

EXPLORING THE EXISTENCE, SURVIVAL AND WORKING MECHANISM OF TRADITIONAL GOLD MINES IN BANYUWANGI REGENCY

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Abstract Mining activities carried out by the community of Sumberagung Village show contradictory conditions. On the one hand, mining is a major source of income for residents who have difficulty finding other jobs. This activity drives the village economy and provides economic opportunities for the local community. However, on the other hand, mining practices often face various complex problems. This study discusses the resilience and working mechanisms of traditional gold mining in Sumberagung Village. This study uses ethnographic studies and a qualitative approach, with in-depth interviews, participatory observation, and document studies that identify the factors that enable the sustainability of this mining. The results show that the existence of traditional gold mining is supported by strong social and economic networks, with this activity being the main source of livelihood for some of the community. Their working mechanisms operate through informal cooperation and profit-sharing systems, creating an independent economic ecosystem. The resilience of this mining is also supported by local knowledge (local wisdom) that has been passed down from generation to generation, especially in identifying mining locations and simple gold ore processing. Although traditional mining can support the economy, the lifestyle in remote mining locations, which is male-dominated and lacks the presence and interaction of women, triggers inappropriate behavior, including harassment.

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1. Introduction

The mining sector is a strategic pillar of Indonesia's economic development. Not only does it contribute significantly to the country's revenue, but it also provides employment for millions of people and is the main source of livelihood for many families. Indonesia's natural resources, such as minerals, gold, and coal, have attracted large investments and driven economic growth for decades. However, mining in Indonesia is not uniform. Alongside large, organized companies, there is another reality: traditional mining. The term 'traditional' in this context signifies a practice that is fundamentally distinct from its corporate counterpart. Drawing on

anthropological insight, such as those discussed by Jorgensen (1977) regarding land rights and local claims, traditional mining is often deeply embedded in local social structures and historical territorial claims. Its existence is not solely determined by modern formal permits, but often relies on local knowledge, ancestral claims and community based organizational mechanisms. This is typically characterized by small-scale operations, labor intensive methods and limited capital investment, presenting a complex social and economic phenomenon that requires specific attention. As noted in the broader anthropological literature Godoy (1985), understanding mining requires focusing on these varied social organization and their interaction with economic structures, an approach vital for studying the traditional sector.

The village of Sumberagung, located in Banyuwangi Regency, is an interesting example for understanding the complexity of mining issues in Indonesia. In 2009, this village became the center of attention due to conflicts and protests by the community who rejected the presence of a large-scale gold mining company in Mount Tumpang Pitu, located in Sumberagung Village. While the 2009 conflict in Sumberagung highlighted the community's rejection of a large-scale corporate presence, this event simultaneously points to the existence of a robust, albeit informal, local mining economy. The central question shifts from external conflict to internal resilience: why do they still exist? Referring to the traditional mines themselves. Exploring this existence requires shifting focus to the survival mechanisms of traditional miners. This perspective is vital, echoing the work of Grätz (2004), who in his study of gold trading networks in Benin, emphasizes how the entire artisanal gold economy relies heavily on the creation of trust and strong social networks. Unlike the formal contractual relationship of large corporations, the traditional gold supply chain from miner local buyers and beyond is sustained by informal social ties and credit based relationships. The Sumberagung case, therefore, is not merely a tale of protest, but a study of economic resilience and social embeddedness. The persistence of traditional gold mining, despite regulatory ambiguity and risks is likely attributable to these networks of trust and cooperation that provide immediate livelihood and flexible economic opportunities for local residents. The traditional mines exist because of their deep roots in the local social and economic fabric, forming a distinct, informal system that operates in parallel to or in defiance of the state's formal mining sector, a system deserving of focused analysis.

The existence of small-scale mining in Sumberagung Village creates an interesting dilemma. On the one hand, this activity serves as the main source of income for people who have limited opportunities in other economic sectors. This activity is able to drive the village economy, form micro supply chains, and empower local communities. However, on the other hand, small-scale mining practices face a variety of complex challenges. Miners often lack technical knowledge and face environmental impacts that are difficult to control. In addition, their uncertain illegal status makes them vulnerable to various problems. They can become trapped in illegal practices, land conflicts, and legal uncertainty. An equally significant challenge is land conflicts with large-scale mining companies. Overlapping permits or claims over the same area often trigger protracted disputes that harm all parties and fuel social instability. This complex interplay of economic necessity, social organization and external conflict is precisely the type of dilemma that the anthropological study of mining aims to unravel (Godoy, 1985). In this situation, small-scale miners are generally in a weaker position when dealing with much larger corporations.

