

RURAL COMMUNITY WELL-BEING IN MINING AFFECTED AREAS: A PORTRAIT OF SOCIO-ECONOMICS, HEALTH, AND AGRICULTURE IN NORTH MINAHASA REGENCY

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ABSTRACT

This study examines the socio-economic, health, and agricultural conditions of communities in mining-affected villages in North Minahasa Regency, Indonesia, using a comprehensive census of 2,288 respondents across five villages—Tumohon, Talawaan, Tatelu, Warukapas, and Tatelu Rondor with Klabat Village as a control site. Employing the Sustainable Livelihood Approach (SLA) framework, the research analyzes five key livelihood assets: human, social, natural, financial, and physical capital. Findings reveal a significant shift in livelihoods, with artisanal mining emerging as a primary income source, surpassing agriculture in economic contribution. While access to infrastructure and basic services is relatively adequate, critical vulnerabilities persist in human capital, particularly in education quality and youth school dropout rates linked to mining work. Health indicators show low prevalence of infectious diseases and high Covid-19 vaccination coverage; however, maternal and child health practices such as exclusive breastfeeding and routine immunization remain suboptimal. Nutritional challenges are evident, with low consumption of fruits and vegetables despite sufficient meal frequency. Social capital is structurally present but weakly expressed in collective action, as participation in communal activities is minimal. Financial dependence on informal and extractive sectors, coupled with limited access to formal financial institutions, increases economic vulnerability. The comparison with Klabat Village highlights a development paradox: higher income in mining areas does not equate to greater multidimensional well-being. This research underscores the need for holistic development strategies that strengthen institutional capacity, diversify livelihoods, and prioritize human development over short-term economic gains. The findings provide critical insights for policymakers, corporations, and local governments aiming to foster inclusive and sustainable development in extractive regions.

INTRODUCTION

Sustainable development in rural regions demands a comprehensive understanding of local communities' social, economic, and health conditions. In Indonesia, areas surrounding mining operations often become critical zones where development dynamics involve competing interests between resource exploitation and community welfare issues. Mining activities, both large-scale and artisanal, can significantly alter economic structures, livelihood patterns, and social relations in nearby villages (Huntington and Marple-Cantrell, 2022; Ofosu et al., 2020). Within this context, agriculture, traditionally the backbone of rural economies, risks being marginalized as communities shift their focus toward mining. This economic transition is often not matched by equitable improvements in quality of life (Ballet et al., 2020; Carley & Konisky, 2020; Ma et al., 2025). Health status, educational attainment, and access to basic services are essential indicators for assessing the social impact of such economic transformations. In North Minahasa Regency, the existence of artisanal mining and the planned expansion of PT Tambang Tondano Nusajaya (PT TTN) have created a complex social landscape. Therefore, a thorough examination is necessary to understand how community well-being is shaped and distributed amid extractive development dynamics.

Villages in the Talawaan and Dimembe Subdistricts, including Tumbohon, Talawaan, Tatelu, Warukapas, and Tatelu Rondor, are situated in areas that are geographically and economically influenced by mining activities. Residents in these regions exhibit a high dependence on artisanal mining as their primary livelihood, although agriculture and fisheries remain supplementary sources of income. Artisanal mining has stimulated local economic growth; however, it presents challenges related to security, social cohesion, and environmental sustainability. This economic transformation has had a multidimensional impact on community life, including shifts in consumption patterns, social mobility, and local values (Heifetz & Jaffe, 2023; Surya et al., 2020). Meanwhile, the agricultural sector faces stagnation due to limited access to technical support, markets and financial capital. Public health, particularly maternal and child health, remains a concern despite relatively good access to health care facilities. Levels of participation in community events and local governance suggest strong social capital potential; however, this has not been fully leveraged for economic empowerment. Thus, accurate mapping of the current conditions is essential for formulating responsive and inclusive policies.

This study is motivated by the need for accurate, up-to-date empirical data on the socioeconomic conditions of communities in mining-affected areas. Such data are crucial not only for mining companies in designing Corporate Social Responsibility (CSR) programs but also for local governments in formulating sustainable development policies. The Sustainable Livelihood Approach (SLA) is employed as an analytical framework to examine five livelihood assets: human, social, natural, financial, and physical capital (Chowdhury, 2021; Knutsson & Ostwald, 2023; W. Li et al., 2020; Su et al., 2021). Applying the SLA enables the identification of community vulnerabilities and strengths in the face of external changes. This research also aligns with the Sustainable Development Goals (SDGs), particularly those addressing poverty reduction, health, education, and inequality. By integrating quantitative and qualitative data, this study offers a holistic perspective on rural life. The inclusion of both mining-affected villages and a comparison village (Klabat) allowed for a deeper comparative analysis. The primary objective of this study is to provide evidence-based policy recommendations that support inclusive and sustainable development.

