

DELVE COUNTRY PROFILE

INDONESIA

ARTISANAL AND SMALL-SCALE MINING SECTOR



DELVE

A GLOBAL PLATFORM FOR ARTISANAL & SMALL-SCALE MINING DATA

Delve is an initiative to build a global platform for artisanal and small-scale mining (ASM) data. Its vision is a world in which ASM is recognized as an important contributor to global development.

Acknowledgements and Key Contributors:

The Delve Country Profile: Indonesia was developed through a collaboration between the World Bank Extractives Global Programmatic Support Multi-Donor Trust Fund, Pact, and the World Bank Indonesia.

The authors were Safura Intan Herlusia (World Bank), Patricia Ndagano (World Bank), and Nathan Schneck (Pact).

Additional contributors to the profile include Balada Amor (World Bank), Alief Aulia Rezza (World Bank), and Rachel Perks (World Bank).

Cover Photo: © Daniel Stapper, Pact.

This document has been produced with the financial assistance of the World Bank’s Extractives Global Programmatic Support Multi-Donor Trust Fund (Pact).



Disclaimers:

All opinions, views, and comments expressed in this profile solely belong to the authors and do not necessarily reflect those of the World Bank, Pact, or any of the institutions the authors are affiliated with.




All data points and original open access sources used in this report are on the Delve platform. To avoid further data recycling when referencing any figures contained in this profile, the original source should be cited.

Definitions & Acronyms

AGC	Artisanal Gold Council
APRI	Asosiasi Penambang Rakyat Indonesia (Indonesian Artisanal Mining Association)
ASM	Artisanal and Small-Scale Mining
ASGM	Artisanal and Small-Scale Gold Mining
BPPT	<i>Badan Pengkajian dan Penerapan Teknologi</i> (Agency for the Assessment and Application of Technology)
CSOs	Civil Society Organizations
DGMC	Directorate General of Mineral and Coal
GDP	Gross Domestic Product
GDI	Gender Development Index
GEORIMA	Geological Resources of Indonesia Mobile Application
GII	Gender Inequality Index
GNI	Gross National Income
HDI	Human Development Index
HSE	Health, Safety and Environment
IESR	Institute for Essential Services Reform
IHDI	Inequality-adjusted Human Development Index
IPEN	International Pollutants Elimination Network
IPR	<i>Izin Pertambangan Rakyat</i> (People's Mining License)
IUP	<i>Izin Usaha Pertambangan</i> (Mining Business License)
IUPK	<i>Izin Usaha Pertambangan Khusus</i> (Special Mining Business License)
KK	<i>Kontrak Karya</i> (Contract of Works)
KPPM	<i>Komite Penelitian dan Pemantauan Merkuri</i> (Committee for Research and Monitoring of Mercury)
LIPI	<i>Lembaga Ilmu Pengetahuan Indonesia</i> (Indonesian Institute of Science)
LSM	Large Scale Mining
MEMR	Ministry of Energy and Mineral Resources
MoEF	Ministry of Environment and Forestry
MoH	Ministry of Health
MoIA	Ministry of Internal Affairs
MoT	Ministry of Trade
MoU	Memorandum of Understanding
Perhapi	<i>Perhimpunan Ahli Pertambangan Indonesia</i> (Association of Indonesian Mining Professionals)
PESK	<i>Pertambangan Emas Skala Kecil</i> (Small-Scale gold mining)

PETI	<i>Pertambangan Emas Tanpa Izin (Non-licensed gold mining)</i>
PKP2B	<i>Perjanjian Karya Pengusahaan Pertambangan Batubara (Coal Mining Concession Work Agreement)</i>
PPE	Personal Protective Equipment
PPM	Parts per million
PSDMBP	<i>Pusat Sumber Daya Mineral Batubara dan Panas Bumi (Center for Mineral, Coal and Geothermal Resources)</i>
Puskesmas	<i>Pusat Kesehatan Masyarakat (Public Health Centers)</i>
RAN-PPM	<i>Rencana Aksi Nasional – Pengurangan dan Penghapusan Merkuri (National Action Plan on Mercury Use Reduction and Abolishment)</i>
RSUD	<i>Rumah Sakit Umum Daerah (Regional general hospitals)</i>
SDGs	Sustainable Development Goals
SIGNAS	National Geological Information System
SMEs	Small and Medium Enterprises
SOEs	State-Owned Enterprises
TI	<i>Tambang Inkonvensional (Unconventional Mining)</i>
UNDP	United Nations Development Programme
VC	Vital Capacity
VOC	<i>Vereenigde Oostindische Compagnie (The Dutch East India Company)</i>
WKP	<i>Wilayah Kerja Pertambangan (Mining Working Area)</i>
WPR	<i>Wilayah Pertambangan Rakyat (People’s Mining Area)</i>
YTS	<i>Yayasan Tambuhak Sinta</i>

Country Profile Snapshot: Indonesia

 <p>MATERIALS MINED BY ASM (in order of individuals employed per mineral from largest to smallest)</p>	
<p>Sandstone Gold Tin Coal Diamond</p>	<p>Government institutions</p> <p>MEMR (Ministry of Energy and Mineral Resources) MoEF (Ministry of Environment and Forestry) MoH (Ministry of Health) MoT (Ministry of Trade)</p> <p>KPPM <i>Komite Penelitian dan Pemantauan Merkuri</i> (Committee for Research and Monitoring of Mercury) BPPT <i>Badan Pengkajian dan Penerapan Teknologi</i> (Agency for the Assessment and Application of Technology)</p>
 <p>MINERAL GOVERNANCE FRAMEWORK</p>	<p>Associations, member organizations and NGOs</p> <p>Yayasan Tambuhak Sinta Nexus3 Foundation (previously known as BaliFokus) APRI (Indonesian Artisanal Mining Association) Lentera Kartini</p>
<p>Government priorities</p>	 <p>ECONOMIC AND DEVELOPMENT DATAⁱ</p> <p>2019 Population</p> <p>Total: 270,625,568 Labor force: 136,694,226 Women: 50.4 % Men: 49.6 %</p>
<p>Licensing Environmental management Mercury abolishment</p>	
<p>Laws and policy</p>	
<p>Mining Law No.11/1967 Mining Law No.4/2009 Government Regulation No.22/2010 Mining Law No.3/2020</p>	

2019 Classification (GNI per capita)
Upper Middle Income GNI per capita Atlas method (current USD): 4,050 GNI per capita PPP (constant 2010 USD): 4,322
2019 Gross Domestic Product
USD \$1.119 Trillion
Poverty headcount ratio (2011 purchasing power parity)
Population on/below poverty line: 9.8% (2018) Population living on < USD 1.90 per day: 4.6% (2018) Population living on < USD 5.50 per day: 56% (2018)



LIVELIHOODS

Employment

ASM: An estimated 3,600,000 people were working in the ASM in 2018.ⁱⁱ This number is twice that of the official 2018 figure 1,454,256 ([Central Bureau of Statistics 2019](#)) for total individuals employed in the mining sector inclusive of both ASM and LSM.

Gender participation in ASM

About 10% of the total ASM workforce in Indonesia are women.ⁱⁱⁱ

MINING SECTOR SUMMARY

General Mining Context

Artisanal and small-scale mining (ASM), referred to as people's mining in Indonesia dates to the pre-independence era. Archaeological evidence suggested that the first mining activities in Indonesia was in parallel with the emergence of empires in ancient Indonesia ([Lestari 2013](#)), such as Kutai (4th century AD), Tarumanegara (4th century AD) and Sriwijaya (7th century AD). Several communities claim that they have been conducting mining activities for generations. Take, for instance, the Banjar people who have mined diamonds in Martapura for generations ([Lahiri-Dutt 2017](#)). The history of community mining in Indonesia could not be detached from the involvement of ASGM activities in areas where miners are varied in terms of social, cultural and economic characteristics ([Yunianto and Saleh 2011](#)).

In the last decades, rapid development has taken place in the Indonesian economy, leading to a significant change in the management structure of the mining sector. The evolution of mining in Indonesia is traceable throughout the socio-historical framework of Indonesian politics and societies as distinguished by the four notable periods of mining regulatory development in Indonesia:

- The Dutch Colonial Period (1816 – 1945)
- The Old Order Period (1945-1966)
- The New Order Period (1966-1998)
- The Reform and Regional Autonomy Period (1998-Present)

Regulations with respect to the governance of the mining sector in Indonesia have also existed since the pre-independence era ([Miharja, Setyo and Hadi 2015](#)). At this period, Indonesische Mijwet Year 1899 Staatsblad 241 was implemented by the Dutch government in order to govern all mining activities, both LSM and ASM. Large mines, such as coal mines in Ombilin and tin mines in Bangka were operating at the time alongside community mining, albeit the latter being less governed. Mining licenses for community mining were granted by local authorities according to the different minerals that were mined, such as tin, gold and diamond. This regulation underwent several changes in 1906, 1910 and 1928 preceding a new regulation that was recorded during the pre-independence era; i.e., Ordonantie dated 25 November 1923 Staatsblats 1923 No. 565 that replaced Ordonantie dated 7 June 1900 No. 174.

During the so-called Old Order period, Soekarno – Indonesia's first president and founding father – implemented policies focused more on the nationalization of Indonesia's resources, including natural resources. Consequently, foreign investments were being limited as well in the mining sector, with the issuance of the Government Substitute Law No.37/1960 on Mining. Based on Article 1(J), people's mining was acknowledged as small-scale mining conducted by the people using simple equipment, for the purpose of meeting their own needs, based on their cultural norms or within cooperatives. Minerals that could be mined ranged from those that were categorized into Group A, B, and C.iv Article 12(2) of the Law mentioned that community mining was not to be interrupted by other mining activities, including enterprises holding a valid license. However, following the independence of Indonesia in 1945, the mining sector began to suffer and declined ([Devi and Prayogo 2013](#)).

Entering the New Order era, the government implemented Law No.11/1967 on the Basic Provisions on Mining. In this Law, people's mining was regulated "to provide opportunities for people to conduct mining activities so they would be able to participate in the national development of the mining sector with technical assistance from the government." To do so, the community must obtain a mining permit from the

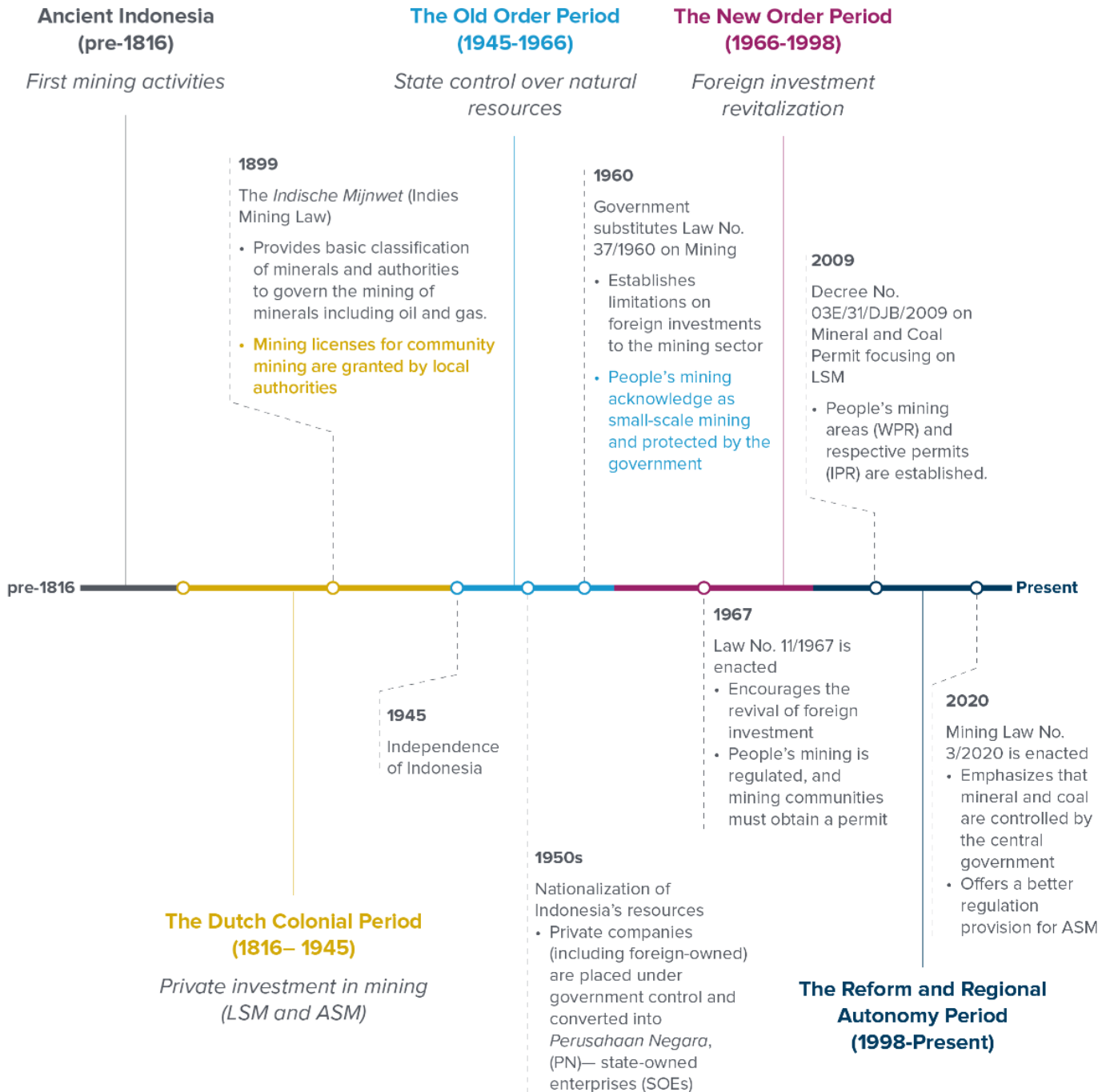
district head. Government Regulation No.75/1969 was then published to guide the implementation of said Law.