The small-scale mining in Sumberagung involves a complex and closely intertwined system of work, characterized by a clear division of roles from miners and transporters to financiers and processors, and a profit sharing mechanism based on community agreed fairness rather than formal regulation. This entire system particularly the development of creative capital sources

through social networks, trust system and mutual assistance practices, reflects the global phenomenon of artisanal and small-scale mining. This finding aligns strongly with the socio-economic function of ASM discussed by Hilson (2002) who highlights its critical role as an economic safety valve by providing immediate income and employment in marginalized rural areas. Furthermore, the community's reliance on social capital and collective solidarity is a direct response to the financial exclusion often faced by small-scale miners, a challenge widely documented in the literature. This strong collective solidarity is the main foundation enabling the activity to continue serving as strong evidence of the local community's resilience in overcoming external economic pressures and regulatory ambiguity. By conducting ethnographic research, this study seeks to reveal what is often unseen, how communities live off the mines and how the mines support the communities, highlighting these social and cultural aspects as proven adaptive strategy that sustain their existence to this day.

2. Method

This study uses an ethnographic approach, which is part of qualitative methods to gain an in-depth understanding of the social phenomena behind traditional mining practices in Sumberagung Village. Qualitative research aims to interpret social phenomena from the perspective of the participants (Muleong, 2022: 6-7). With this approach, researchers will not only describe what happened, but also explore the meaning and motivation behind each action. In this case, the author acts as an observer, interacting directly with the research subjects through intensive communication and participatory observation. The goal is to obtain rich and in-depth data, including the experiences, perspectives, and strategies developed by the community in carrying out mining activities. Data was collected through in-depth interviews with three key informants selected based on their knowledge and roles in the mining community. These interviews were conducted in stages in January, July, and August 2025, allowing researchers to obtain comprehensive information and observe developments over time. In addition to interviews, the researcher also made detailed field notes and took photographs for visual documentation. The entire documentation process, including the use of photographs, was carried out in accordance with ethnographic research ethics. The author obtained permission from the informants, ensuring that they understood that the documentation would be used in the research. This approach was chosen to build a rich and complete narrative that goes beyond statistical data. Thus, this study not only explains how mining practices take place but also reveals the social and cultural dimensions that are the main pillars of the sustainability of the mining community in Sumberagung Village.

3. Result and Discussion

3.1 Overview of Sumberagung Village and the History of Traditional Mining Development

Sumberagung Village is located in Pesanggaran Subdistrict, Banyuwangi Regency. According to the 2024 Sumberagung Village Profile data, this village covers an area of 13,262 hectares and is directly adjacent to Barurejo Village to the north, Pesanggaran Village and Sumbermulyo Village to the east, the Indian Ocean to the south, and Kandangan Village to the west. The distance from Sumberagung Village to the regency government office is 65 km. Sumberagung Village itself is divided into four hamlets, namely Pancer, Silirbaru, Rejoagung, and Sungailembu. Sumberagung Village is known for its beautiful beaches, one of which is Pulau Merah Beach, located near Mount Tumpang Pitu. The mountain is a gold mining area managed

by PT Bumi Sukses Indo (BSI) (Banyuwangi, 2024).

Table 1. Population of Sumberagung Village

No	Gender	Amount
1.	Male	7.069
2.	Female	6.993
Amount		14.062

Source: Profil of Sumberagung Village in 2024

Sumberagung Village has a total population of 14.062, comprising 7.069 males and 6.993 females. According to the 2024 Village Profile, education levels are significantly low. The largest groups are those who have never attended school 5.131 and those who did not finish junior high school 3.900. While 210 people aged 7-18 are currently in school, the number of graduates drops sharply at higher levels, junior high school 2.339 and senior high school 1.738. Access to higher education is extremely limited, with only 105 total graduates holding Diploma, Bachelor's, or Master's degrees. This low educational attainment is linked to local employment in the non-formal sector, such as mining. This sector requires practical skills over academic qualifications, leading to a vicious cycle: limited education restricts job options, forcing people into mining, which in turn reinforces the belief that formal education is unnecessary for prosperity.