Numerous studies have examined the effects of mining on rural communities, particularly regarding economic and social changes. Naibaho et al. (2021) revealed that improved access to infrastructure and basic services was a positive outcome of corporate empowerment programs in communities near PT Newmont Minahasa Raya. However, the same study also identified rising social inequality and erosion of local values due to economic restructuring. Ayitey et al. (2025) compared socio-economic indices between mining-affected and non-affected

communities, finding higher incomes in mining areas but not necessarily greater multidimensional well-being. Other studies indicate that reliance on extractive industries can create enclave economies that remain disconnected from broader local economic systems. Despite income gains, aspects such as education, reproductive health, and social protection are often neglected in the literature. Some studies have also reported increased social conflict and environmental degradation as consequences of mining expansion. Hence, a fragmented approach to development is insufficient to ensure sustainable well-being for all.

In the context of social capital, research shows that rural communities in Indonesia generally possess strong kinship and religious networks that can be leveraged for empowerment. Carmen et al., (2022; Fraser, (2021); Hall et al., (2023) emphasized the importance of social capital in enhancing community resilience to economic and social shocks. However, mining activities can alter social dynamics by replacing local solidarity with economic competition and resource-based conflicts. In certain areas, civil society organizations, such as local youth groups (ormas), play a key role in maintaining security and upholding social norms, as observed in Warukapas Village. Nevertheless, community participation in village forums and social events remains limited, as evidenced by data showing that most respondents have never participated in communal labor. This highlights the gap between the potential of social capital and its actualization in collective action. Research by Dushkova and Ivlieva (2024), Hanke and Lowitzsch (2020), and Hariram et al. (2023) suggests that economic empowerment programs lacking active community involvement tend to be unsustainable. Therefore, strengthening social capital must be an integral component of community-based development strategies in the region.

Health and nutrition are also central to sustainable development research, given that health is a foundational element of the quality of life. The data indicate a low prevalence of infectious diseases, such as measles, malaria, and diphtheria. However, immunization coverage and routine child health check-ups at posyandu (integrated health posts) still require improvement. Low consumption of fruits and vegetables suggests vulnerability to hidden malnutrition despite an adequate overall meal frequency (more than 14 times per week). Smoking remains a health behavior that requires intervention, particularly among adult males. Access to health facilities, such as community health centers (Puskesmas), is relatively high; however, the significant use of traditional or alternative medicine reflects a preference for indigenous healing practices. COVID-19 vaccination coverage was encouraging, with over 85% of respondents having received at least one dose. However, challenges persist in maternal and child health services, including low rates of exclusive breastfeeding and modern contraceptive use. Improving the quality of health services must be accompanied by community-based health education.

Although no longer dominant, the agricultural sector retains significant potential as a foundation for food security and economic diversification in the country. Many residents still own farmland, but limited technical assistance and market access hinder productivity. The data show that only a small proportion of farmers are members of farmer groups or have received government support. At the same time, fluctuating commodity prices, such as those for coconuts, disadvantage farmers and encourage a shift toward mining work. The inactivity of village-owned enterprises (BUMDes) reflects weak institutional support for the local economy. Chandegara et al. (2023) and Rivera-Valle and Silva (2024) demonstrate that strengthening local economic institutions can enhance farmers' and fishers' bargaining power. Furthermore, integrating agriculture with tourism or ecotourism can offer sustainable economic alternatives. Thus, revitalizing agriculture involves not only technical improvements but also institutional and policy support for farmers.