In 1997, the financial crisis severely affected the country, leading to political instability and a transition to decentralization in the country ([Devi and Prayogo 2013](#)). During the transition before Law No.4/2009 was officially implemented, the Decree of the Minister of EMR through Directorate General Mineral, Coal and Geothermal No.03E/31/DJB/2009 on Mineral and Coal Permit was put in place, albeit, failing to mention any reference to the people's mining in the Decree. Unlike previous Mining Laws, Law No.4/2009, has no clear definition of people's mining. Such mining activities were acknowledged by the regulations stipulating people's mining areas (WPR) and respective permits (IPR). Both are granted by district/town heads (Article 8).

Indonesia's mining sector continued its positive contribution to the country's economy in the last decade, albeit with fluctuations mostly due to changes in national policy and global commodity prices. At present an evident gap exists in the governance between the LSM and ASM subsector. The former is better regulated, despite both having the potential to contribute to national and regional development through increased local government and state revenue and improved environmental and social safeguarding mechanisms, including stronger gender relations in the sector.

The newly enacted Mining Law No.3/2020 as a revision of the previous Mining Law is expected to better regulate the ASM subsector, among others by addressing the existing issues within the subsector, including awarding of licenses and good mining practices. To achieve this, collaboration among relevant stakeholders, whether from the government, CSOs, academia and development agencies, is of utmost importance.

Timeline



ASM context and livelihood

In rural Indonesia, artisanal mining is a lucrative activity compared to other activities. It is estimated that the sector attracted 3,600,000 miners in 2018.ⁱⁱ Although women's roles are more diverse than previously, unequal gender roles in society influence women's participation in ASM activities. Current estimates suggest women make up less than 10% of the total ASM workforce and are identified as one of the most vulnerable groups in the sector. Despite the often-hazardous working environment in which they work, they are also less likely to have access to, and control over, the means of production and financial resources. In the course of their work, both male and female artisanal miners face various challenges to implement proper mining techniques; they use non-standardized Personal Protective Equipment (PPE) and rarely employ environmentally friendly techniques. Gold miners also still use mercury, which pollute the environment and can be potentially harmful to the health of miners and the surrounding communities.

EMPLOYMENT

With regards to ASM, many argue that the officially recorded employment data does not represent the actual figure. The absence of official data is due to various factors, but principally due to the fact that many ASM activities are conducted without a license. 2014 data from the Center for Mineral Technology Development mentioned that only 3% of the 77,000 small-scale mining operations in the country were carried out under a license (Miharja, Setyo and Hadi 2015). As of June 2020, only 16 IPRs were recorded by the Directorate General of Mineral and Coal (DGMC 2020b). There are three probable main causes for the low level of legalization: (i) complex and inefficient formalization mechanism; (ii) ASM is not a priority issue for the government; and (iii) lack of managerial skills, capital, and environmental management exerted by the ASM operators (Miharja, Setyo and Hadi 2015). Other factors include seasonal participation in the sector and the migration of miners (outflux of local miners and influx of non-local miners), who mainly look for new reserves. Despite the lack of official data, the estimated number of individuals who are involved in ASM can be found sporadically in several studies. Table 1 and 2 below summarize the recorded data from those studies on the number of ASM miners. Table 1 provides the data at a national level, while Table 2 shows the numbers in several locations over different years.

Table 1. ASM employment at national level

Year	Employment in all sectors	Employment in mining	% mining to all sectors	Employment in ASM	% ASM to mining sector
2003	95,456,935	923,591	1.0%	50,000 (ASGM)	5.4%
2010	108,207,767	1,254,501	1.2%	250,000 (ASGM)	19.9%
2013	110,804,041	1,420,767	1.3%	300,000 (ASGM)	21.1%
2014	114,628,026	1,436,370	1.3%	250,000 (ASGM)	17.4%
2015	114,819,199	1,320,466	1.2%	1,000,000 (ASGM)	75.7%
2018	124,004,950	1,454,256	1.2%	3,600,000 ⁱⁱ	247.5%

Sources: National employment data in all sectors and mining were derived from publications of [Central Bureau of Statistics](#) (2019; 2016; 2015; 2014; 2011; 2007). Employment data in ASM was derived from Gatot Sugihartoi, Balifokus 2015, [Seccatore and others](#) (2014, 5), [Blacksmith and YTS](#) (2013), Ismawati (2010) and Geology Research Center (2006) cited by [IPEN](#) (n.d, 2).

Based on Table 2, the trend in ASM employment showed an increase over the period of 2006 – 2013, with a fourfold increase from 2006 to 2010. Such sharp increase was the result of an economic crisis (Ismawati 2010). During this period, working in ASM was a quick solution for people who were discharged from their formal job due to the crisis. Moreover, the escalating gold prices during the same period gave way to the opening of more ASGM locations (nearly doubling) and triggered new miners to become active.

The number of ASM miners in 2018ⁱⁱ is twice that of the official figures for total employment in mining and quarrying as recorded by the [Central Bureau of Statistics](#) (2019). Albeit official data is not available to validate the 3.6 million workers estimate, such an assumption is widely accepted, considering the high number of unlicensed ASM activities.

Table 2. ASM employment at different sites

Year	Location	Employment in all sectors	Employment in mining	% mining to all sectors	Employment at ASM site	% ASM to mining sector
2003	Galangan, Central Kalimantan	801,379	26,891	3.4%	2,000 – 3,000	7.4% - 11.2%
2010	Talawaan, North Sulawesi	936,939	17,224	1.8%	2,000	11.6%
2011	Central Sulawesi	1,260,999	26,254	2.1%	5,000	19.0%
2012	Lombok, West Nusa Tenggara	56,557	5,641	10.0%	22,500	398.9%
2020	Lebak, Banten	5,562,846	85,017 ^v	1.5%	1,348	1.6%

Sources: Employment figures in all sectors and mining and quarrying sector were derived from Central Kalimantan Bureau of Statistics (2004), North Sulawesi Bureau of Statistics (2011), Central Sulawesi Bureau of Statistics (2012); West Nusa Tenggara Bureau of Statistics (2013) and Banten Bureau of Statistics (2020). Employment data in ASM was derived from [Castilhos and others](#) (2006, 321); [Bose-O'Reilly and others](#) (2010, 714), Environment Agency of Palu (2011) cited by [Albasar, Daud and Maria](#) (n.d., 4), Krisnayanti and Anderson (2012) cited by [Ekawanti and Krisnayanti](#) (2015, 25) and [Lebak Sub-national Government](#) (2020).

Table 2 above lists data on the number of miners from several sites in Indonesia, at different points in time. The total number of work force represents the national level, both in all sectors and in the mining and quarrying sector. The percentage of ASM miners with respect to total mining and quarrying employment is varied across locations and years ranging from below 10% to just about 20%. Data from Lombok, West Nusa Tenggara (2012) represents an outlier where the number of ASM miners is nearly four times the formal sector. This number is comparable with the number found in a similar research which investigated the level of mercury contamination in Sekotong, Lombok ([BaliFokus, 2015](#)). Based on this study, in this year, 40,000 Lombok inhabitants were recorded, nearly half of which were involved in ASGM activities.

GENDER PARTICIPATION

In Indonesia, official gender-segregated data in the ASM work force is unavailable, however, female presence and involvement in ASM activities have been recorded in various studies. A study conducted in 2003, indicated that **10% of the total ASM workforce in Indonesia were women** ([Hentschel, Hruschka, and Priester 2002](#)). In their report on health and environmental assessment in two ASGM sites in North Sulawesi and Central Kalimantan, [Bose-O'Reilly and others](#) (2010) recorded that few women were involved

in mining activities. In Tewang Pajangan Village, Central Kalimantan, a survey found that 15 out of 240 miners **(6.35%) were women** (Sim 2019).

The roles of women in Indonesia's ASM communities have changed over time (Aspinall 2001). Women were involved in ASM activities in North Sulawesi for instance, through supporting roles, whether as cook, "healer", or "mother" of the young workers. Nowadays, women's roles are more varied, not only in supporting roles (including the food vendors), but also in the direct mining activities as miners, ore crushers, pit owners, and landowners.

Clearly, gender gaps still exist in Indonesia's ASM sector and women are identified as being amongst the most vulnerable groups in ASM communities.^{vi} They are commonly involved in the amalgamation process of gold mining, heightening the risk of mercury poisoning. With regards to their reproductive roles, mercury contamination can lead to deformation of newborns. A study by the International Pollutants Elimination Network (IPEN) examined mercury levels in the hairs of women in the reproductive age range. The study found that 97% of the women sampled (n=67) from Sekotong and Pongkor, West Java exceeded the 1 ppm threshold (Bell and others 2017). This could be due to direct mercury exposure through the "traditional" amalgamation process as women often "roast" the amalgam in their kitchen or inside the house.

Women are also often less likely to have access to, and control over, the means of production and financial resources. Take, for example, the case of women miners in Sekotong, West Lombok, West Nusa Tenggara (UNDP Indonesia 2020). In this location, miners often work as a family unit. Women are involved in the transportation and crushing of the ore and are paid at a flat fee, based on how many sacks they can fill. Their income will be paid to their husbands, which will be spent mainly for household needs. On the other hand, male miners receive proportionate compensation based on the amount of gold that is produced and sold to the buyer. They also have the additional privilege of managing their own income.

Unequal gender roles in society can also influence women's involvement in ASM activities. Women's dual responsibilities mean that they have to be responsible for both the public and domestic spheres. In relation to ASM activities, many bring their offspring to the mining site, despite the often-hazardous working environment. In Central Kalimantan, women miners work 4-5 hours per day and can earn a net income of IDR 100,000.^{vii} In comparison, their male counterparts earn a net income of IDR 100,000-150,000 per day on average, but do not work every day (Sim 2019). Child-care facilities are also not always available in ASM locations. In the absence of child-care facilities, young women are the ones who usually take care of their younger siblings when the parents are at work. In some cases, ASM activities are conducted in locations where gender issues are present, such as child marriage and inequality in education opportunities for women, further exacerbating the vulnerabilities of women in the ASM sector. Women miners usually combine their responsibility of taking care of their family with mining activities.

Based on these challenges, various initiatives have been implemented to improve gender imbalance in the ASM sector. A few Civil Society Organizations (CSOs) are working with local communities to achieve this goal (AGC 2019^{viii}; YTS^{ix} 2019). The efforts are varied and include: creating training opportunities for female miners in terms of environmentally friendly technology, providing technical assistance for women in order to legally register their business, allowing them to apply for microfinance loans and work with cooperatives or under a more strategic program, educating women on gender issues such as early marriage and gender-based violence. More and more initiatives from the private sector are also noticeable within the female empowerment space. For example, a jewelry shop in Bali intentionally pays a higher price than the national gold market rate for mercury-free gold that is mined by a female cooperative in Central Kalimantan (Geraldine 2019; YTS 2019).

LABOR, SAFETY AND WORKING CONDITIONS

There is no doubt that good mining practices are imperative for improved safety, health and environment status. However, lack of capital and the urgency to make ends meet can easily drive people to find an immediate viable solution to make money while dismissing safety, health and environmental safeguards. Consequences of the absence of proper mining procedures include higher risks of accidents, lack of quality control, and negligence of the principles of sustainability. ([Eka 2019](#); [Media Indonesia 2019](#); [Sanusi 2019](#); [Azkia 2018](#); [Jejak Rekam 2017](#)).

There are two main recipients of the impacts of unlicensed mining activities: the environment (air, water, soil) and humans ([Miharja, Setyo and Hadi 2015](#)). With regards to the latter, the negative impacts are apparent when health and safety measures are lacking. Miners in the ASM sector cannot be seen as a homogenous group. Some consciously choose ASM as their main economic generating activity – these miners commonly have sufficient capital and are more aware of risk management, while others are driven by the need to make ends meet – these are usually the individuals who operate without a permit and do not have the resources to comply with good mining practices. They implement mining activities using non-standardized Personal Protective Equipment (PPE) and rarely employ environmentally friendly techniques in conducting their work.

As such, the unlicensed miners are in fact aware of the importance of complying to good mining principles in their work since it has been proven to be crucial for their own health and environment, despite the various challenges to implement proper mining techniques. A study in ASGM communities in North Minahasa, North Sulawesi, revealed that the use of PPE can be correlated with a better condition of the vital capacity^x of the miners' lungs ([Budiak, Rattu and Kawatu 2014](#)). However, the majority of miner respondents (61.9%) wore PPE only for 1 – 2 days in a week, followed by those who wore it throughout their working period (23.8%), and 3 – 4 days in a week (14.3%). The authors then concluded that wearing PPE was not the only concern, but obedience in using regularly is necessary to be monitored. In tin mining sites, it was observed that occupational safety and health concerns are weaker in People's Mining Area (WPR) than in Mining Business License (IUP) areas, due to a lack of inspection from authorities, government support, civic infrastructure, regulated procedures, or improvements from mining companies. Furthermore, there is no government-run program in which ASM (i.e. people mining workers) and their families can access basic health services in the areas where they work ([IMI 2018](#)). Several ASM miners, however, are equipped with capital and modern technology, such as some of the tin mines in Bangka Belitung and the coal mines in South Kalimantan. Many others are still driven by poverty and employ traditional ways of working, such as the ASGM in Sekonyer, Central Kalimantan and Lanud, Bolaang Mongondow in North Sulawesi ([Yunianto and Saleh 2011](#)).

