

**Artisanal and small-scale gold mining baseline report:
Camarines Norte and South Cotabato**

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Artisanal and small-scale gold mining baseline report: Camarines Norte and South Cotabato

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Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ALS	Alternative Learning System
AO	Administrative Order
ASGM	Artisanal and Small-Scale Gold Mining
BSP	Bangko Sentral ng Pilipinas
CANORECO	Camarines Norte Electric Cooperative, Inc.
CBMS	Community-based Monitoring System
CDMP	Development and Management Programmes
DAO	Department Administrative Order
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DOH	Department of Health
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology (DOST),
DTI	Department of Trade and Industry
ECC	Environmental Compliance Certificate
EIS	Environmental Impact Statement
EO	Executive Order
FGD	Focus Group Discussion
GDO	Gross Development Product
GES	General Effluent Standards
GFMS	Gold Fields Mineral Services
GPP	Gold-Processing Plant
IEE	initial Environmental Examination
ILO	International Labour Organization
KII	Key Informant Interview
LBMA	London Bullion Market Association
LGU	Local Government Unit
MENRO	Municipal Environment and Natural Resources Office
MGB	Mines and Geosciences Bureau
MPDO	Municipal Planning and Development Office
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OSHS	Occupational Safety and Health Standard
OTOP	One Town One Product
P/CRMB	Provincial/City Mining Regulatory Board
PEMO	Provincial Environment and Management Office
PSA	Philippine Statistics Authority
RA	Republic Act
REL	Recommended Exposure Limit
SSM	Small-Scale Mining
TJA	T'boli Jewelers Association

TLV	Threshold Limit Value
TMC	Tribal Mining Corporation
TWA	Time-Weighted Average
UNEP	United Nations Environment Programme
USDOL	US Department of Labor
WHO	World Health Organization
WQG	Water Quality Guidelines

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EXECUTIVE SUMMARY

Artisanal and Small-Scale Gold Mining (ASGM) refers to a thriving economic sector, which provides livelihood for over 15 million people in 70 countries all over the world. Despite being mostly informal, the sector is responsible for producing as much as 20 to 30 per cent of the gold produced globally.

The lack of proper monitoring and regulation mechanisms for most ASGM communities have translated to indecent working conditions, which include reports of child labour and hazardous working environments. The rampant use of mercury as well as the mining methods employed in ASGM have also been major contributors to environmental degradation. In fact, the sector accounts for 37 per cent of the total anthropogenic emissions of mercury around the globe.

Due to its informality, the ASGM sector has been closely linked with thriving black markets for gold. These illicit financial flows have been identified as major factors in shaping various industry practices, and in limiting the capacity of vulnerable miners to access better opportunities.

The ASGM Baseline Profile Report aims to assess the current environmental, social and economic conditions in ASGM in the Philippines. The study covers three mining municipalities, including Labo and Paracale in Camarines Norte and T'boli in South Cotabato.

ASGM in the study areas

South Cotabato and Camarines Norte both have rich mining histories. The ASGM sector in Camarines Norte traces its roots back to pre-colonial times, with early settlers already trading gold with Chinese merchants long before the Spanish occupation in the Philippines. On the other hand, T'boli's ASGM sector is relatively young – mining settlements only started forming after pyrite was discovered in water bodies around the municipality in the 1970s.

Both areas have significant mining populations with mine workers utilizing almost identical mining practices and gold processing procedures. However, the main difference lies in the fact that the ASGM sector in Camarines Norte is largely informal, such as small-scale mining (SSM) in the province is considered illegal, and is thus, unmonitored and unregulated. In comparison, T'boli has a locally recognized *Minahang Bayan*. Although national recognition is yet to be given to T'boli, local declaration has

translated to a number of government programmes and projects that have improved the lives of miners in the area.

Key issues in ASGM

a) Socio-economic conditions in ASGM

The study results show that miners in Camarines Norte are regularly exposed to hazardous working environments. This translates to increase risks of workplace accidents, extended working hours, exposure to harmful dusts and chemicals, and exposure to unsanitary environments, and so on. Moreover, as SSM is driven primarily by poverty issues such as child labour and unequal wealth-sharing persist.

Mine workers in Camarines Norte have also reported experiencing harassment from officials and uniformed men. The informality of the sector has translated to higher incidences of crimes such as extortion and corruption against mining communities. Aside from the inherent security issues, this has had negative impacts on the incomes that mining stakeholders receive. Similarly, miner perspectives and attitudes towards authorities have been negatively affected.

In T'boli, miners are still exposed to the same risks. However, these risks are minimized significantly due to government support. Regular inspection of mine sites has greatly minimized the risk of accidents. Mercury use and child labour have also been addressed – the study reports that mercury use and child labour only occur outside of the monitored and regulated *Minahang Bayan*. Even then, these activities persist only in secret as the government agencies still conduct regular monitoring activities in areas where child labour or mercury use are reported.

Mine workers in T'boli also enjoy a number of benefits from government support. Miners have better access to social services, and often are beneficiaries of various training and education programmes sponsored by the government and its partner organizations.

b) Working conditions in ASGM

Mine workers in both study areas face a number of risks on a daily basis as mining is still considered a high-risk occupation. As discussed in the preceding section, workers are regularly exposed to hazardous working environments, where there are increased risks of workplace accidents, exposure to harmful dusts and chemicals and unsanitary environments.

The risks faced by mine workers are exasperated by the lack of access to adequate protective equipment, and knowledge on safety measures. These miners regularly engage in heavy manual labour for more than 10 hours a day with little access to protective services and decent income.

c) *Child labour in ASGM*

The emergence of ASGM as a primarily poverty-driven sector has paved the way for significant social issues such as child labour. Despite being one of the most hazardous forms of child labour, the ASGM sector remains an attractive option for children in poverty. Child labourers are left with no choice but to engage in heavy manual labour as a means to support their families and their own education, among other reasons.

Children who engage in the ASGM sector are at risk of acquiring negative long-term effects of heavy manual labour. Moreover, children are being robbed of valuable opportunities to have fruitful childhood, and a decent education.

d) *Women in ASGM*

A glaring issue in the ASGM sector are the prevailing patriarchal perspectives. Women are often relegated to auxiliary roles with unequal access to job opportunities and income. At times, traditional beliefs such as the belief that women bring bad luck to mining areas prevent women from participating in mining activities.

The ASGM sector is also indirectly tied to illegal prostitution. The gains from mining allow miners to engage in prostitution, often as a way to relieve work-induced stress. Aside from contributing to views on women, this also endangers informal sex workers who may experience various health and security issues associated with their work.

Still, women in ASGM have been experiencing a resurgence in recent years. Both Camarines Norte and T'boli are home to women leaders who hold high positions in a number of mining associations. Various women have also been known to fund their own SSM operations, and play major roles in the industry. These women have been instrumental in gradually leading the shift to more progressive perspectives in the sector.

e) *Gold trade in ASGM*

The lack of proper monitoring mechanisms for post-production stages, even in the formalized ASGM sector in T'boli, have led to a thriving black market for gold. Although the study identifies various potential endpoints for gold, it is generally agreed upon that

most of the gold produced by the sector ends up in the hands of illegal buyers, some of whom are based abroad.

The prevailing gold trade practices in the sector has paved the way for a gold supply chain that have translated to inequitable wealth-sharing practices. Mine workers generally receive lesser income shares with major gold traders benefitting the most from the sector. Essentially, miners remain poor while gold traders continue to get rich by manipulating market prices for gold.

f) Environmental impacts of ASGM

The findings of the study reveal that the activities associated with the ASGM sector can impact the environment negatively. The sector is a primary source of mercury pollution in the country. Moreover, its ties with deforestation means that SSM activities may potentially contribute to climate change.

ASGM also leads to significant land degradation, especially when ASGM is unregulated and unmonitored. In the informal ASGM sector of Camarines Norte, mining areas are often abandoned once tunnels are exhausted, leaving areas damaged and polluted.

Finally, the lack of proper waste management practices in the sector contribute to the degradation of water bodies and water quality. This pollution may potentially pose threats to the ecosystem and human health.

Conclusions

The findings of the study call for various actions intended to capacitate mining communities and support their activities. In particular, the findings suggest:

- Formalization of the ASGM sector to provide a platform for stakeholders and duty-bearers to ensure that SSM is undertaken responsibly.
- Government support to provide for the various needs of the ASGM sector especially as it transitions into a formal economy.
- Strengthening of formal chains to facilitate legal trade of gold to improve wealth-sharing practices and ensure that ASGM gold is traded legally as per local and national policies.

1. INTRODUCTION

Artisanal and small-scale gold mining (ASGM) is a thriving economic sector, especially in developing countries, which provides livelihood for over 15 million people in more than 70 countries and aids in generating significant financial flows.¹ In 2015, the sector generated an estimated income of US\$120 million worldwide, both from direct and secondary economies.² Annual global ASGM production is estimated at 400 tonnes, accounting for nearly 15-20 per cent of officially recorded worldwide primary production.^{3 4} The continuous expansion of the mostly-informal ASGM sector is widely attributed to a number of factors including the rising global prices for minerals such as gold, migratory low-cost workforces⁵ and lack of livelihood opportunities.

ASGM is defined by the Minamata Convention on Mercury as “*gold mining [activities] conducted by individual miners or small enterprises with limited capital investment and production.*”⁶ Depending on country-specific criteria, ASGM may employ “*rudimentary techniques in extracting minerals, most commonly gold by miners working in small-sized operations.*” Approximately 70 to 80 per cent of ASGM operations worldwide is considered informal or lacking standards and/or compliance to government regulations.⁷

Due to the sector’s largely informal status, ASGM has been associated with aggravating social and environmental costs, including primarily precarious working and living conditions, poor health and safety records.⁸ Particularly, the continued use of mercury in the sector has implications on the peoples’ right to the highest attainable standards of health and the right to a healthy ecology.

¹Basri, Sakakibara, M., Ratnawati. (2017). Economic features of the artisanal and small-scale gold mining industry in Bombana, Southeast Sulawesi, Indonesia. *IOP Conference Series: Earth and Environmental Science* 71, pp. 1755-1315. doi:10.1088/1755-1315/71/1/012016

²Persaud, A. and Telmer, K. (2015). *Developing Baseline Estimates of Mercury Use in Artisanal and Small-scale Gold Mining Communities: A Practical Guide*. British Columbia, Canada: Artisanal Gold Council. ISBN 978-0-9939459-6.

³Seccatore, J., Veiga, M., Origliasso, C., Marin, T., De Tomi, G. (2014). An estimation of the artisanal small-scale production of gold in the world. *Science of the Total Environment* 496, pp. 662-667. <http://doi.org/10.1016/j.scitotenv.2014.05.003>.

⁴Fritz, M.M.C., Maxson, P.A., Baumgartner, R.J. (2016). The mercury supply chain, stakeholders and their responsibilities in the quest for mercury-free gold. *Resources Policy* 50, pp. 177-192. <http://dx.doi.org/10.1016/j.resourcol.2016.07.007>.

⁵Salo, M., Hiedanpaa, J., Karlsson, T., Avila, L.C., Kotilainen, J., Jounela, P., Garcia, R.R. (2016). Local perspectives on the formalization of artisanal and small-scale mining in the Madre de Dios gold fields, Peru. *The Extractive Industries and Society* 3, pp. 1058-1066. <http://dx.doi.org/10.1016/j.exis.2016.10.001>.

⁶United Nations Environment Programme. (2013). *Minamata Convention on Mercury: Text and Annexes*. Geneva, Switzerland: UNEP Chemicals Branch.

⁷Fritz, M., McQuilken, J., Collins, N., Weldegiorgis, F. (2018). Global trends in artisanal and small-scale mining (ASM): a review of key numbers and issues. Published by the International Institute for Sustainable Development. Retrieved from: <https://www.iisd.org/sites/default/files/publications/igf-asm-global-trends.pdf>

⁸*Ibid.*

A serious workplace hazard, mercury and mercury compounds are highly toxic substances with adverse impacts to human and environmental health. Mercury as an element exists naturally in the environment and is transported through natural geochemical cycles from the deep reservoirs of the earth to the atmosphere through volcanic and geologic activity. In recent years, however, global emissions of this toxic substance has been attributed to anthropogenic sources. Once released, mercury is distributed to the environment through air-surface exchanges with soil, freshwater and vegetation, as well as exchanges between soil-vegetation and water-vegetation. Its cycle undergoes a complex process that involves the transformation of mercury from one form to another such as in the case of organic methylmercury. Considered to be mercury's most toxic form, methylmercury can bio-accumulate in living organisms, and bio-magnify through the food chain. These transport and transformation mechanisms allow mercury to drift long distances and contaminate global food supplies at levels, which present major risks to human health.

According to the World Health Organization (WHO), mercury is one of the top ten chemicals of major public health concern.⁹ Humans may be exposed to mercury through inhalation when elemental mercury is converted to vapor or through ingestion of methyl mercury-contaminated food products such as seafood, which is considered the main protein source for most fisherfolk. It is well-absorbed through the lungs, carried throughout the body and is capable of crossing blood-brain and placental barriers.¹⁰ Acute inhalation exposure may result to pneumonia, bronchitis, chest pain, dyspnea, cough, stomatitis, gingivitis, excessive salivation and diarrhea.¹¹ On the other hand, exposure to methyl mercury through ingestion mainly impacts the central nervous system, causing symptoms such as loss of control of body movements, numbness of limbs, muscle weakness, damage of hearing and speech, loss of peripheral vision, insanity or even paralysis, coma and death.

Studies and data on worldwide emissions, releases and transport of mercury in the environment were consolidated by the United Nations Environment Programme (UNEP) in a report entitled "*Global Atmospheric Mercury Assessment: Source, Emissions and Transport*" in 2008.¹² An updated report released in 2013 included an inventory of new sources that were quantified for the first time, filling some data gaps on mercury transport and its fate in the atmosphere.

⁹World Health Organization. (2017). *Mercury and Health*. Retrieved from 29 August 2017 at <http://www.who.int/mediacentre/factsheets/fs361/en/>

¹⁰Clarkson, T.W. (2002). The three modern faces of mercury. *Environmental Health Perspectives*, 110(1), 11-23.

¹¹Baxter, P.J. (2000). *Hunter's Diseases of Occupations*. 9th ed. London, UK: Arnold Press.

¹²United Nations Environment Programme (2009). *The global atmospheric mercury assessment: source, emissions and transport*. Published by the United Nations Environment Programme. Retrieved from: https://wedocs.unep.org/bitstream/handle/20.500.11822/11517/UNEP_GlobalAtmosphericMercuryAssessment_May2009.pdf

Both reports identify two main source categories of anthropogenic mercury emissions and releases. The first category includes coal burning, mining and industrial activities that process ores to produce various metals or other raw materials to produce cement. The presence of mercury as an impurity in the fuels and raw materials used and processed in these activities lead to 'by-product' or 'unintentional' emissions or releases, amounting to almost 53 per cent of the total anthropogenic emissions and releases per annum.¹³ The second source category includes sectors where mercury is used intentionally. ASGM is the largest of these, accounting for 37 per cent of total anthropogenic emissions, which translates to a staggering 727 tonnes of mercury per annum.¹⁴ Geographically, countries in the East and Southeast Asian regions serve as the largest contributors of mercury pollution. However, newer data on ASGM emissions have increased the proportion of global emissions attributed to South America and Sub-Saharan Africa in recent years.

Several environmental and health assessment studies have documented severe mercury contamination in ASGM communities, as well as the high incidence of symptomatic mercury intoxication in workers.¹⁵ In addition, mercury pollution of downstream water bodies is widespread and threatens a very important source of high quality protein — fish and shellfish mostly of the developing world population including that of the Philippines.

The Philippines is the fifth-most mineral rich country in the world with rich deposits of gold, nickel, copper and chromite.¹⁶ Approximately, 9 million hectares of the country's territory, which accounts for almost a third of the country's total land area are considered to have high mineral potential.¹⁷ Consequently, the country's mining industry is continuously growing with a reported 12 per cent average annual increase in overall mining employment in large-scale mining alone.¹⁸ Mining for gold, in particular, is looking to be a lucrative venture – gold reserves in the country are projected to be worth around Philippine Peso (Php)7.36 trillion.¹⁹

¹³Global Mercury Assessment 2013, p. 9

¹⁴*Ibid.*

¹⁵Gibb, H., O'Leary, K.G. (2014). Mercury Exposure and Health Impacts among Individuals in the Artisanal and Small-Scale Gold Mining Community: A Comprehensive Review. *Environmental Health Perspectives*, 122(7), 667-672. <http://dx.doi.org/10.1289/ehp.1307864>.

¹⁶Chaves, L. (2012). 9 things you need to know about mining in the Philippines. Published by Rappler.com.

¹⁷MGB. (2016). *Mining Facts and Figures*. Retrieved 20 July 2017 at <http://www.mgb.gov.ph/images/homepage-images/mining-facts-and-figures-----updated-January-2017.pdf>

¹⁸Philippine Extractive Industries Transparency Initiative. (2015). Second Country Report. Published by PH-EITI.

¹⁹Jennings, R. (2015). Trillion-dollar Philippine economic goldmine emerging from murky pit. Published by Forbes.com

According to the Mines and Geosciences Bureau (MGB), the estimated national value of gold produced in 2014 is Php32.97 billion, which accounts for almost 25 per cent of the total Php138.61 billion value of production for metallic minerals in that year.²⁰ Of this, small-scale mining (SSM) is considered a significant contributor. Data from the MGB shows that the value of gold mined by the SSM sector is more than twice that of the large-scale mining sector amounting to Php36.91 billion in 2009 alone.²¹ More recently, approximately 70 per cent (28 tonnes) of the gold production in the country was attributed to the ASGM sector in 2015.²² This percentage share is way above the global average of 20 per cent.

ASGM remains a thriving industry which has contributed 0.60 per cent of the Philippine's gross development product (GDP) in 2016.²³ Overall, the sector employs an estimated 500,000²⁴ miners throughout the country with at least 18,000 women and children in ASGM communities belonging to the workforce. The livelihood opportunities presented by the sector has attracted a large number of potential miners, especially in rural areas where opportunities for the poverty-stricken are limited.

The economic opportunities offered by the ASGM sector, however, come with significant health and environmental costs. Gaps and overlaps in existing mining policies and the weak enforcement of regulations in the sector have resulted in the unabashed use of mercury in the gold extraction process. Using a toolkit provided by the UNEP, the Department of Environment and Natural Resources (DENR) analyzed the ASGM sector's contribution to mercury pollution, with the sector emitting/releasing more than 113 tons of mercury per annum.²⁵ This makes ASGM the most significant source of mercury emissions and releases in the country, thereby contributing to mercury exposure of miners, their families and the general population.

²⁰Llaguno, E.L., Soriano, V.J., Tamayao, M.M. (2016). Improving the Minahang Bayan Declaration Process: A First Step Towards Achieving Sustainability in Philippine Small-Scale Gold Mining Industry. *Philippine Engineering Journal* 37(1): 45-62.

²¹*Ibid.*

²²World Gold Council. (2016). *Interactive Gold Mining Map*. Retrieved 5 May 2017 at <http://www.gold.org/gold-mining/where-gold-mining-occurs/interactive-gold-mining-map>

²³Mines and Geosciences Bureau. (2017). *Mining Industry Statistics*. Retrieved September 6, 2017 at [http://mgb.gov.ph/attachments/article/162/MIS\(2015\)%20\(1\)%20\(1\).pdf](http://mgb.gov.ph/attachments/article/162/MIS(2015)%20(1)%20(1).pdf)

²⁴Philippine Extractive Industry Transparency Initiative. (2015). *Country Report Volume 2*. Retrieved October 4, 2017 at https://eiti.org/sites/default/files/documents/volume-ii_of_the_ph-eiti_country-report_2015_1.pdf

²⁵Peralta, G.L., Pausing, E. (2008). *Mercury Assessment for the Philippines*. Retrieved 20 June 2017 at [http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/-](http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/-Mercury%20Inventory%20Assessment%20for%20the%20Philippines-2008Philippines%20HgInventoryReport%202008.pdf.pdf)

[Mercury Inventory Assessment for the Philippines-2008Philippines HgInventoryReport 2008.pdf.pdf](http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/-Mercury%20Inventory%20Assessment%20for%20the%20Philippines-2008Philippines%20HgInventoryReport%202008.pdf.pdf)

Finally, it is also important to note that the presence of mercury in ASGM also exacerbates the dangerous conditions vulnerable populations such as women and children are exposed to. As defined in Republic Act (RA) No. 9231,²⁶ mining is already considered one of the worst forms of child labour because it exposes children to harmful chemicals (mercury and cyanide) and harsh working conditions.²⁷ Likewise, the Department of Labor and Employment (DOLE) Occupational Safety and Health Standards (OSHS) classifies mining areas as hazardous workplaces.²⁸

1.1 Background of the study

In 2016, the International Labour Organization (ILO) and BAN Toxics, in cooperation with the US Department of Labor (USDOL) embarked on a three-year project entitled the Convening Actors to Develop and Implement Strategies to Reduce Child Labour and Improve Working Conditions in Artisanal and Small-Scale Gold Mining (CARING Gold) Mining Project to implement interventions designed to assist local government units (LGUs) and other relevant stakeholders in developing programmes and mechanisms to eliminate child labour in ASGM areas. Key focal issues include the lack of formal mechanisms to regulate and monitor the extraction, processing and trade of ASGM gold, poor forward linkages to formal markets, and other systematic issues that encourage unsustainable practices linked to child labour.

As part of the project, BAN Toxics has conducted a baseline study covering mining municipalities in the SSM hotspots of South Cotabato and Camarines Norte. The information gathered during these data-gathering activities are presented in this ASGM Baseline Report. Highlighted in the document are overviews of the study areas, the different facets of the SSM industry, the working conditions of artisanal mine workers, and a glimpse of the ASGM gold supply chain that provides income to this marginalized sector.

1.2 Objectives of the study

The study aims to provide a comprehensive overview of the SSM industries and practices in the towns of Labo and Paracale in Camarines Norte as well as in T'boli, South Cotabato. In particular, the study aims to:

- a. Provide a social, economic and environmental overview of the mining communities of Labo and Paracale in Camarines Norte, as well as of T'boli, South Cotabato.

²⁶Congress of the Philippines (2003). Republic Act No. 9231. Twelfth Congress. Retrieved from: https://www.lawphil.net/statutes/repacts/ra2003/ra_9231_2003.html

²⁷Pasion, P. (2017). Groups urge to legalize small-scale mining to stop child labor. Published by Rappler.com. Retrieved from: <https://www.rappler.com/move-ph/158403-legalize-small-scale-mining-stop-child-labor>

²⁸Department of Labor and Employment (1989). Occupational safety and health standards. Retrieved from: <http://www.oshc.dole.gov.ph/images/Files/OSH%20Standards%202017.pdf>

- b. Highlight the working conditions and child labour situation in the study areas.
- c. Describe the gold supply chain in the ASGM sector, including trade practices and existing markets.
- d. Identify key socio-economic and environmental issues existing in the mining communities.
- e. Identify key opportunities for growth in the local ASGM market.
- f. Provide recommendations based on the identified issues and needs in the sector.

2. STUDY METHODOLOGY

The following tools and methodologies were employed by the BAN Toxics Research Team to collect the necessary information for the ASGM Baseline Report.

2.1 Desk research and field visits

A thorough review of existing literature was conducted to provide foundational knowledge for the identification of priority data and information to be gathered during the fieldwork activities. Moreover, data gathered during the desk research comprised most of the secondary data and information presented in the document.

Likewise, field visits were conducted to familiarize the research team with the prevailing environmental and social conditions in mining communities. Ocular visits to mining sites from the study areas were also done to highlight valuable geographic information about mining sites as well as nuances and social cues that may not be apparent during focus group discussions (FDGs) and interviews.

2.2 Focus group discussions and key informant interviews

FDGs were held involving various stakeholder groups such as representatives from the LGUs, women mining groups, children miners and adult male miners. Highlighted during these FDGs are current legislative trends with regards to SSM, existing practices, potential opportunities for growth, and social and environmental conditions.

Key informant interviews (KIIs) were also used to validate information gathered during the FDGs. Moreover, interview topics deemed too sensitive for full FDGs (namely, trading practices of gold buyers, sources of mercury, and so on) were discussed during the KIIs.

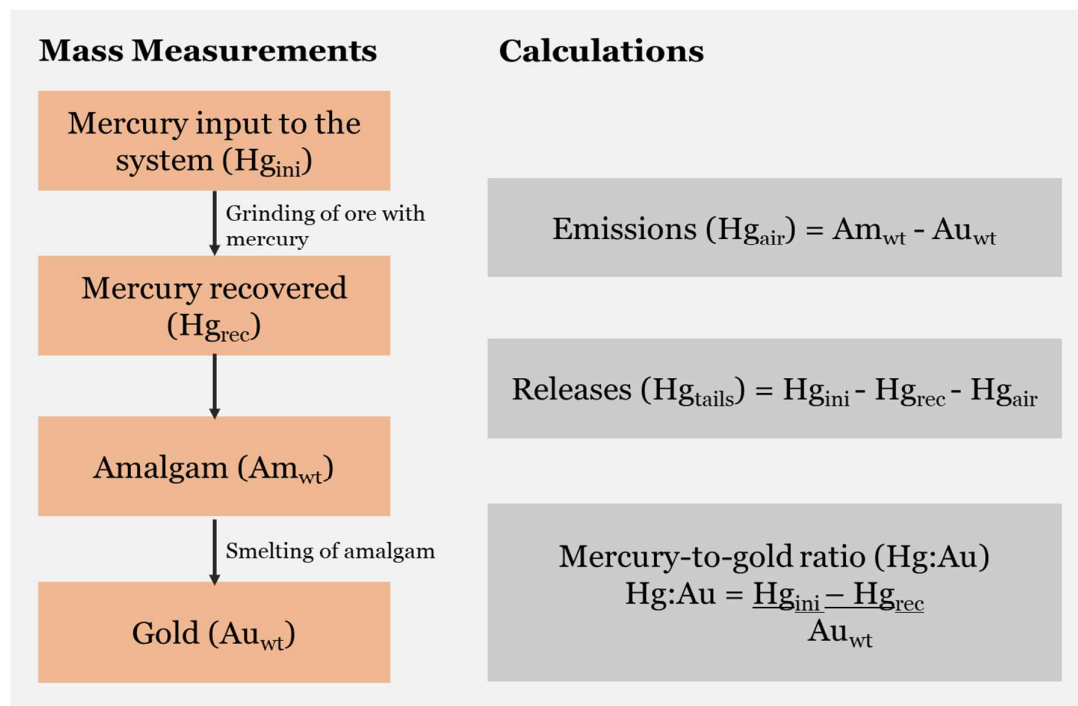
2.3 Field surveys

Field surveys were conducted in the study areas to further understand the socio-economic and environmental conditions in the mining communities. The survey tools utilized a Likert-type scoring system²⁹ to determine prevailing perspectives among the different mining groups, while a quota sampling method was utilized to identify the survey respondents. In total, the field surveys involved 765 respondents from adult males, adult females and children mining groups.

2.4 Environmental sampling and analysis and mercury inventory

Actual site measurements were taken to acquire an indication of the extent of mercury use in the study areas (Figure 1). The measurement methodology used during the study is based on the substance flow analysis framework,³⁰ which incorporates mass balance measurements of mercury and its products associated with gold extraction and processing in the gold supply chain.

Figure 1. Diagram of procedure for mercury inventory. The process involves mass balance measurements along the gold extraction process. Also shown are the calculations done based on the measurements.



²⁹McLeod, S. (2008). Likert scale. Published by Simply Psychology. Retrieved from: <https://www.simplypsychology.org/likert-scale.html>

³⁰Brunner, P.H. & Rechberger, H. (2004). *Practical Handbook of Material Flow Analysis*. Florida, USA: CRC Press LLC.

Additional measurements were conducted using an RA 915+ Lumex mercury vapor analyzer for detecting mercury concentration in the air. Tailing samples were also analyzed using an x-ray fluorescence (XRF) analyzer to estimate the samples mercury content. Based on the initial analyses, tailing samples with significant readings of mercury were sent to licensed laboratories for verification.

3. LEGISLATIVE FRAMEWORK OVERVIEW FOR SMALL-SCALE MINING

In the Philippines, the SSM sector is governed by two major policies. Presidential Decree 1899 entitled, *“Establishing Small-Scale Mining as New Dimension in Mineral Development”* was enacted by the government in 1984 and is the first SSM-related legislation in the country. It intends to develop small mineral deposits, generate income for the poor, and alleviate the poor living conditions in rural areas.³¹ On the other hand, RA No. 7076 (otherwise known as the People’s Small-Scale Mining Act of 1991) was formulated to provide guidelines toward achieving a systematic and rational scheme for the small-scale development and utilization of mineral resources in order to address the social, economic, technical and environmental challenges pertaining to SSM activities.

In addition, to reiterate compliance to RA No. 7076, the MGB is implementing Executive Order (EO) No. 79 series of 2012, otherwise known as *“Institutionalizing and Implementing Reforms in the Philippine Mining Sector Providing Policies and Guidelines to Ensure Environmental Protection and Responsible Mining in the Utilization of Mineral Resources.”* The order covers a wide range of issues in the mining industry, and it aims to strengthen protection of the environment, the promotion of responsible and sustainable mining, and the provision of a more equitable revenue-sharing scheme in the mining sector. Here, the prohibition on the use of mercury in ASGM is clearly stated as one of the most important provisions.