Despite extensive research on the impacts of mining, there remains a gap in studies that comprehensively integrate health, agriculture, and social capital within the context of mining-affected villages in North Sulawesi. Most

prior studies focus on single dimensions, such as the economy or environment, without examining the interconnections among livelihood assets. Additionally, secondary data from the BPS (Statistics Indonesia) or local governments often fail to reflect micro-level conditions, particularly regarding community perceptions and social capital. This study fills this gap by employing a holistic SLA framework and combining primary data from a comprehensive census and in-depth Focus Group Discussions (FGDs). Focusing on five villages with distinct characteristics enables a more accurate spatial and comparative analysis. No similar study has been conducted in North Minahasa with a comparable scope and depth. Data on community participation, contraceptive access, and nutritional intake are rarely integrated. Therefore, this study makes a significant contribution to the multidimensional understanding of well-being in extractive regions.

The novelty of this study lies in the integration of the Sustainable Livelihood Approach with spatial analysis and community perception data within the context of artisanal mining and corporate expansion plans. Unlike previous macro-level studies, this study uses micro-level data from 2,288 respondents, covering health, education, employment, and social capital in detail. The inclusion of a control village (Klabat) strengthens the validity of the findings by distinguishing direct mining impacts from general development trends. Moreover, the study reveals the active role of local civil organizations in maintaining village security, a dimension rarely highlighted in the academic literature. Findings on the dominance of artisanal mining as a livelihood, coupled with its threat to youth education, offer new perspectives for empowerment policies. The participatory approach through FGDs ensured that community voices were central to the analysis. The results are not merely descriptive but analytical, identifying vulnerabilities and development potentials. Thus, this study presents a replicable research model for mining regions in Indonesia.

This study aims to comprehensively portray the socioeconomic, health, and agricultural conditions of communities in mining-affected villages in North Minahasa Regency. An analysis was conducted to identify assets and vulnerabilities based on the five livelihood capitals within the SLA framework. It also seeks to evaluate the impact of artisanal mining on community economic and social structure. Furthermore, the research aims to uncover community perceptions regarding 's planned expansion of PT TTNand potential conflicts. Another objective is to compare the conditions in mining-affected villages with those in a non-mining comparison village to understand the specific effects of mining activities. This study also aims to identify barriers to agricultural development and local economic empowerment. The findings are expected to inform the design of relevant and sustainable CSR programs in the hospitality industry. Broadly, this research aims to contribute academically and practically to the just and inclusive management of natural resources.

METHOD

This study employs a mixed-methods approach, integrating quantitative and qualitative data to provide a comprehensive understanding of community conditions in mining-affected villages. Quantitative data were collected through a full census targeting all household heads and family members in five mining-adjacent villages and one control village. The research sites included Tumbohon and Talawaan in Talawaan Subdistrict, and Tatelu, Warukapas, and Tatelu Rondor, with Klabat Village in Dimembe Subdistrict serving as the control area, all located in North Minahasa Regency, North Sulawesi. Data collection was conducted door-to-door, with enumerators directly visiting each household. The sampling frame was based on official household lists provided by local community leaders (Pala or Head of Hamlet). Individuals not listed in the initial frame were recorded on-site to ensure full coverage. Face-to-face interviews were conducted using laptops equipped with specialized data collection software. This technological integration aimed to minimize input errors, enhance data accuracy, and accelerate the processing efficiency.

The primary data collection technique was a complete census rather than a sample survey, ensuring that the entire population was included without random sampling error. Each household was interviewed using a structured questionnaire covering social, economic, health, educational, and environmental aspects of the household. The questionnaire was designed based on the Sustainable Livelihood Approach (SLA) framework to assess five livelihood capitals: human, social, natural, financial, and physical. Trained enumerators conducted the interviews, assigned by geographic zones, with each responsible for approximately 210 respondents per zone. The entire fieldwork was completed within 45 days, reflecting a high operational efficiency. The collected data were stored directly in a digital system, reducing the risk of data loss or distortion. Real-time data validation was enabled through computer-assisted interviews, ensuring immediate error detection and correction. This systematic method ensured high-quality primary data and consistent data collection standards across all sites.

Following data collection, raw data were systematically tabulated into pre-designed templates aligned with the initial planning of dummy tables. This tabulation process ensured that all the variables were accurately recorded and prepared for analysis. Quantitative data were analyzed using Microsoft Excel to generate clear, descriptive statistics. The outputs included frequency tables, charts, and other visualizations that detailed the community profile. In addition, this study constructed a Sustainable Livelihood Framework by evaluating each livelihood capital using qualitative benchmarks: “Good” (5 points), “Moderate” (3 points), and “Poor” (1 point). Average scores for each capital human, social, natural, financial, and physical—were calculated to assess the overall status of livelihood assets. This scoring system enabled the identification of specific vulnerabilities and development potentials in each village, thereby supporting targeted policy recommendations.

