditions, and accidents. This calls for urgent improvements in health and safety protocols to protect miners and prevent occupational diseases.

The highest mean score of 2.69, related to protective equipment, indicates that some miners have access to basic safety gear, although the adequacy of this equipment is still questionable. The standard deviation of 1.05 reflects variability in respondents' experiences, as some workers may have more access to PPE than others. This finding suggests that mining companies may not be consistently providing adequate protection for all workers, leaving them vulnerable to health risks. López et al. (2021) indicate that miners must be adequately equipped with sufficient protective gear, including masks, gloves, and boots, to mitigate exposure to harmful substances and accidents. The provision of adequate PPE should be a basic requirement for all mining operations to ensure workers' health and safety. Regular training on the correct use of safety equipment is also necessary to maximize its effectiveness.

The lowest mean score of 2.42, related to the provision of health checkups and medical assistance, reveals that workers are not receiving sufficient healthcare support in mining areas. The standard deviation of 1.04 indicates some variability in experiences, with some miners reporting better access to healthcare than others. The lack of medical assistance is particularly concerning, as miners are

exposed to high-risk environments that can lead to severe health issues. This finding highlights the need for stronger medical support systems in mining areas, including regular health screenings and access to emergency care. Tan et al. (2021) note that comprehensive health programs and insurance coverage are vital for miners' well-being and should be integrated into mining operations. Ensuring that miners receive adequate medical care is crucial for reducing the negative health impacts associated with small-scale mining activities.

Table 7
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities in terms of Health and Safety Practices

Indicators	Mean	Std. Deviation	Response	Interpretation
Miners wear protective equipment during mining activities.	2.69	1.05	Agree	High Negative Impact
There are proper safety measures to prevent mining accidents.	2.53	1.02	Agree	High Negative Impact
Miners receive adequate health checkups and medical assistance.	2.42	1.04	Disagree	Moderate Negative Impact
Mining activities expose workers to respiratory health risks.	2.46	1.04	Disagree	Moderate Negative Impact
There are emergency response teams available for mining-related accidents.	2.49	1.06	Disagree	Moderate Negative Impact
Overall	**2.52**	**1.04**	**Agree**	**High Negative Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Negative Impact/Strong Compliance), 1.76-2.50 Disagree(Moderate Negative Impact/Moderate Compliance), 2.51-3.25 Agree(High Negative Impact/Weak Compliance), and 3.26-4.00 Strongly Agree(Very High Negative Impact/Very Weak Compliance)

Table 8 presents the local stakeholders' assessment of regulatory compliance in small-scale mining activities. The overall mean score of 2.48 and standard deviation of 1.03 suggest that respondents generally disagree with the assertion that mining operations in Barangay Pawa are fully compliant with regulatory requirements. This indicates moderate negative impacts, especially in areas such as licensing, regular inspections, and labor law compliance. The data highlights that while some degree of regulatory compliance is observed, there are concerns regarding the enforcement of these laws, particularly in terms of environmental regulations and fair wages. González et al. (2021) argue that weak regulatory enforcement often results in unsustainable mining practices, harming both the environment and workers' rights. Strengthening legal frameworks and improving enforcement will be crucial to ensure that small-scale mining operations operate within the bounds of the law.

The highest mean score of 2.54 regarding licensing and government inspections highlights that respondents believe small-scale mining operations are somewhat licensed and subject to inspections, though not consistently. The standard deviation of 1.06 shows significant variation in stakeholders' views on the enforcement of these regulations. This suggests that while some mining operations may be compliant with certain regulations, others may be circumventing the system. López et al. (2021) emphasize that regular inspections and penalties for non-compliance are essential for holding mining companies accountable. These measures help ensure that mining activities are conducted safely and responsibly, minimizing negative environmental and social impacts. Regular oversight and transparency are key to ensuring that mining operations follow proper regulatory procedures and standards.

The lowest mean score of 2.34, related to labor law compliance, suggests that respondents disagree with the idea that mining operations consistently follow labor laws and provide fair wages. The standard deviation of 1.00 highlights some variability in responses, with some workers possibly

receiving fair compensation while others are exploited. This points to a need for stronger labor protections and enforcement of labor laws within the mining industry. Hernández et al. (2021) argue that addressing labor rights issues in small-scale mining is crucial for protecting workers' well-being and ensuring that they receive fair wages and benefits. Policy reforms that provide better labor rights protection can improve the quality of life for miners and contribute to more sustainable mining practices. Therefore, improving labor law enforcement will not only enhance fairness but also promote social justice within mining communities.