3.1 Legal definitions of small-scale mining

“Artisanal and small-scale gold mining” are general terms that refer to informal mining activities that are carried out using low technology or with minimal machinery. A singular definition of the sector does not exist, and local definitions may vary from country to country.³²

³¹Mines and Geosciences Bureau. (n.d.). *Presidential Decree No. 1899: Establishing Small-scale Mining as a New Dimension in Mineral Development*. Retrieved from http://www.mgb.gov.ph/images/stories/PD_1899.pdf

³²Fraser Institute (n.d.). What is artisanal and small-scale gold mining? Retrieved from: <http://www.miningfacts.org/communities/what-is-artisanal-and-small-scale-mining/>

In the Philippines, SSM is defined by RA No. 7076, otherwise known as the “People’s Small-Scale Mining Act of 1991.” RA 7076 defines small-scale mining as “activities which rely heavily on manual labour using simple implements and methods and do not use explosives or heavy mining equipment.”³³ Currently, the country has no legal definitions for medium-scale mining.

3.2 Legal prerequisites for small-scale mining

For SSM operations to be formalized, a number of requirements must first be accomplished. This means that proper licenses and permits must be acquired by the potential mining operator before the start operations. These national policies also provide guidelines for the production and sale of gold produced from SSM. The responsibility to implement these rules and regulations is devolved to a number of government entities as stipulated in RA No. 7076, with the DENR being the law’s primary implementing agency.

3.2.1 Guidelines for *Minahang Bayan* applications

RA No. 7076 authorizes the provincial/city mining regulatory board (P/CMRB) to declare and segregate existing gold-rush areas for SSM, award contracts to small-scale miners and formulate and implement rules and regulations related to SSM, and so on.

Despite the authority given to the Provincial Mining Regulatory Board (PMRB), the actions of the board will still be guided by the policies stipulated in RA No. 7076. For example, Section 5 of the Revised Implementing Rules and Regulations (R-IRR) of RA No. 7076 and the accompanying Administrative Order (AO) 2015-03 state that “*no small-scale mining shall be undertaken outside a Minahang Bayan and that no entity shall engage in small-scale mining without a small-scale mining contract.*” This effectively categorizes small-scale miners operating outside a designated *Minahang Bayan* and/or those without existing SSM contracts as informal.

Section 9, on the other hand, limits the potential applicants by stipulating that the applications for *Minahang Bayan* may be undertaken only by an individual miner, a cooperative of small-scale miners or by a party interested in filing a petition or request for the declaration of an area as a *Minahang Bayan*.

³³Congress of the Philippines (1991). Republic Act No. 7076. Eighth Congress. Retrieved from: http://www.lawphil.net/statutes/repacts/ra1991/ra_7076_1991.html

3.2.2 Related environmental requirements

DENR Department Administrative Order (DAO) 97-30, otherwise known as the “Small-Scale Mine Safety Rules and Regulations,” provides rules and regulations with regards to environmental safety in SSM. The order requires applicants to submit monthly safety reports to the PMRB. These safety reports must reflect the standards of safety stipulated in the DAO’s Section 5, where it is stated that it is the duty and responsibility of the operator to ensure the safety and health of the workers/miners while on duty, to adopt all necessary facilities for safe, sanitary and healthful working conditions, and to maintain a fully equipped first aid station or stations in mining sites, and so on.

Additionally, the DENR DAO 2015-03 (otherwise known as the revised Implementing Rules and Regulations for Small-Scale Mining)³⁴ also stipulates that *Minahang Bayan* will be subject to the environmental impact statement (EIS) system, which aims to identify, predict, interpret and communicate information regarding changes in environmental quality associated with a proposed project.³⁵

Equally relevant are the national environmental laws that govern the overall management of air and water quality nationwide. The “Clean Air Act of the Philippines” or RA No. 8749 with its corresponding implementing rules and regulations (IRR) outlined in DAO 2001-81 provides the legal basis for the formulation and implementation of a holistic national air pollution management programme, including the development of a set of Ambient Air Quality Guideline Values and Standards and Emission Standards for Pollution from both Stationary and Mobile Sources.

On the other hand, RA No. 9275 or the “Clean Water Act of the Philippines” with its corresponding IRR explained in DAO 2005-10 allows for the development of national water quality management programme that will promote environmental strategies, use of appropriate economic instruments and of control mechanisms for the protection of water resources. DAO 2016-08 further provides Water Quality Guidelines (WQG) and General Effluent Standards (GES) as bases for water quality management.

3.2.3 *Bangko Sentral ng Pilipinas* gold-buying programme policies

Section 17 of RA No. 7076 stipulates that all sales of gold produced by the SSM sector must go through the *Bangko Sentral ng Pilipinas* (BSP), which in turn is mandated to establish gold buying stations in strategic areas where gold produced by small-scale miners shall be sold at competitive prices.

³⁴Philippine Star (2014). DENR wraps up IRR revisions to formalize small-scale mining. Published by the Philippine Star. Retrieved from: <https://www.philstar.com/business/2014/09/21/1371312/denr-wraps-irr-revisions-formalize-small-scale-mining>

³⁵Congress of the Philippines (1995). Republic Act No. 7942. Retrieved from: http://www.mgb.gov.ph/images/stories/RA_7942.pdf

Currently, the BSP imposes a 2 per cent excise tax and a 1 per cent creditable withholding tax for each sale of gold on top of other fees levied by the BSP. The BSP also ensures that the gold sold by ASGM operations are responsibly sourced to some extent by adopting the standards set forth by the London Bullion Market Association (LBMA). The BSP was accredited by the LBMA in 2009,³⁶ however, discussions with the BSP during the time of publication reveal that the BSP is having issues with the LBMA accreditation due to the human rights issues plaguing the Duterte administration.

The BSP has listed its requirements for accepting gold from potential sellers as outlined in Table 1.

Table 1. BSP requirements for acceptance

Physical form	Bar or disc (powder or grains are not accepted).								
	Does not contain mercury or its amalgam.								
	Does not contain slags and other foreign matters.								
	No layering or metallic segregation.								
Size and weight requirements	<table border="0"> <tr> <td>Maximum dimensions for bar form:</td> <td>16.5 x 8 x 4cm (LxWxH)</td> </tr> <tr> <td>Maximum dimensions for disc form:</td> <td>10 x 5 cm (diameter x height)</td> </tr> <tr> <td>Maximum weight per piece:</td> <td>5 kg</td> </tr> <tr> <td>Maximum weight per lot:</td> <td>10 kg</td> </tr> </table>	Maximum dimensions for bar form:	16.5 x 8 x 4cm (LxWxH)	Maximum dimensions for disc form:	10 x 5 cm (diameter x height)	Maximum weight per piece:	5 kg	Maximum weight per lot:	10 kg
Maximum dimensions for bar form:	16.5 x 8 x 4cm (LxWxH)								
Maximum dimensions for disc form:	10 x 5 cm (diameter x height)								
Maximum weight per piece:	5 kg								
Maximum weight per lot:	10 kg								
Minimum preliminary assay	30% gold								

4. ASGM COMMUNITY PROFILE AND BASELINE INFORMATION

The ASGM Baseline Report covers three mining municipalities – Paracale and Labo from Camarines Norte and T’boli from South Cotabato. This section presents a comprehensive overview of these mining communities as well as brief assessments of the socio-economic and environmental conditions in the areas.

³⁶Romero, P. (2009). Bangko Sentral cited for purity of its gold bars. Published by the Philippine Star. Retrieved from: <https://www.philstar.com/business/2009/08/25/498671/bangko-sentral-cited-purity-its-gold-bars>

4.1 Camarines Norte ASGM baseline information

This section provides an overview of the province of Camarines Norte with a specific focus on the municipalities of Paracale and Labo. Presented are data gathered from secondary sources such as official data from the LGU as well as other relevant government agencies such as the Philippine Statistics Authority (PSA).

4.1.1 Camarines Norte provincial background

Camarines Norte is one of the six provinces that make up Region V,³⁷ otherwise known as the Bicol Region. Daet, the province's capital is an ancient settlement as remains of the prehistoric Tabon cave men were discovered in the area.

For most of its early history, the areas now known as Camarines Norte and Camarines Sur formed one political unit known as Ambos Camarines. This lasted until 1919, when the two were separated and Camarines Norte was established by virtue of RA No. Act 2809.³⁸

a) Geographic characteristics

The province of Camarines Norte covers a total land area of around 2,320 km², which accounts for 12.4 per cent of the total Bicol area.³⁹ It is bounded on the north by the Pacific Ocean, on the east by San Miguel Bay, on the west by Lamon Bay, and on the south by Quezon province, as well as the adjoining province of Camarines Sur.

Camarines Norte is politically subdivided into 12 municipalities,⁴⁰ namely, Basud, Capalonga, Daet, Jose Panganiban, Labo, Mercedes, Paracale, San Lorenzo Ruiz, San Vicente, Sta. Elena, Talisay and Vinzons. Mercedes is the largest town with a total land area of 589.36 km² followed by Capalonga with 290 km².

Camarines Norte typically has no dry season with a very pronounced maximum rain period from November to January.⁴¹ The average temperature is 27.87°C with December being the coolest month, and May being the warmest.

³⁷Department of Tourism (2009). Camarines Norte. Retrieved from: <http://www.tourism.gov.ph/sitepages/InteractiveSitesPage.aspx?siteID=27>

³⁸Department of Tourism (2009). Camarines Norte. Retrieved from: <http://www.tourism.gov.ph/sitepages/InteractiveSitesPage.aspx?siteID=27>

³⁹Camarines Norte Gov't. (2018). History of Camarines Norte. Retrieved from: <http://www.camarinesnorte.gov.ph/index.php/about/31-history>

⁴⁰Department of Tourism (2009). *Op. cit.*

⁴¹Philippine Statistics Authority (n.d.). Philippine standard geographic code: Camarines Norte. Retrieved from: <http://nap.psa.gov.ph/activestats/psgc/province.asp?provCode=051600000>

In terms of mineral resources, it is estimated that Camarines Norte's total metallic mineral reserves (which includes gold, silver, iron, lead, zinc, iron lump, bull quarts and iron in laterite) may amount to as much as 125.27 million metric tons. On the other hand, non-metallic mineral reserves in the province are estimated to amount to 274.93 million metric tons. These reserves include silica, sand, marbleized limestone, kaolin/white clay, refractory clay and diatomaceous earth.

b) Social characteristics

2016 data from the PSA⁴² reports that Camarines Norte has a total population of around 583,000. Among the six provinces in the region, Camarines Norte is fifth in terms of population count. Based on the 2010 Census of Population and Housing, the population growth from 2000 to 2010 translates to an annual population growth rate of 1.44 per cent, which is lower than the province's growth rate from the prior decade (1990 to 2000).⁴³

Based on the 2010 Census of Population and Housing, the median age in the province increased from 19.6 years in 2000 to 21.3 in 2010. This means that half of the population in the province is younger than 21.3 years old. Additionally, males outnumbered females in age groups from 0 to 59 years. However, there were more females in age groups from 60 years and above. This is indicative of the differing life expectancy rates for males and females.

People aged 15 years and below comprised 37.2 per cent of the total population in Camarines Norte, accounting for nearly two out of five persons in the province. The largest age groups in the province included children aged 10 to 14 years old (12.5 per cent), followed by children aged 5 to 9 years (12.4 per cent), and children aged 0 to 4 years old (12.4 per cent). On the other hand, only 6.9 per cent of the population are over 60 years old. This is typical in developing areas – the high fertility rates as well as the lower life expectancies contribute to the large population gap between younger and older age groups.

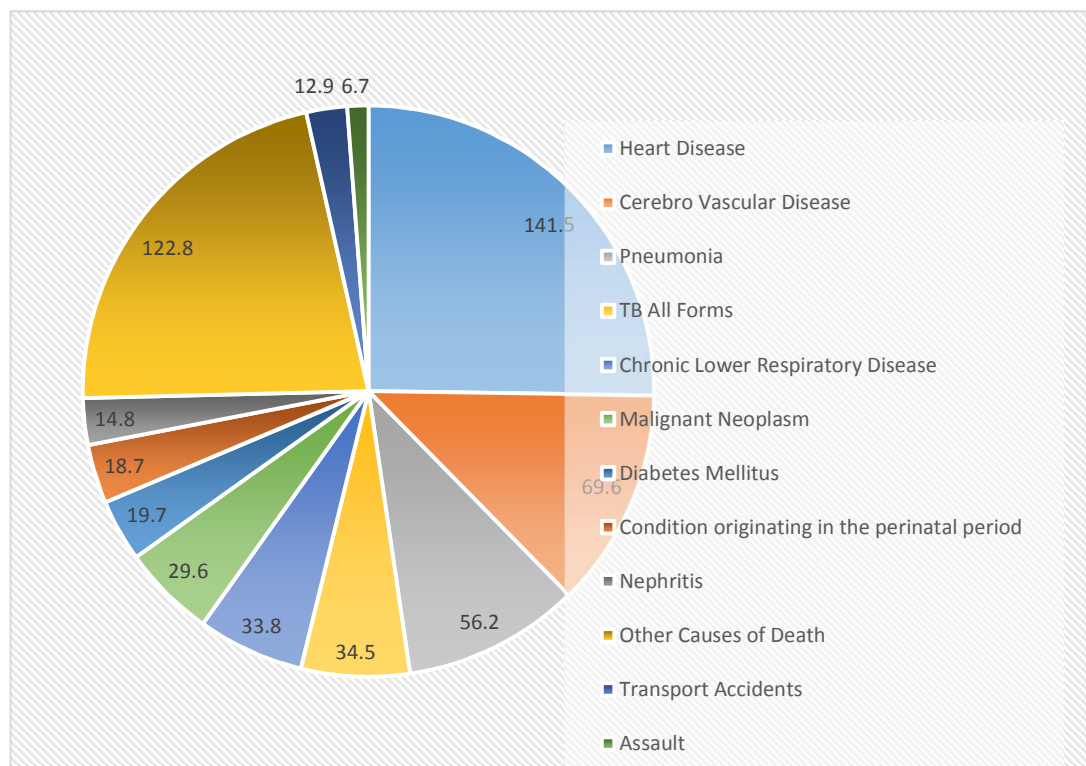
⁴²Philippine Statistics Authority (2016). Population of Region V – Bicol (based on the 2015 census of population). Retrieved from: <https://psa.gov.ph/content/population-region-v-bicol-based-2015-census-population>

⁴³Philippine Statistics Authority (2013). Population of Camarines Norte reached more than half a million (results from the 2010 census of population and housing). Retrieved from: <https://psa.gov.ph/content/population-camarines-norte-reached-more-half-million-results-2010-census-population-and>

The quality of life in Camarines Norte has also been improving in recent years. Life expectancy rates increased from 61.64 and 65.88 for males and females, respectively, from 2000 to 2005, to 65.94 and 70.18 from 2010 to 2015.⁴⁴ However, this is still lower than the life expectancy rates for the rest of the Bicol Region, where the average rates for 2010 to 2015 are 67.6 for males and 72.6 for females.⁴⁵

The 2013 Philippine Health Statistics Report from the Department of Health (DOH)⁴⁶ presents data on deaths caused by common diseases and illnesses (Figure 2). Heart disease remains the leading cause of deaths in Camarines Norte with 803 recorded deaths in 2013. This translates to a rate of 141.5 deaths per a population of 1,000. Aside from heart diseases, cerebro vascular diseases (medical conditions that affect the blood vessels in the brain) and pneumonia have also been identified as significant causes of death. Finally, the crude death rates posted for the same year is 6.3 deaths per a population of 1,000, which is still higher than the national average of 5.4.

Figure 2. Leading causes of death in Camarines Norte



⁴⁴National Statistics Office (2013). Camarines Norte quickstat. Retrieved from: https://psa.gov.ph/sites/default/files/attachments/ird/quickstat/Camarines%20Norte_14.pdf

⁴⁵Philippine Statistics Authority (2013). Quickstat on Region V – Bicol. Retrieved from: https://psa.gov.ph/sites/default/files/attachments/ird/quickstat/reg05_14.pdf

⁴⁶Department of Health (2013). The 2013 Philippine health statistics. Retrieved from: http://www.doh.gov.ph/sites/default/files/publications/2013PHScompressed_0.pdf

Data acquired from the study areas⁴⁷ also show the leading causes of morbidity for both infectious and non-infectious diseases. Table 2 outlines these diseases for both Paracale and Labo.

Table 2. Morbidity data, Paracale and Labo

Paracale morbidity data 2012							
Infectious diseases				Non-infectious diseases			
	Disease	No. of cases	Rate/ 10,000 pop.		Disease	No. of cases	Rate/ 10,000 pop.
1	Upper respiratory tract infection	14,650	2,825.07	1	Muscle pains	1,583	305.23
2	Acute viral influenza	606	116.66	2	Skin disease, all types	1,265	244.01
3	Diarrhea	532	102.61	3	Malnutrition	1,245	240.1
4	Pneumonia	248	48.1	4	Accidents, all types	1,042	201.01
5	PTB	181	35.1	5	Bronchial asthma	792	152.71

Most of the leading causes of morbidity data in the study areas are issues that can be linked with mining work and exposure to chemicals. However, data gathered in communities also suggest that most cases of morbidity and mortality in relation to mining are underreported – this is due to the fact that most mine workers are poverty-stricken and have limited access to health services. Moreover, a number of informants have suggested that mine workers who get into accidents, as an example, may be wary of reporting it to authorities due to fear associated with working illegally as miners. Finally, issues that may be linked with mercury use such as respiratory problems and skin diseases may not be attributed fully with confidence to exposure to heavy metals due to the bio-accumulative nature of mercury, such as symptoms may appear only years after initial exposure.

Although definitive data is lacking, circumstantial evidence point toward strong links between the leading causes of morbidity and mining work. Surveys conducted by BAN Toxics reveal that most mine workers attribute respiratory issues and skin diseases to their exposure to different fumes while working in mines.

⁴⁷Municipality of Paracale (2012). Municipal comprehensive land use plan 2013–2033. Municipality of Paracale.

4.1.2 Labo municipal profile

The Municipality of Labo is a first class municipality in Camarines Norte. By virtue of the Sangguniang Bayan Resolution No. 177-97 and Ordinance No. 108, September 8, 1800 is officially recognized as the municipality's date of creation.⁴⁸ Currently, Labo is politically subdivided into 52 barangays.⁴⁹

Like the neighbouring towns of Paracale and Jose Panganiban, there is a vast deposit of gold ore in the mountains of Labo. This, along with circling rumors of buried treasure in the area, has made Labo a popular destination for thrill-seeking treasure and gold hunters, both local and foreign.

a) Geographic characteristics

The municipality of Labo covers an aggregate land of 648.84 km² and is relatively located at the centre of Camarines Norte (Table 3). The town covers approximately 25 per cent of the province total land area. The land is generally rugged with rolling hills and mountainous terrain. Additionally, there are also small sections with relatively flat terrain.

Table 3. Municipalities in Camarines Norte⁵⁰

Municipality	Land area (km²)	Barangays
Basud	260.28	29
Capalonga	290	22
Daet	46	25
San Lorenzo Ruiz	119.37	12
Jose Panganiban	214.44	27
Labo	589.36	52
Mercedes	173.69	26
Paracale	197.9	27
San Vicente	57.49	9
Santa Elena	199.35	19
Talisay	30.76	15
Vinzons	141.43	19

⁴⁸Commission on Audit (2016). Labo, Camarines Norte Annual Audit Report. Retrieved from: https://coa.gov.ph/phocadownloadpap/userupload/annual_audit_report/LGUs/2016/Region-V/Municipalities/Camarines-Norte/Labo_CamNorte_ES2016.pdf

⁴⁹amarines Norte Gov't. (n.d.). Municipalities – Labo. Retrieved from: <http://www.camarinesnorte.gov.ph/index.php/municipalities/69-labo>

⁵⁰Philippine Statistics Authority (2017). PSGC: Camarines Norte. Retrieved from: [http://nap.psa.gov.ph/activestats/psgc/province.asp?provcode=051600000®Name=REGION%20V%20\(Bicol%20Region\)](http://nap.psa.gov.ph/activestats/psgc/province.asp?provcode=051600000®Name=REGION%20V%20(Bicol%20Region))

Labo is abundant with natural resources such as gold, nickel, iron, magnetite sand, copper, lead and manganese. As one of the provinces hotspots for ASGM, gold reserves in the municipality are plentiful. An assessment of mineral reserves conducted by the MGB in 2004⁵¹ estimated that gold reserves in the area may amount to at the very least around 1,340,000 metric tons.

b) Social characteristics

Labo consists of 52 barangays with a total estimated population of 101,082 based on 2015 data from the PSA.⁵² The municipality's population is dominated by males – 51.40 per cent of the population is comprised of males as opposed to only 48.6 per cent for females.⁵³ The town of Labo has consistently been one of the most populous towns in the province, with the 2010 census reporting that 17 per cent of the province's total population are centered in the municipality.

The literacy rates for the municipality of Labo are generally higher than the rest of the province. Most recent data from the PSA places the literacy rate in Camarines Norte at 93.00 per cent.⁵⁴ On the other hand, data from the same period reports a 98.7 per cent literacy rate for Labo.

The high literacy rates may be attributed to the number of educational facilities in the municipality (Table 4). In total, there are 71 day-care centres, 35 preparatory schools, 48 elementary schools, 12 high schools, 2 colleges and 3 technical vocational institutions in the municipality.

Table 4. Educational institutions in Camarines Norte

Level	Public	Private	Total
Day-care	71	N/A	71
Prep/Kindergarten	28	7	35
Elementary	46	2	48
High school	9	3	12
College	1	1	2
Technical-Vocational	2	1	3

⁵¹Mines and Geosciences Bureau – Region 5 (2004). Mineral resources of Bicol region. Retrieved from: <http://www.mgbregion5.ph/MINERAL-CN.PDF>

⁵²Philippine Statistics Authority (2016). *Op. cit.*

⁵³CBMS (2013). Community-based monitoring system data for Labo, Camarines Norte.

⁵⁴Philippine Statistics Authority (2012). Camarines Norte Quickstat. Retrieved from: https://psa.gov.ph/sites/default/files/attachments/ird/quickstat/Camarines%20Norte_8.pdf

c) Economic characteristics

Due to its location and population size, Labo has developed into an agricultural centre as well as a potential investment destination for businesses and various industries.⁵⁵ The freshwater bodies and mountains in the area have also become valuable sources of tourism revenues for the municipality.

Agriculture is the leading livelihood in Labo. Around 390.39 km² (roughly around 65.17 per cent) is devoted for agriculture crop production in the municipality, 343.46 per cent of which is dedicated to coconut plantations with 18.47 km² being dedicated for rice production. Other popular crops in Labo include bananas, pineapples and pili.

The abundance of agriculture as well as forest products have also led to thriving industries that produce different plant-based products. Locals are producing and marketing handicrafts due to the abundance of rattan and bamboo in Labo's forests. Additionally, other community livelihoods include processing forest and agricultural products such as pineapple and coconut for preserves, bamboo and wood for furniture, and pineapple weaving for traditional clothing such as the *barong tagalog* (embroidered formal clothing).

Finally, the abundant mineral resources in the municipality have also translated to valuable economic opportunities. At least ten barangays in the municipality have heavy SSM activities, which is directly related to the growth of the local jewelry-making sector. Essentially, the SSM industry in the municipality draws a significant portion of the population due to the abundance of resources as well as its accessibility to locals.

d) Public utilities and services⁵⁶

Transport accessibility in Labo is generally mixed. Although a number of barangays such as Poblacion can easily be accessed through a number of ways, accessing more far-flung areas such as Malaya may prove to be difficult. This may be due to a number of reasons, including the lack of proper road networks or public transport options.

Labo is serviced by buses, jeeps, vans and cargo trucks who traverse through the Maharlika Highway. The national highway passes through 17 out of the 52 barangays in Labo. For short-distance commutes, tricycle services are available in Poblacion as well as in nearby barangays.

⁵⁵Camarines Norte Gov't. (n.d.). *Op. cit.*

⁵⁶BAN Toxics (2017). Socio-economic profile: Labo, Camarines Norte.

In total, Labo's road networks amount to around 429.65 km, including 24.215 km of municipal roads and 405.435 km of barangay/provincial roads.

Only 36 out of Labo's 52 barangays are covered by local electricity supplier Camarines Norte Electric Cooperative, Inc. (CANORECO). This means that only 8,516 households or 50 per cent of the town's entire household population have access to electricity.

A significant portion of Labo does not have access to clean water with 29.2 per cent (around 5,669 households) do not have access to clean water. Moreover, 15.99 per cent (around 3,105 households) do not have access to sanitary toilets.

In terms of access to forms of communication, there are a number of options for the citizens of Labo as there are public calling spaces, a post office and a number of cellular mobile phone providers (Globe, Smart and Sun Cellular) in the area as well as local cable television signals. Additionally, there are a number of radio stations based in Labo.

e) Crime rates

Available data on the crime rates in Labo show fluctuating rates for crimes against persons⁵⁷ and properties.^{58 59} From 2007 to 2009, the crime rates for persons increased exponentially from 10.2 to 53.2. Crimes against property, on the other hand, have been less predictable over the years as shown in Figure 3.

In terms of security, available data from 2011⁶⁰ suggest issues with police coverage with the municipality of Labo only solving less than 50 per cent of the total recorded crimes. However, the Crime Solution Efficiency Rate recorded in Labo is similar to the rates recorded for the rest of the province.

⁵⁷National Statistics Coordination Board (2010). Crime against person. Retrieved from: <http://nap.psa.gov.ph/ru5/povmapping/camnorte/2007-2009/indicators/peaceorder1.htm>

⁵⁸National Statistics Coordination Board (2006). Crime against property. Retrieved from: <http://nap.psa.gov.ph/ru5/povmapping/camnorte/2003-2005/indicators/peaceorder2.htm>

⁵⁹National Statistics Coordination Board (2010). Crime against property. Retrieved from: <http://nap.psa.gov.ph/ru5/povmapping/camnorte/2003-2005/indicators/peaceorder2.htm>

⁶⁰Philippine Statistics Authority (2011). Crime solution efficiency rate. Retrieved from: <http://nap.psa.gov.ph/ru5/atlas/camnorte/crimesolve.htm>

Figure 3. Crime rates in Labo per 100,000 population



4.1.3 Paracale municipal profile

Paracale is a third-class municipality⁶¹ in Camarines Norte, which traces its roots back to 1581 when it was founded by Franciscan friars as a mission post.⁶² This eventually led to the establishment of Paracale as a full-fledged town in 1863. Today, the Municipality of Paracale has 27 barangays.

The town's name is derived from *para cale*, which roughly translates to "canal digger." The name comes from Paracale's rich history with gold mining when the Spanish colonizers discovered a large gold mine in 1626.

a) Geographic characteristics

Paracale covers a total land area of 197.9 km². The town is located in the northeastern coast of the province, and is bounded in the north by the Lamon Bay, Vinzons in the east, Labo in the south and Jose Panganiban in the west.

Despite the long history of gold mining in the municipality, gold reserves still remain abundant in Paracale. A 2004 assessment by the region's MGB⁶³ reports that the gold reserves in three barangays alone (Gumaus, Tugos and Sitio Tapukan) amount to as much as 533,172 metric tons.

⁶¹Camarines Norte Gov't. (n.d.). Municipalities – Paracale. Retrieved from: <http://www.camarinesnorte.gov.ph/index.php/municipalities/71-paracale>

⁶²Mines and Geosciences Bureau – Region 5 (2004). *Op. Cit.*

⁶³Camarines Norte Gov't. (n.d.). *Op. cit.*

b) Social characteristics

Paracale consists of 27 barangays with a population of 59,149.⁶⁴ The town is dominated by males with 51.5 per cent of the total population. According to the 2010 census, Paracale is the fourth most populous town in the whole province.⁶⁵

Literacy rates in Paracale are excellent. Based on CBMS data from 2016, there are 37,201 individuals who are considered literate out of the total over-10 years old population of 37,900. This translates to a literacy rate of 98.16 per cent, which is higher than the provincial average of 93.00 per cent.

According to 2015 data acquired from the local Department of Education (DepEd) office, Paracale is home to 23 public elementary schools and five schools offering secondary education. The teacher-student ratio for elementary and secondary schools is steadily improving with reports placing them at 1:38 and 1:44, respectively. However, these numbers are slightly lower than the national ratio of 1:35 in 2017.⁶⁶

c) Economic characteristics

Paracale's economy is driven by agriculture and mining. Being a coastal community, the town's proximity to bodies of water around the Pacific has also made Paracale an attractive destination for tourists.

Paracale is primarily an agricultural municipality with 2010 data from the Municipal Planning and Development Office (MPDO) reporting a total of around 41.2 km² of land being dedicated for agriculture, which translates to around 20.82 per cent of the municipality's total land area. Some of Paracale's major agricultural products include rice, corn, coconut, root crops and vegetables, and so on.

The mining sector in Paracale continues to thrive. Mining activities are scattered across the municipality with all 27 barangays having gold processing facilities. Additionally, the local quarrying industry is slowly growing with 2010 data reporting the existence of quarrying activities in at least six barangays in the municipality.

Finally, Paracale's proximity to bodies of water as well as the presence of historical monuments such as the Monument of the First *Bikolano* Priest in Poblacion Sur has made it an attractive tourist destination.