In addition to quantitative data, this study incorporated qualitative insights through contextual understanding of local dynamics. Although in-depth interviews or Focus Group Discussions (FGDs) were not elaborated in detail, their role in enriching interpretation is acknowledged. The analysis was primarily descriptive and statistical, focusing on factual conditions without advanced inferential statistics or hypothesis testing. The main objective was to present transparent and relevant data on community well-being in extractive regions. Klabat Village was selected as a non-mining comparison site to isolate the direct effects of mining activities from broader regional development trends in the province. This comparative design strengthened the validity of the findings by highlighting the differences between mining-affected and-unaffected communities. The SLA framework served as the core analytical foundation, enabling a holistic asset-based assessment. The final results were compiled into a comprehensive report intended to inform CSR programming and public policy. Through a systematic methodology and robust analytical framework, this study contributes meaningful empirical insights into the inclusive and sustainable management of natural resources.

RESULTS AND DISCUSSION

Result

This study generated comprehensive empirical data on the socio-economic, health, and agricultural conditions of communities in five mining-adjacent villages and one comparison village in the North Minahasa Regency. Data were collected through a full census of 2,288 respondents from Tumbohon, Talawaan, Tatelu, Warukapas, Tatelu Rondor, and Klabat Villages, which served as the control site. The Sustainable Livelihood Approach (SLA) was applied as the analytical framework, focusing on five livelihood assets: human, social, natural, financial, and physical capital. The following section presents the research findings organized by key thematic areas.

1. Human Capital

Human capital encompasses education, health, and community-related skills. Census results indicate that educational attainment in mining-affected villages is relatively low. Most residents completed only primary or secondary education, with a small proportion pursuing higher education. In Warukapas Village, for instance, despite the presence of numerous teachers, the quality of youth education is perceived to have declined compared with previous generations. School dropout among adolescents is a growing concern, as many choose to work in artisanal mining to earn income quickly. The involvement of children and teenagers in mining activities suggests a disruption in access to formal education for these children. In terms of health, the prevalence of infectious diseases such as measles, malaria, diphtheria, and chikungunya was very low, with only 2–10 reported cases each among the 2,288 respondents. Conditions such as diarrhea and paralysis were reported by 24 respondents, indicating relatively stable sanitation and health. However, maternal and child health services require further improvements. Only 397 respondents reported exclusively breastfeeding, whereas 93 indicated that they did not. Basic immunizations BCG, DPT, and Hepatitis B were reported by 450, 443, and 362 respondents, respectively, although most respondents deemed the question irrelevant, likely because their children were outside the infant age range. Covid-19 vaccination coverage was encouraging: 271 respondents received the first dose, 1,258 received the second, and 452 received the third, with only 306 remaining unvaccinated. Access to health facilities is relatively good, with 1,166 visiting Puskesmas (community health centers), 558 visiting public hospitals, and 621 using alternative treatments. Nutritional intake remains a challenge: although 2,227 respondents reported eating more than 14 times per week, vegetable and fruit consumption was reported by only 916 and 327 respondents, respectively. Smoking was reported by 600 respondents, primarily adult men.

2. Social Capital

Social capital was assessed through community participation, security, social cohesion, and engagement with local institutions. Overall, communities in mining-affected villages exhibit strong social networks, marked by high levels of social harmony and minimal crime rates. In Warukapas, local civil groups, such as LINMAS, actively contribute to maintaining security and addressing social issues, including alcohol consumption among youth. However, participation in collective activities, such as communal labor (gotong royong), is very low. Most respondents reported never participating in such activities, indicating a weak expression of social capital through collective action. Engagement in formal community organizations is also limited in this regard. Although artisanal mining involves many residents, no official group coordinates these activities in the region. On the other hand, farmer groups are joined by only a small fraction of farmers, and village-owned enterprises (BUMDes) in villages like Warukapas remain inactive despite their potential to support agricultural and fishery marketing. Community perceptions of PT TTN's planned expansion vary. While many welcome the potential for economic growth, concerns remain regarding social disruption, environmental damage, and loss of farmland. In Tumbohon and Talawaan, residents expect the company to provide fair employment and skills training rather than short-term aid. Participation in village forums and development discussions is limited, highlighting the need for stronger, participatory institutions.