The village population of 14.062 is overwhelmingly Javanese 14.042, with only small numbers of other ethnic groups, including 17 Sundanese and 3 Balinese. Javanese is the most common language spoken daily. Religiously, the population is predominantly Muslim 13.417. Other religious groups include Christians 225, Hindus 130, and Buddhists 290. This strong similarity in ethnic background Javanese and religion Islam fosters a collective mindset and shared perspective among residents, which influences their worldview, especially concerning livelihood and survival. This cultural homogeneity also strengthens solidarity and cooperation, essential elements that support the continuation of local economic activities, particularly traditional mining.

Historically rooted in agriculture, the primary livelihood in Sumberagung Village remains dominated by this sector. The 2024 Village Profile confirms this, showing that 5.888 people work as farmers, farm laborers, and fishermen. A unique characteristic is the prevalence of dual livelihoods, where many individuals engaged in traditional mining are also classified as farmers, indicating a combination of traditional and extractive work. The self-employment sector ranks second, involving 3.060 people, suggesting a strong entrepreneurial spirit. Meanwhile, other professions are fewer, private employees (769), private teachers (80), and small numbers of traveling merchants and drivers. The data highlights economic challenges, with 1.642 people unemployed and 270 people lacking permanent jobs. Overall, the economic capital of Sumberagung Village is firmly tied to the informal and agricultural sectors, reflecting a reliance on traditional and non-formal work.

The history of traditional mining in Sumberagung Village is intrinsically linked to Mount Tumpang Pitu and the subsequent conflicts with mining companies. Mount Tumpang Pitu is a protected forest area situated near three national parks. Geologically, it is part of the Sunda-Banda magmatic arc, formed by the movement of the Indo-Australian plate and stretching across Indonesia. This makes the area exceptionally rich in minerals. The mountain is characterized by sandstone formations containing argillite, limestone, and volcanic sandstone. A 2012 Joint Ore Reserves Committee (JORC) report confirmed its enormous mining potential, estimating deposits of 898.262 ounces of gold and 21.644.984 ounces of silver. The upper layers of the mountain contain oxide deposits rich in gold (Au), copper (Cu), and silver (Ag), underscoring its significant mineral wealth.

The local traditional mining activities began accidentally when local miner Salamin and

others discovered gold while searching in rivers and ditches. This discovery rapidly attracted many community members to the river. Initially, mining was purely traditional and individual, using only simple equipment like a pan and a pickaxe. Salamin recounted earning 1-2 grams of gold daily (about 5 grams weekly), with gold prices around Rp. 250,000 per gram at the time. By 2010, small-scale mining experienced rapid expansion. Methods evolved beyond simple panning to include excavation techniques, with miners digging holes 10-20 meters deep. This growth attracted migrant miners from outside the area (including Bandung and Sulawesi) who brought their experience. Local miners transitioned from working individually to forming teams of 10-15 people, cooperating with the newcomers. The mining area also expanded from the original Area 56 to include Lompongan Hill and Genderuwo Hill. The local community benefited significantly, gaining new knowledge from the migrants, such as techniques for identifying gold deposits by recognizing indicators like pyrite.

The traditional mining boom in Sumberagung faced a major setback starting in 2012 when the mining permit for Mount Tumpang Pitu was transferred to PT Bumi Sukses Indo (BSI). The situation intensified when the project was designated a National Vital Object (Obvitnas) a few years later. This status turned the Mount Tumpang Pitu area into a closed, heavily guarded zone, barring the local community from continuing their mining activities. Consequently, traditional miners were forced to seek new locations. Over time, the overall traditional mining activity has declined sharply. Field data shows that the few remaining groups face increasing challenges: Miners must now dig significantly deeper holes to find gold and this depth requires specialized and expensive machinery called a *dompeng*. Limited capital became the primary barrier, forcing many miners to stop operating. Survival in the mining business is now restricted to a handful of individuals or groups with sufficient capital, while others have joined these better-funded operations.

3.2 The Existence and Survival of Traditional Mining

3.2.1 Economic Factors and Living Needs

A person's decision to engage in traditional gold mining cannot be separated from structural poverty. This poverty occurs when the social and economic system fails to provide equal opportunities for everyone. As a result, access to resources and stable economic opportunities becomes very limited. In such situations, gold mining emerges not as a primary choice, but as a survival strategy or adaptive response to the lack of available employment options. For them, gold mining is a way to overcome existing livelihood constraints, not just a career choice.