⁶⁴Philippine Statistics Authority (2013). *Op. cit.*

⁶⁵Jalandoni, A. (2017). DepEd, ipinagmalaki ang :135 teacher-student ratio. Published by ABS-CBN News. Retrieved from: <http://news.abs-cbn.com/news/05/17/17/deped-ipinagmalaki-ang-135-teacher-student-ratio>

⁶⁶Jalandoni, A. (2017). DepEd, ipinagmalaki ang :135 teacher-student ratio. Published by ABS-CBN News. Retrieved from: <http://news.abs-cbn.com/news/05/17/17/deped-ipinagmalaki-ang-135-teacher-student-ratio>

d) Public utilities and services⁶⁷

In terms of transport accessibility, Paracale is serviced by a total of 462 registered land transportation vehicles comprised of 27 buses, five jeepneys and 430 tricycles. Additionally, a total of 232 vehicles registered with other municipalities also pass through Paracale and provide transport services to and from nearby municipalities.

Tourist spots such as Macolabo Island can also be reached through sea transport available in the municipality. A motor boat with a 15 to 20-person capacity services the municipality with 3-4 daily trips, depending on the weather conditions.

Access to services such as electricity is limited in the municipality. Data from the MPDO report that only 58.74 per cent (around 3,418 households) of rural households are serviced by local electricity supplier CANORECO. Urban households, on the other hand, fare better – almost 74 per cent of the total urban household population have access to electricity in the municipality.

Like electricity, access to water is a significant issue in Paracale. 2017 data from the MPDO also reveal that only 45.4 per cent of the households in the area are supplied with water. Moreover, only 66.5 per cent of these households are equipped with sanitary toilet facilities.

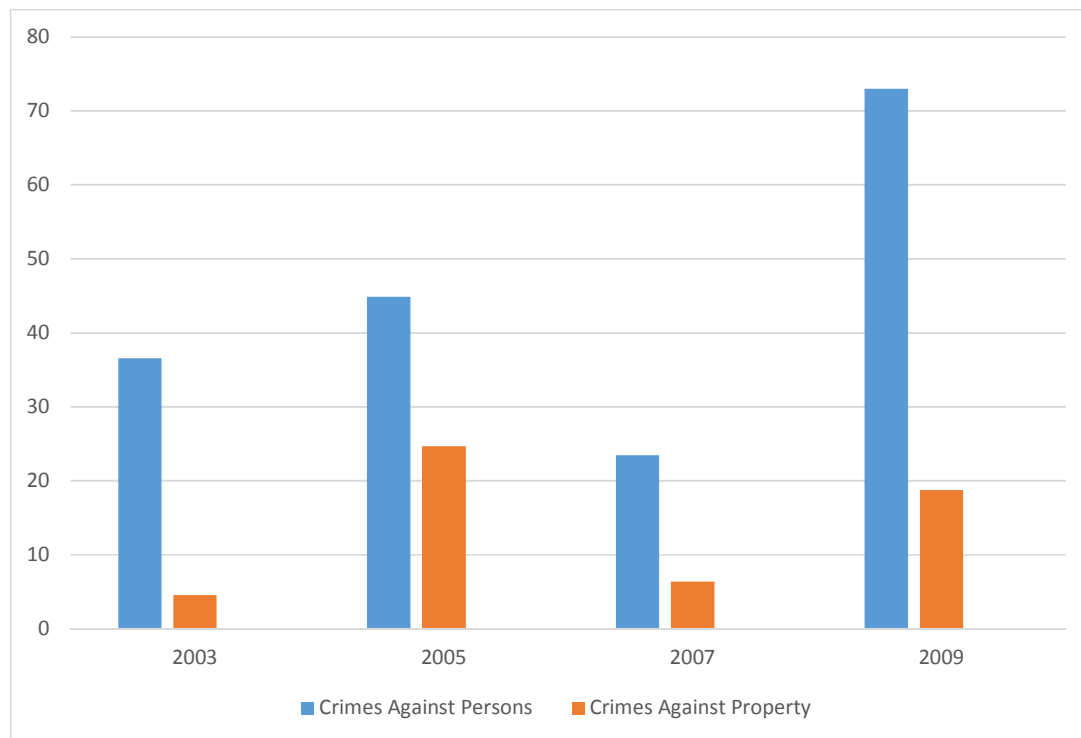
In terms of access to forms of communication, postal and internet services are readily available from the Philippine Postal Corporation as well as the growing number of internet shops in the municipality. Moreover, mobile communication services are provided adequately by Globe and Smart, the two biggest telecommunication companies in the country. Finally, the Paracale Cable Television Network provides access to locally-produced shows as well as major television networks such as GMA and ABS-CBN.

e) Crime rates

Similar to data for Labo, the rates for crimes against persons and properties in Paracale are fluctuating. Crime rates against persons for 2007 to 2009 jumped from 23.5 to 73.0 in the span of a year. On the other hand, crime rates against properties have fluctuated heavily from 2003 to 2009 as depicted in Figure 4.

⁶⁷BAN Toxics (2017). Socio-economic profile: Paracale, Camarines Norte.

Figure 4. Crime rates in Paracale per 100,000 population



Similar to the rest of Camarines Norte, 2011 data report that only less than 50 per cent of the total recorded crimes have been solved in Paracale.⁶⁸

4.2 Profile of small-scale mining in Camarines Norte

4.2.1 History of ASGM in Camarines Norte

Artisanal and small-scale gold mining in Camarines Norte traces its roots back to pre-colonial times. In fact, Aeta tribes have been settling and mining in Jose Panganiban, then called Mambulao – a name derived from the Bicolano word “mabulawan”, which means “rich in gold” – even before the Spanish colonizers came. These aetas were already digging open pits, canals and narrow tunnels for gold nuggets, which were eventually traded with Chinese merchants who regularly visited the area.⁶⁹

⁶⁸Philippine Statistics Authority (2011). Crime solution efficiency rate. Retrieved from: <http://nap.psa.gov.ph/ru5/atlas/camnorte/crimesolve.htm>

⁶⁹Calleja, D. (2012). Jose Panganiban: Bicol’s Gold.

When the Spaniards came to the Philippines in the middle of the 16th century, news of the rich gold mines in Camarines Norte prompted then-Governor-General Miguel de Legazpi an expedition led by Captain Juan Salcedo to locate the purported treasure. Captain Salcedo then went on to remark that the thriving gold mining settlements were of excellent quality with most tunnels reaching as much as 30 to 40 *estados* in depth⁷⁰ or roughly around 50 to 60 meters deep.⁷¹

At the turn of the 21st century, the Spaniards were gone and eventually replaced by colonizers from the United States of America, marking the beginning of the American occupation of the Philippines. For most of their five-decade rule, the Americans set-up huge dredges and mined primary lode deposits⁷² from the gold-rich areas in the region.

Today, the gold mining activities in Camarines Norte are centered in the towns of Labo, Paracale, Jose Panganiban and in Capalonga.⁷³ The small-scale gold mining sector, although operating informally continues to thrive centuries after the first gold mines were dug up in the region.

4.2.2 Demographics and types of mining activities and facilities in Camarines Norte

With the absence of a declared *Minahang Bayan* in Camarines Norte, SSM activities in the province remain informal. Although it is widely acknowledged that mining is filled with risks, the fact that mining activities in Camarines Norte are unregulated means that these mining operations may not necessarily comply with modern safety standards for SSM.

Small-scale mining in Paracale and Labo in Camarines Norte occur in the form of two major mining methods, namely, tunnel mining and compressor mining. Tunnel mining refers to the construction of either a drift (an underground mine driven horizontally into the ore seam) or a shaft (another underground mine with the vertical shaft as the main entry point) for mining. Tunnel miners usually end up digging for weeks and months on end before they can recover gold ores, and are exposed to various risks such as the possibility of tunnel collapse and suffocation, and so on.

⁷⁰Philippine Statistics Authority (n.d.) Historical background. Retrieved from: <http://nap.psa.gov.ph/ru5/overview/profiles/daet/history.htm>

⁷¹Bennett, J. (1824). *The American system of practical book-keeping*. Published by Collins & Hannay, 230 Pearl Street. Retrieved from:

https://books.google.com.ph/books?id=lfRCAAAIAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

⁷²Calleja, D. (2012). *Op. cit.*

⁷³Mayuga, J. (2017). *Bicol 'gold rush'*. Published by Business Mirror. Retrieved from: <https://businessmirror.com.ph/bicol-gold-rush/>

Compressor mining, on the other hand, is an informal and highly dangerous form of SSM where the miner is submerged underwater through small holes in the ground for hours on end. The name “compressor mining” is derived from the compressor machine, where a breathing tube is attached to give miners access to oxygen while staying underwater. Aside from the stressful working conditions associated with compressor mining, the risk of suffocation, drowning and underwater tunnel collapses are increased.

Gold processing facilities are scattered across the municipalities of Labo and Paracale, and are mostly located in residential areas. These include carbon-in-pulp facilities, and the more common ball mill facilities, which use mercury in processing gold. Most of these facilities are attached to their owners’ houses, and thus, pose significant risks to the health of the immediate family as well as their neighbours.

Due to the informality of the ASGM sector, there is no definitive statistical data on the total number of operational mine tunnels, compressor wells and gold processing facilities in Camarines Norte. However, data gathered by the BAN Toxics community development officer suggest a total of 90 registered ball mill facilities, and six gold processing plants in Paracale. Based on estimates from the community members, the total number of ball mill facilities may reach as much as 300-500 when accounting for unregistered facilities that operate in secret.

About half of the total population in Paracale are also engaged in SSM activities either as financer, mine worker, processor or independent gold panner. This assumption translates to a total mining population of about 16,815 local residents in the municipality who benefit from mining in one way or another. Local residents from the municipality of Labo, on the other hand are less dependent on mining with only around an estimated 10 to 20 per cent of the total population depending on mining for livelihood.

4.2.3 Status of formalization

Based on primary data gathered by the BAN Toxics community development officer in Camarines Norte, there are ten existing *Minahang Bayan* applications in the province.

For most of the applications in Camarines Norte, the main issue remains to be the lengthy approval and application process for a *Minahang Bayan* as well as the difficulty of acquiring consent permits, especially from large-scale mining operations who have ceased to mine in the area, but have possession of the Mineral Production Sharing Agreements covering the proposed *Minahang Bayan* areas.

Still, mining advocates in the province are hopeful that a *Minahang Bayan* will be approved soon. The PMRB of Camarines Norte note that a number of applications have successfully acquired consent permits from claim-owners and thus, have high chances of getting approved.

4.3 ASGM gold supply chain in Camarines Norte

4.3.1 Stakeholder groups in mining

There are a number of stakeholder groups present in Camarines Norte's SSM sector. In the study areas, the following stakeholder groups were identified:

a) Mining groups

Mining groups refer to entities or individuals who are directly involved in the production chain. The subgroups identified include:

Mining associations	Mining associations refer to community organizations formed by mining stakeholders such as mine workers, financiers, facility owners and other relevant community groups who advocate for the formalization of the sector and are responsible for lobbying and applying for the establishment of a <i>Minahang Bayan</i> .
Mine workers	Mine workers refer to individuals who work directly in the mine sites. These workers include those who go into tunnels or wells, operators of various equipment such as compressors and air blowers, and other auxiliary workers such as cooks and ore baggers. In Camarines Norte, most mine worker groups are referred to collectively as a corporation. Like in most situations, mine workers are generally the group most vulnerable to mining risks and horrible working conditions.
Financers	Financers are individuals who provide funding and capital for mining operations. Financing mining operations is a high-risk, high-reward venture, with most financers standing to lose huge amounts of money if mining operations fail. On the other hand, discovery of high grade ores can easily double or triple their initial investments.
Ball mill operators	Ball mill operators refer to individuals who own and operate ball mill facilities. These ball mill operators mostly process ores from operations they finance as well as from other individuals or groups who may want to have their ores processed.
Gold buyers	Gold buyers refer to individuals who engage in the business of buying and selling gold. A number of gold traders in Camarines Norte also take on other responsibilities as financiers or ball mill operators.
Women	Women play vital auxiliary roles in the SSM industry in Camarines Norte. Their roles as one of the most vulnerable subgroups in mining are outlined in Section 4.3.4(c) on Women and Mining.

Child labourers	Child labourers refer to children who engage or formerly engage in SSM activities. As discussed further in Section 4.3.4(d), child labour groups are among the most vulnerable sectors involved in SSM.
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b) Secondary economies

Secondary economies are considered valuable beneficiaries of increased mining activities. Although no data on the specific impacts of SSM have been recorded, the field surveys conducted by BAN Toxics noted that 86 per cent of the total respondents believe that secondary economies benefit from mining activities. These small-scale enterprises such as local *carinderias* and other establishments within and around mining communities experience increased economic activities whenever mine production is bountiful. Local government officials as well as different mining groups, through the various FGDs have also asserted the positive effects of SSM on the local economy.

c) Large-scale mining sector

The presence of the large-scale mining sector in Camarines Norte is minimal with most of the province's gold production being made by the SSM sector. According to interviews with relevant government officials from the municipal and provincial levels, most of the large-scale mining activities in the study areas have all but stopped in recent years. However, the sector still largely affects SSM due to the fact that most of the mining claims in Paracale and Labo are in the possession of large-scale mining corporations making the push for a local *Minahang Bayan* extremely difficult.

d) Philippine government

The government serves as the primary implementers for the various rules and regulations associated with SSM as well as direct beneficiaries of its activities through relevant fee and taxation systems as outlined in the law.

Because of the informality of SSM in Camarines Norte, the roles of the provincial government are limited – there are no existing SSM policies on the provincial level, and there are no immediate programmes and projects to benefit the sector. Moreover, the provincial officers who participated in the FGDs also noted that this is due to the national ban on SSM and the absence of a formal *Minahang Bayan* in the province. This, as noted during the discussions have also affected local revenues from SSM.

The LGU and related agencies, on the other hand, are taking a more active role in SSM. Although the informality of the sector has limited the actions that can be taken by the municipal government office, a number of officials from Paracale and Labo have been vocal advocates of the legalization of SSM in their municipalities. It is also

important to note that some government officials may have personal stakes in the sector, as former miners, current landowners or in some cases, beneficiaries of corruption in the sector.

If SSM is legalized in Paracale and Labo, the LGUs will stand to benefit from the mining activities through the relevant fees and indirectly by the increased economic activities in their municipalities.

e) The Camarines Norte Jewelry Producers Inc.

The Camarines Norte Jewelry Producers Inc. is a group of 24 jewelry manufacturers⁷⁴ who are based in the province. The association was formed in 1988. Although no current partnership with small-scale mines is in place, the association may serve as potential investors and partners should the sector be formalized.

4.3.2 The ASGM gold supply chain

a) General stages in gold production

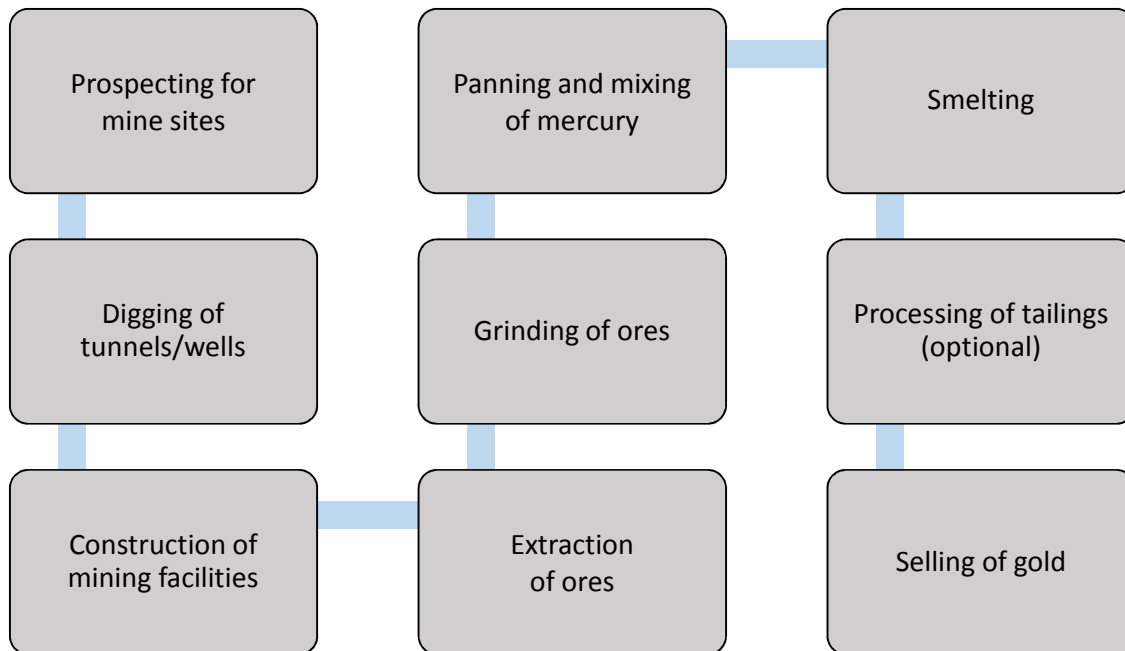
SSM in Camarines Norte predominantly takes the form of compressor or tunnel mining. Although specific processes may differ, the general stages in gold production are very similar.

Gold production in Camarines Norte begins with prospecting for possible mine sites (Figure 5). Once potential areas are identified, negotiations with the landowners (in cases where the financier does not own the land to be mined) commence. During this phase, essential details such as the scope of the mining area, and the profit sharing schemes acceptable to all relevant stakeholders are finalized.

Because SSM is still informal in Camarines Norte, no permit or consent is secured from the local government offices. Instead, miners begin operations as soon as the involved parties have agreed on their respective terms.

⁷⁴Manila Times (2009). Bulawan: The gold of Camarines Norte. Published by the Manila Times. Retrieved from: <https://www.pressreader.com/philippines/manila-times/20090905/281990373554504>

Figure 5. Gold supply chain in Camarines Norte



Most miners involved with tunnel mining typically spend the first few weeks preparing the mine sites and constructing mining facilities before actual extraction of gold. Miners go unpaid during this period as their income is heavily dependent on gold ores discovered. This income drought may stretch for months, if miners are unable to find ores.

Most miners involved with compressor mining, on the other hand, earn income faster. Although highly dangerous, compressor mines provide constant sources of income for miners because of how compressor mining can potentially produce small amounts of gold on a daily basis.

For both compressor and tunnel mining, the extracted ores end up in ball mill processing facilities where they are processed and prepared for sale. This stage is also critical as most of the mercury in mining is used during the panning and smelting stages for mercury. Additionally, most of the mine tailings produced in these ball mill processing facilities are sold to carbon-in-pulp facilities around the area, where they are further processed to recover materials such as more gold or silver.

b) ASGM gold trade

After gold is processed in Camarines Norte, a number of potential trade routes may be identified. This section discusses these trade routes as well as the specific gold-trading practices in the study areas.

Gold produced by mine workers are immediately sold to local gold buyers. At times, these gold buyers also double as shareholders – some gold buyers have been known to own ball mill processing facilities or rent out mining equipment such as drills and air blowers. These gold buyers earn income from their shares aside from the income they receive from trading gold. In the case of most compressor mines, however, the main gold buyers also double as financiers. This means that most of the gold produced at compressor mines go straight to the financiers.

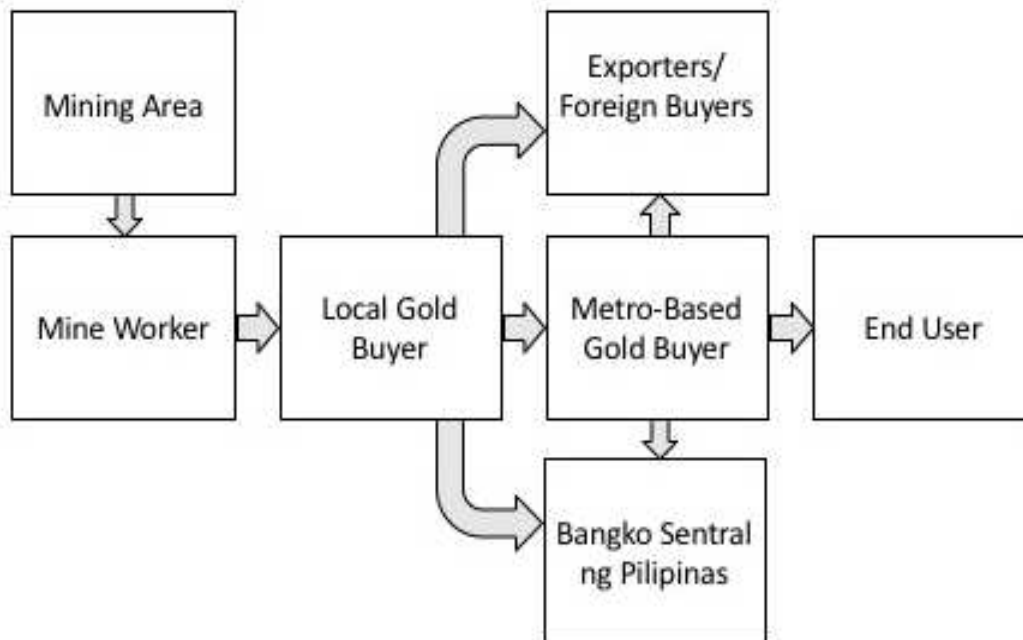
Gold acquired by small gold buyers are often sold to bigger gold buyers. Once this happens, a number of trade options become available. The three main routes for selling of gold identified during the FGDs and key interviews are exporters/foreign gold buyers, metro-based gold buyers and BSP.

The legal option is still to sell the gold to the BSP with a buying station located in Naga City being the nearest option. Although sale of gold to the BSP has stagnated in recent years, key interviews with local gold traders have revealed that the reductions in the tax rates (from a total of 7 per cent for the excise and creditable withholding taxes to just 3 per cent total) have made selling to the BSP an attractive option for gold traders. However, most gold buyers still choose to sell gold through illegitimate channels due to the relative ease of transacting with the black market. Additionally, the decrease in tax rates may only attract bigger gold buyers, as 3 per cent may still be considered too high by smaller gold buyers who depend on trading gold for their daily needs.

As illustrated in Figure 6, local gold buyers may choose to sell their gold to gold buyers based in Metro Manila as well as in nearby areas or to known exporters and foreign buyers. Based on information gathered during the FGDs, gold produced in Camarines Norte are often shipped to hot spots such as Binondo, Manila and Meycauayan, Bulacan, where numerous gold-buying shops and jewelry centres are located. These metro-based gold buyers have enough capital to purchase gold regularly, and a gold trader from Meycauayan interviewed by the research team noted that most gold buyers in the area are capable of affording transactions well over a million pesos or more than US\$20,000.

Metro-based gold buyers serve as critical points in the chain because of how they can decide where gold ultimately ends up in. These gold buyers consider a number of external factors when choosing who to eventually sell their gold to. Some of these factors include global prices, supply and demand, as well as local prices from interested sellers and the BSP. Thus, metro-based gold buyers may choose to sell their gold to jewelry shops and end users who need gold for personal uses, the BSP and to exporters and foreign buyers.

Figure 6. Gold trade routes in Camarines Norte



Respondent gold traders and miners noted that although foreign buyers and exporters play a significant role in the local gold mining industry, not many have directly negotiated with them. Speaking from experience, one respondent noted that known foreign buyers in Camarines Norte only engage with the biggest local buyers in the province. This means that only around three to five buyers have actually dealt with foreign buyers. The same respondent also noted how meticulous the process of dealing with foreigners is with the prospective seller needing to produce a number of documents before foreign buyers can consider working with them. Even then, the respondent noted that most of these deals are handled by local representatives who work for foreign buyers who take the gold to countries like Singapore and Hong Kong.

4.3.3 Wealth-sharing schemes and power distribution

This section discusses the power relations between the different mining stakeholders in Camarines Norte as well as the wealth-sharing schemes employed in the province. The impacts of the current sharing scheme on the marginalized mine worker groups will also be discussed.

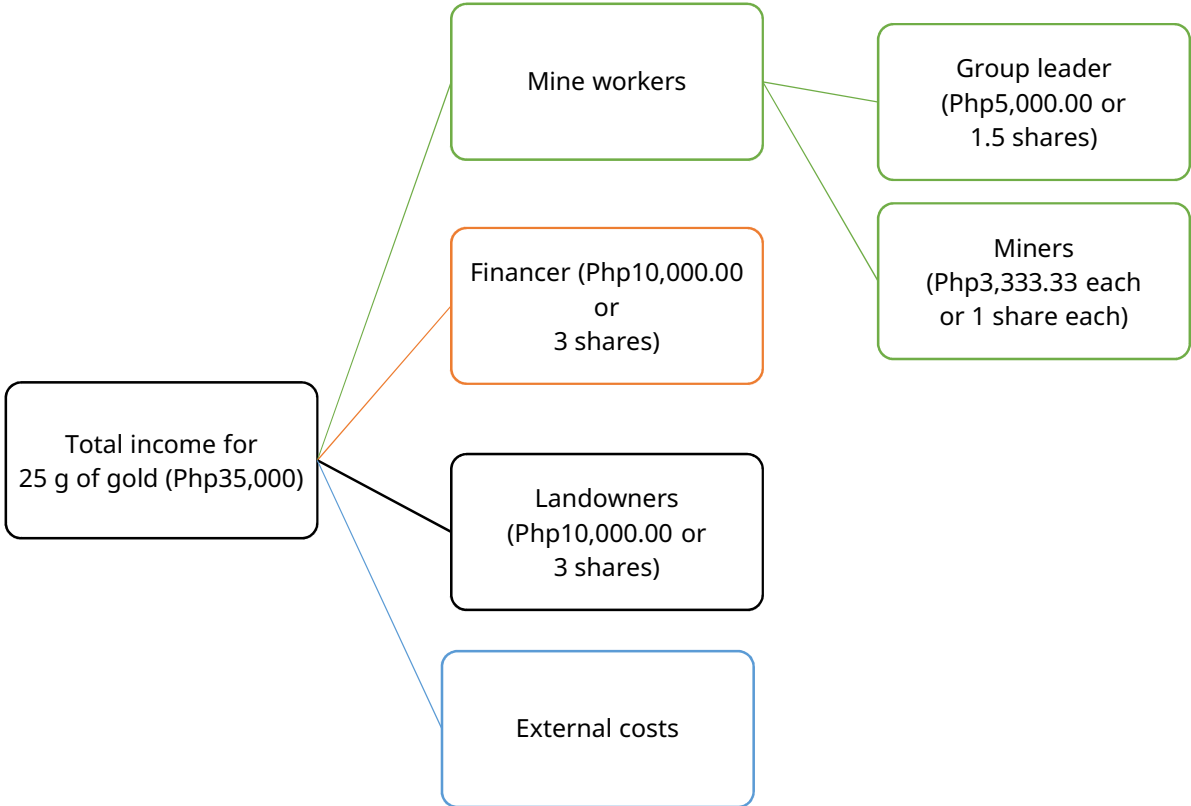
a) Wealth-sharing scheme

As mining in Camarines Norte is still largely informal, all of the profits generated from gold production is shared among the identified mining groups. However, there is no fixed wealth-sharing scheme – the percentage shares that each individual gets depends on the negotiations that take place before mining operations start.

Each individual involved in mining is allocated a certain number of shares. Landowners and financiers typically have the biggest number of shares given to them due to their initial investments and the fact that landowners own the land to be mined. Mine workers, on the other hand, are given shares depending on their roles and responsibilities in mining as well as their overall workload. This means that auxiliary workers such as cooks may be given less shares (if shares are negotiated for auxiliary workers instead of direct payments) compared to a mine worker who actually digs for ores. Additionally, shares may be allocated to individuals who rent out their equipment for use in mining.

Figure 7 outlines a hypothetical mining operation consisting of a financier, a landowner, a group leader and four mine workers with a total production of 25 grams of gold for a period of one month. This value is mostly consistent with survey results where the majority of respondents reported an average daily production of 1 g of gold. With the average price of gold at around Php1,400 per gram, this translates to a total income of Php35,000 for the mining operation for 25 days of work or roughly a month's worth of work.

Figure 7. Hypothetical wealth-sharing scheme in Camarines Norte.
Note that external costs are not accounted for.



The overall income generated from mining is divided depending on the number of shares. This means that if a mining operation has an accumulated value of ten shares, then one share is equal to the total profits divided by ten shares. Moreover, external costs such as electricity, water, food, mercury and other related expenditures are subtracted from the total profits before they are divided among the workers. For the purpose of this section, however, Figure 7 only outlines a prospective wealth-sharing scheme without taking into account these external costs.

If financiers and landowners are given three shares each, this means that they get around Php8,750 per month for a total production of 25 grams of gold. Group leaders typically get more shares each due to the added responsibility of overseeing the mining operations while performing other mining tasks such as digging for ores, and operating various mining equipment. All other mine workers may receive one share each, which translates to only around Php3,500 per month.

In a typical mining operation, both mine worker groups and financiers face considerable economic risks. Financiers shell out hundreds of thousands of pesos without certainty of a return of investment. Similarly, mine workers may accumulate huge debts from the financier during the first few weeks of tunnel mining when gold ores are yet to be found. This level of uncertainty in income generation for the miners is seen to heavily contribute to the cycle of poverty that they face. Still, even with the shared risks binding mining groups together, a number of other problems may arise due to the lack of standards in wealth-sharing as well as monitoring and regulation policies.