Table 8
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities in terms of Regulatory Compliance

Indicators	Mean	Std. Deviation	Response	Interpretation
Small-scale mining operations in Barangay Pawa are correctly licensed.	2.54	1.05	Agree	High Negative Impact
Government authorities conduct regular inspections of mining sites.	2.52	1.03	Agree	High Negative Impact
There are penalties for miners who violate environmental regulations.	2.54	1.06	Agree	High Negative Impact
Mining companies comply with labor laws and pay fair wages.	2.34	1.00	Disagree	Moderate Negative Impact
The local government is actively involved in monitoring mining activities.	2.44	1.04	Disagree	Moderate Negative Impact
Overall	**2.48**	**1.03**	**Disagree**	**Moderate Negative Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Negative Impact/Strong Compliance), 1.76-2.50 Disagree(Moderate Negative Impact/Moderate Compliance), 2.51-3.25 Agree(High Negative Impact/Weak Compliance), and 3.26-4.00 Strongly Agree(Very High Negative Impact/Very Weak Compliance)

Table 9 presents the local stakeholders' assessment of the economic contribution of small-scale mining activities. The overall mean score of 2.91 and standard deviation of 0.95 suggest that respondents generally agree that small-scale mining has a high negative impact on the local economy. This reflects the perception that while mining operations provide job opportunities and income for local families, these benefits are outweighed by the negative consequences, such as economic instability and dependence on mining. Respondents express concerns that mining's contribution to the economy is not sustainable, with potential long-term consequences for local industries and social welfare. Torres et al. (2022) emphasize that the economic contribution of small-scale mining often comes with hidden costs, such as resource depletion and economic volatility, which can undermine community prosperity in the long run.

The highest mean score of 3.04, regarding the improvement of family living standards, suggests that respondents view small-scale mining as contributing to the improvement of household income, particularly for families directly involved in mining activities. The standard deviation of 0.90 indicates a relatively high level of consensus on this issue, with respondents acknowledging that mining provides economic relief. However, the long-term sustainability of these benefits is questioned, given the fluctuating nature of mining income. Pérez and Martínez (2023) argue that while small-scale mining can provide immediate economic relief, it often fails to offer stable and sustainable growth for the community. Long-term economic development requires diversification and investment in other sectors to complement mining's short-term benefits. As such, expanding economic opportunities beyond mining should be a priority to ensure future stability.

The lowest mean score of 2.76, related to fair wages, highlights concerns about the adequacy of compensation for miners. The standard deviation of 0.97 suggests that while some miners may be satisfied with their pay, others feel they are underpaid for their work. This reflects the disparity in wage

distribution within the mining sector, where some workers are exploited, while others may receive fair compensation. Robinson et al. (2020) emphasize that improving wage fairness and ensuring proper labor rights are crucial for creating a more equitable mining economy. Addressing these disparities would not only improve miners' well-being but also contribute to social stability within mining communities. Policymakers should implement stronger wage regulations and enforce labor rights protections to ensure that miners are fairly compensated for their work.

Table 9
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities in terms of Economic Contribution

Indicators	Mean	Std. Deviation	Response	Interpretation
Small-scale mining contributes to the local economy of Barangay Pawa.	2.96	0.95	Agree	High Negative Impact
Mining has increased job opportunities for local residents.	2.86	1.01	Agree	High Negative Impact
The income from mining helps improve the living standards of families.	3.04	0.90	Agree	High Negative Impact
Local businesses benefit from mining-related activities.	2.95	0.91	Agree	High Negative Impact
Miners receive fair wages for their labor.	2.76	0.97	Agree	High Negative Impact
Overall	**2.91**	**0.95**	**Agree**	**High Negative Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Negative Impact/Strong Compliance), 1.76-2.50 Disagree(Moderate Negative Impact/Moderate Compliance), 2.51-3.25 Agree(High Negative Impact/Weak Compliance), and 3.26-4.00 Strongly Agree(Very High Negative Impact/Very Weak Compliance)

3. How do local stakeholders assess the impact of small-scale mining activities on social risks in terms of:

3.1 Health risks;
3.2 Livelihood disruption;
3.3 Displacement and resettlement;
3.4 Food and water security; and
3.5 Community conflicts?

Table 10 presents the local stakeholders' assessment of health risks in small-scale mining activities. The overall mean score of 3.00 and standard deviation of 1.39 suggest a general agreement that mining activities have a severe impact on the health of the community, especially in terms of respiratory diseases and skin conditions. This reflects the widespread concern over the harmful effects of exposure to dust, chemicals, and mining waste, which are associated with severe health risks. Costa et al. (2022) argue that health risks such as respiratory illnesses and waterborne diseases are some of the most common health problems linked to mining activities, which often affect workers and surrounding communities. Effective measures to monitor and mitigate these risks are essential to protect public health, particularly in mining-affected regions.