Jaelani recounted his experience of changing professions. He revealed that before becoming a miner, he was a farm worker and took care of his parents' rice fields on a rotating basis. The income was only enough to cover daily needs. He then decided to become a miner because of the promise of faster and greater returns. This admission shows how mining was able to drastically change his family's fate, even providing better access to education for his children, who went on to become police officers. The same thing happened to Salamin, who previously worked as a fisherman.

Salamin revealed that the fishing profession often brings uncertainty in income. This is because fish catches are highly dependent on the season and weather. In addition, operational costs such as expensive boat fuel are often not balanced with the income earned. When catches decline, Salamin turns to gold mining as a livelihood strategy. This demonstrates the dual role of mining, which is not only a primary source of income, but also an alternative to supplement income from other sectors. This adaptation mechanism shows how communities face economic

challenges and seek flexible solutions to ensure their survival.

3.2.2 Social and Cultural Roots

Traditional gold mining is built on a belief system that differs from modern economic logic. Miners interact not only with geological materials, but also with the spiritual world they believe in. Belief in guardian spirits at mining sites or ancestors who protect nature is not merely a myth, but a guideline that governs their behavior. Rituals and traditions performed before mining begins, such as offering sacrifices or reciting prayers, are tangible expressions of these beliefs. The purpose of these rituals is not only to ask for permission for the activity to run smoothly and safely, but also to create a sense of security, togetherness, and harmony with nature.

The use of offerings is a manifestation that the earth is not considered a dead object or merely a resource to be exploited, but rather the earth is viewed as a spiritual entity or a home that has an owner. This concept reflects local wisdom that places humans as part of nature, not as rulers who have the right to exploit it as they please. By asking for permission, miners show respect and awareness that they are guests in the natural environment. This attitude contrasts with modern logic, which often views nature as a commodity. This view demonstrates an internalized environmental ethic, where harmony between humans and nature is the key to sustainability.

3.2.3 Access Gaps and Capital Constraints

Traditional gold mining in Sumberagung Village emerged as a survival mechanism, not merely an economic choice. This activity was a response to the failure of the formal sector to provide inclusive employment opportunities. Interviews with Salamin revealed that many people were hindered by the formal banking system, which required collateral and complicated bureaucracy. The lack of certificates in their place of residence, namely Pancer Hamlet, is a major obstacle that prevents them from accessing capital loans. In addition, low financial literacy makes people feel incapable or lacking in knowledge to access banking procedures. As a result, people choose informal channels.

Based on field observations, traditional mining serves as a crucial economic safety valve, especially for individuals who are marginalized from the formal employment sector. This sector has low barriers to entry. The absence of requirements for diplomas, certifications, or formal work experience makes traditional mining very inclusive and accessible. Unlike the formal sector, which demands strict qualifications, traditional mining operates based on practical knowledge and skills that can be learned directly in the field. This allows individuals with limited educational backgrounds to participate and earn an income. Thus, traditional mining becomes the last resort that is always open when other employment options are unavailable. This sector fills the void left by the formal job market, providing a pragmatic solution for those struggling to survive in an economic system that is not always fair.

The sustainability of traditional gold mining in Sumberagung Village can also be seen from the limited formal employment opportunities available in the area. The village has no manufacturing industry, large-scale service companies, or capital and labor-intensive agricultural sectors. Village Profile data shows a significant imbalance between the number of workers in the formal and informal sectors. The number of workers in the formal sector is very limited, with only 28 civil servants, 15 members of the Indonesian National Armed Forces, 80 private teachers, and 769 private company employees. These figures confirm that opportunities to obtain formal employment offering stable salaries and social security are minimal. This has led to traditional gold mining becoming the only available and reliable source of employment for

the community. This sector fills the void left by the formal sector, making it a rational and important choice for the community's survival.