The other risks of occupational health and safety come from the substance that is commonly used in ASGM activities: mercury. During the gold mining process, mercury can enter the human body in several ways: through contamination present in the air, water, land, and food, through the amalgamation process and through the discharge of mining waste ([Hong and others 2013](#); [Park and Zheng 2012](#); [Limbong and others 2003](#)). In the body, mercury can potentially disrupt multiple systems (nervous, hematological, immune, respiratory, gastrointestinal, cardiovascular) along with kidney and reproductive function. The severity of mercury intoxication is dependent on various factors including the chemical form, dosage, age or developmental stage of the exposed individual, along with the duration and route of exposure.

Indonesia is the highest mercury emitter in the world, with an estimated 304 metric tonnes of mercury being emitted per year (Ratnawati 2020). Sixty percent of this emission is said to originate from ASGM

activities ([Baqiroh 2019](#)). Mercury-induced environmental pollution has been found in certain ASGM areas, such as Kalirejo Village, Kokap Subdistrict, Kulon Progo District, Yogyakarta (Larasati, Setyono, and Sambowo 2012); Buyat Bay, Kotabunan Subdistrict, Bolaang Mongondow District ([Lutfillah 2011](#)); Dimembe, North Minahasa District, North Sulawesi ([Sumual 2009](#)); Na'e River, Pesa Village, Wawo Subdistrict, Bima District, West Nusa Tenggara ([Fatoni 2012](#)); and Poboya, Palu, Central Sulawesi ([Mirdat and Isrun 2013](#)), to name a few.^{xi}

Mercury is frequently used by miners as it is considered to be efficient, effective, and affordable ([Krisnayanti and others 2012](#)). With regards to its negative impacts, along with the current national initiative on mercury abolishment, the government has been continuously promoting the use of mercury-free technology in ASGM activities. The main drivers of this initiative are the Ministry of Environment and Forestry (MoEF) and the Agency for the Assessment and Application of Technology (BPPT). As the focal point of the National Action Plan on Mercury Use Reduction and Abolishment (RAN-PPM), MoEF is responsible for any activities related to mercury reduction and abolishment, including the development of mercury-free technology. BPPT, on the other hand, is assigned to conduct the more technical tasks in advancing the technology. In 2017, BPPT succeeded in conducting a comprehensive study in three mining sites: Pacitan (East Java), Banyumas (Central Java) and Lebak (Banten). This study covered several topics, which were gold ore characterization, metallurgical testing, gold processing design, detailed engineering design of a mercury-free pilot plant, and project feasibility ([BPPT 2018](#)). The result of the study became the basis of the design of mercury-free technology which used cyanide as an alternative. In the same year, MoEF signed an MoU with District Head of Lebak, Iti Octavia Jayabaya (incumbent, took office since 2014), on management of waste and hazardous materials. One of the points in the MoU was the establishment of a non-mercury gold processing facility at the ASGM site within the district. This pilot plant was then successfully launched by MoEF in 2018 and was located in Lebak Situ Village, Lebakgedong Subdistrict, Lebak District, Banten Province ([Banten news 2018](#)).

A substantial amount of research has been dedicated to conducting health assessments and examining mercury intoxication in ASGM communities in Indonesia (see Table 3 below for summary). While some studies focused solely on the health status of the miners, others also compared the miners' health status to that of the general population (e.g. [Arifin and others 2015](#); [Ekawanti and Krisnayanti 2015](#)) and to the mercury level in fish ([Bose-O'Reilly and others 2010](#); [Castilhos et al. 2006](#)). Studies that compared the health status of ASGM communities with a control group, revealed that miners commonly showed higher level of mercury intoxication, seen from lower hemoglobin levels and higher mercury levels found in urine and hair samples. Studies that investigated the mercury levels in fish showed that findings of high mercury levels in fishes in the research area highly corresponded with high mercury levels in human blood and hair samples.

Table 3. Summary of health assessment in Indonesia’s ASGM communities

Year	Location	Sampling		Finding			
		Human samples	Body samples	Affected samples (see Note)	Type of mercury found	Possible Route	Symptoms
2004	Sulawesi (Tatelu), Kalimantan (Tangkiling, Kereng Pangi)	167 (Sulawesi) 220 (Kalimantan)	Blood, hair, urine	General Population: 29% (Sulawesi), 43% (Kalimantan) Amalgam smelters: 54% (Tatelu), 60% (Kereng Pangi)	Inorganic, organic and Methylmercury	Mineral processing, fish, water	Ataxia, tremor, movement disorders
2010	Galangan and Talawaan	281	Blood, hair, urine	93%	Inorganic, organic and methylmercury	Mining process, fish	ataxia, tremor, hypomimia, memory
2015	Sekotong	100	Blood, hair, urine	100%	Elemental, inorganic and ethyl-mercury	Mining process, food and water	Proteinuria, lower hemoglobin level
2015	Gorontalo	95	Hair	100%	Methylmercury (possibly)	-	-
2016	Cisitu, Banten	18	Hair, urine	83%	Methylmercury (possibly)	Mining process, polluted rice and fish	ataxia, tremor and coordination problems

Sources: [Bose-O'Reilly and others \(2016\)](#); [Arifin and others \(2015\)](#); [Ekawanti and Krisnayanti \(2015\)](#); [Bose-O'Reilly and others \(2010\)](#); [Filho and others \(2004\)](#). Note: Most of these studies use Human Biomonitoring Level (HBM), a standard published by German Human Biomonitoring Commission in 1999 to categorize health risks from Hg exposure (Bose-O'Reilly et al., [2016](#); [2010](#); [Arifin and others 2015](#)). Others use Hazard Quotient ([Castilhos and others 2006](#)) – a risk assessment index which portrays the ratio of exposure level or daily intake dose in relation to the reference dose – and WHO standards ([Ekawanti and Krisnayanti 2015](#)).

Mercury has been found in both the inorganic and methylmercury forms with the former found among ASGM miners who conduct the amalgamation process and the latter found in fish and not commonly found among miners. This finding suggests that mercury intoxication in the human body can also be induced indirectly through food intake of e.g., contaminated staple food and fish.

The presence of children in mining sites is also a concern. According to research conducted by the International Labour Organization ([ILO](#)) in 2014, the estimated number of child laborers between the ages of 5 and 17 working in informal tin mines of Kepulauan Bangka Belitung province was estimated at about 6,300, the majority (69%) being age 15-17. This figure is equivalent to 5% of the total number of children age 5-17 in the province surveyed and 13% of the total number of children found to be working in the region([ILO 2015](#), 61).

Environmental degradation resulting from inappropriate mining activities that do not comply with good mining practices is of further concern. There does not exist any legal provisions for a simplified environmental permit for ASM limiting better environmental management of the sector ([IMI 2018](#)).

Key Minerals

Sandstone, gold, tin, coal and diamond are the key minerals extracted by artisanal miners in Indonesia. Based on the national data verification of 352 mining locations across the country, sandstone miners accounted for more than one-third of the ASM workforce in 2015, while gold accounted for one-quarter of the minerals mined by ASM communities. Most of the miners of these commodities commonly operate without a license, preventing the government from collecting taxes and limiting compliance with good mining practices. Miners are generally reluctant to apply for license due to the apparent complexity of the administrative process. Local governments face a dilemma in preventing unlicensed miners from engaging in mining activities since these activities reduce unemployment in their subregions and generate income to households.

SANDSTONE

Sandstone mining in Indonesia has been conducted for decades, are commonly small-scale and sporadic, thus, it is difficult to obtain official data on the activities. Similar to other commodities in ASM, sandstone mining is also commonly conducted without license. Take, for instance, those in Kuantas Singingi District, Riau Province ([Siburian 2016](#)) and Plosoklaten Sub-district, Kediri District, Central Java Province ([Bahroni 2018](#)). Sandstone miners in both areas are reluctant to apply for license due to the perceived complicated administration process. The obligation to pay taxes that entails with license issuance is also considered as burdensome, as sandstone mining does not provide miners with high income ([Bahroni 2018](#)).

In addition to miners' hesitancy to apply for licenses, law enforcement from the sub-national government is considered limited, as most actions taken by law enforcement focus on awareness raising and preventative action rather than enforcement ([Bahroni 2018](#); [Siburian 2016](#)). In some cases, sub-national governments have admitted that they are not able to prevent people from conducting sandstone mining as these activities generate income for local households. Employers advocate that sandstone mining can reduce unemployment within mining regions as each employer attracts roughly 2-3 people to work for them. Yet, miners still saw their income as inadequate, hoping for the government to provide them with access to capital to improve production volumes.

The unlicensed sandstone mining activities are commonly conducted without compliance to good mining practices. As a result, communities around the mining site often complain about the negative impacts to the environment –such as landslides of the riverbanks which can cause flooding during rainy season – and to public facilities – such as damaged roads and drainage systems ([Bahroni 2018](#)). Miners, on the other hand, are often not aware of the need to implement good mining practices. In addition, they lack the financial resources to implement necessary measures.

GOLD

ASGM activities can be found across Indonesia. In 2006, 576 locations were identified, with more than 50,000 miners. In 2009, 850 ASGM hotspots were recorded, with more than three times the number of miners identified in 2006 (Ismawati 2010). The increase in the number of ASGM activities can be attributed to the fact that gold mining activities are often seen as a panacea during times of crisis. During the

economic crisis in 2010, the number of miners reached 250,000 workers and spread across double as many hotspot areas than in 2006 (Ismawati 2010).

Based on the national data verification of 352 mining locations across the country (MoEF 2015), gold accounted for a quarter of the minerals mined by ASGM communities in 2015. Gold mining activities are present in almost all provinces, usually attracting migrants from other regions outside the ASGM site.

In 2013, the Blacksmith Institute and Yayasan Tambuhak Sinta estimated that more than 300,000 people are directly employed by ASGM (Blacksmith and YTS 2013, 5). Today, ASGM in Indonesia produces USD 5 billion in gold a year, accounting for about 7% of total national gold production (McGrew 2016). In 2017 urban artisanal gold miners in Makassar, South Sulawesi had an average income of USD 265/month (USD ~9/day). Their income was slightly higher than the income of ASGM workers in Kalimantan, who earned around USD 74–223/month. Most of the gold workers had low education levels, having only attended elementary, junior, and senior high school, and none had graduated from university (Abbas and others 2017).

One of the main concerns of ASGM activities is the high level of mercury contamination in the mine sites and the surrounding periphery, as indicated by the multiple studies that have found elevated levels of mercury in peoples' hair at ASGM sites (Castilhos and others 2006; Bose-O'Reilly and others 2010; Krisnayanti and others 2012). Indonesia has ratified the Minamata Convention to abolish mercury, including in the ASGM sector. Currently, the MoEF, as the national focal point of the initiative, has been working with other ministries and stakeholders as well as international development agencies in advocating for the use of mercury-free technology in ASGM activities. Grassroot initiatives are also recorded, often promoted by local CSOs who work with community miners.

Many ASGM operations faces uncertainties of tenure as in some cases the government has ceded areas where people's mining was occurring to larger companies. This has resulted in conflicts between ASGM miners and industrial companies as artisanal and small-scale gold miners were forced to leave areas they previously had mined and were left without other livelihood opportunities. The term penambang tanpa ijin is used to refer to miners operating without a license (Andiko 2006 cited by Agrawal et. al 2018).

TIN

The term commonly used in Indonesia to describe the activities with regards to the tin community mining is TI (*Tambang Inkonvensional*, literally translated as unconventional mining). Most commonly they are practiced sporadically in tin-rich areas without a proper license. The islands of Bangka, Singkep and Belitung are the main producers of tin (Sutedjo 2007). Although a decline in tin production was experienced in recent years, this sector has contributed greatly to the regional economy since the Bangka Belitung province was established in 2001. During a 2010 study, it was estimated that there were around 10,000 operations across Bangka-Belitung providing a livelihood for 50,000 people with 80% of Indonesian tin exports coming from artisanal mines (International Tin Association 2018).

The commodity has become the main source of income for people in Bangka since the VOC (Dutch occupation) era (Erman 2010). The emergence of TI in Bangka Belitung can be attributed to several factors (Subiman and Resosudarmo 2010). The biggest tin mining company in Indonesia that operates in Bangka decided to employ contractors to conduct the mining operations due to the global tin crisis in 1985. Through these contractors local mining capacity was developed. In the 1990s there was a decline in pepper prices, which was the main agricultural commodity for people in Bangka at the time, and tin mining

became an alternative livelihood for many farmers impacted by the price decline. Further contributing to the sector's growth was the creation of the province of Bangka Belitung 2000^{xii} following the economic crisis between 1997 and 1998 which contributed to an overall weak law enforcement in mining areas found across the province.

Placing the informal aspect aside, people's tin mining is one of the key sources contributing to economic growth in the region. Artisanal cassiterite miners in Bangka and Belitung earn about IDR 3 to 5 million/month (US \$222 - 370/month), while the minimum of Indonesian wage is US \$198/month ([Maia and others 2019](#)). Tin mining contributes to an 89-95% increase in household income per month ([Nurtjahya, Agustina and Putri 2008](#)). Cash from these activities are received in a shorter time period in comparison to that from pepper plantations ([Subiman and Resosudarmo 2010](#)). The multiplier effects as a result has supported the emergence of various small businesses near the mining areas ([Sulista 2019](#)).