The highest mean score of 3.06, related to skin diseases caused by exposure to mining-related chemicals, indicates that respondents perceive this health risk as particularly severe. The standard deviation of 2.61 shows considerable variation in responses, suggesting that some respondents have more direct experience with these issues than others. The significant health risks associated with exposure to mining waste underscore the need for better safety measures and medical monitoring for miners. Smith and Harris (2021) emphasize that skin diseases, such as dermatitis, are common among miners exposed to toxic chemicals, highlighting the importance of adequate protective gear and health surveillance programs. Reducing exposure to harmful substances and providing regular health checkups are critical for preventing these health issues.

The lowest mean score of 2.94, related to respiratory diseases caused by dust exposure, reveals that although respiratory issues are a concern, they are not seen as the most severe health threat in mining communities. The standard deviation of 1.07 suggests some variability in the responses, with some respondents perceiving respiratory diseases as a more significant issue than others. This finding points to the need for stronger dust control measures and regular health screenings for miners. Harris et al. (2020) emphasize that effective air quality management can significantly reduce the prevalence of respiratory diseases in mining environments. Mining companies need to invest in dust suppression technologies and ensure that miners are provided with the necessary protective equipment. Improving air quality and ensuring regular health monitoring will help reduce respiratory risks in mining areas.

Table 10
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities on Social Risks in terms of Health Risks

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining activities have led to an increase in respiratory diseases in the community.	2.94	1.07	Agree	Severe Impact
Water contamination from mining has resulted in health issues among residents.	3.01	1.07	Agree	Severe Impact
Exposure to toxic mining waste affects the health of community members.	3.03	1.09	Agree	Severe Impact
Noise pollution from mining activities has caused stress-related illnesses.	2.96	1.12	Agree	Severe Impact
Miners and their families experience higher rates of skin diseases.	3.06	2.61	Agree	Severe Impact
Overall	**3.00**	**1.39**	**Agree**	**Severe Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Impact), 1.76-2.50 Disagree(Moderate Impact), 2.51-3.25 Agree(Severe Impact), and 3.26-4.00 Strongly Agree(Very Severe Impact)

Table 11 presents the local stakeholders' assessment of livelihood disruption due to small-scale mining activities. The overall mean score of 3.02 and standard deviation of 1.01 suggest that respondents generally agree that mining operations have severely disrupted local livelihoods, particularly in agriculture and fishing. The highest mean scores, ranging from 2.95 to 3.13, indicate that farming, fishing, and tourism have all been negatively affected by mining activities. This disruption highlights the need for alternative livelihood programs to help communities adapt and diversify their economic activities. Rodríguez et al. (2022) emphasize that small-scale mining often displaces traditional livelihoods, leaving workers vulnerable to economic instability and poverty. Providing support for alternative livelihoods can help mitigate the negative impacts of mining and promote long-term community resilience.

The highest mean score of 3.13, regarding the reduction of opportunities in agriculture and fishing, indicates that these sectors have experienced the most significant economic setbacks due to mining activities. The standard deviation of 0.98 shows relatively consistent agreement among respondents about the negative impact on agriculture and fishing, which are vital sources of income for many families. This disruption suggests that mining has displaced traditional livelihoods, leading to increased competition for resources and decreased food security. López and Vargas (2021) note that mining operations often result in land degradation, water contamination, and loss of agricultural productivity, further exacerbating food insecurity in mining communities. Stakeholders need to consider the broader impact on local food systems and agrarian sustainability when evaluating the economic benefits of mining.

The lowest mean score of 2.95, related to the decline in local tourism, reflects concerns that mining activities are also negatively impacting the tourism sector. The standard deviation of 0.98 suggests

some variability in responses, with specific areas experiencing more noticeable declines in tourism than others. This disruption points to the need for a balanced approach that considers both the economic benefits of mining and the preservation of other local industries. Rodríguez et al. (2022) argue that sustainable tourism practices can coexist with responsible mining, provided that the environmental and social impacts of mining are appropriately managed. Fostering sustainable tourism alongside mining operations can help diversify the local economy and reduce the adverse effects of mining on community livelihoods.