The second factor explaining the sustainability of traditional gold mining in Sumberagung Village is the gap in educational qualifications between the local workforce and the demands of the formal job market. Most of the community has limited formal education, which effectively limits their opportunities in sectors that require diplomas and certifications. Village profile data shows that the proportion of high school graduates is very small, with only 1,738 high school graduates and 79 bachelor's degree graduates. Conversely, school dropout rates and low education levels dominate, with 5,131 people only graduating from elementary school/equivalent and 3,900 people not completing junior high school. This condition structurally closes their access to most of the existing formal job vacancies. Observational data shows that many traditional miners have low levels of formal education, such as Jaelani, who only graduated from elementary school, and Salamin, who did not graduate from elementary school. This automatically closes their opportunities to compete in the formal sector, which requires diplomas and certifications. The skills they have tend to be practical and passed down from generation to generation, as required in traditional mining. The traditional mining sector does not require diplomas, certifications, or formal experience. Mining skills can be learned directly in the field, making it the most realistic and inclusive option.

This sector also offers financial logic and flexibility, which are its main attractions. The number of formal jobs in Sumberagung Village is very minimal and is exacerbated by barriers to access to formal capital, making traditional mining a quick and efficient route. Miners can start with minimal initial capital and earn an income that can be used immediately for daily needs. In addition, the flexibility of time allows them to set their own working hours and adjust them to other activities such as farming. The flexible and autonomous nature of gold mining is key to its sustainability. Unlike rigid formal jobs, miners can work individually or in small groups without being bound by formal contracts. This flexibility gives them full control over the duration and intensity of their work, allowing them to adjust their mining activities to other activities, such as seasonal farming or other activities. The ability to switch between these sectors shows that traditional mining is an integral part of people's livelihood strategies, not just a single occupation. Therefore, its flexible and autonomous nature is the key that allows this practice to survive and continue to be a relevant economic solution amid changing times.

3.2.4 Regulatory Dynamics and Law Enforcement Challenges

Indonesia has a long history of regulating the mining sector, which is governed by Law No. 4 of 2009 concerning Mineral and Coal Mining (Minerba). This law specifically recognizes the existence of Small-Scale Mining (PR). In this law, PR is defined as small-scale activities carried out by local communities, using personal or group capital and simple equipment. The initial purpose of this regulation was to legalize and supervise traditional mining activities, as well as to minimize their negative impacts. The government provides a licensing scheme called the People's Mining Permit (IPR), which is regulated in several articles, including:

1. Article 26: Mining areas can be designated as People's Mining Areas (WPR), which are given priority to the community.
2. Article 68: IPR is granted for a maximum period of five years and can be extended.
3. Article 71: The maximum area of an IPR is five hectares for each permit holder.
4. Article 72: IPR applications are submitted to the regent/mayor, indicating the decentralization of authority at that time.

However, a fundamental change occurred with the enactment of Law Number 3 of 2020. The

revision of the Minerba Law centralized licensing authority, which was previously at the regency/city level, to the Central Government. This is regulated in:

1. Article 35: Licensing, which was previously granted by the regent/mayor, is now centralized with the Central Government.
2. Article 35A: This article was added to emphasize that business licenses in the mining sector are granted by the Central Government through a non-ministerial government agency in charge of investment.

Efforts to standardize mining policy have inadvertently created a complicated, expensive, and difficult bureaucracy for traditional miners, driving them back to illegal operations as the formal route is deemed unrealistic. The issue lies in mining regulations being irrelevant to local socio-economic realities. The process to obtain a People's Mining Permit (IPR) is highly bureaucratic, demanding feasibility studies, environmental documentation, and significant capital, requirements that small-scale miners struggle to meet. Furthermore, the designation of official People's Mining Areas (WPRs) often fails to align with the traditional mining sites communities have operated for decades. This gap between rules and field practice means regulations intended to legalize mining have become obstacles, pushing miners to continue operating outside the law. This situation highlights the critical need for flexible and adaptive policies that align with local conditions.

Law enforcement in the traditional mining sector in Sumberagung Village also faces complex social dilemmas. Mining activities have become the lifeblood of the economy for some communities. Faced with these conditions, law enforcement officials find themselves in a difficult position. Decisive action to crack down on illegal mining could trigger social instability, conflict, and economic crisis among communities that have no alternative sources of employment. Therefore, crackdowns are often limited, temporary, or even ignored. Traditional miners in Sumberagung Village have also developed various strategies to continue operating despite the risk of crackdowns, exploiting weaknesses in the law enforcement system. One tactic that is often used is a strategy of mobility. When a location is detected, they dismantle their equipment and move to a more remote location. This creates a cat-and-mouse game that renders crackdowns ineffective, given the limited resources available to authorities to conduct continuous surveillance. The sustainability of mining is also supported by a strong information network. This network functions as an early warning system that disseminates information about police operations. In addition, miners often use simple, easily transportable technology to minimize financial losses when they have to move.