3. Natural Capital

Natural capital includes land ownership, agricultural productivity, and the sustainability of natural resources. The findings show that most households still own agricultural land, primarily used for coconut, corn, and vegetable farming. However, land productivity is hindered by commodity price fluctuations, especially the sharp decline in coconut prices. Fish feed prices continue to rise, and raw materials are increasingly difficult to obtain, negatively impacting small-scale aquaculture. Commercial land use is not yet optimized, and adequate irrigation systems are lacking in the region (Abd-Elaty et al., 2024; H. Li et al., 2020; Sun et al., 2019). Most farmers rely on rainfall, making agricultural output highly dependent on seasonal rainfall patterns. In several villages, artisanal mining has altered land

use, with some farmland being converted for mining purposes. Although there is no explicit data on soil degradation, residents recognize the importance of environmental protection, particularly in preserving cultural and natural heritage. Biodiversity remains intact, with local flora and fauna forming part of agricultural and community forest ecosystems. However, no formal conservation programs actively involve the local community. Environmental awareness is emerging, especially among traditional and religious leaders, but has not yet developed into a structured, collective movement (Carberry et al., 2019; Hancock, 2020; Koehrsen, 2021; Smith et al., 2024).

4. Financial Capital

Financial capital was measured by access to savings, credits, and income sources. Census results show that most residents lack access to formal financial institutions. Savings are managed informally, either in cash or through valuable assets such as land. Only a small number of farmers are members of savings and loan groups or cooperatives. Primary income sources vary among households. Artisanal mining is the second most common occupation after agriculture in the DRC. Many families report having members who work in mining, either directly or indirectly. Income from artisanal mining is significant, but not formally recorded. Meanwhile, agriculture and fisheries face economic pressure due to low selling prices and high production costs, respectively. Most households rely on a single livelihood, making them vulnerable to economic shocks. Livelihood diversification remains limited despite the potential for livestock farming and eco-tourism (Ávila-Foucat et al., 2021; Makwindi & Ndlovu, 2022; Pandya et al., 2023; Singh et al., 2021). Government assistance, such as agricultural subsidies or social programs, reaches only a small proportion of the population. In Warukapas, most farmers and fish farmers reported difficulties in marketing their products and obtaining fair prices.

5. Physical Capital

Physical capital includes basic infrastructure, such as roads, electricity, clean water, markets, and public facilities. Access to electricity and clean water is relatively good, although the quality varies. Village road networks are generally passable, but not all are paved, particularly in the border or mountainous areas. Health and education infrastructure is present, including Puskesmas, posyandu (integrated health posts), and schools from the elementary to secondary levels. However, the quality of these facilities varies significantly. Some posyandu operate irregularly, and the number of healthcare personnel remains limited. Traditional market facilities exist but are not effective as marketing hubs. Commodity prices are often set by middlemen, leaving farmers and fishers with little bargaining power to negotiate prices. In some villages, no independent village markets exist. Agricultural infrastructure, such as storage warehouses or processing equipment, is nearly absent. BUMDes, which are intended to drive village economic development, are not yet operating effectively. In Warukapas, residents hope that BUMDes will soon become active in supporting the marketing of agricultural and fishery products. In contrast, facilities for social and cultural activities, such as community halls and places of worship, are generally available and serve as community centers.

6. Comparison with the Control Village (Klabat)

Klabat Village, which is unaffected by artisanal mining or PT TTN's expansion plans, served as the control site. Overall, the socio-economic conditions in Klabat are more stable, with a primary focus on agriculture and fisheries. Community participation in collective activities, such as mutual labor, is higher in mining-affected villages. Education and health outcomes are relatively better, with fewer school dropouts in the region. However, income levels in Klabat are lower than those in mining-affected villages, where artisanal mining provides significant supplementary income. Despite this, Klabat's residents are more self-reliant and less dependent on a single economic sector. The BUMDes in Klabat is more active, albeit on a small scale. This contrast suggests that while mining increases income, it does not necessarily translate into multidimensional improvements in the well-being.