Table 11
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities on Social Risks in terms of Livelihood Disruption

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining activities have reduced opportunities in agriculture and fishing.	3.13	0.98	Agree	Severe Impact
Families engaged in non-mining occupations have experienced income loss.	2.98	1.06	Agree	Severe Impact
Traditional livelihoods (e.g., farming, handicrafts) are negatively impacted by mining.	3.06	0.99	Agree	Severe Impact
Mining activities have caused a decline in local tourism.	2.95	0.98	Agree	Severe Impact
The presence of mining operations affects local business growth.	2.98	1.04	Agree	Severe Impact
Overall	**3.02**	**1.01**	**Agree**	**Severe Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Impact), 1.76-2.50 Disagree(Moderate Impact), 2.51-3.25 Agree(Severe Impact), and 3.26-4.00 Strongly Agree(Very Severe Impact)

Table 12 presents the local stakeholders' assessment of displacement and resettlement caused by small-scale mining activities. The overall mean score of 2.61 and standard deviation of 1.08 suggest that respondents generally agree that mining operations have caused severe displacement of families, but disagree regarding the adequacy of resettlement assistance. This indicates concerns over the social impacts of mining, including the loss of homes and disruption of community ties. The variability in responses, as indicated by the standard deviation, suggests that some families may have received better resettlement support than others. Hernández et al. (2021) argue that displacement caused by mining often results in the loss of social capital, leaving affected families vulnerable to further economic and social challenges. Strengthening resettlement programs and ensuring that displaced families are adequately supported is crucial for mitigating these negative impacts.

The highest mean score of 2.76, related to the displacement of families, highlights the severity of this issue in mining-affected areas. The standard deviation of 1.09 suggests that there are some differences in how respondents perceive the displacement process, with some considering it more disruptive than others. This indicates the need for more comprehensive and transparent resettlement programs that address the specific needs of affected families. González and Silva (2020) highlight that resettlement programs often fail to provide adequate compensation or support, exacerbating the social and economic hardships of displaced families. Ensuring that displaced individuals receive fair compensation and appropriate relocation support is essential for reducing the negative social impact of mining.

The lowest mean score of 2.50, related to the improvement of living conditions after resettlement, indicates that respondents disagree that displaced families experience better living conditions following relocation. The standard deviation of 1.05 further suggests that some families may not perceive resettlement as beneficial. This finding emphasizes the need for more effective resettlement

strategies that prioritize the well-being of displaced families. Hernández et al. (2021) argue that resettlement efforts should be designed to improve not only the physical living conditions but also the social and economic well-being of the displaced population. Better planning and community involvement in the resettlement process are essential to ensure that displaced families are integrated into their new environments and have access to adequate resources.

Table 12
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities on Social Risks in terms of Displacement and Resettlement.

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining operations have led to the displacement of families in Barangay Pawa.	2.76	1.09	Agree	Severe Impact
Residents have been forced to relocate due to mining-related hazards.	2.62	1.07	Agree	Severe Impact
The government provides adequate resettlement assistance for displaced families.	2.58	1.08	Agree	Severe Impact
Families who have been relocated experience better living conditions.	2.50	1.05	Disagree	Moderate Impact
Displacement caused by mining has disrupted social and cultural ties.	2.58	1.09	Agree	Severe Impact
Overall	**2.61**	**1.08**	**Agree**	**Severe Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Impact), 1.76-2.50 Disagree(Moderate Impact), 2.51-3.25 Agree(Severe Impact), and 3.26-4.00 Strongly Agree(Very Severe Impact)

Table 13 presents the local stakeholders' assessment of the impact of mining activities on food and water security. The overall mean score of 2.99 and standard deviation of 0.99 indicate a general agreement that mining activities have a severe impact on food and water security. This highlights the significant concerns surrounding the contamination of water sources and the deterioration of soil quality due to mining operations. The data reflects widespread anxiety over the loss of agricultural productivity and fish stocks, both of which are essential for local food security. Liu et al. (2022) argue that mining operations often lead to soil erosion and water contamination, which disrupt local food systems and exacerbate food insecurity. Given the importance of these resources for community survival, mitigating these risks must be a priority for both mining operators and policymakers.

The highest mean score of 3.03, regarding the deterioration of soil quality, indicates a significant concern about the long-term impact of mining on local agriculture. The standard deviation of 0.99 suggests a high level of agreement among respondents about the negative effects of mining on soil quality. Mining operations often lead to the loss of fertile soil, which is crucial for growing crops, affecting both food production and the livelihoods of farmers. Zhang et al. (2021) emphasize that soil degradation caused by mining activities can significantly reduce agricultural yields, further contributing to food insecurity. It is essential to implement land restoration practices and sustainable farming techniques to reverse soil damage and improve food security in mining-affected areas. Supporting farmers with training and resources can also help mitigate the long-term impact of soil degradation caused by mining.

The lowest mean score of 2.95, regarding the challenges in accessing clean drinking water, reflects concerns that mining activities have made it more difficult to access safe water. The standard deviation of 0.98 indicates that there is some variation in how respondents perceive the severity of this issue. Despite recognizing the water contamination risks, some may not experience immediate water access issues, but the general trend suggests that this is a growing problem. Liu et al. (2022) highlight that

water pollution from mining often makes drinking water unsafe, which can lead to health problems and increased poverty. Therefore, improving water quality through better waste management and pollution control is essential for ensuring safe drinking water. Moreover, providing communities with alternative water sources and treatment facilities can help alleviate the impact of mining on water security.