These mining activities are supported not only by the miners themselves, but also by a strong informal network. This network includes capital providers, middlemen who buy the mined products, and influential individuals who can provide protection. This network creates an economic ecosystem that operates outside the control of the state. Law enforcement efforts that only target miners in the field often fail because they do not address the root of the problem, which lies in this capital and distribution network. The sustainability of small-scale mining is not just a matter of simple legal violations. It is the result of complex interactions between inflexible and bureaucratic regulations, weak law enforcement, socio-economic support, and informal networks that facilitate illegal activities. These conditions create a system that allows small-scale mining to continue to exist. Thus, laws and policies will not be effective if they are not supported by a deep understanding of the socio-economic realities on the ground.

3.3 Mechanism of Operation and Impact of Small-Scale Mining

3.3.1 Sources of Capital and Financing Systems

Observational data collected from one group of traditional miners in Sumberagung Village revealed that the mining financing structure centered on a key figure, Jaelani. He played a dual role as the head of the mining team and the main capital owner. Jaelani provides comprehensive capital, not only in the form of cash for initial operations, but also in the form of equipment. In addition, he also covers the costs of consumption, fuel for machinery, and daily logistics for his team. This direct investment places Jaelani in a central position in the financing system of his group. Jaelani said,

Based on the interview, Jaelani's capital is the result of his previous mining activities and personal savings. His financial strength not only supports his team, but also makes him an important figure in his mining community. Jaelani has a rolling mill at his home that he rents out to other mining groups who do not have their own machines. From renting out the machine, he earns 10% of the proceeds from the sale of gold processed by the tenant. This side business is very profitable, even reaching one million rupiah per day when business is booming.

The income from renting out the machine not only adds to his personal wealth, but is also allocated to finance the operations of his own team. This practice is a clear example of an informal economic diversification strategy (Sulista, 2019). Jaelani uses profits from one source of income to support and finance other sources of income, demonstrating how economic capital in the informal sector can be managed independently to create sustainability. This proves that despite limited access to formal financial institutions, communities are capable of building resilient and adaptive financial systems.

3.3.2 Mining Processes, Technology, and Techniques

Traditional miners in Sumberagung Village forgo formal geological surveys, relying instead on a combination of inherited local knowledge, traditional beliefs, and empirical observations to identify gold deposits. A core tenet guiding their operations is the belief that gold deposits follow underground patterns. If gold is found at a specific depth (e.g., 15 meters) in one shaft, miners consistently assume that gold veins must also be present at that similar depth in the surrounding area. This method highlights how practical knowledge and spiritual beliefs drive their operations. Miners also rely heavily on direct physical indicators. The most important natural sign is the presence of pyrite, which is easily recognizable by its glow or sparkle in the light. Finding pyrite is considered a strong visual signal that validates the potential for gold beneath the surface, forming a crucial part of their technical and cultural capital.



Figure 1: *Blower Machine*

When a mine shaft reaches a certain depth, the most crucial aspect is ensuring the quality of the air inside. To address this issue, miners turn on a generator connected to a blower. This blower has a vital dual function for miner safety. First, the blower is used to remove toxic gases or stale air from inside the shaft. According to observational data, miners have realized that at a certain depth, the air becomes heavy and can cause shortness of breath. Although they do not know the specific type of gas, their experience in the field has taught them that blowers can remove these dangerous gases. By removing unwanted air, the air inside the pit becomes better and safer to breathe. The use of blowers is an example of adaptive technology that is important for reducing health and safety risks. This demonstrates miners' awareness of the hidden dangers underground and their efforts to minimize risks for the sake of work continuity.

After preparing the area, the mining team enters the core stage of excavation and material extraction. This stage is the heart of the operation, combining specialized techniques with modified technology to ensure efficiency and suitability for the terrain. The main technique used in excavation in Sumberagung Village is the vertical or shaft method. Therefore, the local community refers to this activity as *nglubang* or making holes. This technique involves digging straight down into the ground, forming a shaft or well as the main route to the gold deposit. This technique was chosen based on the geological characteristics of the location, where gold ore at a certain depth is most efficiently accessed vertically, while minimizing more complicated horizontal work.