Discussion

This discussion interprets the research findings through the lens of the Sustainable Livelihood Approach (SLA), which emphasizes the importance of balancing different livelihood assets to achieve sustainable well-being. The results indicate that while financial and physical capital are relatively strong, human and social capital exhibit significant vulnerability. This imbalance reflects a development pattern in which income growth does not necessarily translate into comprehensive improvements in the quality of life. Within the framework of the Sustainable Development Goals (SDGs), these findings suggest progress in economic objectives (SDG 8) but stagnation in education (SDG 4) and health (SDG 3) (Abera, 2023; Friedman et al., 2020; Kreinin & Aigner, 2022; Lakioti et al., 2025). The dominance of artisanal mining as the primary livelihood source has created a structural dependency, exposing communities to economic volatility and potential displacement due to the expansion of corporations. Low participation in communal activities indicates that economic growth has not strengthened the collective social networks. Therefore, development strategies focused solely on infrastructure and income generation require critical reassessment. Sustainable development demands the integrated strengthening of all livelihood assets.

The high level of involvement in artisanal mining reported by 2,243 respondents signals a fundamental economic shift in the study areas. This activity is no longer a side job but has become the primary household income source, replacing the declining role of agriculture in the region. This trend reflects short-term economic logic, where communities prioritize immediate income despite the risks to health and education. Within the SLA framework, this demonstrates the dominance of financial capital over human capital, which should be the foundation of long-term wellbeing. Local economic sustainability is weakened by a lack of livelihood diversification. Moreover, the absence of formal cooperatives or organized groups for artisanal mining highlights the weakness of local economic institutions. Communities operate within an informal economy that offers little protection or bargaining power to its members. Consequently, policy interventions should focus on strengthening micro-economic institutions rather than merely improving market access.

Low educational attainment and high school dropout rates among adolescents are critical indicators of human capital vulnerability. Despite the presence of many teachers in Warukapas Village, the perceived decline in education quality shows that teacher availability does not guarantee service quality. The decision to work in mining reflects household economic pressure that undermines long-term investment in education. In the context of the SDGs, this contradicts the principle of "leaving no one behind," as youth risk being trapped in structural poverty. Educational investment must go beyond infrastructure to include incentives that make schooling more attractive than labor participation (Atolia et al., 2021; MacLeod & Urquiola, 2019). Scholarship programs, vocational training, and corporate partnerships can serve as viable alternatives. Additionally, parents and community leaders must be engaged to shift perceptions of the value of education. Without strategic intervention, the current economic gains will remain temporary.

Good access to public health facilities such as Puskesmas and government hospitals has not fully translated into high-quality service delivery in the region. The high number of Puskesmas visits (1,166) reflects public trust in government services, but low attendance at routine posyandu (integrated health post) sessions (287) suggests weak preventive health care. Low rates of exclusive breastfeeding (397) and basic immunization (450 for BCG) reveal a gap between access and health behaviors. Cultural norms, limited information, and population mobility due to mining work may contribute to this disparity. The high rate of Covid-19 vaccination (over 85%) shows that health campaigns can succeed with effective information dissemination systems. However, success in one program does not guarantee

success in others. Context-specific and sustained health communication strategies are required. Interventions should involve health cadres, religious leaders, and local organizations to build community trust in the vaccine.

Unbalanced nutritional intake: Only 14.3% of the population consumed fruit more than 14 times per week, indicating vulnerability to hidden hunger or micronutrient deficiencies. A diet that is high in calories but low in nutrients can lead to stunting, anemia, and metabolic diseases in the long term. While communities meet basic food needs, access to nutritious food remains limited by price, availability, and personal preference. In the SLA framework, this reflects constraints on financial and natural capital for quality food security. Local agriculture has great potential to meet nutritional needs, but it is not yet optimally managed. Home gardening or family food plots could be simple yet effective solutions to this problem. Integrating health and agriculture through nutrition-sensitive farming approaches should be considered in future studies. Improving nutrition involves not only health but also production, distribution, and education.

Low community participation in mutual labor (gotong royong) and village activities indicates a decline in social capital, despite strong kinship and religious networks in the village. Social capital that is not expressed through collective action weakens community resilience to such shocks. The presence of local civil groups, such as LINMAS, in Warukapas shows the potential of local institutions, but their focus remains on security, not economic empowerment. In the mining context, strong social capital is essential for collective negotiations with companies and the government. Without it, communities are vulnerable to exploitation and social fragmentation. Low participation in village forums also reflects a weak local democracy. Strengthening social capital should be a priority in CSR and rural development programs. Interventions involving deliberation, leadership training, and cooperative business groups provide viable pathways.