Table 13
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities on Social Risks in terms of Food and Water Security

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining activities have contaminated water sources in the community.	3.00	1.00	Agree	Severe Impact
Access to clean drinking water has become more difficult due to mining.	2.95	0.98	Agree	Severe Impact
The soil quality for farming has deteriorated due to mining-related pollution.	3.03	0.99	Agree	Severe Impact
Mining has led to reduced fish catch and loss of aquatic biodiversity.	3.01	0.98	Agree	Severe Impact
The community faces challenges in growing crops due to mining-related soil erosion.	2.96	0.98	Agree	Severe Impact
Overall	**2.99**	**0.99**	**Agree**	**Severe Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Impact), 1.76-2.50 Disagree(Moderate Impact), 2.51-3.25 Agree(Severe Impact), and 3.26-4.00 Strongly Agree(Very Severe Impact)

Table 14 presents the local stakeholders' assessment of community conflicts related to small-scale mining activities. The overall mean score of 2.87 and standard deviation of 1.26 suggest that respondents generally agree that mining activities have contributed to significant community conflicts. The highest mean scores, ranging from 2.84 to 3.08, highlight concerns about land disputes, resource competition, and tensions between miners and non-miners. The data reflects a broader trend of social unrest in mining-affected communities, where resource control and land rights are at the heart of the conflict. Miller et al. (2021) argue that small-scale mining often exacerbates local conflicts by intensifying competition for land and resources, making it more challenging to maintain social harmony. Addressing these conflicts requires a multi-faceted approach, including legal frameworks for land rights and resource sharing.

The highest mean score of 3.08, related to disputes over land ownership, suggests that land conflicts are one of the most severe issues associated with small-scale mining. The standard deviation of 2.46 indicates considerable variability in how respondents view the intensity of these disputes, with some perceiving them as more critical than others. Land ownership issues often arise when mining activities displace traditional communities or when mining operators claim land rights over areas previously occupied by local families. Martínez et al. (2022) argue that conflicts over land rights can lead to violence and social instability, especially in areas where property rights are not clearly defined. To mitigate these land disputes, it is essential to establish transparent land tenure systems and ensure that communities are involved in decision-making processes regarding land use. Furthermore, legal support and conflict resolution mechanisms can help address land disputes peacefully and equitably.

The lowest mean score of 2.84, related to increased crime rates, reflects the concern that mining operations contribute to social instability, but the effect is seen as somewhat less severe. The standard deviation of 0.98 suggests moderate agreement among respondents regarding the relationship between mining and crime. Although crime rates may increase in mining areas, some respondents may not

perceive this as a significant issue. Martínez et al. (2022) suggest that the influx of people due to mining activities often leads to social strain, which can escalate criminal activity. Improving community security, promoting local governance, and implementing crime prevention measures can help reduce the negative social impacts of mining. By fostering a safer environment, communities can better cope with the challenges posed by mining operations.

Table 14
The Local Stakeholders Assessed the Impact of Small-scale Mining Activities on Social Risks in terms of Community Conflicts

Indicators	Mean	Std. Deviation	Response	Interpretation
Mining has led to disputes over land ownership among community members.	3.08	2.46	Agree	Severe Impact
Conflicts between miners and non-miners are common in Barangay Pawa.	2.68	0.96	Agree	Severe Impact
Competition over natural resources has intensified due to mining operations.	2.87	0.94	Agree	Severe Impact
here are tensions between local government officials and mining companies.	2.87	0.98	Agree	Severe Impact
Mining has contributed to increased crime rates in the community.	2.84	0.98	Agree	Severe Impact
Overall	**2.87**	**1.26**	**Agree**	**Severe Impact**

Legend: 1.00-1.75 Strongly Disagree(Low Impact), 1.76-2.50 Disagree(Moderate Impact), 2.51-3.25 Agree(Severe Impact), and 3.26-4.00 Strongly Agree(Very Severe Impact)

4. Is there a significant difference in social risks in affected communities when grouped according to their demographic profile?

Table 15 depicts the test of the significant difference in social risks in affected communities by sex. The t-test results show that there is no statistically significant difference in the social risk scores between male and female respondents, with a t-value of 0.401 and a p-value of 0.689, which is greater than the alpha level of 0.05. This suggests that both male and female respondents perceive social risks, such as health and livelihood disruptions, displacement, and food and water security, in similar ways. The findings indicate that gender does not significantly influence the perception of the social risks associated with mining activities in the community. These results align with previous studies by Johnson and Clark (2020), which found no significant gender differences in risk perception in mining-affected communities. Policymakers should therefore focus on addressing social risks in a manner that benefits the community as a whole, rather than targeting specific genders.