Figure 2: Drill Machine

The effectiveness of excavation in traditional mining relies on a variety of tools tailored to specific functions within the narrow working environment. The primary tool for the excavation team inside the pit is the drill, used to break up the gold-bearing rock material. The use of the drill demonstrates work specialization and the application of basic technology to accelerate the extraction process. Once broken, the material is efficiently collected and placed into sacks for transport to the surface. Miners also utilize hammers and chisels for tasks requiring greater precision or to break rocks too hard for the drill, as well as for tidying the excavated areas. The

presence of these simpler tools highlights the miners' technical adaptability to various rock conditions encountered in the field.

At the top of the mine shaft, there is a hoisting machine known as a *dompeng* machine, which is the backbone of mining operations. Its main function is to pull bagged material from inside the pit to the surface. However, this machine has also been modified by miners to serve a dual function as a tool to help workers ascend and descend. This modification is clear evidence of the miners' creativity and technological adaptation. Limited access to modern heavy equipment has encouraged them to maximize the functions of existing tools, creating practical solutions that are vital for worker mobility and efficient material transportation in deep pits. With a combination of vertical excavation techniques and the use of modified tools, the mining team is able to extract gold material effectively, even with limited resources. After the gold-bearing rock material has been successfully transported to the surface, the next most crucial stage is the processing. This process is known by miners as smelting, which is a method that serves to crush and separate valuable minerals from their host rock. This process is the final step in obtaining gold concentrate that is ready for sale.



Figure 3: *Gelondong* Machine

This gold processing activity relies on simple technology in the form of a rolling mill. The machine is shaped like a long, round tube, measuring approximately 80 cm in length and 50 cm in diameter. At the processing site, there are six rolling mills ready for operation. These machines are designed with special holes or cavities to release air, ensuring that the machines rotate optimally without resistance from air pressure. This demonstrates the miners' technical adaptation in operating the equipment efficiently. The processing begins by placing two small sacks of gold ore into each machine tube. To aid in crushing the ore, three small iron bars with a diameter of 2-3 cm and a length of approximately 40 cm are also inserted. These iron bars function like crushing balls that collide with the ore as the machine rotates, thereby crushing the ore into fine powder. During this process, the machine is filled with water until it is almost full.

The water acts as a solvent and coolant, helping the rock break down into a fine slurry. This process takes about three hours, until the rock material is completely fine and ready to be separated.

Once the rock material has been crushed into a fine slurry, the next step is to separate the valuable minerals from the mud and rock residue. This stage is known as the peak of the entire process, carried out to extract gold. The separation process begins by combining traditional methods with an unusual ingredient, namely cement mixed with the slurry material. According to Jaelani, cement is used to improve the final quality of the gold and enhance its color. The mixture of cement slurry and gold material is then transferred to a flat surface and processed by panning or swinging. This movement serves to separate the heavier gold particles from the lighter mud and rock, utilizing the basic principle of gravity. After panning produces a gold concentrate, the next stage of extraction is to mix the gold concentrate with mercury or quicksilver. The mercury binds the fine gold particles through a process called amalgamation, forming lumps that separate the gold from the concentrate. The lumps of gold and mercury are then filtered or squeezed using a thin cloth, separating the mercury and leaving behind gold concentrate that is ready for sale.



Figure 4: Final result in gold

Although the milling process is important for extracting gold, it is not entirely efficient. This method is only capable of obtaining 70% of the total gold, while the remaining 30% is wasted along with the waste. However, the limitations of this simple technology create a second economic opportunity for miners. The waste material that has been milled is not considered garbage, but rather a commodity that still has value. Its value depends on the remaining gold content. There is a direct relationship between the abundance of ore from a pit and the price of its waste. If a pit produces a lot of gold, its waste will be more expensive. This phenomenon demonstrates the empirical knowledge among miners and buyers. They know that waste from gold-rich sources still has the potential to be reused, even though the process is more complicated. Thus, waste that should have been discarded becomes a vital source of additional income.