Unsurprisingly however, negative impacts of tin mining activities were also recorded ([Nurtjahya and Agustina 2015](#)). Offshore mining leads to degradation in the water quality, along with disruption of the lives and diversity of the intrinsic flora and fauna. Further deterioration of the natural environment adversely impacts the livelihood of the local community, as there has been a decline in number of fish caught and degradation of soil fertility around the inland mine-sites. Moreover, activities that are not conducted in compliance with good mining practices have led to occupational accidents and death.

Finally, while tin mining has contributed to increased income for miners or people active in mining, it also caused social conflicts at mining sites usually between locals and immigrants ([Nurtjahya and Agustina 2015](#)).

COAL

As in the case of LSM, most of the coal community mining is mainly found in South and East Kalimantan. Often enough, the unlicensed ASM activities in both provinces are very problematic since they are held responsible for various issues; i.e., breach in the law, environmental degradation and occupational accidents ([Utama 2019](#); [Apahabar 2019](#); [Katadata 2019](#); [Utama 2019](#); [Yovanda 2019](#); [Pewarta Kalsel 2012](#)). These activities are conducted on individually owned land (often during land clearing), by renting people's land, using palm oil licenses or collaborating with legal mining operations ([Katadata 2019](#)). Clearly many of these operations do not comply with Health, Safety and Environment (HSE) standards, therefore leaving exposed mine-holes that can cause minor to fatal accidents ([Utama 2019](#); [Yovanda 2019](#)). The high number of unlicensed mining operations in East and South Kalimantan is believed to be enabled by the weak law enforcement, lenient monitoring by the mine inspectors and the excessive issuance of IUP licenses (before the clean and clear policy was implemented) ([Katadata 2019](#)). Stronger collaboration between ministries – i.e., Ministry of Energy and Mineral Resources (MEMR), Ministry of Trade (MoT), Ministry of Environment and Forestry (MoEF), Ministry of Internal Affairs (MoIA) – is much needed. Estimated employment for the artisanal coal sector from a 2001 study estimates 20,000 people are directly employed in the sector ([Aspinall 2001](#)).

DIAMOND

Diamond mining in Indonesia is mainly located in South Kalimantan, more specifically in Cempaka, Tiung River, Bangka and Salam, employing a total of around 1,000 individuals involved in mining activities in these areas ([Azkia 2018](#) citing Media Indonesia 2011). Pumpung Village, Cempaka Subdistrict, Banjarbaru, South Kalimantan is said to be the main producer of diamonds that are sold in Martapura, a market known

as having some of the best diamonds in the world ([Media Indonesia 2019](#)). The mining area covers more than 2,000 ha.

Another location of diamond mining in South Kalimantan is in Riam Kanan Dam, Aranio Subdistrict, South Kalimantan ([Albanna 2019](#)). The mining activity here started with only a number of people, before multiplying exponentially due to the reaped economic benefits. At its peak, more than half of the people in the village (hundreds of them) mined hundreds of diamond grains each day. However, since 2008, no more diamond mining was conducted following the overflowing of the river where the mining activities normally took place.

Diamond mining activities are often conducted without any mining license; however, the local government and mining agency faces a dilemma in taking action against the diamond mining activities since the mining activities provide sustenance and generate income for the people. Some of the mining operation even encroach tourism areas, i.e.; the Meratus Geopark ([Azkia 2018](#) citing Media Indonesia 2011).

Many of these mining activities are conducted without adhering to good mining practices, which can cause landslides and accidents that, in some cases, lead to fatalities ([Eka 2019](#); [Media Indonesia 2019](#); [Sanusi 2019](#); [Azkia 2018](#); [Jejak Rekam 2017](#)). These practices also cause environmental degradation, such as water pollution and biodegradation.

Among the government's efforts to discourage diamond mining activities, one is done by providing alternative livelihoods to the miners, such as animal (duck) farming ([Sanusi 2019](#)). Some have shifted work, but other are more hesitant to leave a lucrative income generating activity that had been their livelihood for many generations. Diamond mining is viewed as a tradition that runs through their family and as such, must be continued even when they are aware of the risks associated with the job. For this reason, the government has launched campaign efforts to educate the people in terms of occupational health and safety.

Although diamond mining is able to provide income to communities, many still live in poverty. This might be due the fact that miners usually sell their diamonds at a low price ([Azkia 2018](#)). Moreover, the existence of free-riders, or using the local term "*pengempet*", (defined as individuals who take profit from an activity without necessarily investing any capital or work) consequently magnifies the miners' loses. The free-riders buy diamonds from the miners while making use of the miners' need to receive immediate cash and their inability to access any other trading channels, thus obtaining diamond for very low prices before selling them two to three-folds in the big diamond markets in Martapura.

Development & Economic Indicators

Indonesia has made tremendous progress in poverty reduction during the past 20 years. The mineral sector, which plays a crucial role in the country's economy, contributes to the development of several remote regions in Indonesia. Developing the ASM subsector and achieving the SDGs involves both dynamic processes of transformation for Indonesian society and creating opportunities to build a sustainable and innovative economy. Data and information exist to demonstrate the contribution of ASM to achieving SDGs 1, 2, 8, 10, 17 in Indonesia, including poverty reduction, employment and partnerships revitalization. Formalization efforts can help leverage these contributions and reduce the many challenges facing the sector, including miners' working conditions and environmental degradation.

GENERAL DEVELOPMENT & ECONOMIC CONTEXT

Since overcoming the Asian financial crisis in late 1990, Indonesia has recorded remarkable economic growth ([UNDP 2019](#)). With a population of nearly 268 million, Indonesia ranks fourth in the world's most populated nations, and 10th as the world's largest economy in terms of purchasing power. Indonesia's HDI for 2019 was 0.707, placing the country in the high human development category, ranking at 111 out of 189 countries ([UNDP 2020b](#)). Between the year of 1990 and 2018, the value of Indonesia's HDI increased by a staggering 34.6%, with increases in life expectancy (+9.2 years) and the mean years of schooling (+4.7 years). Within the same time period, Indonesia's Gross National Income (GNI) per capita increased by approximately 155.9%.

The country has made tremendous progress in poverty reduction, reducing the poverty rate by more than half since 1999 to 9.4% in 2019. While increased efforts are being made to improve basic public services, the quality of health facilities and schools are uneven relative to average incomes, contributing to worrisome indicators, particularly in the area of health.^{xiii} While poverty has decreased over the last two decades, inequality has increased in the country. The Gini coefficient^{xiv} increased from 0.30 points in 2004 to 0.41 points in 2014, one of the fastest increases in the region.

The GII measures gender-based inequalities using factors related to reproductive health, empowerment, and economic activity. Indonesia's GII is at 0.451, placing the country at the 103rd position out of 162 countries in the 2018 index. The female participation rate in the labor market is 52.2% compared to the significantly higher 82% for male.

The mineral resources sector plays a crucial role in the Indonesian economy contributing to the growth of the national economy and accounting for a significant contribution to its exports, government revenue, employment, and the development of several remote regions in Indonesia. The mining and utility outputs in Indonesia are considerably larger than in its East Asian neighbouring countries, having historically accounted for around 12% since the late 1980s ([Elias and Noone 2011](#), 39). Following a decline from 6.1% of GDP in 2011 to 4.2% in 2016, the sector has since experienced an improvement to approximately 5% in 2018 ([PWC 2019](#), 26). Due to the positive correlation between mining contribution and mining commodity prices, the rise in GDP was largely due to the increase in commodity prices, particularly for coal. Thermal coal production increased by 42% from 2015 to 2018 and was also a primary driver of the mining sector's increasing contribution to total export revenue reaching 16% in 2018 ([Central Bank of Indonesia n.d.](#)).

ASM LINKAGES TO DEVELOPMENT INDICATORS



In order to reach the targets, set out by the Sustainable Development Goals (SDGs), the mining sector plays a crucial role as one of the largest revenue contributors for Indonesia. The development of the mining sector and achieving the SDGs both involve dynamic processes of transformation for Indonesian society to become more sustainable and innovative. In this regard, some of the goals associated with the country's challenges include achieving food and energy security, adding value to commodities, and improving the management of natural resources through increasing resource efficiency and renewable energy use.








Despite Indonesia's huge potential as a resource-rich nation, several transmission channels through which commodity dependence negatively impacts development outcomes have been identified ([Perez 2017](#)). These channels include direct as well as indirect links to development outcomes, the most important being: (i) terms of trade effects; (ii) fiscal and monetary policy challenges; (iii) microeconomic channels.

In an under-optimized condition, commodity-dependency can be associated with low human development and pessimistic development prospects. Countries with a mass population such as Indonesia should be able to optimize its ASM subsector so it can strengthen the transmission links to better contribute to development by: i) providing employment ii) increasing local purchasing power iii) stimulating local economic growth iv) slowing urban migration v) facilitating technology transfers. Formalization efforts — the integration of the sector into the formal economy, society and regulatory system—can leverage ASM's contribution to the social and economic development of the Indonesia and reduce the many challenges that the sector faces including the working conditions of miners and environmental degradation.

The following table presents the linkages between selected SDGs and how ASM can contribute, through formalisation, to the achievements of those goals.

Table 4: ASM linkages to development indicators

 <p>1 NO POVERTY</p> <p><i>End poverty in all its forms everywhere</i></p>	<ul style="list-style-type: none"> ○ ASM is a largely poverty-driven activity that provides livelihoods for more than one million people in over 27 provinces in Indonesia. ASM provides the means for individuals to fulfil their subsistence needs. ○ Although ASM is a source of job opportunities and helps individuals rise from poverty, the prominent inequality in the trading system results in unjust payments to ASM workers (IGF 2017). The existence of free-riders, or using the local term “<i>pengempet</i>”, (defined as individuals who take profit from an activity without necessarily investing any capital or work) contribute to imbalances in trading system. Free-riders buy diamonds from the miners while making use of the miners' need for immediate cash and their inability to access any other trading channels, thus, obtaining diamond for very low prices before selling them two to three-folds in the big diamond markets in Martapura (Azkia 2018).
 <p>2 ZERO HUNGER</p> <p><i>End hunger, achieve food security and improved nutrition and promote sustainable agriculture</i></p>	<ul style="list-style-type: none"> ○ Artisanal gold mining in Indonesia has begun since several hundred years ago in which most of the miners are farmers who wait for their agricultural harvest time by mining gold in river's stream nearby (Chamid and Sulistijo 2012). ○ Artisanal mining and farming have been complementing each other. Economically, artisanal mining contributes to increase household income, including agricultural cost of production. In some regions of Indonesia, such as in Lombok, about three quarters of the household's total income comes from ASGM mining and the rest from farming. ○ However, both sectors can compete for resources including land, labor and capital. Artisanal mining which provides quick and more lucrative income to households reduces labor availability for agriculture, therefore affecting crops production. ○ When not adhering to good mining practices, miners use hazardous and polluted materials (including mercury in ASGM) that impacts agricultural land and contaminate water needed for agriculture activities. (Limbong and others 2003)

 <p>5 GENDER EQUALITY</p>	<p><i>Achieve gender equality and empower all women and girls</i></p>	<ul style="list-style-type: none"> o Women make up 31% of the workforce in Indonesia, and only 3% are employed in mining operations (Lahiri-Dutt & Macintyre 2006). o However, women face the added disadvantage of income inequality, where they receive a significantly lower compensation for completing the same work as their male counterpart. o Additionally, as women are often times considered to be at the bottom of the social hierarchy, they face discrimination in land ownership, obtaining bank loans, and when applying for licenses.
 <p>3 GOOD HEALTH AND WELL-BEING</p>	<p><i>Ensure healthy lives and promote well-being for all at all ages</i></p>	<ul style="list-style-type: none"> o ASM activities are often conducted without the implementation of proper Health Safety and Environmental guidelines. Artisanal miners usually implement mining activities using non-standardized Personal Protective Equipment (PPE) and rarely employ environmentally friendly techniques in conducting their work. This affects their own health and environment.
 <p>6 CLEAN WATER AND SANITATION</p>	<p><i>Ensure availability and sustainable management of water and sanitation for all</i></p>	<ul style="list-style-type: none"> o ASM activities are linked to water, since water plays an important role in the processing of the minerals. In those instances, in which ASM activities are not properly executed, severe environmental impacts, such as mercury discharge into lakes and rivers, are detrimental to the local community's resource for drinking and maintaining their household and agricultural activities.
 <p>14 LIFE BELOW WATER</p>	<p><i>Conserve and sustainably use the oceans, seas and marine resources for sustainable development</i></p>	<ul style="list-style-type: none"> o Indonesia is the highest mercury emitter in the world, with 304 metric tonnes of mercury being emitted per year.¹ Sixty percent of this emission is said to originate from ASGM activities (Baqiroh 2019). Mercury that pollute the environment threatens the health of miners and surrounding communities. Although the practice of using mercury to extract gold was banned by the Indonesian government in 2014, nearly all artisanal miners use mercury to extract their gold.² In the process, miners released hundreds of tonnes of mercury into the water, soil, and air, often in poor, remote areas, contaminating food and wildlife.
 <p>15 LIFE ON LAND</p>	<p><i>Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</i></p>	<ul style="list-style-type: none"> o Other improper mining activities which disregards adherence to good mining practices results in environmental degradation. The use of unregulated explosives, for example, causes environmental damages, such as those which are disruptive to the ecosystem on riverbanks.
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<p><i>Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</i></p>	<ul style="list-style-type: none"> o ASM has increased the income and social welfare of household and created job opportunities. Mineral commodities have become a source of income for an estimated 3,600,000 people and their families. A study conducted in the West Sumbawa Regency, for example, found that the average income of miners increased more than 10-fold after the transition to mining. From USD 2.4 /day or less, miners average income increased to USD 35.2 /day or more (Krisnayanti and others 2016).
 <p>10 REDUCED INEQUALITIES</p>	<p><i>Reduce inequality within and among countries</i></p>	<ul style="list-style-type: none"> o Artisanal mining is one of the sources contributing to local economic growth in some regions of Indonesia. Through the 'multiplier effect' ASM also supports many millions more people indirectly through livelihoods in associated industries, i.e.; SMEs supporting the mining sector, including processing, engineering, security services, accounting, catering, farming, and transport. In Bangka Belitung, for example, the multiplier effects, as a result of tin mining, has supported the emergence of various small businesses near the mining areas (Sulista 2019). Tin mining also contributes to an 89-95% increase in household income per month (Nurtjahya, Agustina and Putri 2008). o However, due to their informal nature, unlicensed miners generally do not pay royalties and other taxes to the government, contributing to a loss of revenue to the state and to reducing the potential for the ASM sector to better contribute to subnational development and state revenue