While gender did not show a significant impact on social risks in this study, it is still essential to recognize the potential role of gender in influencing how these risks are experienced at the individual level. For instance, women may be more vulnerable to certain types of social risks, such as health and safety risks, due to their roles in caregiving and family responsibilities. Efforts to integrate gender-sensitive policies into risk management strategies could ensure that the needs of both men and women are considered. According to Miller and Thompson (2021), gender-responsive disaster risk management is key to ensuring that both men and women have equitable access to resources and protection during mining-related disruptions. This approach can contribute to more inclusive and adequate social protection measures for all community members.

Despite the lack of significant findings in gender differences, it remains essential to address the underlying drivers of social risks in affected communities. Developing comprehensive strategies that take into account diverse community needs will enhance resilience and improve the effectiveness of policy interventions. Ensuring that all community members—regardless of gender—have access to the

support and resources they need will reduce vulnerability to mining-related risks. Collaborative efforts from local government units, community organizations, and stakeholders can help ensure that social risks are minimized and the well-being of all individuals is safeguarded

Table 15
Test of Significant Difference in Social Risks in Affected Communities when Grouped According to their Demographic Profile

Profile	Social Risk					
	Category	Mean	f-value	t-value	Remarks	Decision on Ho
Sex	Male	2.84	.708	.401	Not Significant	Failed to Reject
	Female	2.86				

Significant if p-value <0.05
Legend: Ho is rejected if Significant
Ho is failed to reject if Not Significant

Table 16 depicts the test of the significant difference in social risks in affected communities when grouped according to age. The f-test results show that there is no statistically significant difference in the social risk scores among different age groups, with an f-value of 0.811 and a p-value of 0.438, which is greater than the alpha level of 0.05. This suggests that respondents across different age groups perceive social risks, such as health, livelihood, and community conflicts, similarly, regardless of their age. The findings indicate that age does not play a significant role in shaping the perception of the social risks associated with mining activities. These results align with findings from Kumar et al. (2021), who also found no significant age-related differences in risk perception in mining areas. This implies that interventions to address social risks should be designed to target the entire community, rather than specific age groups.

Despite the lack of significant differences between age groups, it is still essential to consider the unique needs and vulnerabilities of different age demographics when designing community-based risk management strategies. Older adults and younger people may experience social risks differently due to their roles in the community and their levels of vulnerability. As noted by Brown and Lee (2021), age-related factors such as health, mobility, and caregiving responsibilities can influence how individuals experience and respond to environmental risks. Policymakers should consider these differences in their efforts to reduce the impacts of mining activities on various age groups and ensure that social support systems are accessible to all.

The findings suggest that the perception of social risks in mining communities is relatively uniform across age groups. However, this does not negate the need for tailored interventions that address the specific concerns of different age demographics. By incorporating age-sensitive policies and practices, mining-related risks can be better managed to reduce their adverse effects on the community. Comprehensive risk reduction strategies that include education, healthcare, and livelihood support will be essential for fostering resilience in mining-affected communities, regardless of age.

Table 17 depicts the test of the significant difference in social risks in affected communities when grouped according to civil status. The t-test results indicate a significant difference in the social risk scores between single and married respondents, with a t-value of 1.305 and a p-value of 0.254, which is greater than the alpha level of 0.05. This suggests that civil status has a statistically significant effect on how social risks are perceived. Married respondents tend to perceive higher levels of social risk, particularly in terms of health and safety concerns, compared to single respondents. Martínez and Gómez (2020) found that married individuals, especially those with children, are more likely to be concerned about the long-term implications of mining activities on their family's health and livelihood. Policymakers should consider these differences in risk perception when designing programs aimed at reducing social risks in mining communities.

Table 16
Test of Significant Difference in Social Risks in Affected Communities when Grouped According to their Demographic Profile

Profile	Social Risk					
	Category	**Mean**	**f-value**	**t-value**	**Remarks**	**Decision on Ho**
Age	18 to 21	2.83	.320	.811	Not Significant	Failed to Reject
	22 to 25	2.89				
	26 to 29	2.94				
	30 and above	2.80				

Significant if p-value <0.05
Legend: Ho is rejected if Significant
Ho is failed to reject if Not Significant

The higher mean score for married respondents indicates a heightened concern about the impacts of mining on family well-being. The standard deviation of 1.01 shows some variability in the responses, but the general trend points to a stronger perception of risk among married individuals. This may be due to the added responsibility of caring for family members and the desire to protect their health and livelihood from mining-related hazards. As Pérez et al. (2020) explain, family members often bear the brunt of the health and safety risks associated with mining activities, making married individuals more sensitive to these concerns. Developing policies that focus on family-centered health and safety interventions could help alleviate some of these concerns and improve overall community resilience.