Environmental conditions and land use reveal a conflict between short-term economic needs and long-term ecological sustainability. The conversion of farmland into artisanal mining sites reflects urgent economic pressure but risks degrading future land productivity. Drastic fluctuations in coconut prices force farmers to shift sectors, highlighting the fragility of single-commodity agricultural systems. In the SLA framework, degraded natural capital systematically weakens all other forms. Environmental protection should not be viewed as a barrier to development but as a foundation for well-being. Diversifying coconut products, such as organic coconut oil or charcoal briquettes, can add value and reduce dependence on global prices. Strengthening human capacity through processing technology training is also necessary in this regard. Sustainable development must harmonize ecological, economic, and social aspects.

Limited access to formal financial institutions reflects the dominance of informal economies and reliance on traditional savings methods. The inability to access productive credit restricts communities from starting or expanding their businesses. In the SLA framework, limited financial capital narrows the livelihood options. Inactive village-owned enterprises (BUMDes) represent a missed opportunity to build an independent local economic ecosystem. Meanwhile, dependence on middlemen to market agricultural products reveals power imbalances in the value chain. Farmers and fishers occupy the weakest positions and lack access to fair markets. Strengthening financial capital must begin by empowering local economic institutions. Village cooperatives, professional BUMDes, and partnerships with microfinance institutions offer strategic solutions.

Relatively good physical infrastructure is one of the strongest assets for regional development. Access to electricity, clean water, and decent roads provides a solid foundation for economic and social progress. However, the quality of productive infrastructure, such as storage warehouses, processing tools, and village markets, remains severely limited. In the SLA context, physical capital unsupported by other forms of capital cannot generate

sustainable well-being. Infrastructure must be designed holistically, not only for connectivity but also for productivity. Establishing a BUMDes-managed village market could enhance farmers' bargaining power. Processing facilities for agricultural products can reduce reliance on imported raw materials. Thus, infrastructure interventions must be linked to strengthening financial and institutional capital.

A comparison with Klabat Village reveals a development paradox: mining increases income but does not always improve multidimensional well-being. In Klabat, despite lower income, social participation is higher, and economic dependence is more balanced. This suggests that well-being is measured not only in monetary terms but also in terms of freedom, participation, and sustainability. Klabat's residents are more self-reliant and do not depend on a single extractive sector vulnerable to market fluctuations. The success of its small-scale BUMDes shows that local economic empowerment is possible with strong, institutional support. These findings challenge the narrative that mining always brings progress. Inclusive development must weigh the trade-offs between rapid growth and sustainable long-term development. True well-being lies in resilience rather than mere consumption.

Findings on disability show few cases, but the existence of one person being restrained (*dipasung*) is a serious indicator of stigma and limited access to services. In the context of human rights and SDG, every individual must be protected, regardless of their numbers. The case of restraint points to weak mental health systems and inadequate social support for people with disabilities. Although the community values mutual cooperation, it has not been applied inclusively. Local governments and organizations must strengthen social rehabilitation programs and family training efforts. Public education on disabilities is crucial for reducing stigma. Social protection must include all vulnerable groups, including persons with disabilities (PWD). Equitable development must not leave anyone behind.

Community perceptions of PT TTN show high hopes and deep concerns. People desire fair employment and skills training, not just short-term material assistance. This reflects social maturity and awareness of the importance of empowerment. However, without transparent participation mechanisms, these expectations can lead to conflict. Charitable CSR programs do not create lasting change. Companies must involve communities from the planning stage and not only when conflicts arise. Inclusive dialogue, monitored by the government and NGOs, can prevent escalation. PT TTN has the opportunity to become an inclusive development agent, provided that its approach is rights-based and participatory. Equal partnerships between companies, communities, and the government are key.

Low membership in farmer groups and cooperatives reveals a weak local economic institutional capacity. However, farmer groups can facilitate access to technology, markets, and government support. Inactive BUMDes reflect insufficient managerial support and enabling policies in the village. In the SLA framework, social and financial capital cannot thrive without strong institutional support. Local governments should provide technical guidance and incentives for professional BUMDes management training. Training in management, accounting, and marketing should be included in empowerment programs. Furthermore, regulations that simplify BUMDes operations need to be strengthened. Local institutions bridge communities and modern markets.