Sharing schemes in Camarines Norte are subject to negotiations, and it is important to note that the lack of standards mean that mine workers are vulnerable to exploitation. FGD respondents, for example, reported that although financiers usually receive two shares, it is extremely easy for abusive financiers to jack up the shares they receive at the expense of mine workers. Conversely, the respondents are also aware of instances where mine workers have stolen gold from financiers.

b) Power structures in mining

The power structures in mining communities in Camarines Norte is relatively straightforward with access to resources being directly correlative to the power or influence over the sector. This means that groups such as landowners and financiers have significant control and influence over the sector due to the fact that most of the valuable resources such as land and business capital come from them.

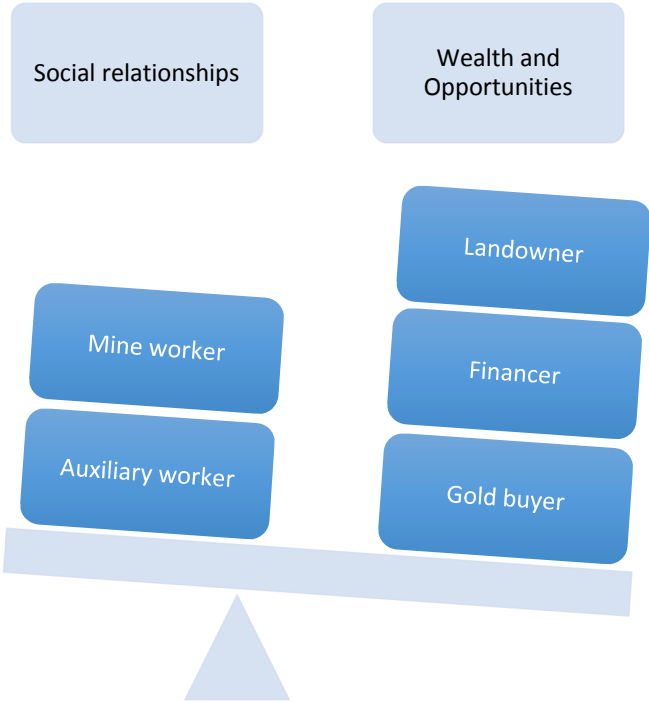
The influence of landowners and financiers are most apparent when discussing issues of income. This means that financiers and landowners may have the upper hand in discussing the number of shares allocated per individual, for example. It is important

to note, however, that instances of abuse of authority are extremely rare as noted during FGDs. Most financiers and mine workers understand the risks that each mining subgroup face, and are extremely helpful of each other most of the time.

As most of the gold buyers in Camarines Norte also double as financiers or owners of ball mill facilities, most of the shared ores from their mine workers go directly to them. Moreover, mine workers interviewed for the study generally feel that these transactions are fair. In contrast, mine workers interviewed in T'boli believe that some financiers/gold buyers may use their power to buy gold at lower prices from mine workers. This greatly affects the income of mine workers, and prevents them from pursuing valuable growth opportunities.

Essentially, power structures do exist in mining communities in Camarines Norte, but its economic impacts are not as apparent when compared to other mining communities (Figure 8). Still, these structures play a significant role in perpetuating specific industry practices. FGD respondents revealed that a major reason why mercury use remains prevalent in the province in spite of the efforts of various government and non-government agencies is the fact that mercury is at times sold by financiers, ball mill owners or gold buyers themselves. These mining subgroups inherently possess more influence than mine workers, and refusing to buy mercury from them may lead to mine workers losing their jobs.

Figure 8. Typical power structure in ASGM in the Philippines



4.3.4 Socio-economic conditions and practices

This section discusses the general working and social conditions in the mining communities of Paracale and Labo. The impacts of mining on vulnerable subgroups such as women and children as well as its effects on the community.

a) Working conditions

In the Labor Code of the Philippines,⁷⁵ mining is explicitly classified as a hazardous occupation. Miners, most specially those engaging in such activities in the ASGM sector are subjected to various risks and occupational hazards on a daily basis. Artisanal and small-scale gold miners present during the FGDs have noted that most of them are aware of the life-threatening nature of the occupation they are engaged in, but are however, left with no other viable livelihood option.

Mine workers in ASGM work extended hours in high-risk situations with daily wages that are equal only to the bare minimum, and because SSM is considered informal in the province, these workers are deprived of a number of social benefits and protection enjoyed by others. This also means that standards for the use of protective equipment, access to medical personnel, compensation and guidelines for safely undertaking mining procedures do not exist. Moreover, protection from crimes such as extortion, theft or workplace abuses are often not readily available.

Due in part to the informality of the sector, there are limited opportunities for mine workers to organize themselves. There are a number of mining associations in the study areas, but a significant portion of mine workers still do not engage in community organization activities. This is currently a challenging discussion, as current initiatives to strengthen ASGM associations and organizations are relatively new and still growing.

In between mining activities, the mine workers stay in make-shift shelters for the duration of the mining operation. Due to the location of mine sites, most of these shelters are built on unstable ground with risks of collapse in the event of heavy rains or heavy winds. Additionally, these shelters often do not provide adequate sanitation facilities such as toilets, which may contribute to the spread of illnesses around the mine sites.

⁷⁵Department of Labor and Employment. *Op. cit.*

Similar to mine shelters, the tunnels and compressor wells are likewise crudely built. Most tunnel openings are dug just big enough to accommodate mine workers who do not wear personal protective equipment when entering these tunnels, exposing themselves to occupational hazards that may include dust and particulate inhalation and other physical injuries due to falling rocks and debris. Apart from the equipment not being readily accessible, miners also feel that protective equipment can make maneuvering inside the tunnels more difficult for them. Moreover, some mine workers have also reported that some mine tunnels may even be constructed without timbering and linings in an effort to save resources. This places miners in an extremely risky situation, where the probability of tunnel collapses is exceptionally high.

When high-grade gold is found, miners often work extended hours with some reportedly working at least 15 hours a day. During the course of the day, miners may experience extreme temperature changes, difficulty of breathing, exposure to various chemicals and increased risk of acquiring workplace injuries. In the field surveys conducted by the research team, 33.74 per cent of the respondents admitted to experiencing at least a minor injury due to mining activities.

Due to work-induced stress, the intense physical exertion, and the difficult working conditions in mining, some miners resort to taking illegal drugs such as methamphetamines (known locally as *shabu*) to be able to continue working beyond normal work hours. Although local miners and government officials are aware of the issue of drug use in some mining operations, the informality of the sector makes it more challenging to implement monitoring and regulatory mechanisms that could prevent drug use in these communities.

In ball mill processing facilities, people are exposed directly and indirectly to various hazards and risks. 82.67 per cent of the total respondents have reported using chemicals such as mercury and nitric acid during gold processing. Most of the miners do not use protective equipment and instead handle mercury with their bare hands. This may be attributed to the fact that some miners may not be aware of the harmful effects of mercury. In extreme cases, miners may be aware of the effects of mercury, but are not concerned because of the absence of discernible immediate effects of mercury exposure in their bodies.

b) Socio-economic conditions in mining

Camarines Norte's rich mining history has made it one of the primary livelihoods for people in the province. This history is considered one of the primary pull factors for the sector – with traditional knowledge on mining being readily available, people looking for quick sources of income may turn to SSM to supplement their incomes. The

relatively easy accessibility to SSM has made it an essential part of the economy, with most engaging in SSM as their full-time or part-time jobs.

The income generated during mining differs depending on the type of mining engaged in. Results from the field survey show that around 70 per cent of tunnel miners earn around Php200-299 on a daily basis, which is close to the prevailing minimum wage rates in the province. On the other hand, around 60 per cent of compressor miners indicated daily income rates of less than Php200. Despite the differences in income rates, both miner groups have affirmed the inadequacy of their earnings to support their daily needs – most of the respondents have reported that mining income is enough to cover immediate expenses like education and food, but is not enough to cover emergency expenses such as hospital bills or to allow them to save money.

As income from mining is often inadequate and unreliable, most mine workers live subsistence lifestyles where acquiring daily needs such as food and water are dependent on the day's earnings. Still, most miners would choose to stay mining even when presented with other livelihood opportunities. Although the economic opportunities in mining are limited, the prospect of earning that big payday continues to lure more miners everyday.

Although many eventually succeed and lead more comfortable lives due to the “spoils” derived SSM, the industry is still predominantly a poverty-driven sector.⁷⁶ SSM continues to thrive in part due to the prevailing condition of poverty with most mine workers engaging in the sector because of the lack of available opportunities.

In truth, engaging in SSM can and does provide benefits to those involved in the sector. It, however, also endangers its workers while providing minimal productivity and little wealth accumulation opportunities.⁷⁷ Because miners are primarily concerned only of their subsistence needs, the current nature of the ASGM sector in Camarines Norte potentially places miners in a poverty trap, where getting out of poverty becomes an extremely difficult task.

⁷⁶Hentschel, T., Hruschka, F., Priester, M. (2003). Artisanal and small-scale mining: challenges and opportunities. Published by International Institute for Environment and Development. Retrieved from: <http://pubs.iied.org/pdfs/9268IIED.pdf>

⁷⁷Wilson, M., Renne, E., Rocnoli, C., Agye-Baffour, P., Tenkorang, E.Y. (2015). Integrated assessment of artisanal and small-scale gold mining in Ghana – part 3: social sciences and economics. Published by the International Journal of Environmental Research and Public Health. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4515713/>

Without adequate support from the government and the unpredictable nature of mining, most miners end up chasing that big payday for years with no result. Most miners spend their active working years living day-to-day with no hope of overcoming poverty unless they find high-grade ores. This is a reality that most mine workers are aware of, and although most would attest that they would choose mining over any stable job, the fact is that there are very little economic opportunities that are available for miners because of the lack of education and resources.

c) Women and mining

Women play an important role in Camarines Norte's ASGM sector with women most commonly performing auxiliary roles such as panning gold or preparing food for mine workers. Additionally, they play an important role in the secondary economies, as women most often operate eateries, and small-time stores that benefit mine workers and the community. Despite this, women in mining are often viewed as a subgroup of little importance.

Prevailing cultural views of women in Camarines Norte are a major factor in limiting the roles of women in mining. Although women are generally treated fairly in terms of allocating income shares, they are not given enough opportunities to grow in the sector. The FGDs revealed stark differences in perspectives with men generally agreeing that women are not capable of engaging in more physical activities. Women groups, on the other hand, reveal a legitimate desire to engage in more mining activities that they feel they can perform. This is based on the fact that some of the women respondents have reported previously engaging in heavy manual labour such as digging in tunnels. This difference in perspectives (and ultimately the lack of opportunities for women to engage in ASGM) points to a form of discrimination at work where they are prevented from engaging in labour due to their gender differences.

Despite being prohibited from engaging in a number of mining-related activities, the fact that women are being relegated to perceived 'lighter' tasks such as mixing of mercury and panning of gold means that women may be exposed to higher degrees of risks. The field surveys conducted in the study areas reveal that almost 73 per cent of the female respondents have handled mercury. Women are especially sensitive to the harmful impacts of mercury because of how, aside from the usual health risks associated with the chemical, it can greatly affect future pregnancies and childbearing capacities of women.

Another issue raised during the discussions with the mining communities is the growing problem with prostitution. This has become a lingering problem in informal sectors such as the ASGM communities in Camarines Norte where men are enabled and empowered by the income they earn to engage in activities that promote prostitution. More than the sexualized and objectified views of women in the sector, this also places

women in situations where they are at risk to acquire sexually-transmitted diseases, unwanted pregnancies, client abuse and other issues from which they are not protected from.

Although women involved in ASGM in Camarines Norte lack the institutional support and access to economic opportunities present in more formalized situations, women miners in the province have been consistently growing their presence in the sector. Various women's organizations have been put up to support women involved in mining, and there are also numerous women miners, landowners and financiers who are vocal about improving the situation of women mine workers in Camarines Norte.

d) Child labour in mining

Eradicating child labour has been identified as a key priority by officials in Camarines Norte during FGDs. This has translated to a number of local ordinances prohibiting children from engaging in SSM. Mine workers generally feel that there are adequate policies to protect children from engaging in child labour with local *barangay* security officers performing routine inspections at mines to ensure that mines are child labour-free. However, because of the lack of manpower and the informality of the sector, keeping children away from the mines has been challenging. Of the 43 field survey respondents who were below 18, around 63 per cent still worked at mines.

In Camarines Norte, children engage in mining at very young ages due to poverty. During the FGDs, most of the respondents reveal that they try to help their families in any way possible, and this includes taking several jobs in public markets, the coconut plantations, farms and mine sites, and so on. Most of these children are forced to abandon formal education opportunities, and the lucky few who get to stay in school or enroll in the government's Alternative Learning System (ALS) for adults still work during the weekends to supplement their families' income.

Children working in mines or conducting mining activities is considered one of the most hazardous forms and worst kinds of child labour⁷⁸, because it exposes children to a number of risks that are detrimental to their health, well-being and development. Child labourers are often confined to tasks such as carrying heavy sacks of ore, but it is also important to note that their presence in mining and processing sites render them vulnerable to exposure to other health hazards such as dust and mercury inhalation. In

⁷⁸International Labour Organization (n.d.). Hazardous child labor. Retrieved from: <http://www.ilo.org/ipec/facts/WorstFormsofChildLabour/Hazardouschildlabour/lang--en/index.htm>

recent years, a number of studies on the effects of carrying heavy loads reveal that a significant portion of children who carry backpacks regularly with an average weight of around 12 kgs suffer back pains by the age of 14 with an increased risk of acquiring spinal abnormalities.⁷⁹ Children who engage in mining may carry loads heavier than typical school backpacks. Moreover, children due to their size are sometimes tasked to enter tunnels or compressor wells. This puts children at considerable risk, and reports such as the death of 17-year-old Nel Pernecita⁸⁰ and his brother in 2014 due to suffocation in the mines depicts the reality that children and adults alike face inside the mines.

The harmful effects of child labour in mining are not limited to the apparent risks involved. Apart from the short- and long-term health effects, children are robbed of valuable opportunities for development. When children are taken out of the classroom, and put inside the mining area, the cycle of poverty is perpetuated as this essentially limits the options available to children when they grow up. Children are also robbed of the opportunity to enjoy their childhoods when they are “forced” to work at an early age.

e) The impacts of mining on the community

SSM is considered the primary livelihood for most of the people in Paracale and Labo. Moreover, the provinces rich gold mining history has made mining a source of cultural pride for many in Camarines Norte. As such, SSM has had various positive impacts on surrounding communities.

Aside from providing valuable economic opportunities, increased mining activities also translate to increased economic activities for communities. This means that secondary economies like local stores and eateries become indirect beneficiaries of SSM. Since the sector’s informality means that local governments do not benefit from ASGM taxes, the primary benefits that the LGU receives from the ASGM sector come from the increased economic activities.

The importance of SSM to the province cannot be overstated. As relayed by government officials from Paracale at one of the FGDs, the recent ban on SSM is considered a major factor for the increase in crime rates in the municipality. Without SSM, people have no other livelihood options available to them.

⁷⁹Stevens, J. (2012). Heavy school bags are “deforming” children as growing numbers suffer irreversible back problems. Published by the Daily Mail. Retrieved from: <http://www.dailymail.co.uk/news/article-2114118/Heavy-school-bags-deforming-children-growing-numbers-suffer-irreversible-problems.html>

⁸⁰Human Rights Watch (2015). Philippines: children risk death to dig and dive for gold. Published by the Human Rights Watch. Retrieved from: <https://www.hrw.org/report/2015/09/29/what-if-something-went-wrong/hazardous-child-labour-small-scale-gold-mining>

The effects of SSM to Paracale and Labo are not limited to economic impacts. The cultural pride that gold brings to the communities in Camarines Norte have also paved the way for festivals such as the *Pabirik* Festival of Gold, which celebrates Paracale's rich gold mining history. Moreover, this pride extends to the adoption of specific cultural practices such as *pangungulipaw*, where miners give shares of their income to their neighbours highlight how SSM helps strengthen community relations. This practice extends to wealthier financiers and mine workers who have been known to contribute to local development by funding public facilities such as paved roads, classrooms and hospitals. Moreover, these miners have been known to help neighbours in cases of emergencies as well as in giving assistance to struggling students within the communities.

Small-scale mining, however, may also impact communities negatively. Due to the lack of community awareness on the effects of mercury, most ball mill processing facilities are built in the backyards of miners themselves. This not only exposes the immediate mining family to mercury, but can potentially expose their neighbours to mercury through a number of ways including pollution of nearby water bodies, pollution of farm lands and air pollution.

In summary, SSM has had significant effects in shaping cultural practices and strengthening community relations. The role that SSM plays in the economy, albeit in its informal state, is essential because of how it is considered the primary livelihood for most in Paracale and Labo. However, due to its informality, mining communities are constantly at risk of exposure from harmful chemicals such as mercury, due to the proximity of ball mill facilities to residential areas as well as the lack of general awareness on the harmful effects of mercury use.

4.4 South Cotabato ASGM baseline information

This section provides an overview of the province of South Cotabato with a specific focus on the study area of T'boli. Presented are data gathered from secondary sources such as official data from the LGU as well as other relevant government agencies such as the PSA.

4.4.1 South Cotabato provincial background

South Cotabato is a province located in the SOCCSKSARGEN region in Mindanao – officially designated as Region XII in the Philippines. The province history traces its roots back to early Malay pioneers during pre-colonial times some of which later evolved into various ethnic groups that continue to exist to this day.

The turn of the 20th century also led to an influx of settlers coinciding with the development of trade and industries in the area.⁸¹ This population growth spurt eventually led to the declaration of South Cotabato as an independent province in 1966, when RA No. 4849 (An Act Creating the Province of South Cotabato)⁸² was enacted.

a) Geographic characteristics

The province of South Cotabato covers a total land area of around 3,706 km² and is bounded by the provinces of Sultan Kudarat, General Santos and Sarangani in the north and west, east and south, respectively. By sea, the province can be accessed through Sarangani Bay where the modern port of General Santos City is located.⁸³

South Cotabato is politically divided into 11 municipalities, namely, Banga, Koronadal City, Lake Sebu, Norala, Polomolok, Sto. Nino, Surallah, Tampakan, Tantaran, T'boli and Tupi. Lake Sebu is the biggest municipality with a land area of approximately 891.38 km² followed by T'boli with an area of 809.00 km². Table 5 outlines relevant geographic and statistical data from 2015 on South Cotabato's 11 municipalities based on information gathered from the PSAs 2015 data.

Table 5. Municipalities in South Cotabato

Municipality	Land area (km²)	Barangays
Banga	240.35	22
Koronadal City	284.25	27
Lake Sebu	891.38	19
Norala	194.4	14
Polomolok	339.97	23
Sto. Nino	109.04	10
Surallah	241	17
Tampakan	242.5	13
Tantaran	126	13
T'boli	809	25
Tupi	228	15
Total	3,705.89	199

The maximum daytime temperature throughout the province ranges from 36-38^oC, which drops to 23-32^oC during night time. Rainfall is more or less evenly distributed throughout the year and humidity is highest from June to October while humidity is lowest during February and April.⁸⁴

⁸¹The Provincial Government of South Cotabato (n.d.). South Cotabato history. Retrieved from: <http://www.southcotabato.gov.ph/south-cotabato-history/>

⁸²Congress of the Philippines (1966). Republic Act No. 4849. Retrieved from: <http://www.chanrobles.com/republicacts/republicactno4849.html#.Wk3QmVT1VE4>

⁸³The Provincial Government of South Cotabato. (2013). Geography. Published by <http://www.southcotabato.gov.ph/general-information/geography/>

⁸⁴*ibid.*

In terms of mineral resources, the province is rich in metallic and non-metallic mineral reserves. The municipalities of Tampakan and T'boli in particular are rich in gold deposits having significant deposits buried in the mountainous areas. The exploration activities of mining companies such as the Sagittarius Mine Inc. and Tribal Mining Corporation, revealed a total of 12.8 million metric tons of total copper reserve, 15.2 million ounces of total gold reserve, 2.4 million tons of inferred reserve of gold and about 2 million inferred reserve of iron.⁸⁵ Non-metallic resources in the areas, on the other hand, are comprised of sand and gravel, red clay, agricultural lime, shale, sandstone and jasperoid, which are all estimated at millions of metric tons.⁸⁶

b) Social characteristics

2016 data from the PSA reports that South Cotabato has a total population of 933,046. Prior PSA data from 2015 as presented in Table 6, also notes that South Cotabato is the second most populous province in Region XII with a growth rate of 1.86 from the year 2000 to 2015.⁸⁷ The growth in population is also reflected in the available information with 2015 data indicating a population of 915,289, while 2016 data indicates an increased total population of 933,046.

Table 6. Population statistics in South Cotabato

Municipality	Total population
Banga	83,989
Koronadal City	174,942
Lake Sebu	87,442
Norala	46,642
Polomolok	152,589
Sto. Nino	40,947
Surallah	84,539
Tampakan	39,525
Tantangan	43,245
T'boli	91,453
Tupi	69,976
Total	915,289

⁸⁵Data from the Provincial Environmental Management Office (PEMO) of South Cotabato.

⁸⁶Department of Health Regional Office XII: Cotabato City. (n.d.). *South Cotabato Province*. Retrieved from <http://ro12.doh.gov.ph/index.php/health-profile/provincial-profile/south-cotabato>

⁸⁷Philippine Statistics Authority. (2015). Census of Population.

Based on the 2010 Census of Population and Housing, the median age for the province's population is 22.2 years.⁸⁸ This means that half of the population is younger than 22.2 years, indicating a slight increase when compared to the median age of 20.0 years in 2000. Moreover, data shows that males slightly outnumber females in the province with a sex ratio of 105 males for every 100 females.

The largest age groups in South Cotabato are comprised of children. 12.1 per cent of the total population are children aged 0 to 4 years, 11.6 per cent are children aged 5 to 9 years and 11.2 per cent are children aged 10 to 14 years old. Conversely, only 5.9 per cent of the total population in the province is made up of individuals aged 60 or above.⁸⁹ This is similar to the situation in Camarines Norte where the high fertility rates and the low life expectancies are major factors in the gap between younger and older age groups.

The quality of life in South Cotabato is generally better when compared to the three other provinces in the region.⁹⁰ Comparisons of 2012 data from the PSA⁹¹ reveal that people in South Cotabato have longer life expectancy rates of as much as one year for both females and males.⁹² In general, the life expectancies for males and females in South Cotabato are 68.01 and 73.3, respectively.

Figure 9 outlines the top causes of death as well as the death rate per cause of mortality in South Cotabato based on the Philippine Health Statistics Report of 2013. Heart disease remains the leading cause of death in the province with cerebrovascular diseases and pneumonia among the top three death-causing diseases. The same report also places the crude death rate per 1,000 population in South Cotabato at 5.3, which is slightly lower than the national crude death rate of 5.4.

Table 7 also outlines the leading causes of morbidity in T'boli, South Cotabato. When compared to Camarines Norte, the leading causes of morbidity are similar – respiratory infections and skin diseases are both in the top five. This may be indicative of the risks faced by mine workers in both study areas.

⁸⁸Philippine Statistics Authority (2013). Population of South Cotabato was recorded at 830 thousand (results from the 2010 census of population and housing). Retrieved from: <https://psa.gov.ph/content/population-south-cotabato-was-recorded-830-thousand-results-2010-census-population-and>

⁸⁹Philippine Statistics Authority (2013). South Cotabato quickstat. Retrieved from: https://psa.gov.ph/sites/default/files/attachments/ird/quickstat/South%20Cotabato_17.pdf

⁹⁰Sarmiento, B. (2013). In region 12, quality of life better in South Cotabato. Published by MindaNews. Retrieved from: <http://www.mindanews.com/top-stories/2013/01/in-region-12-quality-of-life-better-in-south-cotabato/>

⁹¹Philippine Statistics Authority. (2012). Quickstat on region XII – SOCCSKSARGEN. Retrieved from: https://psa.gov.ph/sites/default/files/attachments/ird/quickstat/reg12_3.pdf

⁹²Philippine Statistics Authority. (2016). Quickstat South Cotabato.

Figure 9. Leading causes of death in South Cotabato

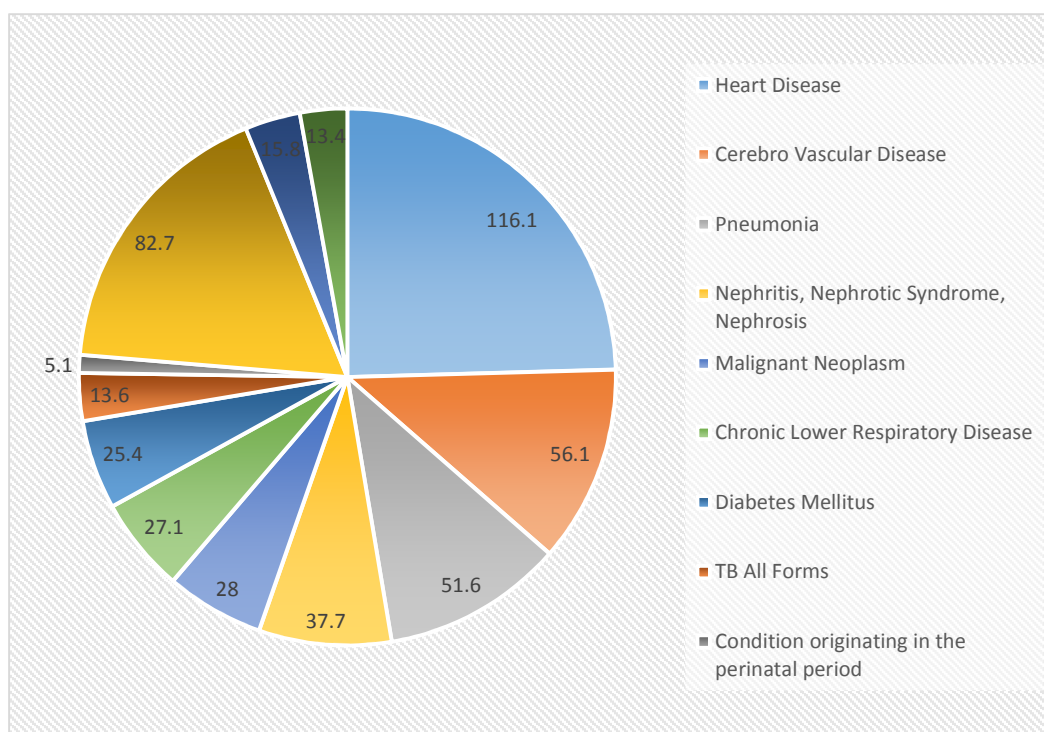


Table 7. Morbidity data, T'boli

T'boli, South Cotabato - morbidity data (year to follow)				
	Disease	M	F	Total
1	Acute upper respiratory infections	1,528	1,728	3,256
2	Pneumonia	310	303	613
3	Diarrhea	278	288	566
4	Hypertension	172	347	519
5	Skin disease	150	148	298

4.4.2 T'boli municipal background

T'boli is a first class municipality⁹³ in South Cotabato⁹⁴ that is predominantly occupied by indigenous groups such as the T'boli and the B'laan tribes. The municipality was created in 1974 under Presidential Decree No. 407. Currently, T'boli is composed of 25 barangays.

⁹³Philippine Statistics Authority (2015). List of municipalities. Retrieved from: <http://www.mtrcb.gov.ph/wp-content/uploads/2015/11/MUNICIPALITIES.pdf>

⁹⁴The Provincial Government of South Cotabato. (n.d.). *T'boli Fast Facts*. Retrieved from <http://www.southcotabato.gov.ph/city-municipalities/tboli/>.

The town is considered one of the foremost eco-cultural tourism destinations in South Cotabato, due in part to the rich history of its indigenous groups as skilled craftsmen. The T'boli are known for their embroidery, brass castings as well as other traditional crafts. The art of T'nalak tribal weaving, in particular is famous because of its dream-inspired and spirit infused designs.

a) Geographic characteristics

The municipality of T'boli covers a total land area of 809 km² and is located in the hinterlands in the southwestern portion of South Cotabato.⁹⁵ The land is characterized by rugged, rolling terrains, valleys and high slopes atop the various mountain ranges in the municipality.

T'boli is abundant in mineral resources. Gold reserves in the municipality are projected to be plentiful. In 2013, the Tribal Mining Corporation (TMC) – primary holders of the Mineral Production Sharing Agreement in the *Minahang Bayan* – estimate deposits of as much as 1.1 million ounces of gold and 3.3 million ounces of silver in the area.

b) Social characteristics

T'boli consists of 25 barangays with a total population of 91,453 and with a growth rate of 2.93. As of 2015, more than half of the population (52 per cent) in the municipality are male. Moreover, more than half of the total population (59 per cent) are considered part of the overall rural population.