The lowest mean score for single respondents suggests that they may be less concerned about the social risks associated with mining, particularly regarding health and livelihood impacts. The standard deviation of 0.98 reflects that while single respondents tend to perceive lower risks, there is still some variation in how they experience these impacts. This finding suggests that interventions targeting the unique needs of married individuals may be more effective in addressing their concerns. Pérez and Gómez (2020) argue that tailoring policies to address the specific needs of different family structures can improve the effectiveness of risk reduction measures. By ensuring that married individuals, especially those with children, receive adequate support and protection, policymakers can better address the perceived social risks in mining communities.

Table 17
Test of Significant Difference in Social Risks in Affected Communities when Grouped According to their Demographic Profile

Profile	Social Risk					
	Category	**Mean**	**f-value**	**t-value**	**Remarks**	**Decision on Ho**
Civil Status	Single	2.78	1.305	.254	Not Significant	Failed to Reject
	Married	2.93				

Significant if p-value <0.05
Legend: Ho is rejected if Significant
Ho is failed to reject if Not Significant

Table 18 depicts the test of the significant relationship between small-scale mining activities and social risks in affected communities. The regression analysis reveals that mining operations have a considerable positive correlation with health risks ($r = 0.463$, $p = 0.000$), livelihood disruptions ($r = 0.364$, $p = 0.000$), and food and water security issues ($r = 0.292$, $p = 0.000$), all with highly significant p-values. This indicates that as small-scale mining activities increase, so do the social risks perceived by the community. However, no significant relationship was found between mining activities and community conflicts ($r = 0.216$, $p = 0.000$), suggesting that while mining may influence certain social risks, it may not directly contribute to social unrest. Zhang et al. (2022) found similar results, with

mining activities being strongly associated with health risks and livelihood disruption, but less so with community conflicts. These findings highlight the need to address the direct health and livelihood consequences of mining while also exploring other factors contributing to community tensions.

The significant positive correlation between mining activities and health risks ($r = 0.463$, $p = 0.000$) suggests that mining operations are a major contributor to health problems in affected communities. The standard deviation of 1.04 indicates that there is some variability in how individuals perceive health risks, but the consensus is that mining activities exacerbate health issues. This reinforces the need for more robust health interventions, including medical monitoring and access to healthcare for miners and surrounding communities. González and Torres (2021) emphasize that the health impacts of mining, such as respiratory diseases and skin conditions, are among the most pressing issues for communities near mining operations. To mitigate these risks, health education programs and improved safety measures must be implemented to protect community members from the harmful effects of mining.

The correlation between mining activities and livelihood disruptions ($r = 0.364$, $p = 0.000$) reflects the economic challenges faced by communities due to the displacement of traditional livelihoods. The standard deviation of 1.01 suggests that some respondents may feel more strongly about the economic impacts of mining than others. This finding calls for a multifaceted approach to supporting affected communities, including diversifying local economies and providing alternative livelihood opportunities. Martínez et al. (2021) argue that the disruption of traditional livelihoods, particularly in agriculture and fishing, underscores the need for policies that help communities transition to more sustainable sources of income. Addressing livelihood disruptions and fostering economic resilience will be crucial in managing the social risks associated with mining activities.

Table 19
Test of Significant Difference in Social Risks in Affected Communities when Grouped According to their Demographic Profile

Profile	Social Risk					
	Category	**Mean**	**f-value**	**t-value**	**Remarks**	**Decision on Ho**
Education	Elementary	2.83	.211	.888	Not Significant	Failed to Reject
	High School	2.84				
	College	2.91				
	Post Graduate	2.72				

Significant if p-value <0.05
Legend: Ho is rejected if Significant
Ho is failed to reject if Not Significant

5. Is there a significant relationship between small-scale mining activities and social risks in affected communities?

Table 20 depicts the test of the significant relationship between small-scale mining activities and social risks in affected communities. The regression analysis reveals that mining operations are significantly related to health risks ($r = 0.463$, $p = 0.000$), livelihood disruptions ($r = 0.364$, $p = 0.000$), and food and water security ($r = 0.292$, $p = 0.000$), all with highly significant p-values. These results suggest that the more extensive the mining activities, the higher the perceived social risks in the community. The analysis further shows that health risks are the most strongly correlated with mining activities, followed by disruptions in livelihoods and food and water security. Zhang et al. (2022) found similar patterns in mining-affected areas, where health and economic impacts were the most significant social risks associated with mining. These findings emphasize the need to prioritize addressing health and livelihood impacts when formulating policy responses to small-scale mining operations.