High cigarette consumption (600 smokers) poses a serious threat to public health and household economic wellbeing. Money spent on cigarettes can be used for education, nutrition, or productive savings. In poverty contexts, smoking is not just a health issue but also a household economic concern. Anti-smoking campaigns should be linked to family economic programs such as financial management training. Interventions should involve religious and traditional leaders who hold significant influence. Public smoking bans and school-based education are also important measures. Governments should consider gradually increasing tobacco excise taxes. Public health should be a top priority in development planning.

Overall, this study reveals that development in mining-affected areas is exclusive and uneven. While income and infrastructure have improved, aspects of quality of life, such as education, reproductive health, and social participation, have lagged behind. The current enclave development model benefits only a few and does not address structural poverty. Achieving sustainable development requires a holistic approach that strengthens all livelihood assets. Governments, companies, and communities must collaborate to create participatory development plans. Success indicators must include multidimensional aspects and not just economic growth. True well-being is realized when communities have choice, freedom, and dignity.

CONCLUSION

This study reveals that communities in the mining-affected areas of North Minahasa Regency have undergone significant economic transformation, primarily driven by artisanal mining activities. While this shift has increased household income and improved access to basic infrastructure, it has not uniformly enhanced the overall well-being. The Sustainable Livelihood Approach (SLA) framework highlights an imbalance among livelihood assets, where financial and physical capital are relatively strong, but human and social capital remain underdeveloped. Although education and health are accessible, they face challenges in terms of quality and behavioral adoption, particularly in nutrition, maternal care, and preventive health practices. The high prevalence of smoking and alcohol consumption further exacerbates health vulnerabilities in the population. Despite economic gains, reliance on a single, informal, and extractive livelihood source makes communities susceptible to external shocks. The lack of diversification and institutional support limits their long-term resilience and self-reliance. Therefore, sustainable development in these areas requires rebalancing priorities beyond mere income generation.

The comparison between mining-affected villages and the control village (Klabat) underscores a critical insight: economic growth does not automatically equate to multidimensional well-being. In Klabat, where agriculture remains the dominant livelihood, income levels are lower, but social cohesion, educational continuity, and community participation are stronger than in other villages. This suggests that stability, inclusivity, and local agency are as important as financial gain in defining true development. The absence of mining-related disruptions has allowed Klabat to maintain stronger local institutions, such as active BUMDes and farmer groups. These institutions foster collective action, fair market access, and greater community autonomy. In contrast, mining-affected villages exhibit higher income, but weaker social capital and greater dependency on volatile informal work. This paradox challenges the assumption that extractive industries inherently benefit rural communities. A more nuanced understanding of development is needed, one that values sustainability, equity, and participation over short-term economic metrics.

Community perceptions of PT TTN's planned expansion reflect both hope and caution, indicating a desire for inclusive and empowering development rather than temporary aid. Residents emphasized the need for fair employment, skills training, and transparent engagement, signaling a mature understanding of sustainable development principles. However, without formal mechanisms for participation, these aspirations risk being unfulfilled or leading to conflicts. The current absence of organized groups in artisanal mining weakens the collective bargaining power and leaves workers vulnerable to exploitation. Strengthening local institutions, such as cooperatives, BUMDes, and farmer-fisher associations, is essential to empower communities as equal partners in development. Revitalizing agriculture through value-added processing and nutrition-sensitive practices can diversify livelihoods and improve food security. Environmental protection must be integrated into economic planning to prevent the long-term degradation of natural capital. Ultimately, the future of these communities depends on collaborative governance that prioritizes rights, inclusion, and intergenerational wellbeing.

The path to sustainable development in mining-affected villages lies not in maximizing extraction but in strengthening the interconnectedness of all livelihood assets. Policies and corporate programs must move beyond infrastructure and charity toward capacity-building, institutional empowerment, and participatory planning. The data show that people are not opposed to mining; however, they demand fairness, dignity, and long-term security for themselves and future generations. Investments in education, health behavior, and social capital are as crucial as those in roads and clinics are. A holistic approach aligned with the Sustainable Development Goals (SDGs) can help bridge the gap between economic activity and human development. By learning from both the successes and vulnerabilities revealed in this study, stakeholders can co-create a development model that is resilient, inclusive, and locally owned. The case of North Minahasa offers valuable lessons for other extractive regions in Indonesia and beyond. True progress is measured not by how much is extracted but by how much is built.

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