Although T'boli is still considered predominantly rural, the majority of people have access to basic rights such as education. Based on data on literacy rates, most of the people from T'boli are literate, especially for younger age groups. As an example, Table 8 reveals that most children between 10-14 years old (89.86 per cent) are considered literate. This assertion is based on the DepEds definition of basic literacy as the “ability of a person to read, write and count.” However, these numbers are still lagging when compared to national averages – the then-National Statistics Office (now called the Philippine Statistics Authority) placed the national average literacy rate in 2010 at 97.5 per cent.⁹⁶

⁹⁵The Provincial Government of South Cotabato. *Op. cit.*

⁹⁶Desiderio, L. (2013). PH literacy rate improves to 97.5% - NSO. Published by the Philippine Star. Retrieved from: <http://www.philstar.com/business/2013/12/31/1273515/phil-literacy-rate-improves-97.5-nso>

Age group	Literate			Illiterate		
	Male	Female	Total	Male	Female	Total
10-14	4,576	4,524	9,099	644	382	1,027
15-19	4,163	4,252	8,415	434	347	781
20-24	3,407	3,249	6,656	411	328	739
25-29	2,799	2,457	5,257	339	256	594
30-34	2,530	2,174	4,704	298	415	713
35-39	2,109	1,848	3,957	426	425	851
40-44	1,636	1,359	2,995	358	431	789
45-49	1,189	830	2,019	328	493	821
50-54	739	508	1,248	364	417	780
55-59	558	371	929	221	277	498
60-64	330	237	567	260	321	581
65 and over	469	311	780	303	401	704
Total	24,505	22,120	46,626	4,386	4,493	8,878

Still, the state of education in T'boli is steadily improving with more schools being built in recent years. In fact, the number of primary education schools from both the private and public sectors increased from three to five and 49 to 57 respectively, when comparing the academic years of 2013-2014 and 2016-2017. Currently, there are 12 public schools that offer secondary education in T'boli with 19 other public schools offering senior high school classes.

c) Economic characteristics

The municipality of T'boli is known for its various agriculture production centres and mining development areas.⁹⁸ Moreover, its numerous attractions have made it one of the province's top eco-cultural destination for tourists.

Agriculture is a major part of the municipality's economy. Aside for its banana and abaca production centres, T'boli is also known for products such as tropical fruits, bamboo and rattan, and so on. The town's capacity to produce various plant-based products has also translated to other industries, most notably the local abaca handicrafts (*T'nalak*) industry for which the T'boli have been historically known for.

T'boli is home to a number of tourist spots, earning it the distinction of being one of the province's eco-cultural tourism destinations. Various areas such as the H'dak Falls and the Hikong Falls have vast tourism potential. Moreover, sites such as Lake Holon and Mt. Malibengoy are popular destinations for tourists.

⁹⁷*Ibid.*

⁹⁸Data from DPWH South Cotabato and 2nd District, Provincial Engineer's Office, MPDO provided by PEMO, T'boli, South Cotabato.

T'boli's abundant mineral resources have been valuable sources of livelihood especially with proper support from the government. Aside from the thriving small- and large-scale mining sectors, the establishment of the local Jewelry-making centre as well as the Kematu Mining Area's tourism potential point towards bigger developments for the local mining industry in the municipality.

d) Public utilities and services

The development of road networks in T'boli has been a priority for the LGU due in part to booming industries such as tourism, agriculture and mining. The continued improvement of the road networks is considered a key development in increasing the accessibility of the town's main tourist attractions and agri-businesses.

Data from 2015 suggest that the total road network in T'boli amounts to around 159.82 km covering a total land area of 895.830 km². These road networks include provincial roads (50.94 km), municipal/city roads (59.31 km) and barangay roads (49.57 km).⁹⁹ Popular modes of transportation in and out of the municipality include buses and vans, while public utility tricycles and motorcycles remain the primary choices for commutes within the municipality.

The 2017 Sanitary Report¹⁰⁰ prepared by the municipality show significant progress in terms of access to sanitation equipment. 96 per cent of the total household population have access to safe water. Additionally, 94 per cent of total households have access to sanitary toilets.

In terms of access to technology, the South Cotabato Electric Cooperative estimates that only around 25 per cent of the barangays in T'boli have access to electricity. This means that only 7,443 out of the 21,441 (roughly around 35 per cent) households had electricity in the municipality.

There still are existing issues in terms of access to other services such as internet and telephone connections. As recently as 2016, only 112 subscribers had access to landline telephone services. On the other hand, cellular data connections are also known to fluctuate despite National Telecommunication Commission data reporting a total of seven operational cellular sites/base stations in the area – two sites for Globe Telecom, three for Smart Communications and two for Innove Communications.

⁹⁹Golinggay, H. (2017). T'boli sanitary report 2017. Published by the Municipal Health Office – T'boli.

¹⁰⁰Tupas, E. (2017). PNP eyeing 1:489 police-to-population ratio by 2022. Published by the Philippine Star. Retrieved from: <http://www.philstar.com/headlines/2017/06/22/1712484/pnp-eyeing-1489-police-population-ratio-2022>

e) Crime rates

As of 2016, T'boli employs 50 police officers in the municipality accounting for a police to population ratio of 1:1865. In comparison, the national standard for police to population ratios in the country is set at 1:500.¹⁰¹ This means that the number of active police officers in the municipality are lesser than the Philippine National Police's preferred standards. Despite this, crime rates both index (crimes against persons such as murder, homicide, rape, theft, and so on) and non-index (violations of special laws such as illegal logging or local ordinances)¹⁰² are steadily decreasing with significant changes occurring in 2015 when crime rates decreased by more than half as shown in Table 9.

Table 9. Crime rates in T'boli per 100,000 population

Year	Population	Index crimes		Non-index crimes		Total	
		Volume	Rate	Volume	Rate	Volume	Rate
2013	83,577	236	282.37	223	266.82	459	549.19
2014	85,098	87	102.24	69	81.08	156	183.32
2015	91,453	150	164.02	115	125.75	265	289.77
2016	93,227	53	56.85	44	47.20	97	104.05

4.5 Profile of small-scale mining in T'boli, South Cotabato

4.5.1 History of artisanal and small-scale gold mining in T'boli

Artisanal and small-scale gold mining in T'boli traces its roots back to the mid-1970s, when the presence of pyrite in water bodies such as the El Lobog River and the Blangas Creek led to an influx of migrant workers who started panning for gold. This early discovery led to a growing interest in T'boli gold that culminated in 1980 when foreign investors started exploring the area for gold deposits.

As news of the discovery of gold in T'boli spread, mine workers from nearby cities started mining in the area. By the mid-1980s, the exploration for gold in the area intensified with the influx of interested miners coming from as far as Davao City. The continued proliferation of mining in T'boli eventually led to the establishment of ball mill processing facilities around the tunnels. At this point, ball mill processing facilities were not regulated as such most of these facilities were operating without proper licenses and documents.

¹⁰¹Senate Economic Planning Office (2013). Crime statistics at a glance. Retrieved from: <https://www.senate.gov.ph/publications/AAG%202013-05%20-%20Crime%20Statistics.pdf>

¹⁰²Kentucky Coal Education (1996). Glossary of mining terms. Retrieved from: <http://www.coaleducation.org/glossary.htm>

By the turn of the new decade, the municipality started integrating the growing SSM sector into its development plans. In 1990, T'boli's Comprehensive Land Use Plan designated an industrial zone for ball mill processing facilities, effectively gathering all the existing ball mill processing facilities into a centralized area. At the height of the gold rush in T'boli as much as 600 ball mill facilities were registered and operational.

In October of 1994, the local government's efforts to formalize SSM in T'boli culminated in the establishment of the locally-recognized 21-hectare *Minahang Bayan* in Kematu. Coinciding with the announcement, the municipality started implementing various rules and regulations for SSM, including the registration procedures and other requirements for potential mining operations. Today, the SSM sector in T'boli is thriving with continued support from the municipal and provincial government units.

4.5.2 Demographics, types of mining activities and facilities in T'boli

Legal SSM activities in T'boli are concentrated in the *Minahang Bayan*, which covers part of Barangays Kematu and Desawo. In total, the *Minahang Bayan* covers 21 hectares of land each in Desawo and Kematu with an additional 42 hectares being applied for *Minahang Bayan* status for a total land area of 84 hectares. There are currently seven mining associations handling the *Minahang Bayan* with only four of them being active at the time of the study.

The only legal form of SSM within the *Minahang Bayan* is tunnel mining, which pertains to either the construction of horizontal tunnels (called drift mines), and vertical tunnels (called shaft mines).¹⁰³ Similar to tunnel mining practices in Camarines Norte, miners often enter these tunnels and dig for weeks, creating multiple branch lines following the discovered gold veins. In total, there are 159 registered tunnels in the *Minahang Bayan*, including inactive mines.

Most of the mining tunnels are constructed with minimal equipment resulting in mine sites with substandard quality. Respondents from the FGDs report that most tunnel entrances are barely enough to fit a miner, and despite the numerous safety measures and regulations imposed by the government may still pose some risk to the miners.

¹⁰³Thrush, P. (1968). A dictionary of mining, mineral, and related terms. Published by the US Bureau of Mines. Retrieved from: <http://files.eric.ed.gov/fulltext/ED059035.pdf>

Gold processing facilities are located outside of the *Minahang Bayan*, and are concentrated in Barangay Edwards with a few more scattered across the municipality. These include ball mill facilities, which use mercury in processing gold and/or carbon-in-pulp facilities that are often located near public schools and residential areas with most facilities also doubling as residential areas for their operators and other mine workers. There are a total of 63 registered gold processing facilities in T'boli.

Although mine workers are required to register with the LGU before engaging in SSM, the actual mining population may still be difficult to estimate. At the time of this writing, only less than 200 mine workers were registered officially. A low estimate considering the number of active mine tunnels in the area. This may be attributed to the fact that a large number of mine workers working at the *Minahang Bayan* may be migrant mine workers who come from adjacent municipalities.

There are also a number of undocumented mining activities located outside of the *Minahang Bayan*. These activities are informal, and most are considered destructive. Aside from the construction of small mining tunnels outside of the designated *Minahang Bayan* areas, the proliferation of hydraulic mining is a persistent issue in the municipality.

Hydraulic mining or “banlas” in T'boli, refers to the use of high pressure jets of water to dislodge rock material and move sediments.¹⁰⁴ Continued use of hydraulics in extracting ores is destructive as it may eventually lead to an increased risk of flooding, erosion and the blockage of waterways. As such, it can potentially affect communities and livelihoods around the immediate area. Historically, hydraulic mining has been shown to cause irreparable environmental destruction with the California Gold Rush (which resulted in the flattening of hills and the gouging out of entire mountain sides, among others)¹⁰⁵ in the 1850s being a primary example.¹⁰⁶

¹⁰⁴Kiester, E. (1999). Turning water to gold. Published by the Smithsonian. Retrieved from: <https://www.smithsonianmag.com/history/turning-water-to-gold-170493109/>

¹⁰⁵Calisphere (2005). Environmental impact. Published by the University of California. Retrieved from: <https://calisphere.org/exhibitions/14/environmental-impact-in-the-gold-rush-era/>

¹⁰⁶Lacorte, G. (2014). A template for small-scale mines. Published by Inquirer.net. Retrieved from: <http://newsinfo.inquirer.net/655359/a-template-for-small-scale-mines>

4.5.3 Status of formalization

The *Minahang Bayan* in T'boli serves as the only SSM site in the country that is fully monitored and regulated by the local government.¹⁰⁷ However, the sector is only locally recognized. Currently, the LGU as well as the various mining associations in the area are waiting for a formal declaration from the DENR's MGB.

4.6 ASGM gold supply chain in T'boli, South Cotabato

4.6.1 Stakeholder groups in mining

There are a number of stakeholder groups involved in T'boli's SSM sector, including primary stakeholders who actively participate in the production chain, and secondary stakeholders who have vested interests in SSM.

In the study areas, the stakeholder groups identified are mostly similar with the groups present in Camarines Norte. However, due to the differences in context (for instance, the SSM sector in T'boli is locally-recognized) a number of stakeholder groups from T'boli may have different roles and responsibilities when compared to those in Camarines Norte. Moreover, stakeholder groups unique to the T'boli context such as the local jewelry association have surfaced due to strong institutional support. Overall, the stakeholder groups identified in T'boli include:

a) Mining groups

Mining groups refer to individuals and entities who are directly involved in the processes outlined in the production chain. Under the Mining Groups category, a number of subgroups may be identified. These include:

Mining association	Mining associations are associations that have acquired permission to mine within the designated <i>Minahang Bayan</i> area, and are usually comprised of a mix of mine workers, financiers, ball mill operators and tunnel owners, and so on. These associations are in-charge of preparing requirements (such as Community Development and Management Programme) for mining operations to begin. In T'boli's <i>Minahang Bayan</i> , there are seven existing mining associations.
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¹⁰⁷Sarmiento, B. (2013). T'boli miners to expand processing plant. Published by Minda News. Retrieved from: <http://www.mindanews.com/top-stories/2013/03/tboli-miner-to-expand-processing-plant/>

Mine workers	<p>Mine workers refer to individuals who are directly involved in the ore-extracting process. Inside the mining areas, these workers may be classified according to their tasks – <i>abanteros</i> refer to individuals who dig for ores, and <i>atraseros</i> refer to individuals who carry the extracted ores outside of the tunnels.</p> <p>Mine workers are generally the group most vulnerable to the risks involved in mining as they constantly work in extremely poor conditions.</p>
Financers	<p>Financers are individuals who provide funding and capital for mining operations. Financers may also be involved in mining through other ways by taking other responsibilities as outlined in the proceeding sections. Like in Camarines Norte, financers in T'boli can potentially earn a large amount of money depending on the gold ores discovered by the operations they fund. However, the downside is the fact that they are the most at risk of losing economic resources due to the uncertainty of discovering valuable ore.</p>
Ball mill operators	<p>Ball mill operators refer to individuals who own and operate ball mill facilities. Most operators also double as financers, tunnel owners and gold traders themselves. Aside from processing ores extracted from their own tunnels, ball mill operators may at times also accept ores from mining operators separate from their own.</p>
Tunnel owners	<p>Tunnel owners refer to individuals who exercise ownership over the mining areas. Although the responsibilities of the tunnel owner typically suggest that they are not directly involved in the production chain, the fact that most of them double as financers, ball mill operators and gold traders translate to bigger roles for them in the industry.</p>
Gold buyers	<p>Gold buyers refer to those individuals who engage in buying and selling gold. As most of them double as financers, tunnel owners and ball mill operators, most gold traders first acquire gold from miners who are directly employed under them. The role of gold miners as well as the nature of their operations is discussed further on Section 4.6.5(b) on power distribution and wealth-sharing.</p>
Women	<p>As further explained in Section 4.6.6(c) on Women and Mining, women play vital auxiliary roles in sustaining the SSM industry. Women are also considered one of the most vulnerable mining subgroups because of inherent gender biases.</p>
Child labourers	<p>As further explained in Section 4.6.6(d) on Child Labour and Mining, child labourers are again one of the most vulnerable subgroups in mining as child labour deprives children of valuable opportunities for development such as access to education and the chance to enjoy their childhood.</p>

b) Secondary economies

Secondary economies refer to small-scale enterprises who benefit indirectly due to the business generated by SSM. In T'boli, this may include small enterprises such as eateries and convenience stores. Although these secondary economies are not directly involved in mining, a change in the SSM industry will undoubtedly affect secondary economies. As an example, the decrease in employment in SSM will lead to a decrease in the income flows and potential clients for an eatery situated around the mining areas. Currently, data regarding the definite effects of the SSM industry on secondary economies is scarce. However, various stakeholders such as miners, and the local government assert that mining has impacted secondary economies positively.

c) Large-scale mining sector

The large-scale mining sector, embodied in the TMC, plays a vital role in ASGM-related issues because of its shared interests in the mineral reserves in the area. The presence of a thriving large-scale mining sector serves as a key point of consideration in formulating mining-related policies. In this sense, the large-scale mining sector exercises a semblance of political and socio-economic influence.

The TMC is also directly involved in the SSM industry. As primary holder of the Mineral Production Sharing Agreement,¹⁰⁸ the TMC has control over the *Minahang Bayan*. Thus, potential SSM operators are required to secure a consent permit from the TMC before they can start their operations.

d) Philippine government

The government serves as the primary implementers of the various rules and regulations for SSM. They are also beneficiaries through relevant fee and taxation systems in the sector. Despite the obvious benefits of allowing SSM, the government is also responsible for ensuring that SSM is undertaken in a way that is sustainable and in compliance with environmental and health standards.

The Philippine government, in the context of SSM in T'boli may be further classified depending on the scope of their responsibilities, their roles in SSM and their interests.

¹⁰⁸Maitem, J. (2014). South Cotabato firmly against open-pit mining. Published by Inquirer News. Retrieved from: <http://newsinfo.inquirer.net/652559/south-cotabato-firmly-against-open-pit-mining>

Provincial government and related agencies	Power is devolved from the DENR to the provincial government through the P/CMRB. The P/CMRB is typically composed of a DENR representative acting as the board's chairman, a representative of the
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	<p>governor or the city mayor, a representative each from the SSM sector and the large-scale mining sector, and a representative from relevant non-government organizations (NGOs). The P/CMRB is the primary implementing agency of the DENR.</p> <p>The Provincial government of South Cotabato takes a prominent role in the province's SSM issue as primary supporters of sustainable SSM in the province. Through its Provincial Environment Management Office, it has enacted several legislations such as the Provincial Environment Code and the ban on active open-pit mining.¹⁰⁹ The provincial government has been instrumental in the formalization of SSM in the sector as well as in the establishment of the <i>Minahang Bayan</i> on the provincial level.</p>
Local government unit and related agencies	<p>Finally, the local municipal government of T'boli serves as direct beneficiaries and overseers of the SSM operations in the area. Through the various agencies under it, as well as its partner agencies, the municipal government is responsible for ensuring compliance to various SSM policies and providing relevant programmes to the SSM communities and various related industries.</p> <p>The Municipal Environment and Natural Resources Office (MENRO) serves as the primary implementing agency for the protocols and procedures outlined in various SSM policies. The MENRO maintains a regular presence in the <i>Minahang Bayan</i>, and is in charge of monitoring the compliance of mining operations to the various requirements. Finally, the MENRO is also in-charge of ensuring that potential SSM operations are fit to operate before being given SSM municipal clearance permits.</p>

e) T'boli Jewelers Association (TJA)

The municipal and provincial governments have helped create a number of programmes in partnership with various agencies such as the Mines and Geosciences Bureau of the DENR, the Department of Trade and Industry (DTI) and the Department of Science and Technology (DOST), among others.¹⁰⁹ Under such initiatives, the T'boli Jewelers Association was established in 2015.

¹⁰⁹Sumagaysay, F. (2016). New production center for T'boli jewelers inaugurated. Published by The Provincial Government of South Cotabato. Retrieved from: <http://www.southcotabato.gov.ph/new-production-center-for-tboli-jewelers-inaugurated/>

The TJA provides opportunities to potential jewelry makers by giving free training sessions to members and serving as a venue for marketing their products. The association can also potentially serve a significant role in the DTI's emerging One Town One Product (OTOP) stimulus programme where jewelry is being targeted as T'boli's main product.

As of this writing, the TJA has been sourcing silver from large-scale mining firms such as TMC and has been focusing in silver-based jewelry making to improve their skills. Based on discussions with representatives from the TJA, one of the association's early goals is to gain enough capital and market contacts to start producing gold jewelry at larger quantities.

Although the TJA has no existing formal partnerships with SSM operations, there are a number of potential roles that it can play in the SSM industry.

4.6.2 The gold supply chain

a) General stages in gold production

Although there are a number of mining practices found in T'boli, including river sluicing and hydraulic mining, only tunnel mining within the confines of the *Minahang Bayan* is allowed. This section discusses the general gold production stages in formal scale-scale mining in the area starting from exploration to actual production.

The gold production process in T'boli is similar to that in Camarines Norte, and starts with locating possible tunnel sites within the designated *Minahang Bayan* areas. The main difference, however, is that mine workers from T'boli have also identified points in the chain where different legal obligations as part of being a formalized sector are fulfilled. Once potential areas are identified, consent permits will be acquired from the respective land owners. With proper consent from the land owners, miners will then continue to the trenching stage, where samples of the ore present in the area will be collected for assaying.

If the presence of gold ores is confirmed, miners then proceed to acquire the necessary permits from the authorities as discussed in Section 3.2. These include:

- Small-scale mining permit.
- Mineral processing permit (for ball mills).
- Ore transport permit.
- Business permit (barangay and municipal levels).

Simultaneously, the mining base is constructed around the tunnel area. Mining may start immediately as long as miners acquire a partial permit. Failure to acquire all

the requirements within the allotted timeframe will result in the revocation of the mining permit.

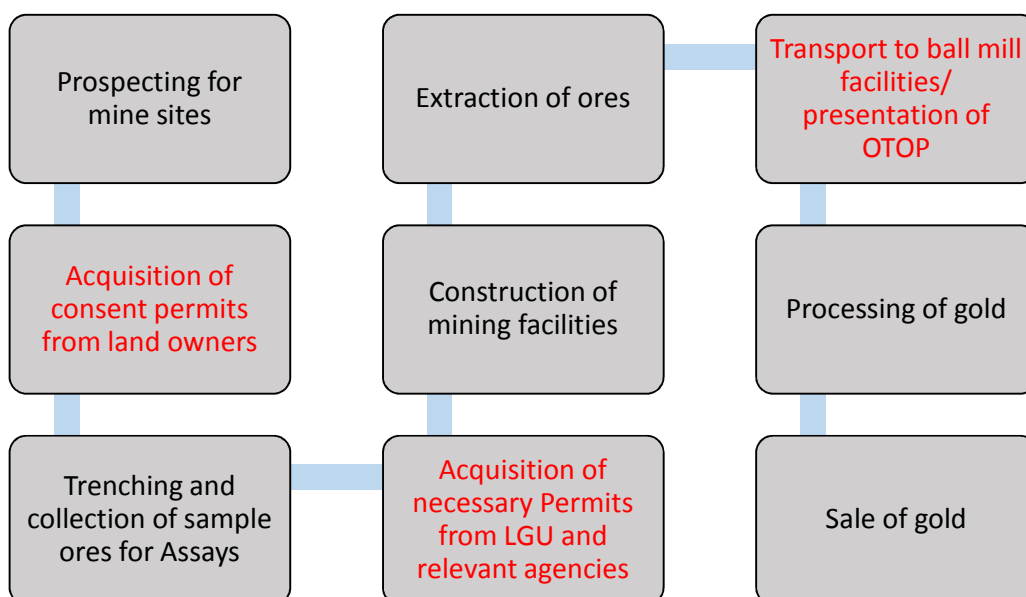
Once all the necessary documents are acquired, mining operations will formally begin. Miners typically mine for around a week to reach a minimum quota of 180 bags¹¹⁰ of ore with each bag weighing around 10 kgs each.

Once the miners are ready to process the ore, the miners will need to acquire a delivery permit from the mining association managing their respective tunnels. The delivery permit allows miners to take their ores outside of the *Minahang Bayan* for processing, and can be acquired by presenting the Ore Transport Permit to the association. Once acquired, the delivery permit will then be presented at the designated monitoring checkpoint, where inspectors from the Municipal Environment and Natural Resources Office of T'boli await. Aside from the regular site inspections, this also serves as the only stage for formal monitoring in the whole production chain. This is done due to the fact that possession of a delivery permit means that all other pre-requisite permits such as the Small-Scale Mining Permit and the Mineral Processing Permit, as examples, have already been previously acquired.

Once cleared, the gathered ore will be delivered to processing facilities, where they will be processed with ball mills and/or the carbon-in-pulp facilities. Additionally, information gathered during the FGDs suggests that the processing stage may be the only stage where mercury is consistently used. This may be due to the fact that mining sites are heavily monitored by the authorities. Ball mill facilities, on the other hand, may not always be monitored especially during the night (Figure 10).

After processing, the gold is then ready to be sold. Based on the data gathered in the field, there are a number of potential endpoints for gold. These include other gold traders based in T'boli, gold traders and jewelers based in the nearby Tagum City and the BSP. Potential trade routes are further explained in the proceeding section.

Figure 10. General stages in gold production in T'boli



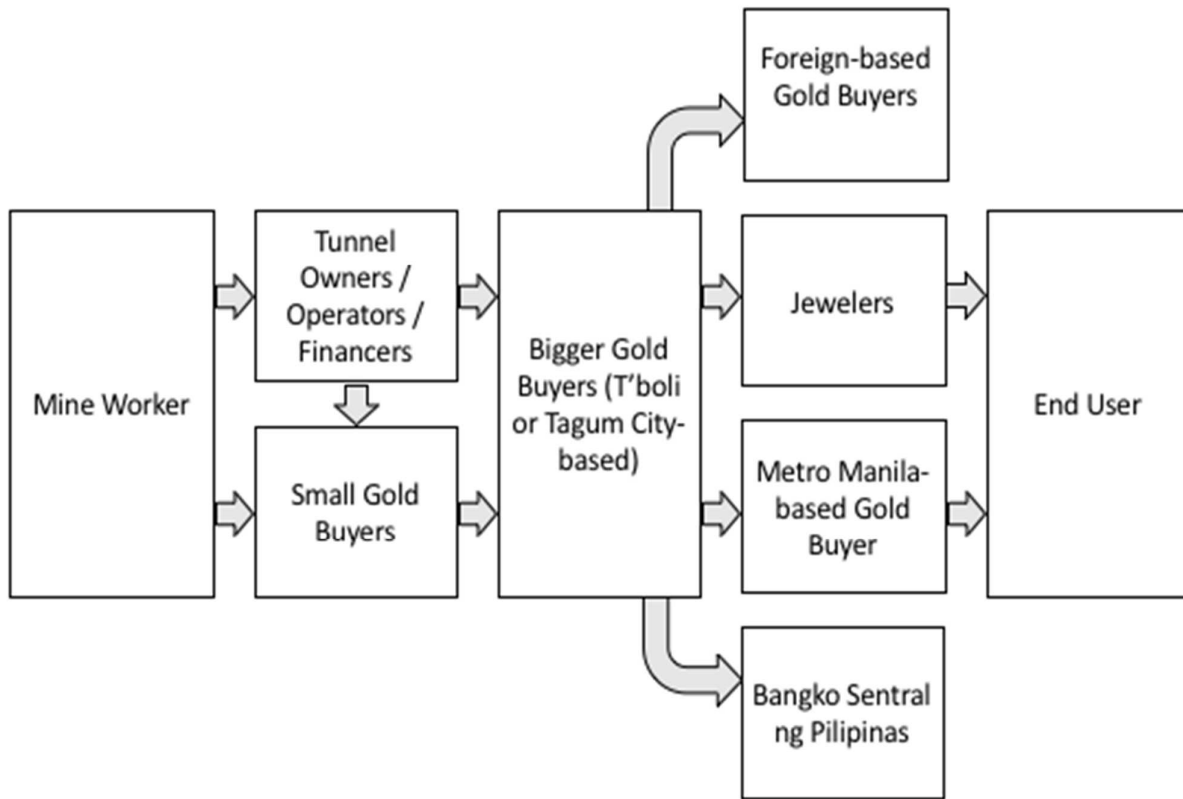
b) Gold trade in T'boli

This section discusses the existing trade routes for gold produced in T'boli, and highlights practices specific to the study areas.

As most primary gold buyers also double as tunnel owners and ball mill operators, a significant portion of the gold produced in small-scale mines go to them almost immediately after processing. This is generally true for most operations, except for mining operations funded by the miners themselves. However, this occurs only rarely as the pre-dominant set-up still revolves a financier-miner relationship.

Once gold is acquired by the primary gold buyers, there are a number of potential trade routes that they can explore (Figure 11). Small-time gold buyers usually sell their gold to bigger gold buyers based in T'boli. These bigger gold buyers usually hoard enough gold to maximize profit. In this case, these bigger gold buyers consider a number of factors including current global gold prices, the exchange rate, local supply and demand, as well as requirements from potential clients. Because several factors affect the potential income from gold trading, gold traders are also at risk of losing significant money should the market conditions experience abrupt changes.

Figure 11. Gold trade routes in T'boli



Based on primary data gathered in T'boli, bigger gold buyers also sell to what they believe are BSP-accredited gold buyers based in Tagum City. However, this may be inaccurate, especially as Tagum City is known for its connections to the black market for gold. In fact, a statement from a 2012 report¹¹¹ suggests that practically nobody in the area sells gold legally to the BSP, primarily because the black market does not impose taxes. Moreover, it is estimated that around 90 per cent of the total gold produced by small-scale miners go to the black market. It is then safe to believe that most of the gold traders in Tagum City may be selling their gold to other informal buyers, with a small portion selling their gold to the BSP.

Finally, the bigger gold buyers may also sell their gold to interested jewelers who are also based in Tagum City. Based on information gathered in the field, these same jewelers may also buy gold from the Tagum City-based gold traders alluded to previously.

¹¹¹Francisco, R. (2012). Special report: Philippines' black market is China's golden connection. Published by Reuters. Retrieved from: <https://www.reuters.com/article/us-philippines-gold/special-report-philippines-black-market-is-chinas-golden-connection-idUSBRE87M02120120823>

Based on the data presented, there are a number of potential endpoints for gold. If the gold finds its way to the BSP, it will then be refined to forms acceptable in the international bullion markets. On the other hand, if gold is purchased ultimately by jewelers, the gold will be turned into jewelry, with the endpoint being the consumers who purchase them. If the gold ends up in the black market, however, a number of possible endpoints can be identified.

Most of the small-time gold buyers in T'boli have reported that they do not know much about the existence of the black market for gold in Tagum City. Bigger gold buyers who have had personal transactions with the black market for gold, however, reveal that aside from the usual jewelers and Tagum-based gold traders, other significant players in the gold market include traders and jewelers based in Metro Manila as well as foreign buyers.

The existence of a large market for gold in Metro Manila is unsurprising, given that major jewelry centres and gold traders are based in the metro. These metro-based gold buyers play similar roles to bigger gold buyers from T'boli and Tagum by using market dynamics to decide whether to sell gold to the BSP, local jewelers or foreign buyers.