The system of profit and revenue sharing in mining in Sumberagung Village reflects a very pragmatic structure, where capital and labor are valued adaptively. This mechanism not only functions as an economic distribution system, but also continuously reproduces the mining field itself, where various forms of capital can be converted and capitalized. After all mining and processing processes are complete, all operational and maintenance costs are deducted from the total gold sales. These costs include the daily needs of all team members and the cost of repairing or replacing damaged equipment. Initially, all these costs were borne by Jaelani as the capital owner. The practice of deducting costs from sales proceeds is an adaptive strategy to secure Jaelani's capital that has been invested upfront, while indirectly distributing operational risks to all team members. After all costs are deducted, the remaining net profit is divided equally among all team members. However, there is an important exception that recognizes Jaelani's capital contribution, namely that his generator set is counted as equivalent to one member in this distribution scheme. This shows that in their system, capital in the form of equipment is considered to have the same value as human labor contributions.

3.3.3 The Impact of Traditional Mining

Based on field observations, traditional miners in Sumberagung Village use environmentally unfriendly processing methods, namely the *gelondong* process followed by mercury amalgamation at the same location. Waste from both processes, which still contains mercury and residual sediment, is directly discharged into the river. This practice poses a significant environmental risk, as hazardous chemicals pollute the river ecosystem and can threaten public health.

The use of the sluice box method produces liquid waste in the form of mud. When this mud is mixed with mercury to bind gold, unbound mercury residues are carried away by the water flow. Because the processing is often carried out on the banks of rivers, this toxic wastewater directly pollutes the rivers without treatment, causing massive contamination. This condition not only increases the mercury content in the water, but also damages the river ecosystem. Sludge that settles at the bottom of the river can disrupt the habitat and life cycle of aquatic biota. Thus, this mining practice not only pollutes the water chemically, but also physically, threatening the sustainability of the river ecosystem as a whole. Another impact is the threat to the availability of clean water for the community. The entry of mercury and cyanide into groundwater and river sources makes the water unfit for consumption. Communities that use river water for daily needs such as bathing and washing are also at risk of exposure to these hazardous substances through skin contact. Therefore, water pollution from traditional gold mining not only damages the aquatic ecosystem but also directly threatens the health and sustainability of local communities.

In addition, the isolated lifestyle at mining sites also has an impact on mental health and social interaction. Mines often spend most of their time at mining sites located in the hills, far from their families and communities. This isolation coupled with the pressure and dangers of the job, can cause mental disorders such as stress and anxiety. The lack of healthy social interaction also exacerbates this condition. The isolated, male dominated environment fosters a highly concentrated culture of mining masculinity that often normalizes aggressive and crude communication. Based on the researchers' experience, the lack of interaction with women at mining sites even triggers inappropriate behavior, such as verbal abuse. This behaviour can be seen as a dysfunctional coping mechanism, where high pressure and social isolation lead to the erosion of norms of civility and respect, subsequently complicating the miners' reintegration and stability within their family lives.

4. Conclusion

Traditional mining in Sumberagung Village is a complex phenomenon that cannot be understood simply as a violation of the law. Rather, it is the result of complex interactions between economic, social, cultural, and structural factors. This practice has become a vital survival mechanism for communities marginalized from the formal economy. The author found that the decision to engage in mining is driven by structural poverty and limited formal employment opportunities. With few job options and barriers to accessing formal capital, including the inability to obtain bank loans, traditional mining becomes the only rational choice. This sector has low barriers to entry, does not require formal qualifications, and provides flexibility that allows miners to manage their own time. This is evident from demographic data and interviews with traditional miners in the area, who have low levels of formal education but are able to survive by relying on practical skills. A work system based on social capital and informal networks can facilitate funding and logistics and create a self-sufficient economic ecosystem. On the other hand, this practice is also integrated with traditional belief systems, where rituals and respect for nature are an integral part of their activities. However, this sustainability comes with serious consequences. Mining practices that use mercury and dump waste directly into rivers have a significant impact on the environment and health. Socially, this work culture also erodes the social order, causing disruption within families and mental health problems. This erosion is actually manifested in the highly isolated mining environment, where the lack of diverse social interaction, especially with women, often contributes to inappropriate behavior and verbal abuse. Ultimately, the existence of traditional mining in Sumberagung Village highlights the gap between regulations and reality on the ground. Bureaucratic and centralized government policies are not in line with the conditions of the community on the ground, which ultimately encourages them to continue operating illegally. Therefore, laws and policies will not be effective if they are not supported by a deep understanding of the socio-economic realities on the ground.

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