	<p>collection. This situation is exacerbated by the loss of benefits that could have been derived from multiplier effects.</p> <ul style="list-style-type: none"> o Mining activities that are conducted without abiding by good mining standards and complying to occupational health and safety requirements result in hazardous workplace for miners. The recently revised Mining Law in 2020, which now lays higher importance of the management of ASM provides for implementation of best practices in working and labor conditions so that ASM can unleash its true contribution to enable decent jobs for hundreds of millions of people, combat child labor and bring about social and economic transformation.
 <p>Revitalize the global partnership for sustainable development.</p>	<ul style="list-style-type: none"> o Formalizing the ASM sector will require inclusive and comprehensive governance involving diverse stakeholders working in partnership, notably Indonesian central and subnational government actors across different sectors, CSOs, private sector companies—including the LSM industry, international agencies, and research institutes.

Source: Authors' work based on various sources. ¹Stated by Rosa Vivien Ratnawati, Directorate General of Waste Management, Ministry of Environment and Forestry, in an opening remark of Webinar on Responsible Management of People's Gold Mining, June 16, 2020.

²See at <https://www.asiapacific.ca/blog/artisanal-and-small-scale-gold-mining-sector-problems-and>

Mineral Governance Framework and ASM Formalization

ASM activities in Indonesia are varied in terms of size and scale, legal status, economic rationale and governance, and are classified into 4 categories: legal, informal, unlicensed and illegal. The licenses are granted to an individual (max. 1 ha), or to cooperatives (max. 10 ha) for the duration of 10 years, with a possible two time period extension, 5 years each. Although operators are required to hold a license and operate in designated areas, no clear licensing mechanism is defined. Acquiring licenses and environmental permits involves high cost and a heavy bureaucracy for miners, which discourages application. Several grassroots initiatives to formalize ASM activities are increasingly evident as there is increased recognition in the sector's potential to contribute to sub-national development and government revenue collection. In the revised law, UU No. 3/2020, new regulations have been established to better manage the ASM sector and protect miners' livelihoods.

MINING STRATIFICATION

Within the Indonesian context, ASM can be described as labor-intensive, small-scale, non-mechanized mining operations. ASM activities are considered equally important as LSM, due to the large number of employment opportunities they provide while the two often operate side by side. The encounters and engagement between LSM companies and ASM are increasing as a consequence of the growth of ASM on the one hand, and the intensification of LSM operations in remote regions of developing countries, where ASM is most likely to be present.

In Indonesia, there has been no consensus in the term(s) used to define ASM activities. PETI “*Pertambangan Emas Tanpa Izin*” (Non-licensed gold mining) or PESK “*Pertambangan Emas Skala Kecil*” (Small-Scale gold mining) are commonly used when referring to artisanal and small-scale gold mining (ASGM). “Unconventional” mining is used when discussing about tin mining. “*Pertambangan rakyat*” (people’s mining) was used in legal documents (Laws, regulations, etc.) to discuss and define a mining area (WPR) and permit (IPR). The term “people’s mining” can refer to all types of minerals, non-minerals and rock extracting activities.

A *Wilayah Pertambangan Rakyat (WPR)* roughly translated to People’s Mining Area represents a part of a mining area where small scale mining activities are conducted. Based on the newly enacted Law No.3/2020, a WPR must meet the following criteria:

- Has a secondary mineral reserve contained in the river and/or at the sides of the river
- Holds a primary metal or coal reserve with a maximum depth of 100 meters
- Consists of sediment terraces, flood plains, and ancient river deposits
- Has a maximum area of 100 hectares
- Explains the type of commodity to be mined
- Meets the criteria of land and area used for mining business based on the existing law

Izin Pertambangan Rakyat (IPR) is a license that gives the holder eligibility to run small-holder mining businesses in WPR areas of limited size and investment. The people’s mining system was set up with the purpose of designating certain areas as community mining zones, therefore, IPRs are inaccessible by foreign investors. In June 2020, there were only 16 IPRs registered at the DGMC ([DGMC 2020](#)).

In addition to the terms being used, ASM activities in Indonesia are varied in terms of size and scale, legal status, economic rationale and governance. The Association of Indonesian Mining Professionals, *Perhimpunan Ahli Pertambangan Indonesia (Perhapi)* in a collaborative project with an international development agency classified ASM into 4 categories: legal, informal, unlicensed and illegal. This categorization was based on variables of legal ownership over the land where the mining activity is conducted; attainment of a permit; and incrimination for involvement in any illicit/ illegal act. Table 5. below summarizes the classification by Perhapi, with additional information on economic rationale, tax that is (not) paid from such activities, and state monitoring. These three categories are based on the works of [Jyotishi, Lahiri-Dutt, and Sivramkrishna \(2018\)](#) to provide additional lenses on the nature of activities, its impacts to revenue collection, and how the state governs the sector.

Table 5. Categorization of ASM activities

	Land ownership	Permits	Incrimination for legal act	Economic rational	Tax	State monitoring/ records
Legal	Yes	Yes	No	Profit	Yes	Yes
Informal	Yes	No	No	Profit/Livelihood/Windfall	No	No
Unlicensed	No	No	No	Profit/Livelihood/Windfall	No	No
Illegal	No	No	Yes	Profit/Livelihood/Windfall	No	No

Source: Authors’ work based on works of Perhapi (2020) and [Jyotishi Lahiri-Dutt, and Sivramkrishna \(2018\)](#)

MINING FORMALIZATION REGULATIONS (ASM FOCUS)

Under the previous Indonesia Mining Law No.4/2009, there was no clear definition of people’s mining. Such mining activities were acknowledged by the regulations stipulating people’s mining areas (WPR) and permit (IPR). Both are granted by district/town head (Article 8). WPR will be granted by district/town head upon consultation with the Regional House of Representatives. The area shall not exceed 25 hectares (ha) and will be no more than 25 meters deep. This is considered to be difficult in practice as many people’s

mining activities exceed these criteria for example in the case of metal and coal mines whose reserves are located deep within the earth ([Yunianto and Saleh 2011](#)). People's mining activities are also commonly very itinerant as the miners are constantly in search of better reserves. Therefore, Article 24 of the Law is regarded as more suitable in addressing issues related to people's mining area, as it stipulates that areas where people's mining activities are currently active will be prioritized for designation as WPR. This stipulation also indicates a degree of concern on the impact of the mining activities to the environment. The implementation of the WPR mechanism is further regulated by Government Regulation No.22/2010 as a derivation of the Law.

IPR will be granted by the district head or sub-district head once approved. IPR can be granted to an individual (max. 1 ha), group (max. 5 ha) and cooperatives (max 10 ha) within the duration of 5 years, with the possibility of an extension. IPR holders are entitled to receive technical assistance and monitoring in relation to HSE, mining practices, and management from the central and/or district government; and capital assistance, when needed. With this permit, IPR holders are subject to several obligations, as is the case with holders of any other mining permits: they are to conduct the activities at the latest 3 months upon granting of the permit; comply to rules and regulations regarding occupational health and safety, environmental management, and other existing standards; participate in environmental management, in collaboration with the regional government; pay fees (regular and production fees); submit regular written reports on mining operation.

On the onset of this set of regulations, a number of concerns emerged ([Yunianto and Saleh 2011](#)). Firstly, if all these obligations are strictly enforced by the government, the community may not be able to obtain an IPR. For miners who do not have resources and access to capital, these obligations present challenges. Secondly, the roles of district/town and subdistrict government are crucial in managing these activities. There has to be regular capacity building and knowledge development for the authorities involved as they are also required to provide technical assistance to these miners. It is expected that through this knowledge-transfer process, mining activities being conducted will better comply with the principles of good mining practices.

Recently, the government had just passed the Revision of the Mining Law (UU No. 3/2020). In relation to ASM, five articles were revised with respect to WPR and IPR. The maximum area of WPR is now expanded to 100 ha with 100 m depth. IPR can be given to an individual (max. 5 ha) or cooperative (max. 10 ha) for a maximum of 10 years with a possible two time period extension, 5 years each.

ASM operators have the obligation to hold a license, operate in designated areas, but no clear licensing mechanism is defined ([IGF 2017](#)). Acquiring licenses and environmental permits also involves high cost and a heavy bureaucracy for artisanal miners who want to comply with regulatory requirements ([IGF 2017](#)). The bureaucratic process to obtain a license was considered as being costly and time-consuming, thus, discouraging application ([Lestari 2013](#)). Actually, the requirements to legitimate the obtainment of a license (IPR) are nearly impossible for the community miners to meet ([Miharja, Setyo and Hadi 2015](#)). Decentralization is also seen as an important factor in the growth of illegal ASM in the country ([Bansah et al 2016](#)) There is a lack of institutional and technical assistance in ASM; thus, impacts of the activity cannot be easily assessed and compliance is difficult to enforce ([Sousa and others 2011](#)).

A number of grassroot initiatives to formalize ASM activities are becoming more evident as there is increased recognition in the sector's potential to contribute to subnational development and state revenue collection. Such initiatives are commonly conducted by local CSOs; e.g., *Yayasan Tambuhak Sinta* (YTS) in Central Kalimantan. This CSO has been consistently providing technical assistance to local miner groups in a few mining districts in the province to enable them to legally register their business (YTS 2019). The

legal status should be able to provide these miners with access to government aid and the opportunity to work with other legal entities, including increasing their likelihood to receive loans from financial institutions.

GOVERNMENT PRIORITIES & KEY TOPIC AREAS

ASM governance has found its way up and settling as one of the key topic areas that are differently stipulated in Law No.3/2020. In the Revised Law, a good amount of changes is found in regard to better managing ASM and giving those who are involved in various types of ASM activities in Indonesia a stronger bargaining position. These alterations include regulations on licensing, environmental management and mercury abolishment (Andi 2020). The below table summarizes the objectives and action plan to address the mentioned key issues with regards to the governance of the ASM sector.

Table 6. Government’s Key Issues

Priority	Objective	Action (stipulation in the Revised Mining Law)
Licensing	Provide broader opportunities for ASM activities to be licensed	WPR expanded and law enforcement is strengthened
Environmental management	Encourage good mining practices	Preparation of implementing regulations on the prohibition of heavy equipment and explosives, as derived from the Revised Mining Law
Mercury abolishment	Enforce safer mining practices	Support initiatives led by MoEF, as stipulated in the Law No. 3/2020

Source: Synthesized by the authors.

Licensing

Unlicensed ASM activities continue to be the government’s challenge, as it relates with difficulties in monitoring of regulation-abiding mining activities and thus, leading to loss of state revenue. As has been discussed earlier, the operating of a mine with minimum compliance with good mining practices, or even none at all, risks to environmental degradation and human safety are inevitable. With consideration to these potential negative impacts, the DGMC intends to better regulate ASM activities through the revision of Law No.4/2009. Among the improved stipulations hereto, is the expanding of the WPR coverage. Under Law No.4/2009, WPR was limited to 25 ha and 25 m deep. This provision cannot effectively manage unlicensed mining activities as miners tend to move to find better reserves potentially outside of the perimeter of the allocated restricted area (Yunianto and Saleh 2011). Thus, the revision of the Mining Law No.3/2020 mandates broader area for the designation of ASM activities (100 ha and 100 m deep). Through this new provision, MEMR expects to see an increase in regional income (through better tax and retribution collection) from ASM activities. The improved returns will, in turn, be allocated for the strengthening of ASM management at the subnational level. Pursuant to the revised Law also, the granting of WPR will be strictly targeted to small formalized groups, including village-owned enterprises, hence, minimizing the opportunity for illegal and/ or unlicensed mining to proliferate.

Environmental degradation

Among the issues that are often discussed with respect to ASM, one of the most prominent is ultimately environmental degradation which is a result of improper mining activities which disregards adherence to good mining practices. On the basis as such, MEMR has now developed stricter regulation, which aims to prohibit the use of heavy equipment and explosives in ASM. The use of unregulated explosives can cause environmental damages, such as those which are disruptive to the ecosystem on riverbanks.