Finally, gold from the black market is purchased by foreign buyers and smuggled outside of the country. Gold buyers interviewed in T'boli report that most of the foreign buyers who are involved in the black market come from Hong Kong, which is similar to the findings in Camarines Norte. This claim is corroborated by various reports, most notably by data from the United Nations International Trade Statistics Database¹¹² which states that around US\$5.3 billion worth of gold were imported by Hong Kong from the Philippines from 2005-2015. Based on official records from the Philippines, however, only US\$1.1 billion of this is considered legal. The discrepancy between these values, which accounts for 79 per cent of gold mined in the country is an approximation of how much gold is smuggled to Hong Kong. Another report¹¹³ published in 2012 confirm Singapore as a destination for smuggled gold, while also adding Indonesia and Malaysia to the mix.

4.6.3 Wealth-sharing schemes and power distribution

This section discusses the power relations between the different mining stakeholders and how it relates to the wealth-sharing schemes employed in the mine sites. Furthermore, the impacts of the current schemes on the marginalized mine worker groups will also be discussed.

¹¹²Tiglaio, R. (2017). 79% of gold mined in PH smuggled to HK: \$4.2B or P200B from 2005-2015. Published by the Manila Times. Retrieved from: <http://www.manilatimes.net/79-gold-mined-ph-smuggled-hk-4-2b-p200b-2005-2015/313552/>

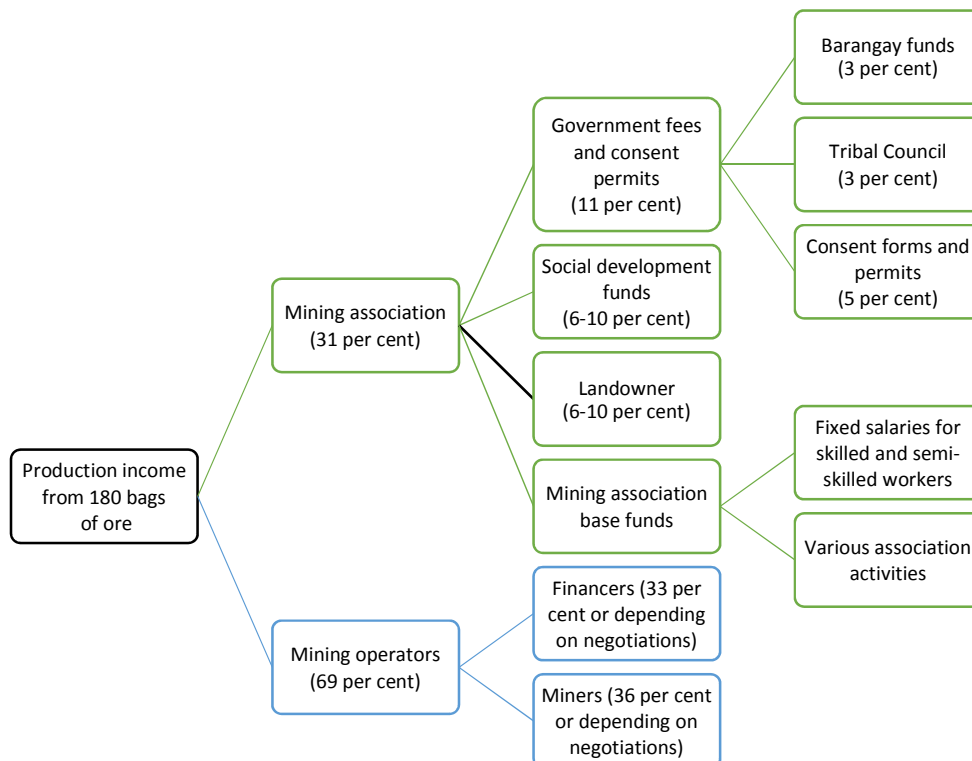
¹¹³Alave, K. (2012). Gone is the gold: the vanishing mineral riches of Eastern Mindanao. Published by GMA News. Retrieved from: <http://www.gmanetwork.com/news/money/content/283582/gone-is-the-gold-the-vanishing-mineral-riches-of-eastern-mindanao/story/>

a) Wealth-sharing schemes

In a typical mining set-up, profits from ore production is shared among the mining association, the mine workers, and the financiers. Although the sharing schemes among all operations and associations may vary depending on what is negotiated between the various stakeholders, a rough wealth-sharing pattern may be portrayed. Essentially, for a typical production of 180 bags of ore, around 69 per cent of the total ores gathered will benefit miners and financiers, with the remaining 31 per cent going to other stakeholder groups such as the mining association and landowners. The profits received by the mining association will further be allocated for a number of mining expenses.

Figure 12 provides a hypothetical outline of how the profits of a typical production of 180 bags of ore is shared across stakeholder groups. 180 bags roughly translate to a ton of ores, and is the required minimum volume before ores can be transported out of the *Minahang Bayan* and into the processing facilities. As ore production increases, the percentage shares of each stakeholder change. The funds received by mining associations remain consistent regardless of production numbers. This is because most of the fees and needs of the association remain unchanged regardless of production numbers, such as the costs for mining permits or the salaries of different employees remain the same and do not depend on production numbers. On the other hand, bigger production numbers mean more income for financiers, miners and landowners depending on their negotiated sharing percentages.

Figure 12. Hypothetical wealth-sharing scheme in T'boli, South Cotabato for 180 bags



The mining association, which takes care of applying for the various mining-related permits, gets around 31 per cent (including the shares of landowners) of the total haul of 180 bags of ore. The association uses the profits for its various activities, including paying the salaries of various skilled and semi-skilled workers employed under the association and as funding for the various fees and permits needed to be acquired.

Before mining operations begin, mining associations will have to pay a total of Php35,000 for all the associated government fees and consent permits. This will be paid regardless of whether or not mining operations are successful or not. As such, mining associations allocate percentages of the profits for various government fees and consent permits. This also serves as the only source of mining-related income for the LGUs.

The 11 per cent allocated for the various government fees takes will further be divided among stakeholders. Specifically, 5 per cent of the total shares cover funding for the different consent forms and permits, 3 per cent each go to the tribal council, and to the barangay.

10 per cent of the mining association profits will go to the social development funds, which will be used for the development and rehabilitation of the mine sites as outlined in the various documents submitted to the authorities such as the Community Development and Management Programmes (CDMP) and the Environmental Compliance Certificates (ECC). These projects are agreed upon within the association, and may range from environmental projects such as tree-planting activities and clean-up drives to development programmes such as building relevant social infrastructures such as school facilities.

Finally, the mining association may also use their funds for its various activities and for the salaries of its various employees. These skilled and semi-skilled workers may refer to managers, and accountants as well as other positions that may not be directly involved in extracting ores, but are nonetheless valuable positions that help sustain the SSM sector.

Skilled and semi-skilled workers are not limited to those employed by the mining association. This category may extend to auxiliary workers such as cooks, ore sack makers and other positions that may be needed in the mine sites. These workers are contracted by individual mining operations, and although most of these workers receive salaries regardless of the amount of gold produced, some may opt to receive ore shares instead. As noted during the FGDs, this too is subject to negotiations between the concerned groups.

Land owners typically get 6-10 per cent of the ores extracted from their areas. Financers, on the other hand, get around 33 per cent of the total income. Because most land owners also double as financers, the potential ores and profit they receive may reach as much as 43 per cent of the total haul.

36 per cent (subject to negotiations between the financier and the miner) of the total production profits go to the miners. Although 36 per cent may seem like a significant amount, it is important to note that most tunnels employ more than a few miners, with more miners being employed the higher the grade of the ore. This means that the income for mine worker groups will further be divided among the mine workers. As an example, for a typical tunnel which houses ten miners, each miner will only get 3.6 per cent of the total haul. Furthermore, this means that a mining tunnel with 10 miners employed needs to produce around 30 grams of gold per week (based on a per-gram price of gold of Php1,300) to provide income equal to the prevailing minimum daily wage rates of Php259 in the T'boli agriculture sector. Based on the hypothetical sharing scheme, this also means that only around 10-13 grams of gold will directly benefit miners. Even then, Php259 per day will never be enough to cover all the basic needs of a growing family.

The economic issues facing miners is aggravated by the fact that most mine workers accumulate large debts especially during the early stages of the mining operation, when miners do not typically find ores. During these times, most miners will borrow funds from their financers, with some informants noting that miners usually borrow P1000 to cover their weekly needs. At the end of the mining operations, the total debts incurred by miners will be subtracted from their total shares. If the mining operations end without any haul, miners will most probably be under large debts. Financers, on the other hand, will incur huge economic losses should the mining operation be unsuccessful.

b) Power structures in small-scale mining

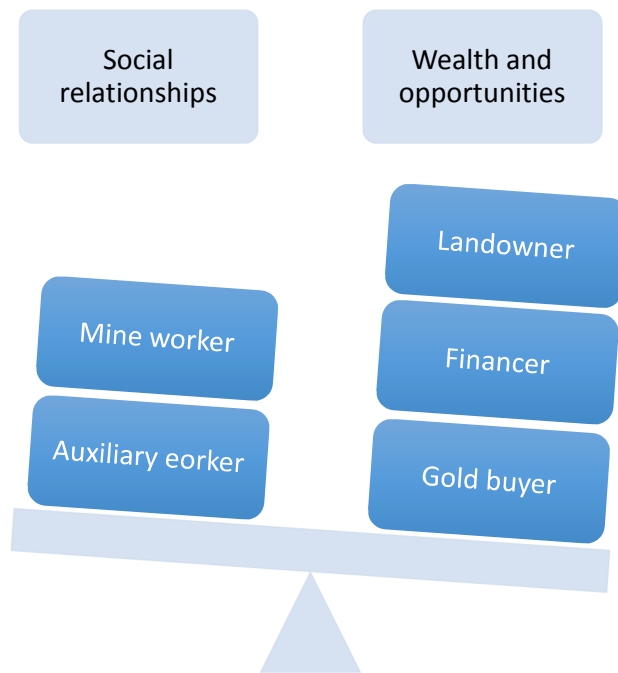
The level of influence exhibited by stakeholders in the mining sector is a driving factor that shapes the industry. Overall, the government exercises administrative power over the sector and its various stakeholder groups by virtue of its legislative mandate. This power is translated through the creation of various policies and programmes that benefit and regulate the SSM sector.

Although the government has authority over the sector, this does not mean that the government has full control over the sector. Policy decisions and programmes are negotiated between the government and mining stakeholders, and the government is tasked with ensuring that its decisions take into account the interests of these stakeholders. Failure to do so will almost always affect the government's programmes negatively. As discussed with the community, losing the support of mine tunnel owners,

for instance, has resulted in government programmes lacking support from the sector. On the other hand, support from miners have been known to translate to significant economic assistance from the sector with regards to government projects. In this sense, the relationship between the government and the mining sector has always been about using their respective power in negotiating terms and conditions for SSM.

For the groups directly involved in the production process, wealth is relative to the power or influence they have over the sector. As illustrated in Figure 13, existing power structures within mining subgroups in T'boli is similar to those in Camarines Norte. Mine workers who earn the least, then, exhibit the least amount of influence. Conversely, as financiers are responsible for giving capital to mining operations and are one of the groups who earn the most, they exhibit greater influence over the whole sector and other stakeholder groups.

Figure 13. Typical power structures in ASGM in the Philippines



How power influences the sector is apparent especially in specific industry practices, such as when miners sell their ores to their financiers for a cheaper price. Based on discussions with the community, miners may sell their gold to their financiers for as much as Php200 per gram less than the prevailing T'boli prices. In situations like this, the potential income for miners are significantly lessened. Thus, their capacity for self-improvement – like starting their own ball mill processing facilities, for example – is greatly lessened.

Likewise, bigger gold buyers from the black market have been known to take advantage of the exorbitant tax rates and buying policies from the BSP to force smaller traders to sell their gold for cheaper prices. This produces a chain effect, as both small-time buyers and mine workers lose a significant amount of money when selling to the black market by virtue of adding another middle-man to the chain. On average, small-time buyers also lose as much as Php200 per gram when compared to the prevailing prices in the black market.

It is important to note that power can be exercised and analyzed in a variety of ways. In the case of the miner-financer relationship, the power dynamic is still considered fair by mine workers. This is because of the fact that financers stand to lose significantly if mining operations fail, and because financers generally treat their miners well. Although financers exercise a semblance of power over mine workers, the shared risks between the two groups generally translates to a power dynamic based on mutual respect. Moreover, financers are generally wary of abusing power, as stories of miners cheating financers out of their profits due to abusive working relations (among other reasons) are plentiful. On the other hand, mine workers also believe that the influence exercised by bigger gold traders is unfair because of how it is perceived to be based mostly on economic capacity. A key contributing factor to this perception, as revealed during discussions with the community, is the fact that the risks associated with events such as failed mining operations are significantly lessened at the level of bigger gold traders.

The power dynamic in mine sites is inherently problematic because of how it, in some way or another, contributes to the poverty trap experienced by mine workers. By virtue of using power to influence the actions of other stakeholder groups, it contributes to perpetuating industry practices that hinder the development of the more marginalized groups. However, some power relationships – although biased towards a particular stakeholder group – may be perceived as mutually beneficial by the “weaker” group depending on a number of factors. In this sense, some power relations are perceived as less harmful, and are instead looked at as essential to sustaining the industry. It is then imperative to take into consideration cultural factors and stakeholder perceptions in analyzing what power relationships are beneficial, and what may be hindering factors in pushing for more equitable industry practices.

4.6.4 Socio-economic conditions and cultural practices

This section discusses the general working and social conditions in the mining sites in T'boli. Additionally, existing gender and child labour issues present in the mines will be discussed.

a) Working conditions

Artisanal mining places workers in extremely hazardous working environments. Although SSMs formalization in T'boli means that basic rights and services are upheld, the risks of entering tunnels remain the same. In fact, the conditions reported during discussions with T'boli miners are similar to those reported by miners in Camarines Norte. Mine workers operate in mine tunnels that are often only small enough for miners to fit in and the risk for tunnel collapse, oxygen deficiency, tunnel flooding, and various other accidents are amplified due to a number of reasons.

Similar to Camarines Norte, the mine workers in ASGM in South Cotabato also stay in make-shift shelters built around the mine tunnels for extended periods of time during mining operations. These shelters are often only good enough for shade and may not even provide enough protection from the elements. Moreover, most mining camps lack adequate sanitation facilities such as toilets, which can affect hygiene and health conditions in mine sites.

Whenever high-grades of gold ores are found, mine workers may work for as much as twelve hours a day, in many instances, even for longer periods. On regular days, mine workers work for eight hours or more, with little access to protective equipment and mining tools. Although wearing protective equipment is required by regulations, it may not always be complied. Discussions with the mining communities reveal that, at times, wearing safety helmets may make working especially in cramped tunnels difficult. A male miner shared that they, at times, prefer wearing the least amount of clothes possible to make tunnel mining a bit more comfortable. Essentially, the working environment in mine tunnels are at times even aggravated when using protective equipment because most mine tunnels do not meet acceptable standards.

As stipulated in RA No. 7076, small-scale miners should only rely on heavy manual labour using simple implements and methods.¹¹⁴ In practice, this has in certain ways, contributed to the poor working conditions in mine sites. Most miners work with hand tools, making digging for ore an extremely strenuous and time-consuming activity. Other activities such as carrying bags of ore are also done manually without the help of modern equipment, subjecting mine workers to high levels of physical strain.

¹¹⁴Congress of the Philippines (1991). An act creating a people's small-scale mining programme and for other purposes. Eighth Congress. Retrieved from: http://www.lawphil.net/statutes/repacts/ra1991/ra_7076_1991.html

At ball mill processing facilities, operators and miners alike are also exposed to various hazards and risks. Despite the ban on the use of certain hazardous chemicals in mining, the rampant use of mercury when processing ores continues, and this exposes workers to a number of health risks. An assessment of ball mill facilities in T'boli revealed an extremely high mercury levels. Considering the fact that there is no known safe levels for mercury exposure,¹¹⁵ workers continue to be oblivious to the tremendous risks of acquiring serious health problems particularly in the nervous, digestive, and immune systems, as well as the lungs, kidneys, skin and eyes.¹¹⁶

The risks involved with processing gold with mercury are compounded by the fact that most workers do not have access to appropriate protective equipment. Although ball mill facilities require the use of equipment such as safety boots and helmets, miners are often still unprotected from the harmful effects of mercury. In a discussion with the community, this may be attributed to a number of factors. Firstly, most miners and ball mill operators are not aware of the harmful effects of mercury. A recurring question during the FGDs involved respondents wondering why mercury was banned instead of cyanide. Respondents argue that they have not experienced any harmful incidents when using mercury, even when handling mercury with their bare hands. Additionally, most mine workers cannot afford adequate protective equipment, as most mercury vapor masks can cost as much as a week's income. This, along with the notion that mercury is not harmful, makes investing in adequate personal protective equipment an extremely difficult decision for workers.

Finally, a key benefit enjoyed by small-scale miners in T'boli is the existence of strong mining associations that have helped them engage in discussions with relevant government agencies and NGOs (among others) in lobbying for their rights. These associations generally ensure the fair treatment of miners, and are responsible for applying for the permits needed to engage in ASGM in the *Minahang Bayan*.

b) Socio-economic conditions in mining

Similar to the situation in Camarines Norte, SSM in T'boli is still primarily a poverty-driven sector that can potentially place miners and the vulnerable population in a poverty trap. However, the SSM sector in the area enjoys a number of unique benefits due to the state recognition of SSM as a formal sector.

¹¹⁵Bose-O'Reilly, S., McCarty, K.M., Steckling, N. and Lettmeier, B. (2010). Mercury exposure and children's health. *Current Problems in Pediatric and Adolescent Health Care*, 40(8), 186-215.

¹¹⁶World Health Organization (2017). Mercury and health. Retrieved from: <http://www.who.int/mediacentre/factsheets/fs361/en/>

In T'boli, most mine workers engage in mining at an early age to help supplement their familial incomes, either as a part-time venture or a full-time job. In most of these cases, the primary pull factors include the potential to earn big money through the discovery of high-grade ores, and the lack of other employment opportunities. There are already limited employment opportunities in predominantly-rural T'boli, and as most miners grow up without the benefit of formal education, most people turn to mining to generate incomes. Small-scale mining, on the other hand, is easily accessible as no expertise or advanced education is needed, and most work depends on physical strength and endurance.

The income generated through mining is barely enough for the immediate needs of the family. In the field survey conducted for this study, the majority of the miners indicated that the income they receive is mostly sufficient to defray their immediate needs for food and the schooling of their children. The majority of the respondents also noted that their income is never enough for them to generate savings or for taking care of other expenditures such as emergency hospital bills. Moreover, the income generated from mining is largely dependent on production levels. This means that miners, at times, spend weeks or months digging continuously without earning any income. In fact, the results of the field survey also indicate that more than half of the miners interviewed agree income from mining is unreliable. To make ends meet, most miners borrow money from mining operation financiers, further placing them in debt.

The uncertainty and inadequacy of mining-related income explains why most mining families are barely meeting their basic needs and have little hope of overcoming poverty. Additionally, the inherent costs associated with mining (such as the health risks) not only exacerbate the poor economic conditions that miners face, but contribute significantly to their marginalization. A scenario where a miner unable to afford hospital bills, is left with major avoidable disabilities due to mining-related accidents is may not be far from reality. In such cases, the miner is robbed of their only accessible source of income as well as the right to a quality life.

Despite the numerous factors that place miners in a disadvantaged position, the locally-recognized mining operations in T'boli have provided the miners with the opportunity to enjoy a number of benefits not seen in other SSM sites. Most of the miners surveyed indicated that they are satisfied with the "employee-employer" dynamics in their areas with most financiers willing to provide support whenever accidents or emergency needs arise. Although miners have mixed responses when asked about existing trainings and capacity-building initiatives as well as financial help from the government, a significant portion of the respondents also believe that the government provides adequate support in terms of protection from crimes and financial support especially during medical emergencies.

c) Women and mining

With adequate government support for SSM in T'boli, women enjoy substantial opportunities in the SSM sector. Aside from actual heavy mining labour such as extracting and carrying ores, most women find decent auxiliary jobs in support of the industry. These jobs not only include part-time ventures such as sewing of ore sacks and cooking food, but also full-time work including taking care of the accounting needs for various mining associations and serving as managers for various mining-related entities and operations.

Aside from engaging in valuable mining-related work, women are very visible as owners of tunnels and ball mill operations as well as active participants in discussions with relevant stakeholders such as the LGUs and other NGOs. Moreover, women make up a significant portion of the secondary economies associated to mining. This includes various *carinderias*, *sari-sari stores* and other related services. Women are also key figures in T'boli's thriving jewelry industry. The T'boli Jewelers Association, for example, is led by women, with the organization holding a firm belief that the creativity that T'boli women possess is a valuable asset in the field of crafting jewelry.

Despite the fact that women are more involved in the SSM sector more than ever, the industry as a whole is still dominated by men. Based on primary data gathered through field surveys, women in T'boli generally feel that there are not enough opportunities extended to women in mining. This may be due to the fact that women are viewed as incapable of performing heavy tasks. Additionally, cultural factors may have major effects on how women are viewed in the context of mining – the view that women should be taken care of is still very prevalent among male miners, and a significant portion of miners still believe that allowing women entry into mine sites is bad luck.

Different socio-economic as well as cultural factors contribute to the discrimination that prevent women from accessing equitable opportunities in mining. However, the conditions present in T'boli suggest that the sector is actively working towards the betterment of the conditions of women in mining. The fact that several women hold important positions in the sector, with some even owning more prominent ball mill operations and tunnels, is indicative of this fact.

Similar to the mining communities in Camarines Norte, a key gender concern that endures indirectly because of the mining industry in T'boli is the problem with prostitution. Prostitution in itself is not a product of the mining industry that is the issue persists regardless of whether or not the mining sector thrives. The role of the mining sector in prostitution, however, is clear – the gains that men receive from mining enable and empower them to perpetuate the informal prostitution sector especially in nearby cities such as Koronadal.

Although women generally hold a more prominent role in T'boli's mining sector, prostitution, although not widespread is an issue that can potentially contribute to a lingering sexualized view of women in the sector. Besides the fact that women who are involved with mining are at risk of having to deal with this kind of treatment those who engage in prostitution are themselves left unprotected from the risks involved. Since prostitution is illegal, there are no safeguards in place in case sex workers are subjected to maltreatment from clients, unwanted pregnancies and sexually-transmitted diseases, and so on.

In summary, cultural views of women may at times hinder them from accessing other opportunities because of the prevailing view that women, solely because of gender and physical differences may be unable to perform certain jobs. Despite this, women engaged in T'boli's SSM sector can still enjoy prominent roles, and are given relatively adequate chances for self-development because of the increasingly progressive views of relevant mining stakeholders. Perhaps the biggest problem facing the sector is the fact that it is still not safe from overarching gender issues of objectification that are exemplified in the persistence of problems such as illegal prostitution, and so on. This points to greater issues with gender that are beyond the mining sector and the municipality.

d) Child labour in mining

In T'boli, the *Minahang Bayan* is strictly monitored by the authorities led by the PMRB and the Provincial Environment and Management Office (PEMO). The MENRO which handles most of the policy implementation, maintains almost a daily presence in the various tunnels in the *Minahang Bayan*. The LGU has also imposed a number of rules and regulations regarding child labour, with violations resulting in the revocation of the mining permits. Based on primary data, majority of those engaged in the mining sector also believe that there are adequate laws and implementation mechanisms for preventing child labour. Although child labour is not a widespread issue in the municipality, it still persists secretly in small numbers.

FGDs involving three children and a former child labourers (aged 14, 15, 16 and 20) reveal that children, some as young as 10 years old, engage in mining due to a number of reasons. Culturally, T'boli families have always worked together, thus, children are used to accompanying their parents to their workplaces and helping out in whatever way they can. This is historically, one of the primary motivations for children going to mine sites and engaging in heavy manual labour. Child labour in mining sites, however, still persist even when rules and regulations protecting children were introduced. Although primary data gathered from the study areas reveal that the majority of both the adult miners and child labourers believe that child labour should be stopped, children still sneak into mines and work because of the limited opportunities presented to them due to poverty. Child labourers work at mines during

their free times, with some even foregoing school altogether to earn extra income for their families. In order to avoid being caught by the authorities, most children work during odd hours or at informal mining sites outside of the *Minahang Bayan*, where activities are not monitored as regularly.

Similar to the situation in Camarines Norte, children in T'boli are mostly confined to performing tasks outside of the tunnels themselves. This means that intensive tasks such as carrying bags of ore are performed by children regularly, which places them at considerable risks of acquiring spinal injuries.

Although most child labourers are reported as only being involved in carrying ores, a small portion of the respondents have noted that they have engaged in other activities such as actual digging of ore and processing of gold. This puts them at greater risks of exposure to toxic chemicals and harmful dust, as well as the possibility of suffocation in the tunnels, and actual tunnel collapse, and so on.

Children are not only exposed to health risks, but are also robbed of valuable opportunities for development. Children who are forced to leave school and engage in child labour have little hope of pursuing better opportunities in the future. Children also have various emotional and social needs that are not satisfied when children are forced to work. FGDs with child labourers and former child labourers reveal that, although they would prefer to not mine, they enjoy working because they get to work with their friends. This is indicative of the need of children to socialize with other children. Mining sites, with all the inherent risks, are not the proper venues for this.

Still, government efforts to stop child labour in mining have intensified over the past years. Aside from introducing stringent anti-child labour policies, the LGU has also introduced programmes to help keep children in school and to give former child labourers a chance to go back to school with a number of educational programmes and scholarship opportunities. Although child labour persists, these programmes have been effective in reducing and minimizing the number of children at risk.

e) The impacts of mining to the community

Small-scale mining impacts surrounding communities in a number of ways. Firstly, mining helps generate valuable livelihood opportunities, especially for poverty-stricken communities where these opportunities are limited. These opportunities extend to the growing secondary economies that benefit indirectly from SSM activities. Although no current statistical data is available, the notion that SSM positively impacts the businesses of small stores and eateries is generally agreed upon by mining stakeholders.

Primarily, the municipal and the provincial government benefit from mining through the various fees and taxes imposed on the sector. The SSM sector proves to be a steady stream of income for the government. The SSM sector also has the potential to provide increased revenues for the government not only through the increased activities of secondary economies but also because of the revenue that can potentially be generated by strengthening the relationships between formal institutions such as the BSP and the sector.

Small-scale mining also impacts communities positively by the various projects presented under their CDMP, ECC and other related programmes. These projects may range from relatively simple tree-planting drives to the construction of public facilities. Moreover, the contributions from the SSM sector do not end with the stipulations in documents such as the CDMP. A number of successful tunnel owners, operators and mine workers have been known to give back to their communities. These efforts include giving scholarships to deserving youth and providing funding for infrastructure projects such as additional classrooms in public schools and improved roadwork.

The presence of gold ores in T'boli has also been seen as a source of cultural pride. In fact, the municipal government is exploring options to jumpstart a mining-related tourist industry. This is in conjunction with the government's OTOP¹¹⁷ programme, which aims to promote homegrown jewelry products and instill a source of cultural pride in T'boli.

Despite the many positive impacts of SSM to the community, the use of mercury and the effects of poverty remain to be lingering issues. Although only mine workers and operators handle mercury directly, the fact that most ball mill processing facilities are located within populated areas exposes the community to various risks. The ball mill facilities in Barangay Edwards, as an example, are located right in the middle of residential areas, with schools and other commercial facilities nearby. This can potentially expose a significant number of the population to mercury vapor coming from ball mill facilities.

Small-scale mining has become the primary option for those looking to supplement their incomes. This has inadvertently lured vulnerable sectors such as children to engage in seemingly short-term solutions such as SSM. This can potentially lead to a number of long-term issues that perpetuate poverty in the communities.

¹¹⁷Minda News (2012). South Cotabato's T'boli town now producing jewelries. Published by Minda News. Retrieved from: <http://www.mindanews.com/business/2012/10/south-cotabatos-tboli-town-now-producing-jewelries/>

In summary, SSM can be a major factor in helping overcome poverty for communities. On the other hand, systemic issues may lead to the abuse of various rights that may instead contribute to perpetuating the cycle of poverty for some of the marginalized sectors. These issues must be addressed to maximize the positive impacts of the sector.

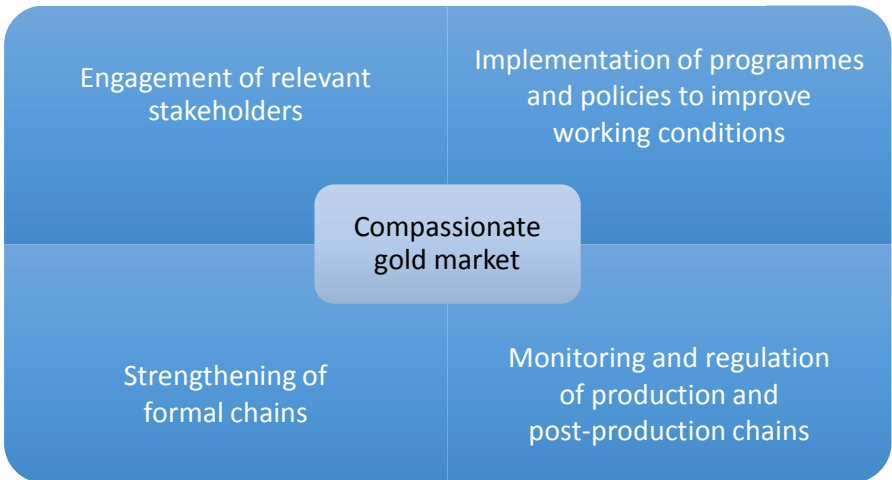
5. KEY OPPORTUNITIES AND PRIORITIES FOR THE ASGM GOLD MARKET

Based on the assessments of the study areas, it is clear that a number of key issues must be addressed to maximize the positive impacts of the ASGM sector. In relation to this, a number of opportunities and recommended projects have been identified by the respondents during the FGDs and KIIs. Although further analysis is advised, these initial opportunities are essential in identifying potential routes for growth for the ASGM sector.