The correlation between mining activities and livelihood disruptions (r = 0.364, p = 0.000) reflects the significant negative impact that mining operations have on traditional livelihoods such as agriculture, fishing, and small businesses. The standard deviation of 1.01 suggests that while many respondents view livelihood disruption as a severe risk, some may perceive the economic impacts differently depending on their proximity to mining operations. This result underscores the importance of developing alternative livelihood strategies for affected communities, such as providing training in other industries or offering compensation for lost income. Martínez and Gómez (2021) suggest that diversifying the local economy and implementing community-driven economic recovery plans are essential for mitigating the economic disruption caused by mining. Fostering sustainable economic development outside of mining activities will help communities adapt and thrive, reducing their reliance on hazardous industries.

The lowest correlation was found with community conflicts (r = 0.216, p = 0.000), indicating that while mining activities do contribute to social tensions, the relationship is weaker compared to the more direct impacts on health and livelihood. The standard deviation of 1.26 highlights that the perception of community conflict caused by mining is more varied, with some respondents viewing the relationship between mining and conflict as less significant. Although mining can exacerbate existing tensions and lead to disputes over resources, the findings suggest that other local factors, such as governance and social capital, may have a greater influence on social cohesion. Ramirez and Soto (2021) argue that community conflicts can be mitigated by improving local governance and fostering communication between mining operators and the community. This highlights the importance of creating platforms for dialogue and ensuring that mining activities do not undermine social stability by causing unnecessary conflict.

Table 20
Test of the Significant Relationship between Small-scale Mining Activities and Social Risks in Affected Communities

Small-scale Mining Activities	***Social Risks*** Health Risks			Livelihood Disruptions			Displacement and Resettlement			Food and Water Security			Community Conflicts		
	R	p-value	Ho	r	p-value	Ho	r	p-value	Ho	r	p-value	Ho	r	p-value	Ho
Mining Operations	.463**	.000	S	.364**	.000	S	.636**	.000	S	.292**	.000	S	.216**	.000	S
Environmental Impact	.629**	.000	S	.662	.000	S	.529**	.000	S	.662**	.000	S	.474**	.000	S
Health and Safety Practices	.500**	.000	S	.336**	.000	S	.681**	.000	S	.267**	.000	S	.163**	.000	S
Regulatory Compliance	.483**	.000	S	.380**	.000	S	.711**	.000	S	.261**	.000	S	.235**	.000	S
Economic Contribution	.044	.460	NS	.237**	.000	S	-.017	.781	NS	.343**	.000	S	.323**	.000	S

Significant if p-value <0.05
Legend: Ho is rejected if Significant
Ho is failed to reject if Not Significant

CONCLUSION

The study highlights the severe social and environmental risks posed by small-scale mining in Barangay Pawa, Boac, Marinduque. Health risks, livelihood disruptions, and community conflicts were found to be significant consequences of mining activities, which contribute to environmental

degradation and economic instability. The research emphasizes the critical need for improved regulatory oversight, including stronger enforcement of environmental and labor laws, as well as the promotion of alternative livelihoods to reduce dependency on mining. Furthermore, the study calls for the active participation of local communities in decision-making processes to ensure that policies are inclusive and responsive to the needs of those most affected by mining operations. Addressing these risks requires a multi-stakeholder approach, involving government, mining operators, community members, and advocacy groups, to foster sustainable practices and ensure the well-being of affected populations.

Recommendations

Based on the summary and conclusion, these are the recommendations:

1. **Local Government Units (LGUs) and Policymakers**. The LGUs should strengthen the enforcement of environmental regulations and occupational safety standards for small-scale mining. They should also prioritize diversifying the local economy by promoting alternative livelihoods, such as agriculture, eco-tourism, and small businesses, to reduce the community's dependency on mining.

2. **Mining Operators and Small-Scale Miners**. Mining operators must adopt safer, more sustainable mining practices by investing in environmentally-friendly technologies and improving safety protocols. Small-scale miners should be educated on the importance of following regulations and using proper protective gear to minimize health risks and improve operational standards.

3. **Community Members and Affected Households**. Community members should actively participate in local decision-making processes regarding mining activities and demand better compensation and support for affected families. Affected households should also seek out training opportunities to transition into alternative livelihoods that are less dependent on mining.

4. **Researchers and Academicians**. Researchers should continue to explore the long-term impacts of small-scale mining on local communities, focusing on identifying effective policies and technologies that can mitigate environmental and health risks. Academicians can play a role in educating both policymakers and communities about the benefits of sustainable mining practices.

5. **Non-Governmental Organizations (NGOs) and Advocacy Groups**. NGOs and advocacy groups should raise awareness about the adverse effects of small-scale mining and work with local communities to develop strategies for reducing its impact. They can also provide technical assistance in implementing sustainable mining practices and help secure funding for community development projects.

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