Mercury abolishment

Indonesia ratified the Minamata Convention on Mercury on September 22, 2017 in Kumamoto, Japan.^{xv} The ratification is the foundation of Indonesia's commitment to participate in mercury eradication efforts, including mercury use that is often found in ASGM activities. This ratification was subsequently put into action by Law No.11/2017 on Minamata Convention Ratification.

On April 22, 2019, President Joko Widodo signed the Presidential Regulation No.21/2019 on RAN-PPM. RAN-PPM will be carried out over the period of 2018 – 2030, including targets of a 50% reduction of mercury use in the manufacturing sector and a 33.2% reduction in the energy sector by 2030; along with a 100% abolishment in ASGM activities by 2025 and also a full abolishment in the health sector by 2020. Strategies that have been formulated to achieve these targets are strengthening commitment, coordination, and collaboration between related ministries and non-ministerial government institutions; strengthening coordination and collaboration between central and subnational governments; establishing an information system for the monitoring and control of hazardous substances; strengthening community involvement through communication, information and education; bolstering the commitment of the private sector in joint efforts towards mercury reduction and abolishment; and adopting environmentally friendly technology.

In relation to ASGM activities, Indonesia's Ombudsman recommends a collaborative effort between four ministries: MoEF, MoT, MEMR and MoH. These recommendations to the four ministries capture the complexities of the issues regarding ASGM in Indonesia, encompassing the lenses of environment, occupational health and safety, mercury trade and distribution.

Within the environment context, mercury-induced mining activities contaminate the surrounding environment. Therefore, it is crucial for MoEF to conduct land amelioration in the contaminated area. To prevent persistence of illegal and unlicensed mining practices, the ministry is advised to collaborate with MEMR in the formalization of unlicensed ASGM activities, provided that these activities are conducted without the use of mercury. Additionally, MoEF has been working on a pilot project with BPPT in the area of Lebak, Banten. The project introduced non-mercury techniques that can be employed by the artisanal miners in conducting their business ([BPPT 2018](#)). Apart from the government, CSOs are also taking part in efforts of mercury reduction and abolishment, as evidenced by the researches by and support of YTS in Central Kalimantan and Artisanal Gold Council in North Sulawesi to the local community miners.

With regards to MEMR, more stringent monitoring is among the key recommendations for improved ASM sector management in Indonesia. The Ministry should solidify cooperation with the MoIA in the monitoring process of the people's mining activities, henceforth ensuring that the mining activities are legally permitted and without the use of mercury.

As for MoH, it may be suggested that the ministry monitors and evaluates the RSUD and Puskesmas at subnational level across the country in order to assess and control mercury impacts at the regional and local level. Whereas in the case of the MoT, among the main challenges the ministry faces, is the absence

of export/import restriction of mercury and the wide-spread illegal trading of the substance. MoT has continuously been working on the trade mechanism of mercury and provisions regulating mercury export/import; currently a draft regulation is under review by the Legal Bureau.

In regard to the monitoring aspect of the distribution of mercury, the example showcased by the local government of West Lombok can be replicated. The local government worked closely together with the local mining agency and the local police force under a formally signed Memorandum of Understanding on the joint effort to control illegal community mining activities and eradicate the use and distribution of mercury in the region ([Rakhman 2019](#)).

Other collaborations between stakeholders taking place recently include the cooperation formed by the gold mining company Amman Mineral which operates in the Nusa Tenggara Barat area, NEXUS3 Foundation and University of Mataram to support the government's initiative to curb illegal mining activities and prevent the distribution of mercury along the trade channels in the region ([Antara NTB 2019](#)).

The Directorate General of Waste Management, MoEF, encouraged the use of cyanide as a replacement to mercury in gold processing.^{xvi} Cyanide is considered to be able to extract more gold content (90%) compared to mercury (40%). However, it is also critical to monitor the utilization and dosage of the substance in supporting mining activities, understanding that cyanide also has the potential to negatively impact the environment. At the moment, MoEF and BPPT is conducting a pilot project on mercury-free technology on ASGM sites in Kulon Progo, Yogyakarta. The successful outcome of this project is expected to inspire other ASGM activities to implement such technologies ([BPPT 2018](#)).

GOVERNMENT INSTITUTIONS

There is no specialized unit within the mining authority that is in charge of ASM/people mining. However, matters relating to ASM/mining of persons may be filed with the Directorate of Mining Business and Development for Mineral/Coal of the MEMR. A study that the Indonesian Mining Institute (IMI) conducted in 2017-2018 indicates that the government does not provide any technical training to ASM/people mining miners to help them improve their mining operations, although with the fund proposed by the local government, they would be able to provide some training in a few provinces ([IMI 2018](#)). The modest amount of mine inspectors could lead to a high number of unlicensed mining activities, along with poor records in health and safety performances ([Katadata 2019](#)). In addition, the mining agency also stated that the lack of financial resources contributes to the inability to provide enough personnel to cover all the mining areas.

Table 7 provides a list of government institutions, based on their formal and structural tasks and responsibilities, whose roles are specific to ASM management in the country. We categorize these government institutions based on as the aspects of licensing, scope of authority in implementation and enforcement, and mercury abolishment. For each aspect, relevant government institutions are identified, both at national and sub-national level, before presenting brief explanations of their scope/mandate and initiatives in this regard (if available).

Table 7. Government Stakeholders Mapping

Aspect	Institution	Scope/mandate	ASM Initiative
Licensing	MEMR (Ministry of Energy and Mineral Resources)	Conduct investigation in mining areas, issue mining area after consultation with related stakeholders (provincial government, regional house of representative) and business permits	
	Subnational Government	Being consulted before the Minister issue licenses	
Implementation and Enforcement	MEMR (Ministry of Energy and Mineral Resources)	Provide technical assistance and monitoring in coal and mining business activities that are conducted by permit holders	
	Subnational Government	Conduct monitoring of mining practices within authorized area	
Mercury abolishment	MoEF (Ministry of Environment and Forestry)	As the focal point of the initiative, implement the RAN-PPM, execute monitoring and evaluation of the mercury abolishment action plan, collect and analyze data, coordinate with other ministries and non-ministerial government institutions, provide technical assistance to subnational governments in carrying out the initiative.	<ul style="list-style-type: none"> o Develop guidelines on land recovery (has completed land recovery in 1 location, Lebak District, Banten Province) o Develop guidelines on the monitoring of mercury exposure for health workers and miners o Collaborate with research centers and NGO o Develop a software system for mercury inventory o Disseminate studies on mercury
	KPPM (Committee for Research and Monitoring of Mercury)	Coordinate research and monitoring activities in regard to mercury, provide policy recommendations, facilitate technology transfer	<ul style="list-style-type: none"> o Conduct baseline study and develop data inventory system at national level o Conduct studies on socio-economic impacts of mercury use
	MEMR (Ministry of Energy and Mineral Resources)	Implement RAN-PPM, monitor and evaluate the program, report to MoEF as the team leader, provide technical assistance to subnational governments in carrying out the initiative.	<ul style="list-style-type: none"> o Socialized mercury abolishment to ASGM communities in 6 provinces in 2019 o Socialized good mining practices to 2 IPR holders in North Sulawesi
	BPPT (Agency for the Assessment and Application of Technology)	Design and develop mercury-free technology	<ul style="list-style-type: none"> o Developed a prototype on mercury containment mechanism
	MoH (Ministry of Health)	Implement RAN-PPM, monitor and evaluate the program, report to MoEF as the team leader, provide technical assistance to subnational governments in carrying out the initiative.	<ul style="list-style-type: none"> o Campaign on the abolishment of mercury use in ASGM
	MoT (Ministry of Trade)	Manage mercury imports and monitor trading channels of the substance	<ul style="list-style-type: none"> o Issued Ministerial Regulation No.47/2019 on mercury imports and distribution

	Subnational Government	Implement RAN-PPM at sub-national level	<ul style="list-style-type: none"> ○ Develop equipment for mercury-free technology ○ Conduct mercury inventory ○ Provide technical assistance to ASGM communities ○ Socialization of mercury abolishment campaign programs ○ Map the ASGM activities
--	------------------------	---	---

Sources: Scope/ mandates on the issues of licensing and apparatus involvement are mainly based on Law No.4/2020, except for the mandate of Sub-National government on apparatus' involvement issue that is based on Ministerial Regulation No.26/2018. Scope/mandates on the mercury reduction and abolishment are mainly based on Presidential Regulation No.21/2019 on RAN-PPM. In addition to this, we also derived materials from government's websites (such as that of BPPT and MoH) and webinars on mercury and ASGM activities to enrich the descriptions. ASM Initiative Activities regarding mercury abolishment were derived from presentation materials of speakers on a Webinar on Mercury-Free Processing of People's Gold based on Policies of Subnational Governments, June 30, 2020.

In addition to the listed government institutions, we believe that other relevant ministries need to be included for a more inclusive and comprehensive governance. In the context of the mercury abolishment issue, for instance, institutions such as the Ministry of Women Empowerment and Child Protection and the National Development Agency – Directorate of Family, Women, Children, Youth and Sport can be strategic partners to deepen the understanding of the impacts of mercury and ASGM to women and children, who are among the most vulnerable groups in this space.

ASM ASSOCIATIONS AND ALLIANCES

In Indonesia, some artisanal and small-scale miners are organized in associations that are involved in a variety of ways in order to provide support to miners and local communities and to influence change for better policies and practices. A selection of active associations includes:

- **YTS (Yayasan Tambuhak Sinta)**: NGO based in Central Kalimantan that supports local communities and government to work in productive, sustainable and equitable way, provides educational program for mercury-free mining technology, assists local communities to develop development plan in order for them to be able to access government/others' programs and assistance, provide technical support for livelihood activities
- **Nexus3 Foundation (previously known as BaliFokus)**: NGO based in Bali that works to safeguard public, especially vulnerable populations, from the impact of development to their health and the environment, and works towards a just, toxic-free, just, and sustainable future.

In relation to ASGM communities, Nexus3 Foundation mainly concerns on mercury intoxication and RAN-PPM implementation:

- The Development of National and regional Approaches to Environmentally Sound Management of Mercury in Southeast Asia project (US Department of State grant award No. S-LMAQM-11-GR-0027)
- The Mercury monitoring project in ASGM Sector and Health Sector in Indonesia (US Department of State grant award No. S-LMAQM-11-GR-0027)
- Developing Mercury Inventories and Trade in Artisanal and Small-scale Gold Mining in Southeast Asia (US Department of State grant award No. S-LMAQM-14-GR-1251)
- **APRI (Indonesian Artisanal Mining Association)**: National mining association (present in 19 provinces) that works together with Indonesian community miners to operate legally, safely, in an

environmentally responsible and sustainable manner, that can bring them to prosperity. The Association provides evidence that community mining is an important income-generating activity, works for the acknowledgement of community mining as a profession and towards the formation of a network of community miners at national level. APRI also serves as a partner for central and regional government in providing employment for the local people, managing environment and monitoring state/regional revenue utilization. APRI has been focusing on establishing Collective Responsible Mining (CRM), a group of ASM miners under APRI which is responsible in managing ASM activities within a specified area. APRI and CRM's activities include, but not limited to:

- Advocating on formal processes on obtaining mining license / IPR (e.g. socialization conducted by APRI to CRM APRI in Sidrap District, South Sulawesi including technical assistance to acquire legal status)
- Conserving mineral resources, designing innovation and capacity planning (e.g. developing environmentally responsible technology, such as mini- dredger for alluvial gold mining)
- Implement and develop standardized mechanisms of good mining practices (e.g. cooperate with tekMIRA and West Java Office of Energy and Mineral Resources to develop an agreement to develop an integrated yet comprehensive ASM management. This agreement includes formalization efforts, aspects on good mining practices, sustainability and post-mining management)
- Creation of employment and promoting the increase in income for ASM miners (e.g. APRI Lumajang, West Java, works with the sub-national government towards legalizing the sandstone activities. Under a formal license, the mining activities are claimed to generate positive impacts to the surrounding, including providing job opportunities to nearby communities)

Key Data Needs & Calls to Action

Table 8 below portrays current opportunities and challenges in Indonesia’s ASM data collection, which are categorized into three broad topics: employment, value chains, and licensing and mineral reserves. In terms of opportunities, several resources are currently available regarding mining information in Indonesia. Yet, many are not segregated by mining scale (LSM and ASM), making it difficult to collect data that is exclusive for ASM activities. In addition, to indicate existing available resources and the gap in ASM data collection, potential stakeholders that could collaborate in these data collection efforts are indicated. Two key areas of action are presented for more effective monitoring of ASM activities and increasing transparency of sector governance: i) a single platform for ASM data ii) the establishment of a community of practice involving all the stakeholders both at national as well as subnational level.