The experiences of both South Cotabato and Camarines Norte highlight the need for a formalized ASGM sector. As consistently shared during FGDs and KIIs, legitimate development in the sector must first and foremost begin with formalization efforts. The experiences of South Cotabato alone show that formalization can bring forth improved working conditions and eliminate harmful practices such as child labour. Essentially, formalization empowers relevant stakeholders such as LGUs, government associations, and community organizations to implement programmes, projects and responsible business models that can benefit the sector.

The glaring socio-economic issues identified during the initial assessment, however, also point to the need for post-formalization initiatives that can improve critical areas in the supply chain. This includes improving the economic and social opportunities that are available to mine workers. Based on the results of the FGDs and KIIs, the identified priority actions may be grouped into four key components as illustrated by Figure 14.

Figure 14. Key components for ASGM development



5.1 Engagement of relevant stakeholders

Imperative to improving the local gold market is the engagement of relevant stakeholders. Aside from engaging primary and secondary stakeholders, the ASGM sector can benefit immensely from engaging private institutions, community organizations, civil society organizations and potential investors for the sector.

The strong presence of community organizations in Camarines Norte and South Cotabato that advocate for a better ASGM sector points to a strong potential for partnerships between government units and peoples' organizations that may eventually lead to programmes, policies and projects for the betterment of ASGM communities.

The presence of jewelry associations in both provinces also opens up potential opportunities for partnerships with the ASGM sector. The TJA formed by local government initiatives, serves as a potential venue for direct partnerships within the locally-regulated ASGM community. In the case of Camarines Norte, the absence of government-formed jewelry associations is offset by the presence of a number of private organizations such as the Camarines Norte Jewelry Producers Association. These organizations may be treated as potential partners, which can help improve the current gold market.

5.2 Implementation of programmes and policies to improve working conditions

Aside from the engagement of relevant stakeholders, various programmes and policies aimed at improving the working conditions in SSM must be established. The study reveals that informal markets for gold are also sustained by selling habits of mine workers. Due to poor working conditions and the little income that miners receive, they are forced to sell their gold to buyers who are easily accessible, for example, the black market for gold. Improving the working conditions and establishing better wealth-sharing standards in mining communities will at the very least, help miners overcome a subsistent lifestyle.

The creation of relevant programmes and policies for the SSM sector is also directly related to the engagement of mining associations, women groups, and other relevant stakeholders. Ensuring that all the needs and concerns of these groups are addressed is essential to creating programmes and policies that are effective.

5.3 Strengthening of formal chains

The recent changes in the gold-buying policies of the BSP as well as the reduction of total tax rates from 7 per cent (creditable withholding tax and excise tax) to 3 per cent has already helped attract gold traders. However, key interviews held with gold traders suggest that the positive effects may only be felt by bigger gold buyers, as smaller gold buyers still prefer selling their gold through the black market due to its accessibility. It is then imperative that these formal chains be strengthened and incentivized to help shift miners and gold traders away from the illegal black market.

Based on the results of the FGDs held in both Camarines Norte and South Cotabato, the clamor for additional gold buying stations that are accessible to local miners and gold traders is strong. This is due to the fact that the nearest gold buying stations are hours away from Camarines Norte and South Cotabato, and access to transportation may prove to be difficult for smaller miners and gold-buyers. As such, key stakeholders should lobby for the establishment of gold buying stations should their *Minahang Bayan* applications be approved.

Strengthening of formal chains is also closely related to engaging relevant stakeholders. The aforementioned jewelry associations in Camarines Norte and South Cotabato may be formally integrated into the chain through government initiatives. With TJA already being supported by the local government, integrating them into the formal supply chain will be a matter of linking the supplies generated by the SSM communities to the demands from the TJA. On the other hand, creating partnerships with private jewelry organizations such as the Camarines Norte Jewelry Producers association will entail presenting proposals that are beneficial for all stakeholders involved. In any case, presenting appropriate business models that integrate these organizations into the formal system can only strengthen the formal gold supply chain, and minimize the sale and trade of gold through illegal channels.

5.4 Monitoring and regulation of production and post-production chains

The implementation of appropriate monitoring and regulation mechanisms into the production and post-production chain serves as a first step towards introducing transparency and accountability in the chain as well as to help minimize the incidences of abuse in the workplace.

Monitoring and regulation of the production chain may also significantly improve working conditions in mine sites. Based on the experience in T'boli, full monitoring and regulation of the sector can significantly decrease the incidences of child labour, mercury use and workplace accidents, and so on. Should Camarines Norte follow suit and have their own *Minahang Bayan*, it is imperative that monitoring and regulation practices be adapted by the local government.

Proper monitoring and regulation of the production chain may also help ensure that gold is produced through humane and environmentally-sound practices. Ensuring that the supply chains are incident-free may also be an opportunity to introduce marketing practices that focus on ethical production of gold.

6. ENVIRONMENTAL ASSESSMENT OF ARTISANAL AND SMALL-SCALE GOLD MINING

This section presents the results of the mercury inventory and environmental sampling and analysis activities in Camarines Norte and South Cotabato. Six mine tunnels and 15 ball mill facilities were included from T'boli, South Cotabato. On the other hand, five mine tunnels and 14 ball mill facilities from Camarines Norte were included. Presented in this section are the results of the assessments as well as their impacts to air, water and land resources.

6.1 Results of gold and silver assay

Rock samples were collected from three municipalities from Camarines Norte, mainly, Barangays Dalas, Malaya and Gumacas. From T'boli, rock samples were collected from Barangays Kematu and Desawo. Outlined in Table 10 are the results of the analysis.

Table 10. Results of gold and silver assay from the study areas

	Camarines Norte			South Cotabato	
	Dalas	Malaya	Gumacas	Kematu	Desawo
Gold, gm/MT	1.90	23.63	9.63	15.33	6.40
Silver, gm/MT	50.03	66.43	16.34	18.23	62.30

6.2 Estimated quantity, emission and releases of mercury in ASGM

Table 11 outlines data on mercury inventories presented in previous studies conducted by BAN Toxics, as well as data gathered in Camarines Norte and T'boli, South Cotabato. The comparative table shows an average use of 21.2 grams of mercury to process a single gram of gold – an extremely high value that pose significant social and environmental risks. Moreover, the study areas of T'boli and Camarines Norte show higher readings than usual as they use 48.1 and 30.03 grams of mercury to process a gram of gold on average.

Table 11. Inventory of mercury use, emissions and releases in ASGM

	Municipality of Jose Panganiban and Labo, Camarines Norte	Brgy. Mt. Diwata, Monkayo, Compostela Valley	Brgy. Bayugan 3, Rosario, Agusan del Sur	Brgy. New Leyte, Maco, Compostela Valley	Brgy. Panoraon, Maco, Compostela Valley	Municipality of T'boli, South Cotabato		Labo and Paracale, Camarines Norte
Year	2015	2015	2017	2017	2017	2015	2017	2017
No. of operations surveyed*	18	27	3	6	4	7	5	4
Hg: Au								
Average, g	34.3	10.7	10.61	5.04	9.62	12.6	48.1	30.03
Maximum, g	149.0	33.8	22.35	7.84	18.57	97.2	207.7	95.2
Minimum, g	1.5	2.9	3.87	2.65	2.93	1.8	1.3	4.33
Emissions								
Air, %	3.5	26.8	15.4	36.3	69.9	11.7	30.1	43.6
Land and water, %	96.5	73.2	84.6	63.7	31.1	88.3	69.7	56.4
*Refers to the number of operations where mercury inventory was completed								

The bulk of mercury used in ASGM enters the environment in the form of releases to land and water. Based on the findings of the study, South Cotabato releases as much as 69.7 per cent of their mercury to land and water. Camarines Norte is not far behind with 56.4 per cent.

Mine wastes collected from tailings ponds are collected and stored in ore processing facilities. Once minimum volume requirements are reached, these tailings are sent to carbon-in-pulp facilities to be processed further, as finer particles of gold can still be recovered using activated carbon. This process can potentially aggravate mercury contamination levels in communities, as cyanide reacts with mercury to produce soluble chemical compounds that are easily transported with water, thereby contaminating larger areas. Moreover, this also produces mercury-cyano compounds which can enter the food chain and bioaccumulate by contaminating groundwater and drinking water, the rehabilitation of which comes at significant economic costs.

An analysis of samples collected from tailings ponds of ore processing facilities in T'boli reveal that these ponds may contain up to 179 mg/kg of mercury, with an average content of 83.19 mg/kg. These numbers are alarming, but they pale in comparison to the findings from Camarines Norte – samples collected from tailings ponds in province showed an average content of 934.21 mg/kg.

Mine waste samples were collected from CIP plants in T'boli and Camarines Norte using 1-m and 3-m cores from relatively “old” and “new” dumps (Table 12). These samples were analyzed separately, and findings show generally higher readings for the samples collected in Camarines Norte. Despite the differences in the results, all the numbers reported are still considerably higher than the recommended soil mercury levels of only 0.1 mg/kg.

Table 12. Results of analysis using 1-m and 3-m cores

	South Cotabato		Camarines Norte	
	Old	New	Old	New
1-m core	21 mg/kg	25 mg/kg	65 mg/kg	85 mg/kg
3-m core	138 mg/kg	24 mg/kg	73 mg/kg	64 mg/kg

6.3 Impacts of small-scale mining on water bodies

Water conservation and protection policies are important to the ASGM sector and to those affected by it. Water bodies such as rivers and lakes, provide important environmental and economic services (such as in fishery and farming) particularly in the rural areas. The impacts of the sector to the aquatic ecosystem can be classified into two: how it affects water demand and water quality of nearby and downstream water systems.

Small-scale mining spans a spectrum composed of miners who extract alluvial gold from river beds, to those who dig vertical shafts underground. In each instance, ASGM operations require water for a variety of functions (such as sluicing/washing, panning, milling and amalgamation), and thus need to be located in close proximity or have access to water sources.

Mining activities and removal of vegetation for mining can cause siltation and sedimentation problems and increase run off, thus affecting turbidity. These were observed in water bodies found near tunnel areas in T'boli, South Cotabato, particularly those surveyed in Barangay Desawo. Similarly, water bodies near ball mill facilities in Barangays Gumaus, Dalas, Malaya and Casalugan in Camarines Norte have shown an increase in turbidity.

Aside from turbidity, pollution runoff can also alter important water quality parameters such as dissolved oxygen, pH, conductivity and nutrient and heavy metal content, resulting in water stress. Increased concentration of silt or contaminants can adversely affect aquatic ecology as well. Increased siltation can cloud water and decrease photosynthetic activity, making aquatic habitats less hospitable for biota.

Additionally, chemicals and nutrients can accumulate in waters and biota of aquatic systems impacted by siltation as they tend to sorb to sediments.

The extraction of ores in tunnel areas may also lead to the release of contaminants in aquatic and terrestrial systems. Ore samples were collected from tunnel areas in South Cotabato and Camarines Norte to analyze their heavy metal contents as outlined in Tables 13 and 14.

Table 13. Summary of analysis for heavy metal content of ore samples from T’boli, South Cotabato

Heavy metal content of ore samples in T’boli, South Cotabato		
	Barangay Kematu	Barangay Desawo
Gold, g/MT	15.3	6.4
Silver, g/MT	18.2	62.3
Silica, %	53.0	65.6
Iron, %	5.0	3.6
Copper, %	0.03	0.02
Manganese, %	0.2	0.2
Lead, %	0.05	0.01
*Analytical method: F-AAS.		

Table 14. Summary of analysis for heavy metal content of ore samples from Camarines Norte

Heavy metal content of ore samples from Labo and Paracale, Camarines Norte		
	Malaya, Labo	Casalugan, Paracale
Mercury, mg/kg**	36	0.5
Silica, %*	27.39	23.53
Iron, %	1.77	0.03
Copper, %	0.001	0.01
Manganese, %	0.01	0.01
Lead, %	0.002	0.001
*Analytical method: Gravimetry-computation.		
**Analytical method: Manual Cold Vapor.		
Preliminary heavy metal content determination using a portable XRF analyzer.		

Ore samples collected and analyzed from Kematu and Desawo were revealed to mostly contain silica (>50 per cent) with trace levels of iron, copper, manganese and lead. Samples gathered from Camarines Norte also mostly contain silica, albeit at lower percentages (<28 per cent).

Because of the transitional nature and short histories of some ASGM operations, sanitation infrastructure such as indoor plumbing and pit latrines or even designated areas for defecation, may be non-existent causing additional biological contamination concerns for drinking water sources.

Impacts to groundwater in ore processing facilities may be significant in areas where appropriate mine waste management are not practiced. Mine tailings, mostly crushed ore and rock, pose potential threats to water quality, ecosystem and human health. Additional laboratory analyses also found other heavy metals in the samples, which may contaminate groundwater in communities as outlined in Tables 15 and 16.

Table 15. Summary of analysis of heavy metals of mine waste samples from ore processing facilities in T'boli, South Cotabato

Heavy metals of mine waste samples from in T'boli, South Cotabato								
Facility	As, ppm	Cr, ppm	Cd, ppm	Co, ppm	Cu, ppm	Hg, ppm*	Pb, ppm**	Zn, ppm
1	105 ± 6.2	21.0 ± 4.9	30.6 ± 6	412 ± 32	223 ± 6.1	70	1,413	1,953 ± 15
2	216 ± 7	53.8 ± 6.5	23.0 ± 6	438 ± 39	293 ± 6.9	108	1,490	239 ± 5.6
3	131 ± 3	141 ± 5.9	19 ± 5.3	224 ± 24	56.7 ± 4	109	220	221 ± 3
4	150 ± 6.3	23.8 ± 5.3	ND	188 ± 27	56.9 ± 4.1	36	1,020	96.6 ± 4
5	1,080 ± 11	19.3 ± 5	42.9 ± 6	308 ± 31	344 ± 7.4	155	1,960	3,169 ± 22
6	175 ± 4.5	ND	22.4 ± 5.9	214 ± 22	78.2 ± 3.9	30	763	578 ± 7.7
7	153 ± 4	19.0 ± 4	ND	230 ± 4	89.6 ± 4	59	507	305 ± 5
8	170 ± 4	14.0 ± 4	22 ± 5	181 ± 22	64.6 ± 4	78	326	239 ± 5
9	1,139 ± 10	17.0 ± 4	31.0 ± 6	449 ± 32	189 ± 6	112	955	1,889 ± 15
10	156 ± 4	18.7 ± 4.3	ND	161 ± 22	43.3 ± 3.2	23	436	227 ± 5
11	554 ± 6	25.5 ± 5.3	28.3 ± 6	176 ± 28	147 ± 5	6.5	325	550 ± 8
12	3,765 ± 23	ND	34.3 ± 7	584 ± 45	504 ± 10	113	1,810	3,765 ± 23
13	124 ± 6	19.8 ± 4.8	ND	264 ± 29	65 ± 4	223	1,420	322 ± 6
14	76 ± 6	25.8 ± 6	23.7 ± 7	308 ± 35	178 ± 6	48	941	1,459 ± 15
15	63 ± 5	22.3 ± 5	36.3 ± 6	188 ± 26	180 ± 6	123	1,100	2,168 ± 17
16	480 ± 5	ND	ND	180 ± 28	35 ± 4	7.3	128	166 ± 5

*Analysis through CV AAS.
 **Preliminary heavy metal content determination using a portable XRF analyzer.

Table 16. Summary of analysis of heavy metals of mine waste samples from ore processing facilities in Camarines Norte

Heavy metals of mine waste samples from in Camarines Norte								
	As, ppm**	Cr, ppm**	Cd, ppm**	Co, ppm**	Cu, ppm**	Hg, ppm*	Pb, ppm*	Zn, ppm**
1	314±5	ND	20.5±5	620±35.3	91.3±4	72	273	101.3±3.7
2	39.3±3	1035.3±15	19.3±6	1138.5±44.5	660.7±9.7	125	136	119.3±4
3	107.3±4.3	71.7±5.3	31±6	1033±39.3	307.7±6.3	114	259	1170±11.3
4	34±9	18±4.5	69.3±6	561.3±34.7	5426±17	96	2440	5426±32
5	44±9	9±3	51±5	342.7±25.3	823.7±10	148	6630	4520.7±26.3
6	420±12	1645.33±21.3	34.5±6	595±41.3	397.3±8.3	139	2550	3052.5±13.3
7	ND	15.33±3.7	55±6	263.7±24.3	535.7±10	80	3870	4656.7±26.7
8	ND	ND	69.3±5.3	163.3±20.7	417±18	76	4120	5176.7±35
9	399.3±4.7	74±23	21.3±5	360±25.3	461±29	134	51	66.7±4
10	244.7±3	29±11.3	25.5±5	502±35	16.3±3	104	125	142±3
11	527±5.7	ND	ND	409±26	47.5±3.5	206	18	68.5±3
12	1202±15	ND	25±7	844.3±54	690±12	73	2890	2150.2±19
13	1597±18	522±12	31.3±7	943±6	721±12	65	3110	1112±13
14	885±12	750.3±22	ND	850±54	890±13	64	2700	2427±19
15	622±14	633.5±12	45.5±6	738±57.5	1582±17	85	3510	5794±36.7
16	899±8	535.7	75±7	629±39	1381±14	9400	4200	1325±13
17	701±8	32±5	40±5	905.7±48	1317±14	2260	848	2077±17
18	1057±23	54±7	41±6	1061±95	943±16	125	799	13633±1

*Analysis through CV AAS.
 **Preliminary heavy metal content determination using a portable XRF analyzer.

6.4 Impacts of small-scale mining on terrestrial environment

There are a total of 159 registered tunnels in the *Minahang Bayan* in T'boli. On the other hand, the informality of the SSM sector in Camarines Norte makes it difficult to estimate the total number of operational mines. Still, the continued proliferation of ASGM activities has significant impacts to the terrestrial environment as vegetation and soil layers are removed, and mining lands are left with piles of mock ores, mine tailings, shallow dug-outs and deep pits. Moreover, mining in forest areas contribute to deforestation and land degradation, which can lead to fragmentation, loss of biodiversity, increased likelihood of erosion, sediment loading and pollution.

A review of the plant samples collected in select tunnel areas in T'boli and Camarines Norte reveals that a plethora of non-native and invasive species of grasses, ferns, flowering plants and shrubs have taken a prominent place in mining areas, and are posing huge threats to the integrity of ecosystems. Table 17 outline the plant species present in the tunnel areas sampled in. Further research is recommended in this area to formulate a more comprehensive inventory comparing non-native species and invasive species found in the study areas.

Table 17. Plant species present in tunnel areas

Plant species present in tunnel areas				
Barangay Kematu, T'boli	Barangay Desawo, T'boli	Barangay Casalugan, Paracale	Barangay Gumaus, Paracale	Barangay Malaya, Labo
<i>Dendrocnide</i> sp.	<i>Impatiens</i> sp.	<i>Pseudelephantopus spicatus*</i>	<i>Pityrogramma calomelanos (L.)</i>	<i>Alpinia</i> sp.
<i>Piper</i> sp.	<i>Cissus</i> sp.	<i>Stachytarpheta jamaicensis (L.) Vahl</i>	<i>Pachyrhizus</i> sp	<i>Pseudelephant pus spicatus</i>
<i>Pipturus</i> sp.	<i>Elatostema</i> sp.	<i>Gleichenia</i> sp.	<i>Chromolaena odorata (L.)</i>	<i>Christella</i> sp.
<i>Ageratum conyzoides</i> (L.)	<i>Chromolaena odorata</i> (L.)	<i>Melastoma malabathricum</i>	<i>Axonopus</i> sp.	<i>Pleocnemia</i> sp.
<i>Synedrella nodiflora</i> (L.)	R.M. King & H.Rob <i>Eragrostis</i> sp	<i>Chromolaena odorata (L.)</i>		<i>Lygodium flexuosum (L.)</i>
<i>Phyllanthus niruri</i> L.	.	<i>Imperata cylindrica (L.)</i>		<i>Lygodium</i>
<i>Ipomoeia batatas</i> (L.)	<i>Pseudelephantopus spicatus (B.Juss ex Aubl) Rohr ex C.F.Baker)</i>	<i>Axonopus</i> sp.		<i>japonicum</i>
<i>Pityrogramma calomelanos (L.)</i>	<i>Lantana camara</i> L.			<i>Abutilon indicum (L.) Sweet</i>
<i>Sida acuta</i> Burm.f.	<i>Ageratum conyzoides (L.) L.</i>			<i>Melastoma malabathricum</i>
<i>Trema orientalis (L.) Blume</i>	<i>Christella</i> sp.			<i>Stachytarpheta jamaicensis (L.) Vahl</i>
<i>Bidens pilosa</i> L.	<i>Aglaonema</i> sp.			<i>Urticaceae</i> sp.
<i>Mikania cordata (Burm.f.) B.L.Rob</i>	<i>Luffa</i> sp.			<i>Chromolaena odorata (L.)</i>
<i>Ageratum conyzoides (L.) L.</i>	<i>Diplazium</i> sp.			<i>Axonopus</i>
<i>Eragrostis</i> sp.	<i>Achyranthes aspera</i> L.			<i>Calamus</i> sp.
<i>Ipomoea triloba</i> L.	<i>Achyranthes aspera</i>			
<i>Acalypha indica</i> L.	<i>Fimbristylis</i> sp.			
<i>Cleome rutidosperma DC.</i>				

Small-scale mining also affects wildlife negatively.¹¹⁸ Activities associated to mining such as the use of generators, grinding machines, artificial light as well as the extraction and crushing of ores can produce loud, disruptive noises and light pollution, which can potentially disrupt wildlife in mining areas. Moreover, increased vehicular and pedestrian traffic can reduce overall habitable land levels and fragment existing habitats for wildlife.

ASGM may also impact farming practices and encourage miners and mining communities to farm on marginal land that may be more prone to soil erosion or desertification. The continued degradation of these terrestrial lands may also have adverse effects on crops. In China¹¹⁹ for instance, rice crops have been found to be important exposure pathways for methylmercury to inhabitants in mercury mining areas.

Aside from the physical impacts caused by ASGM activities to the landscape, land disruption that occurs in ASGM may play a role in increasing metals contamination. The excavation and processing of ore along with the disposal of tailings waste, may facilitate the release of heavy metals into the environment that were otherwise sequestered. Some of these heavy metals can contaminate soils, sediments and water sources and bioaccumulate in local biota. With data from the Bureau of Soils and Water Management reporting two major types of soil in the municipalities – sandy loam and undifferentiated mountain soils – the need to conduct further studies to determine the transport and transformation processes of heavy metals is imperative.

Contamination of flora, wildlife, aquatic life and food crops from metals affect the health of these organisms. Moreover, there is strong evidence that water, food and soils that are heavily contaminated by metals can lead to adverse impacts on human health. As discussed in the previous section, a number of heavy metals were found in ores and mine waste samples collected from the study area, although contamination may not always be attributable to ASGM. Arsenic and cadmium are naturally occurring metals that are associated with gold-bearing ores. High concentrations of lead, cobalt and chromium were also found in geologic formations around the mining areas.

Arsenic, cadmium and lead are well-known toxic metals. A number of studies focusing on the human health effects of these metals have been conducted. Moreover, these metals are also known to impact organisms, wildlife and ecosystem services.

¹¹⁸Rajace, M., Obiri, S., Green, A., Long, R., Cobbina, S.J., Nartey, V. and Basu, N. (2015). Integrated assessment of artisanal and small-scale gold mining in Ghana—part 2: natural sciences review. *International Journal of Environmental Research and Public Health*, 12, 8971-9011.

¹¹⁹Zhang, H., Feng, X., Larssen, T., Shang, L. and Li, P. (2010). Bioaccumulation of methylmercury versus inorganic mercury in rice (*Oryza sativa* L.) grain. *Environmental Science and Technology*, 44(12), 4499-4504.

Several acute toxicity tests show that arsenic, cadmium and lead have adverse effects on soybean root and shoot growth. Cadmium has significant soil-solution, soil-plant, and soil-invertebrate relationships that impact soil properties, thereby affecting animal and human health. Cadmium ingestion, on the other hand, is associated with kidney and skeletal toxicity and cardiovascular disease. It is also known to bioaccumulate in the tissues of aquatic organisms and birds.¹²⁰

Arsenic and cadmium are considered carcinogenic to humans, and are associated with increased cancer risks.^{121 122} Exposure to arsenic in particular, is associated with significant adverse effects on neurodevelopment and behavioural disorders¹²³, cardiovascular and respiratory diseases¹²⁴, skin lesions and anemia in pregnancy. Exposure to both cadmium and arsenic may lead to the potential development of keratosis, skin hyperpigmentation, tremors, low intelligence quotient (IQ) and renal failure.¹²⁵

Childhood lead exposures are associated with reductions in grey matter in the brain in adults, particularly in the prefrontal cortex and anterior cingulate cortex, which are responsible for executive functions, decision-making and mood regulation.¹²⁶

There is moderate certainty that ASGM activities are releasing high and potentially dangerous levels of toxic metals such as arsenic and lead. A number of steps in the mining process (such as excavating, crushing ore, disposal of mine wastes) facilitate the release of other potentially toxic metals into the environment. Despite the potential for widespread contamination by toxic elements other than mercury, however, empirical evidence for such contaminations in ASGM communities remains scarce.

¹²⁰Levit, S.M. (2010). *A Literature Review of Effects of Cadmium on Fish*. Available from

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/alaska/sw/cpa/Documents/L2010CadmiumLR122010.pdf>

¹²¹Smith, A.H., Hopenhayn-Rich, C., Bates, M.N., Goeden, H.M., Hertz-Picciotto, I. and Smith, M.T. (1992). Cancer risks from arsenic in drinking water. *Environmental Health Perspectives*, 97, 259-267.

¹²²Hartwig, A. (2013). Cadmium and cancer. *Metal Ions in Life Science*, 11, 491-507.

¹²³Tyler, C.R. and Allan, A.M. (2014). The effects of arsenic exposure on neurological and cognitive dysfunction in human and rodent studies: a review. *Current Environmental Health Reports*, 1(2), 132-147.

¹²⁴Moon, K., Guallar, E. and Navas-Acien, A. (2012). Arsenic exposure and cardiovascular disease: an updated systematic review. *Current Atherosclerosis Report*, 14(6), 542-555.

¹²⁵Cobbina, S., Dagben, J.Z., Obiri, S., Tom-Dery, D. (2011). Assessment of non-cancerous health risk from exposure to Hg, As and Cd by resident children and adults in Nangodi in the Upper East Region, Ghana. *Water Quality, Exposure and Health*, 3(3-4), 225-232.

¹²⁶Cecil, K.M., Brubaker, C.J., Adler, C.M., Dietrich, K.N., Altaye, M. and Lanphear, B.P. (2008). Decreased brain volume in adults with childhood lead exposure. *PLoS Medicine*, 5(5), e112.

6.5 Impacts of small-scale mining on air

This section outlines the impacts of SSM on air quality. These impacts are discussed according to three key aspects, namely, the estimated overall mercury emissions, the impacts of SSM on climate change, and other non-mercury emissions. Finally, harmful dusts and other particulates present in the mine sites were also assessed in the study.

6.5.1 Mercury emissions

As outlined in Table 18, measurements of ambient mercury levels around ore processing facilities in T'boli show alarming concentrations of mercury in the air. This may be attributed to the mostly-enclosed structure of ore processing facilities, where the lack of ventilation and air circulation may lead to higher mercury readings. As these facilities also double as living spaces for most facility owners, this exposes workers, family members and neighbours to high levels of mercury vapours. In comparison, the WHO places the acceptable level of mercury in indoor air at 1.0 $\mu\text{g}/\text{m}^3$.

Table 18. Average ambient mercury levels in ore processing facilities in T'boli, South Cotabato

Ambient mercury levels in ore processing facilities, T'boli 17 to 21 November 2017, 9:00 a.m. to 5:00 p.m.			
Facility	10 m away from facility, ng/m³	1 m away from facility, ng/m³	1 m away from smelting room, ng/m³
1	7,162	10,580	27,830
2	99	290	5,840
3	516	946	4,900
4	516	946	None
5	2,469	3,031	38,760
6	2,925	5,088	12,850
7	1,085	7,097	None
8	1,040	6,712	10,770
9	200	2,333	None
10	402	9,649	None
11	2,731	15,020	None
12 to 14	531	2,873	9,779
15	290	5,401	1,476
16	1,476	5,619	4,645
*Some facilities do not have a dedicated smelting room.			
**Facilities 12 to 14 are located within one compound.			

In contrast, the ball mill facilities in Camarines Norte do not lack proper ventilation and air circulation pathways. Despite this, the results of the analysis still show alarming levels of mercury concentration in the air as outlined in Table 19.