Table 8. Challenges and Opportunities in Indonesia’s ASM Data Collection

Available Resources		Source of Existing Data	Gap	Key Data Needs	Stakeholders to be Involved
Employment	Total number of employments	Sakernas	Not segregated by LSM and ASM	Disaggregated employment data by mining scale (LSM and ASM). For ASM, data needs to be further segregated by several variables (see further in below section)	DGMC (MEMR), Central Bureau of Statistics, Ministry of Manpower, Sub-national governments, CSOs
	Net income	Central Bureau of Statistics	Not segregated by LSM and ASM, gender	Gender pay gap in LSM and ASM	Central Bureau of Statistics, Ministry of Manpower, CSOs
Value Chains	Production figures	Central Bureau of Statistics	Not segregated by LSM and ASM	Disaggregated production figures by LSM and ASM, commodities and region	DGMC (MEMR), Central Bureau of Statistics, Sub-national governments, CSOs
	No available data on value addition and export	n/a	No further information on value addition and export figures	Data on value addition (if any) and export figures (quantities and values), disaggregated by commodities	DGMC (MEMR), Sub-national governments, CSOs
	No available data on trading hubs	n/a	No information on trading hubs	Information/ dashboard on trading hubs for indicated minerals (e.g. gold)	DGMC (MEMR), Sub-national governments, CSOs
	No available data on commodity price on the ground	n/a	No information on commodity price on the ground	Information/ dashboard on commodity price on the ground	DGMC (MEMR), Sub-national governments, CSOs
Licensing and Mineral Reserves	Mining license data	DGMC (MEMR)	Potentially does not capture the actual number of ASM activities	Actual number of ASM activities, irrespective of formality status	DGMC (MEMR), Sub-national governments, CSOs
	Mineral and coal’s locations, quantities and balance sheet	PSDMBP (Geological Agency, MEMR) and OneMap	Potentially only captures LSM or licensed ASM activities	Similar database for ASM activities, irrespective of legal status	PSDMBP (Geological Agency, MEMR), DGMC (MEMR), MoEF, Sub-national government, CSOs

Source: Synthesized by the authors. Derived from various sources

Employment

Total number of employments

Data on total employment of every sector in Indonesia is published annually by [Sakernas](#), the National Labor Force Survey. In terms of mining, however, this data is not segregated by mining scale (LSM and ASM). Thus, disaggregated data is needed. Moreover, considering the diverse types of ASM activities (see Section 5.1. on Mineral Stratification), data on ASM employment needs to be further segregated by a number of variables, such as age, gender, education, ethnicity, migratory status (e.g. local and migrant), types of employment (full-time/part time/seasonal/casual), formality (e.g. legal/informal/unlicensed/involved in criminal acts), mining roles (e.g. head of mining team/miner/porter/transporter/etc.), work duration, income, commodities and region. Of particular relevance, data on the ASM sandstone sector is very limited even though the sector accounted for more than a third of registered mine site in 2015 and is present in almost all provinces ([MoEF 2015](#)).

Gender pay gap

Data on net income is published annually by the [Central Bureau of Statistics](#). Available data is commonly segregated by age group, educational attainment, province, main occupation and main industry. However, gender segregated data is still unavailable. Clearly, gender pay gap is also found in the ASM sector (see Section 2.2. on Gender Participation), thus, the importance of data on gender pay gap to be made available as the basis for assessments with regards to efforts in furthering gender equity in Indonesia's ASM sector.

Value chains

Production figures can be found in the annual publication of Central Bureau of Statistics. Yet, not all commodity data is segregated by mining scale (LSM and ASM). Only quarrying has production figures segregated by between by companies (assumed to be mainly LSM) and by household (assumed to be ASM). Such classification needs to be conducted for all commodities, with further segregation by region.

In addition to production figures, data on export (quantity and value), trading hubs and commodity prices on the ground would also be beneficial. Data on export quantities and values can contribute to the statistical modelling of the economic contribution for current and future government revenues from the ASM sector. Such economic modelling can then be the rationale for formalization efforts. Data on trading hubs and commodity prices are important to be collected for monitoring purposes, particularly in a time of crisis. Take, for instance, in the case of the COVID19 pandemic where supply chains are disrupted, and commodity prices fluctuate. Artisanal Gold Council (AGC) built dashboards on trading hubs ([Blore 2020](#)) and commodity prices ([Artisanal Gold Council 2020](#)) for monitoring ASGM activities during the pandemic. This initiative can also be implemented at national level for continuous and synchronized monitoring of ASM activities in Indonesia.

Licensing and Mineral Reserves

Mining license

The Directorate General of Mineral and Coal (DGMC) publishes data on the number of mining licenses yearly, including IPR ([DGMC 2020b](#)). In this database, IPR data is segregated by province. However, as elaborated in previous sections (Section 5.1. and 8.2), this figure potentially does not capture the actual

number of ASM activities in Indonesia, which is necessary in order to achieve better governance in the sector.

DGMC has established a platform for online license applications ([DGMC 2020](#)). In the website, applicants are able to monitor their application process (See Figure 9.1 below for details). However, this platform is currently solely available for companies and only at the national level. Considering the complicated bureaucracy of the IPR application, which can potentially demotivate ASM miners to apply for a license ([Lestari 2013](#)), this platform can be a means for improving ease and transparency in IPR applications. For this purpose, the online portal needs to be expanded, not only for company applicants, but also for cooperatives and individuals – the potential of applicants of IPR.

Mineral and coal locations, quantities and balance sheet

The Center for Mineral, Coal and Geothermal Resources “*Pusat Sumber Daya Mineral Batubara dan Panas Bumi*” (PSDMBP) is a center under the Geological Agency (MEMR) whose main job is to conduct studies, investigation, and provide services in mineral resources, coal and geothermal energy ([PSDMBP 2020](#)). It catalogues data on mineral and coal locations, quantities and balance sheets that are captured by its two programs, National Geological Information System (SIGNAS) and Geological Resources of Indonesia Mobile Application (GEORIMA) ([PSDMBP 2016](#), [PSDMBP n.d.](#)). The latter provides a mobile-based app that intends to ease stakeholders’ access to the data. Data gathered is based on PSDMBP’s field research and secondary data from DGMC, sub-national government, and holders of Mining Business License (IUP), Contract of Works (KK), Mining Working Area (WKP), and Coal Mining Concession Work Agreement (PKP2B). Data collected is also presented in the form of a map to portray mineral and coal distributions. Albeit the rich information, relevant data useful for ASM stakeholders is not present, most likely due to the cautiousness of the government to better manage ASM activities across the country and not stimulating a rush or influx of unlicensed miners to enter the potential areas. On the other hand, such information can also be valuable for ASM miners who are well-educated and exposed to good mining principles. Prospective data can inform them about the location and quantity of available and indicated reserves, thus, saving their investment when looking for potential reserves. Knowledge on current ASM locations and their available reserves can also direct miners to certain ASM locations that have been mined over a number of years and which can be prioritized by the government for WPR issuance.

A similar information system is also available on the [MEMR One Map website](#). This system is intended to provide geographical information that is user-friendly and easily accessed by the public, thus, improving data transparency. This system can also be used to identify overlapping licensed areas, distribution of mineral and coal reserves, etc. The portal contains 11 maps, namely maps of mining license area, smelter, special terminal, mining area, mineral bed materials, coal bed materials, coal reserves, metal mineral reserves, non-metal mineral reserves, coal bed methane reserves and peat reserves. The ministry hopes that this platform will bring benefits to related stakeholders, including university students and civil society.

In terms of the number of mining licenses, data that is available on mining activities in One Map potentially does not capture the actual number of ASM activities as it only records the licensed operations. It does, however, indicate WPR locations which are able to inform the presence of ASM activities, albeit without IPR. Yet, considering the small size of IPR and WPR, their locations are rather difficult to locate on the map, particularly among other operation licenses and areas that are much larger in scale.

Data on the locations of ASM activities, which are operating without IPR and/ or outside WPR area, need to be collected in order to understand the actual scale of ASM operations in Indonesia. To do so, the

government's collaboration with CSOs on the ground might be effective. These organizations commonly have broader access to ASM communities; thus, more accurate data can be collected.

In addition to CSOs, synchronization with MoEF data might also be of benefit. Currently, MoEF has developed a [geoportal](#) on ASGM activities which incorporate mercury throughout their mining process. This map includes the distribution of ASGM activities (whether they are conducted within WPR, with a license, unlicensed) and the number of ASGM activities, mercury level (in the environment/people), mercury emission, mercury source (mining or processing), locations of mercury rehabilitation, non-mercury gold processing facilities, and socio-economic transformation facilities. Although this map is exclusively disclosing information for gold commodity, its concept (that is inclusive of unlicensed ASM activities) can potentially be expanded to other commodities.

A single platform database

Based on the above available resources and the key data gaps and needs, we also found that ASM-related data is available on varied platforms that are owned by different government institutions; updated and maintained separately. Take, for instance, the multiple map of ASM locations by both DGMC (MEMR) and MoEF with the former's focus on licensed ASM activities and the latter's on ASGM activities^{xvii}, irrespective of their legal status. For a more effective shared database, a single platform database is a viable solution. This single platform database can potentially prevent any duplication of the data updating process and improve user experience and data access.

- A shared online platform also presents the opportunity to remove the long-standing communication barrier among various stakeholders related to the management of ASM in the country. The envisioned portal will be a powerful knowledge hub and provide space for knowledge exchange between stakeholders. It has the potential to bring together national and subnational partners at national to establish a long needed ASM community of practice and become a catalyst for the basis of a National ASM Roadmap to be established in the near future.

Endnotes

ⁱ World Bank and OECD National Accounts data files

ⁱⁱ An estimated figure was calculated by Gatot Sugiharto, Head of Association of Community Miners Indonesia (hereafter will be referred as APRI, abbreviation in Indonesian). There is no official reference at the moment which we could base our exact calculation on.

ⁱⁱⁱ Hentschel, Hruschka, and Priester 2002

^{iv} Under this old Mining Law, mineral categorization was regulated under Article 3. Minerals under Category A refer to strategic minerals and minerals in this category can only be mined by SOE, whether independently or in collaboration with provincial or district government. Category B consisted of vital minerals which can be mined by parties as mentioned in category A, along with regional-owned enterprises or private companies. Category C were minerals that were not included in the two previous categories and no restrictions were set for those who were interested to mine the minerals under this category.

^v Banten Province's Bureau of Statistics (2020) classifies employment in mining and quarrying sector along with other sectors, namely manufacturing; electricity and gas; water supply; sewerage, waste management, and remediation activities, and construction. In order to estimate the number of individuals employed in mining and quarrying only, we first determined the ratio of those 5 sectors at national level in the same year (2020). At national level, the percentages of mining and quarrying; manufacturing; electricity and gas; water supply, sewerage, waste management, and remediation activities; construction to the total number of employments in all five sectors are 5%: 64%: 1%: 2%: 29% (round to no decimal). We then apply these percentages to each sector's employment figure in Lebak, Banten. From this process, we get the rough estimate of mining employment in Banten, which is around 85,017.

^{vi} Summarized from Workshop on Overview of Gender Mainstreaming in Indonesia's Extractive Industries which was conducted on November 5th, 2019 in Jakarta.

^{vii} In January 2019, IDR 100,000 was equivalent to USD 10.

^{viii} A Canadian-based CSO that focuses on providing technical assistance for ASGM communities in several locations in the world, including in Indonesia. <https://www.artisanalgold.org/>

^{ix} A CSO based in Central Kalimantan that focuses on empowerment of ASGM communities and its surrounding societies.

^x Vital capacity is the greatest volume of air that can be expelled from the lungs after taking the deepest breath possible and is an indicator of underlying lung disease.

^{xi} For a fuller map of mercury hotspots and distribution see Ismawati (2010).

^{xii} Bangka Belitung Province was separated from the province of South Sumatera in the spirit of the decentralization policy through the Law No. 27 of 2000.

^{xiii} See at <https://www.worldbank.org/en/country/indonesia/overview>

^{xiv} A statistical dispersion representing income inequality within a nation or group

^{xv} According to the UN treaties collection website, Indonesia ratifies the convention on September 22, 2017. However, the country signed and adopted it on October 10, 2013. See the UN treaty collection website at https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-17&chapter=27&clang=_en

Accessed on October 1, 2020.

^{xvi} Stated by Rosa Vivien Ratnawati, Directorate General of Waste Management, MoEF, in an opening remark of Webinar on Responsible Management of People's Gold Mining, June 16, 2020. News on the webinar can be accessed here: <https://katadata.co.id/berita/2020/06/16/penambang-emas-kecil-didorong-gunakan-metode-pengolahan-tanpa-merkuri>.

^{xvii} ^{xvii} This is mainly because MoEF is the focal point of the national agenda on mercury abolishment.