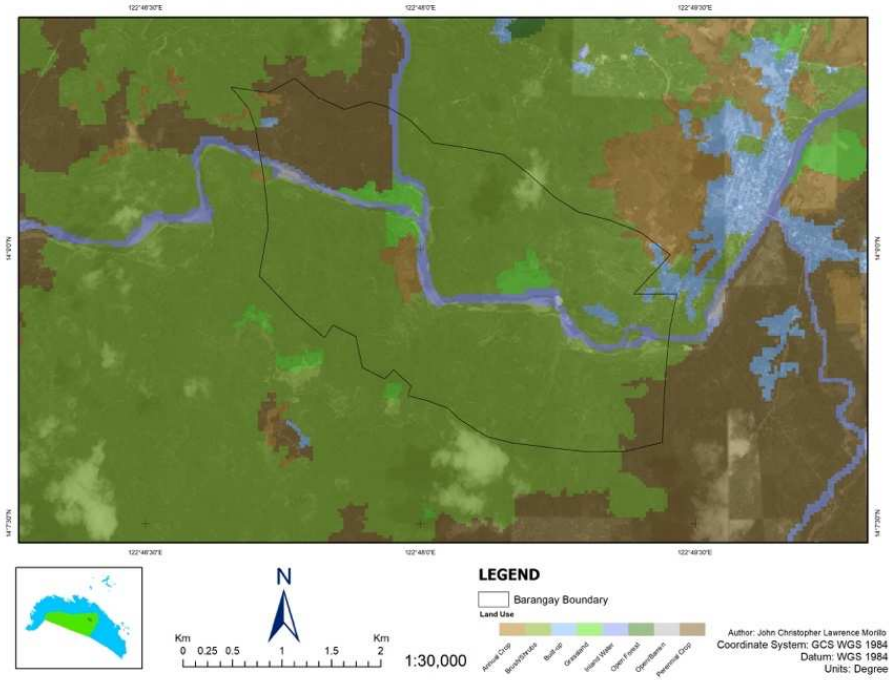
Table 19. Average ambient mercury levels in ore processing facilities in Labo and Paracale, Camarines Norte

Ambient mercury levels in ore processing facilities, Camarines Norte 17 to 21 November 2017, 9:00 a.m. to 5:00 p.m.				
Area	Facility	10 m away from facility, ng/m³	1 m away from facility, ng/m³	1 m away from smelting room, ng/m³
Malaya, Labo	1	352.72	943.55	6,032.55
	2	688.77	3,352.16	3,055.44
	3*	1,660.61	2,490.16	None
Dalas, Labo	1	728.94	2,528.77	38,287.5
	2*	1,850.83	5,788.33	None
	3	454.77	2,981.16	8,845.11
Casalugan, Paracale	1	638.38	689.66	585.61
	2	580.55	563.11	28,764.4
	3	1,267.88	12,771.77	35,639
Gumaus, Paracale	1	962.77	1,765.22	5,102.27
	2*	1,326.22	2,302.61	None
	3*	822.5	2,453.33	None
	4	756.55	794.38	None
	5	405.2222222	4965.666667	5475.5
*Some facilities do not have a dedicated smelting room.				

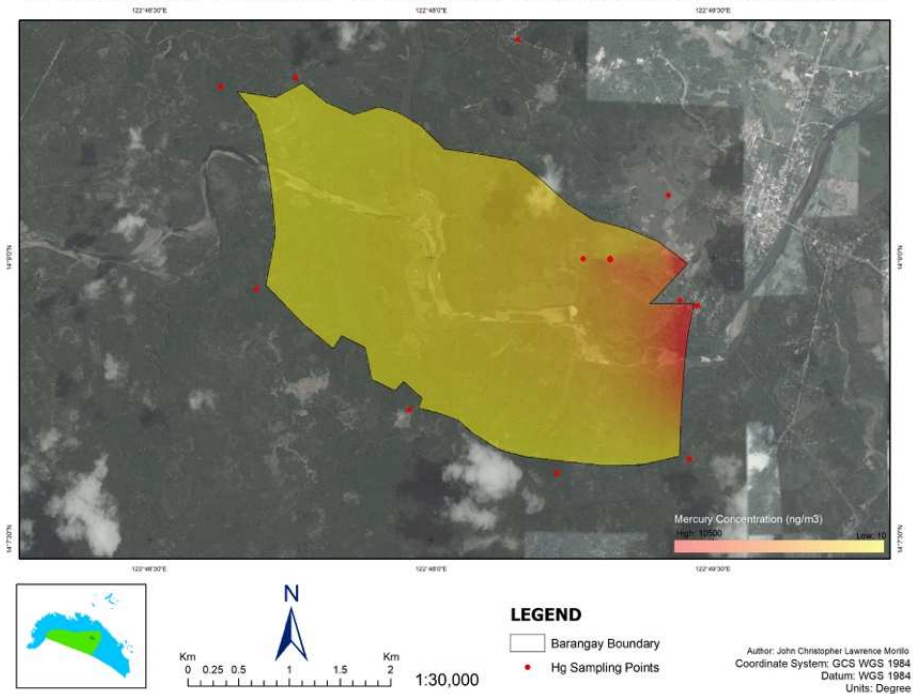
Finally, maps 1, 2, 3 and 4 show heat maps (and the corresponding land use maps of the areas) indicating the extent of mercury concentrations in ambient air in samples areas. These maps were formulated during field work activities in early 2018. Members of the population residing within these areas may be at higher risk to the effects of mercury exposure, given the reference standards recommended by the WHO. Unfortunately, incidences of diseases that might be associated with mercury exposure in these areas are not adequately documented in the municipalities.

Map 1

LAND USE MAP OF BARANGAY DALAS, LABO, CAMARINES NORTE

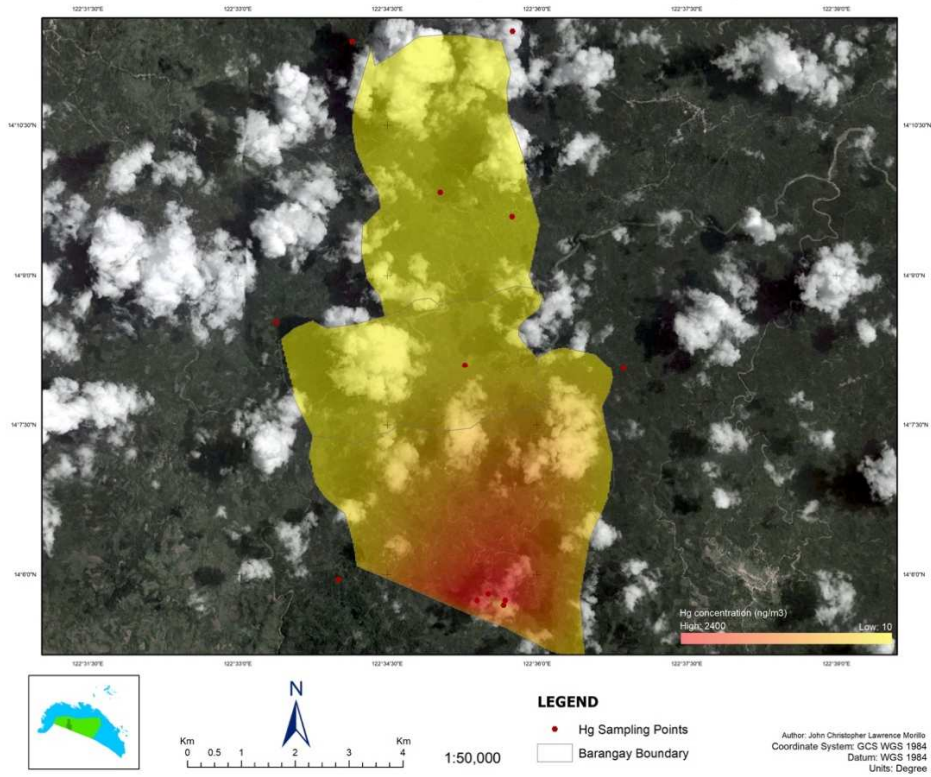


MERCURY AMBIENT AIR MAP OF BARANGAY DALAS, LABO, CAMARINES NORTE

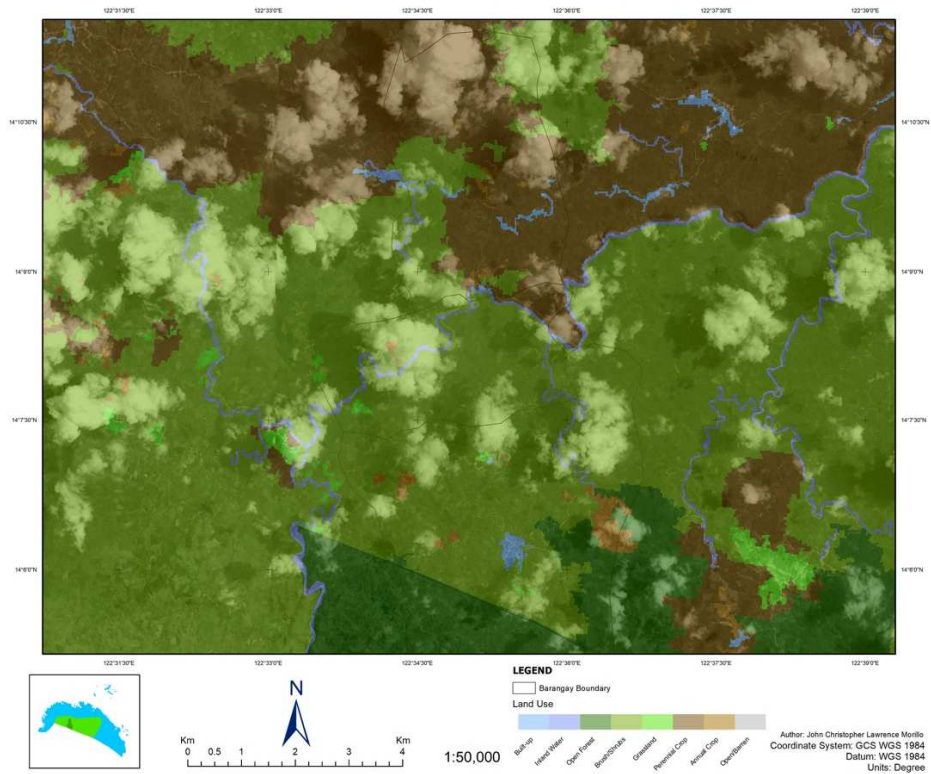


Map 2

MERCURY AMBIENT AIR MAP OF BARANGAYS AMANEAM, MALAYA, AND MALIBAGO, LABO, CAMARINES NORTE

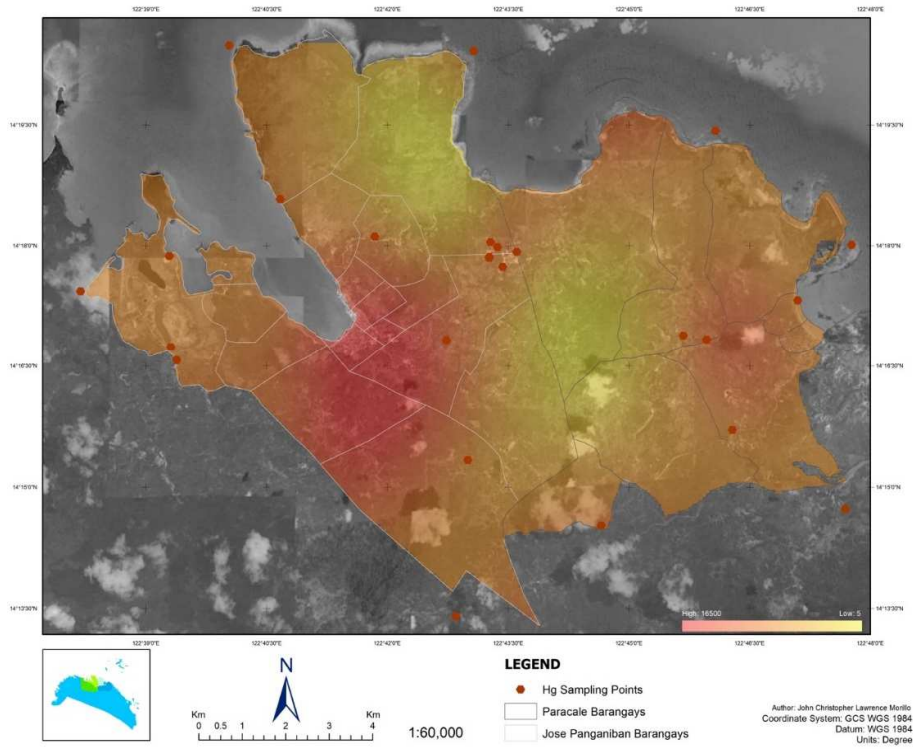


LAND USE MAP OF BARANGAYS AMANEAM, MALAYA, AND MALIBAGO, LABO, CAMARINES NORTE

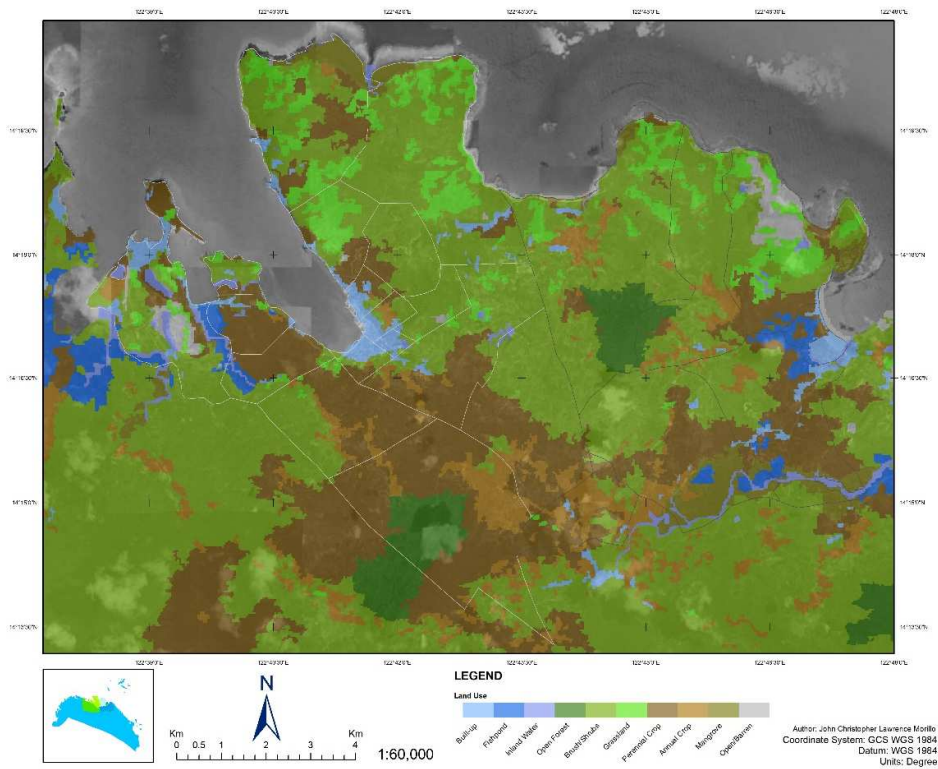


Map 3

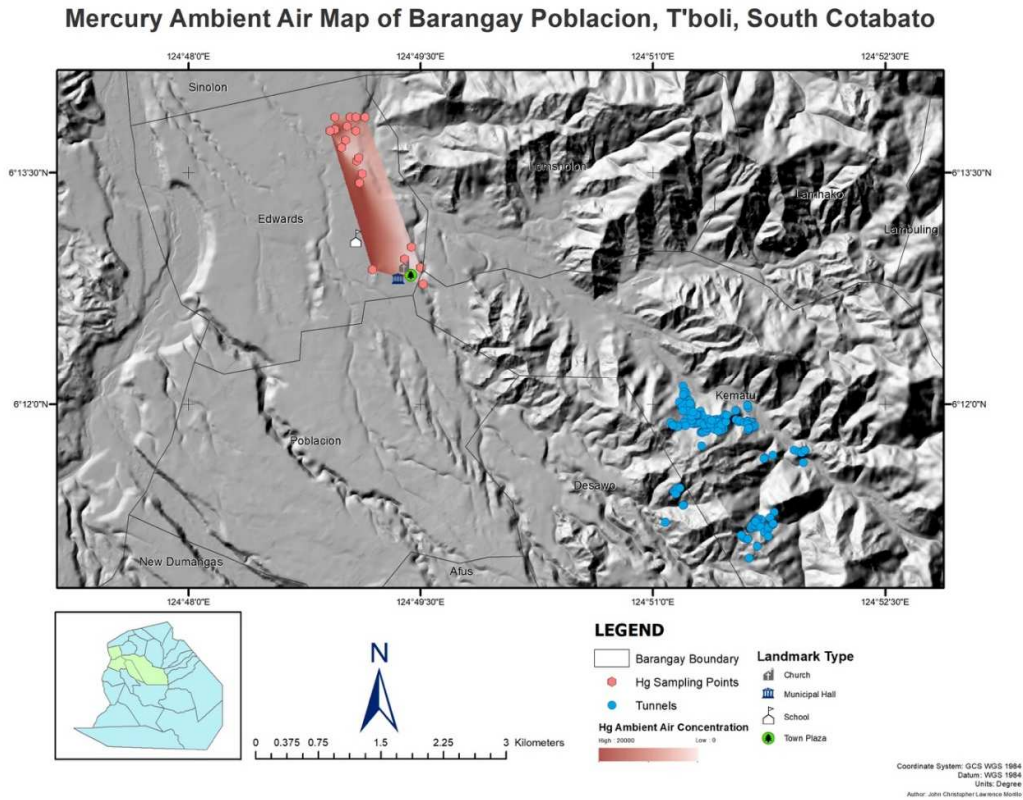
MERCURY AMBIENT AIR MAP OF JOSE PANGANIBAN AND PARACALE, CAMARINES NORTE



LAND USE MAP OF JOSE PANGANIBAN AND PARACALE, CAMARINES NORTE



Map 4



6.5.2 Climate change and other emissions

The Philippines is not a major contributor to emissions of greenhouse gases, but the ASGM sector's direct ties to deforestation and fossil fuel use makes it a contributor to climate change especially as 96 per cent of the country's emissions occur as results of land use changes and forestry losses.¹²⁷ However, there have been no detailed studies conducted in the country to investigate the impacts of gold mining – either by large-scale or small-scale operations – on climate change. Still, by using information on electric consumptions of several tunnel and ore processing facilities and their activity rates, the total carbon footprint¹²⁸ of the sector may be computed.

¹²⁷ *Ibid.*

¹²⁸ Bansah, K.J., Yalley, A.B., Dumakor-Dupey, N. (2016). The hazardous nature of small-scale underground mining in Ghana. *Journal of Sustainable Mining*, 15(1), 8-25.

Monthly electric consumption for the sampled ore processing facilities in T'boli ranged from Php3,000 to 32,000, averaging Php9,800. Based on power rates of the local electric cooperative, this corresponds to an average of 1,075 kWh of energy per operation ranging from 390 to 3,830 kWh.¹²⁹ At its peak number of ore processing facilities (~60), the annual estimated carbon footprint of the area is provided in Table 20.¹³⁰ On the other hand, ore processing facilities sampled in Camarines Norte show electric consumption costs ranging from Php3,000 to as much as Php86,000, with an average of Php25,590. This translates to an average consumption of 2,665.63 kWh of energy per operation, with a low of 313 to a high of 8,958 kWh. Due to the lack of available data on the number and scope of SSM activities in Camarines Norte, estimation of total community impacts to climate change is difficult. However, the average energy consumption in the area roughly translates to a global warming potential of around 1,330 kg CO₂e.

Table 20. Climate change impacts of ore processing facilities in T'boli, South Cotabato per year

Climate change impacts of ball mill facilities, T'boli			
	Minimum	Maximum	Average
<i>Per operation</i>			
Primary energy use, kWh	4,680	45,960	12,900
Global warming potential, kg CO ₂ e	2,400	551,520	23,040
<i>Total (ASGM community)</i>			
Primary energy use, kWh	280,800	2,757,600	774,000
Global warming potential, kg CO ₂ e	144,000	33,091,200	1,381,800

More than its contribution to climate change, the effects of climate change on the mining sector may be of concern, especially as it drives shifts in activity or practices. The Philippines' economy relies heavily on sectors that are sensitive to changes in climate, such as agriculture, fisheries, tourism, forest services, and so on. ASGM already sees influxes in labour when farming becomes unviable, and this pattern could continue if rural livelihoods face pressure from climatic changes, potentially exacerbating the ecological issues described above.

¹²⁹kWh is computed using the power rate calculator provided by the local electric cooperative. Visit <https://socoteco-1.com/consumer-information/power-rate-calculator/>

¹³⁰The global warming potential is calculated using a carbon footprint calculator. Visit <https://www.carbonfootprint.com/calculator.aspx>

Without a robust body of research documenting the effects of climate change in the Philippines, reliable predictions on the impact within the mining sector cannot be made. Changing patterns in rainfall and temperature, however, are beginning to be documented. This area of research is ripe with opportunity. The physical, social and economic dimensions of climate change as they relate to rural livelihoods could help shape effective policy for climate change mitigation and adaptation that supports improvements in ASGM.

6.5.3 Dusts and other particulates

The limited availability of dust samplers with filters for respirable silica meant that dust samples were instead collected from tunnel areas in barangays Kematu and Desawo for analysis of total weight. Silica content ranged from 11.20 to 73.96 per cent, with an average of 54.17 per cent. Due to limitations in the research, dust samples were not collected for Camarines Norte.

A major occupational health hazard associated with mining is exposure to respirable crystalline silica dust which is known to cause silicosis, cancer and other disease. Mining is also associated with higher incidence rates of pulmonary tuberculosis. Infected miners also contribute to secondary tuberculosis infections in the general population due to migration, and therefore have a much greater impact than their numbers alone suggest.

Crystalline silica in the form of quartz is the most common component of soil, sand and rocks. It is released into the air when miners drill, transport, and crush ores in an effort to extract and process minerals, presenting health threats aggravated by poor ventilation.¹³¹ ASGM's largely unregulated/ informal status mean that operations are conducted without regards to health and safety considerations. Occupational exposure to respirable crystalline silica causes silicosis and lung cancer, chronic renal disease and autoimmune diseases such as rheumatoid arthritis. Crystalline silica has been classified as carcinogenic to humans by the International Agency for Research on Cancer and is a significant risk factor for tuberculosis even in the absence of silicosis.

The primary factors determining the pathogenicity of crystalline silica exposures are particle size and airborne concentration. Occupational exposure regulations, including the US Occupational Safety and Health Administration (OSHA), require sampling respirable silica particulates (<10 µm in diameter), and studies with human subjects have shown the most fibrogenic particle size to be about 1 µm in diameter (range 0.5-3µm).

¹³¹Zhang, H., Feng, X., Larssen, T., Shang, L. and Li, P. (2010). Bioaccumulation of methylmercury versus inorganic mercury in rice (*Oryza sativa L.*) grain. *Environmental Science and Technology*, 44(12), 4499-4504.

Silicosis is normally not apparent until 20 years or more after the first exposure to crystalline silica. However, with exposure to extremely high concentrations of crystalline silica an acute or accelerated form of silicosis can occur in 1-3 years. The rate at which silicosis progresses is related to the duration and concentration of crystalline silica exposure. Accelerated silicosis has been reported among gold miners in China, Scottish stonemasons and garment industry workers sandblasting denim jeans in Turkey.

The US National Institute for Occupational Safety and Health (NIOSH) recommended an exposure limit (REL) of 0.05 mg/m³ as a time-weighted average (TWA). The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an even lower threshold limit value (TLV) of 0.025 mg/m³. The Philippines has no regulatory level for crystalline silica exposures.

7. CONCLUSIONS AND RECOMMENDATIONS

The ASGM sector remains largely poverty-driven, with the lack of valuable livelihood opportunities pushing people to engage in mining. ASGM is mostly characterized by poor working conditions, marginalization, corruption, illicit trade, environmental degradation and other human rights related concerns such as the proliferation of child labour and exposure to toxic chemicals (namely mercury, cyanide, and so on). However, in spite of these ills, the hazards and risks commonly found in ASGM communities, the sector continues to provide valuable economic opportunities for mine workers while also providing indirect benefits to secondary economies.

Based on the baseline assessment presented in this report, it can be concluded that in general, the current dismal state of the ASGM sector in the country may mostly be attributed to the lack of formalization which in turn, promotes unregulated and irresponsible practices often capitalized by a few influential and powerful individuals for personal gain. This also further fuels the endless cycle of insecurities and marginalization in the sector, contributing to affected communities not being able to lift themselves out of poverty.

When planned and implemented properly, the economic potential of the sector through formalization programmes can potentially lead to direct benefits not only for the communities involved, the local governments, but also for the national government. Making reference to the South Cotabato experience, while the province enjoys only a locally-recognized formal ASGM status, significant strides in terms of governance, transparency and accountability have already been achieved.

In addition, how the currently-existing ASGM gold supply chains are established, including the trade practices surrounding the sale of ASGM gold can provide more insights to better understand the root causes of the existing socio-economic and

environmental concerns and the negative impacts they create. By examining the ASGM gold supply chain in more detail, specific strategies and interventions can be developed to help meet the requirements of formalization including: (a) addressing critical hotspots along the chain; (b) identifying monitoring approaches; and (c) establishing potential linkages to market endpoints.

7.1 Socio-economic and environmental issues in ASGM

The socio-economic conditions in rural ASGM communities and the informality of the sector present a complex set of development challenges as reflected in the socio-economic and environmental issues reflected in this study. Presented here is a summary of these concerns as discussed in more detail in the preceding sections.

- a) Summary of key socio-economic issues:
- Poor working conditions
 - Characterized by unsanitary working environments, increased risks of workplace accidents, illnesses and exposure to toxic chemicals for miners, women and children.
 - Miners are also forced to work extremely long hours with minimal income and the lack of protection and access to social security.
 - Abuse of rights
 - The nature of mining has also led to issues on child labour, drug use and indirectly prostitution.
 - The informality of the sector in areas such as Camarines Norte has paved the way for various abuses that include extortion from miners.
 - Child labour
 - Child labour continues to persist primarily due to poverty, with children being forced to engage in labour to fulfill their and their families' immediate needs.
 - Child labour is not necessarily a product of the ASGM sector – in reality, children are forced to engage in labour, and the ASGM sector provides a viable option for them due to a number of cultural and social factors.
 - *Children are robbed of valuable opportunities to access education, and to have fulfilling childhoods when they engage in mining.*
 - *Children who are engaged in mining are at risk of having long-term negative impacts associated with manual labour.*
 - Unequitable wealth-sharing practices
 - The lack of wealth-sharing standards give way to various abuses in wealth-sharing, with subgroups such as financiers and gold traders earning the most, while miners earn very little in comparison.
 - The existing wealth-sharing practices perpetuate a cycle of poverty that limits the miners' opportunities for self-development and growth.

- b) Summary of key environmental issues:
- Impacts to air
 - Mercury emissions from the ASGM sector pose significant environmental dangers, and exposes mining communities and adjacent hoods to a number of health risks.
 - Small-scale mining activities may potentially be significant contributors to climate change due to its energy consumption rates as well as its close links with deforestation.
 - Impacts to land
 - Small-scale mining activities contribute to deforestation and land degradation, which can lead to a number of environmental issues including fragmentation, loss of biodiversity, increased likelihood of erosion, sediment loading and pollution.
 - Impacts to water bodies
 - The nature of mining activities as well as the lack of proper waste management practices contribute to the degradation of water bodies and water quality.
 - The pollution of water bodies associated to mining practices pose potential threats to water quality, ecosystem, and human health.

7.2 Recommendations

Based on the identified issues and key opportunities in the ASGM sector, the following general recommendations are presented.

Formalization of the ASGM sector. Formalization provides the platform for both stakeholders and duty-bearers to collaborate in ensuring an ASGM sector that is transparent, accountable and socially and environmentally-responsible.

- a) Development of a formalization framework including a sensible and practical set of procedures and policies governing licensing and permitting.
- b) Implementing appropriate monitoring and regulatory mechanisms to minimize incidences of child labour, indecent working conditions and use of toxic chemicals, and so on.
- c) Introduction of appropriate best practices to improve the working environments especially during critical stages where risks of accidents are heightened.
- d) Introduction of mercury-free alternatives to recovering gold that are accessible and can be easily adapted by mining communities.
- e) Imposition of wealth-sharing standards to ensure equitable income-sharing among relevant stakeholders.

Government support. Part and parcel to formalization is the government's responsibility to also: (a) promote health and environmental protection through the provision of accessible social services; (b) provide technical capacity to adapt responsible practices; and (c) support the financial aspects in relation to the extraction, processing and other related economic activities surrounding the ASGM gold supply/ value chain.

The government is also called on to engage with the relevant stakeholders who are working towards the betterment of the ASGM sector. Partnerships between the government, local community organizations, and related NGOs have been proven to be fruitful in the past. At the time of this writing, the collaboration between ASGM communities, government agencies and NGOs such as BAN Toxics have led to a number of fruitful projects in the context of reducing child labour and advocating for the formalization of the sector. Establishing similar partnerships across ASGM hotspots in the country is necessary for achieving decent working conditions and environmental sustainability in the sector.

Strengthening of formal chains to facilitate legal trade and sale of gold.

Strengthening formal channels of trading and selling gold will help improve the lives of small-scale miners, especially because existing informal trade practices contribute to perpetuating the poverty cycle. Specific recommendations on strengthening these formal chains include:

- a) Encourage sale of gold to formal channels such as the BSP by providing incentives to miners and traders who work with the BSP.
- b) Fully assess the gold supply chain to identify key issues in the supply chain and trade practices.

Explore formal trade options by conducting market studies that can map out the entirety of the gold mining sector and its existing relations to related sectors such as the jewelry sector. This may eventually lead to the formulation of appropriate business models that can link small-scale production chains to formal markets.