References

- Abbas, Hasriwiani, Masayuki Sakakibara, Koichiro Sera, and Lukmanul Hakim Arma. 2017. "Mercury Exposure and Health Problems in Urban Artisanal Gold Mining (UAGM) in Makassar, South Sulawesi, Indonesia." *Geosciences* 7 (3): 44. <https://doi.org/10.3390/geosciences7030044>.
- Agrawal, Sumali, Anthony J Bebbington, Aviva Imhof, Mai Jebing, Nonette Royo, Laura Aileen Sauls, Rini Sulaiman, Tessa Toumbourou, and Arief Wicaksono. 2018. "Assessment and Scoping of Extractive Industries and Infrastructure in Relation to Deforestation: Indonesia." *Climate and Land Use Alliance*. Accessed from <http://www.climateandlandusealliance.org/wp-content/uploads/2018/12/Indonesia-Impacts-of-EII-on-Forests-1.pdf>
- Albanna, Morteza Syariati. 2019. " *Napas Pendulang Intan di Kalimantan Sejak Era Soekarno* [The breath of diamond miners in Kalimantan since Soekarno era]." Accessed from <https://www.tagar.id/napas-pendulang-intan-di-kalimantan-sejak-era-soekarno>. (retrieved June 22, 2020).
- Albasar, Muh Ikhsan, Anwar Daud, Ida Leida Maria. n/d. " *Pajanan merkuri (Hg) pada masyarakat di kelurahan Poboya, Kota Palu, Sulawesi Utara* [Mercury exposure to community in Poboya, Palu, North Sulawesi]." Accessed from: <http://pasca.unhas.ac.id/jurnal/files/b86d2d8e47b63721254a298fc489ecb6.pdf>
- Andi, Dimas. 2020. " *Tata kelola pertambangan rakyat jadi perhatian dalam RUU Minerba* [People's mining governance among the issues in RUU Minerba]." Accessed from: <https://industri.kontan.co.id/news/tata-kelola-pertambangan-rakyat-jadi-perhatian-dalam-ruu-minerba>. (retrieved June 22, 2020).
- Antara NTB. 2019. " *Amman Mineral, Unram & Nexus3 Foundation tandatangani MoU penanganan masalah di kawasan PETI NTB* [Amman Mineral, Unram & Nexus3 Foundation signed an MoU on handling problems in the NTB PETI area]." Accessed from: <https://mataram.antaranews.com/berita/58352/amman-mineral-unram--nexus3-foundation-tandatangani-mou-penanganan-masalah-di-kawasan-peti-ntb>
- Apahabar. 2019. " *KPK dan ESDM Kalsel Temukan 3 Pertambangan Tanpa Izin di Tala* [KPK and ESDM South Kalimantan found 3 unlicensed mining in Tala]." Accessed from <https://apahabar.com/2019/07/kpk-dan-esdm-kalsel-temukan-3-pertambangan-tanpa-izin-di-tala/> (retrieved October 22, 2020).
- Arifin, Yayu I., Masayuki Sakakibara and Koichiro Sera. 2015. "Impacts of Artisanal and Small-Scale Gold Mining (ASGM) on Environment and Human Health of Gorontalo Utara Regency, Gorontalo Province, Indonesia." *Geosciences* 5, no. 2: 160-176. <https://www.mdpi.com/2076-3263/5/2/160>
- Artisanal Gold Council. 2019. "Artisanal Gold Council in Indonesia". In B. Amor (Chair) *Workshop on Gender Mainstreaming in Indonesia's Extractives Industry*. Workshop conducted by World Bank and Women in Mining and Energy, Jakarta.
- Artisanal Gold Council. 2020. "Gold Prices Data." Accessed from <https://www.artisanalgold.org/gold-prices-data/> (retrieved October 22, 2020).
- Aspinall, Clive. 2001. "Small-Scale Mining in Indonesia." *Mining, Minerals and Sustainable Development*. Accessed from: <http://pubs.iied.org/pdfs/G00725.pdf>

- Azkiya, Laila. 2018. “Analisis Sosiologi Ekonomi pada tambang rakyat (Kajian Terhadap Kegiatan Ekonomi Dalam Tambang Rakyat Intan Di Cempaka, Banjarbaru, Kalimantan Selatan) [Eco-sociological analysis of community mining (Evaluation of economic activities in diamond community mining in Cempaka, Banjarbaru, South Kalimantan)].” *Jurnal Pemikiran dan Penelitian Sosiologi*, 3(1), 59-69. <http://jurnal.unpad.ac.id/sosioglobal/article/view/19550>
- Bahroni, A'Shim. 2018. “Hak penambangan pasir oleh masyarakat lokal di Kecamatan Posoklaten Kabupaten Kediri [Sandstone mining rights by local communities in Posoklaten Sub-district, Kediri District].” *Jurnal Transparansi Hukum*, 152-168. <http://ojs.unik-kediri.ac.id/index.php/transparansihukum/article/view/242>
- BaliFokus. 2015. “Health risks related to mercury exposure from selected ASGM hotspots of Indonesia and the Philippines.” International Pollutants Elimination Network (IPEN). <https://ipen.org/project-reports/established-and-strengthened-health-professional-community-and-ngos-capacities>
- BaliFokus. 2015. “Preliminary Report on Suspected Mercury Poisoning in 3 ASGM Hotspots of Indonesia: Case Reports Bombana-Southeast Sulawesi, Sekotong-West Lombok, and Cistitu-Lebak.” Medicus Foundation. BaliFokus. https://16edd8c0-c66a-4b78-9ac3-e25b63f72d0f.filesusr.com/ugd/13eb5b_2ff0d1bd6c0b465a993ecc41ce49ffcf.pdf
- Bansah, K.J., A.B. Yalley and N. Dumakor-Dupey. 2016. “The hazardous nature of small scale underground mining in Ghana. *Journal of Sustainable Mining*,” 15(1), 8–25. www.sciencedirect.com/science/article/pii/S2300396016300039
- Banten news. 2018. “KLHK Resmikan Fasilitas Pengolahan Emas Non Merkuri di Lebak [MoEF launched a non-mercury gold processing facility in Lebak].” Accessed from: <https://www.bantennews.co.id/klhk-resmikan-fasilitas-pengolahan-emas-non-merkuri-di-lebak/>
- Baqiroh, Nur Faizah Al Bahriyatul. 2019. “Tambang Emas Penyumbang Utama Limbah Merkuri [Gold mining as the main contributor of mercury emission].” Accessed from: <https://ekonomi.bisnis.com/read/20190327/44/904801/tambang-emas-penyumbang-utama-limbah-merkuri>
- Bell, Lee, David Evers, Sarah Johnson, Kevin Regan, Joe DiGangi, Jennifer Federico, and Jan Samanek. 2017. “Mercury in Women of Child-Bearing Age in 25 Countries.” IPEN. Accessed from: <https://ipen.org/documents/mercury-women-child-bearing-age-25-countries>
- Blacksmith Institute and YTS (Yayasan Tambuhak Sinta). 2013. “Final Report: Mitigating Mercury Emissions from Artisanal and Small-Scale Gold Mining in Indonesia.” UNEP, Geneva. Accessed from <https://wedocs.unep.org/bitstream/handle/20.500.11822/31242/MercE.pdf?sequence=1&isAllowed=y>
- Blore, Shawn. 2020. “Dashboard - World Gold Trading Hubs (Updated 14 May) - Artisanal Gold Council.” Accessed from <https://www.artisanalgold.org/2020/04/agc-gold-trading-hubs-dashboard/>
- Bose-O'Reilly, Stephan, Gustav Drasch, Christian Beinhoff, Saulo Rodrigues-Filho, Gabriele Roider, Beate Lettmeier, Alexandra Maydl, Stefan Maydl, and Uwe Siebert. 2010. “Health Assessment of Artisanal Gold Miners in Indonesia.” *Science of the Total Environment* 408 (4): 713–25. <https://doi.org/10.1016/j.scitotenv.2009.10.070>
- Bose-O'Reilly, Stephan, Rudolf Schierl, Dennis Nowak, Uwe Siebert, Jossep Frederick William, Fradico Teorgi Owi, and Yuyun Ismawati Ir. 2016. “A Preliminary Study on Health Effects in Villagers

Exposed to Mercury in a Small-Scale Artisanal Gold Mining Area in Indonesia.” *Environmental Research* 149 (August): 274–81. <https://doi.org/10.1016/j.envres.2016.04.007>.

- BPPT (*Badan Pengkajian dan Penerapan Teknologi*). 2018. “BPPT Hadirkan Teknologi Pengolahan Emas non Merkuri [BPPT provides a non-mercury gold processing technology].” Accessed from: <https://bppt.go.id/layanan-informasi-publik/3071-bppt-hadirkan-teknologi-pengolahan-emas-non-merkuri>
- Budiak, Griffit J, AJM Rattu and Paul Kawatu. 2014. “Hubungan antara lama kerja dan penggunaan alat pelindung diri dengan kapasitas vital paru pada penambang emas Wilayah Pertambangan Rakyat Tatelu Kecamatan Dimembe. [Relation between working period and the use of PPE with lung’s Vital Capacity in gold miners in Tatelu, Dimembe].” Accessed from: <https://fkm.unsrat.ac.id/wp-content/uploads/2015/02/JURNAL-FKM-UNSRAT-GRIFFIT-J-BUDIAK-101511216-1.pdf>
- Castilhos, Zuleica C., Saulo Rodrigues-Filho, Ana Paula C. Rodrigues, Roberto C. Villas-Bôas, Shefa Siegel, Marcello M. Veiga, and Christian Beinhoff. 2006. “Mercury Contamination in Fish from Gold Mining Areas in Indonesia and Human Health Risk Assessment.” *Science of the Total Environment* 368 (1): 320–25. <https://doi.org/10.1016/j.scitotenv.2006.01.039>
- Central Bank of Indonesia. n.d. “Statistik Ekonomi dan Keuangan Indonesia [Indonesian Economics and Financial Statistics: State Revenue].” Accessed “Government Revenues” from: <https://www.bi.go.id/en/statistik/seki/terkini/keuangan-pemerintah/Contents/Default.aspx>
- Central Bureau of Statistics. 2010 – 2020. “Statistik Indonesia 2020 [Statistical Yearbook of Indonesia 2020].” Jakarta: Central Bureau of Statistics. Access from <https://www.bps.go.id/publication/2020/04/29/e9011b3155d45d70823c141f/statistik-indonesia-2020.html>
- Central Kalimantan Bureau of Statistics. 2004. “Kalimantan Tengah dalam angka. [Central Kalimantan in figures].” Palangka Raya: Central Kalimantan Bureau of Statistics. Accessed from: <https://kalteng.bps.go.id/publication/2009/01/01/4d7640575bc553a089d3b0f2/kalimantan-tengah-dalam-angka-2004.html>
- Central Sulawesi Bureau of Statistics. 2012. “Sulawesi Tengah dalam angka. [Central Sulawesi in figures].” Palu: Central Sulawesi Bureau of Statistics. Accessed from: <https://sulteng.bps.go.id/publication/2012/10/25/d261f222ebf8269e2b7933c6/sulawesi-tengah-dalam-angka-2012.html>
- Chamid, C. and Sulistijo, B., 2012. “Mercury Level Artisanal Gold Miners and Its Solution with Affordable Technology. In *Environmental, Socio- economic and Health Impacts of Artisanal and Small-Scale Minings*.” Eds. Handayanto E., Krisnayanti, B.D. and Suhartini. Universitas Brawijaya Press (UB Press), Malang, Indonesia, p: 23-30.
- Devi, Bernadetta and Dody Prayogo. 2013. “Mining and Development in Indonesia: An Overview of the Regulatory Framework and Policies.” *International Mining for Development Centre*, 1–60.
- DGMC (Directorate General of Mineral and Coal). 2020. “Aplikasi Perizinan Usaha dan Operasional MINERBA [Application for Mineral and Coal’s Business and Operational License].” Accessed from <https://perizinan.esdm.go.id/minerba/>

- DGMC (Directorate General of Mineral and Coal). 2020b. “*Status iup nasional per juni 2020* [Mining Business License Status Per June 2020].” Access from: https://www.minerba.esdm.go.id/show/show_pdf?link_file=125
- DGMC (Directorate General of Mineral and Coal). n.d “Minerba dalam angka [Mineral and Coal in Figures].” Accessed from: https://www.minerba.esdm.go.id/show/show_pdf?link_file=10
- Eka, Kartika. 2019. “*Simalakama Tambang Intan Tradisional Pumpung yang Terus Meminta Korban Jiwa* [Diamond community mining in Pumpung that leads to death].” Accessed from <https://www.kompasiana.com/kaekaha.4277/5d3db6280d823074fe5e1685/simalakama-tambang-intan-tradisional-pumpung-yang-terus-meminta-korban-jiwa?page=1>
- Ekawanti, Ardiana and Baiq Dewi Krisnayanti. 2015. “Effect of Mercury Exposure on Renal Function and Hematological Parameters among Artisanal and Small-Scale Gold Miners at Sekotong, West Lombok, Indonesia.” *Pure Earth Journal of Health and Pollution* 5 (9): 25–32. <https://doi.org/10.5696/2156-9614-5-9.25>.
- Elias, Stephen and Clare Noone. 2011. “The Growth and Development of the Indonesian Economy Economic Developments.” Reserve Bank of Australia Bulletin, 33-44. <https://www.rba.gov.au/publications/bulletin/2011/dec/pdf/bu-1211-4.pdf>
- Erman, Erwiza. 2010. “*Aktor, akses dan politik lingkungan di pertambangan timah Bangka Actor* [Access and environmental politics in tin mining in Bangka].” *Jurnal Masyarakat Indonesia*, 36(2), 71-101.
- Fahmi, Fraga Luzmi, Budianta, Wawan and Idrus, Arifudin. 2014. “*Dampak pencemaran merkuri terhadap media geologi pada pertambangan rakyat di banyumas, jawa tengah* [The impact of mercury emission to geological medium in people’s mining in Banyumas, Central Java].” *Prosiding Seminar Nasional Kebumihan Ketujuh 7* Jurusan Teknik Geologi, Fakultas Teknik, Universitas Gadjah Mada, 163-175.
- Fatoni, M. 2012. “*Kajian kadar merkuri (Hg) dalam air pada Sungai Na’e akibat pengolahan tambang rakyat bijih emas di Desa Pesa, Kecamatan Wawo, Kabupaten Bima, NTB* [Examination of mercury level in Na’e River due to the gold processing of people’s mining in Pesa Village, Wawo Subdistrict, Bima District, West Nusa Tenggara].” Master’s thesis. UPN Veteran Yogyakarta, Yogyakarta. Accessed from <http://repository.upnyk.ac.id/495/>
- Filho, Saulo Rodrigues Pereira, Ronaldo Luiz Correa dos Santos, Roberto C. Villas Bôas, Zuleica Carmen Castilhos et al. 2004. Environmental and health assessment in two small scale gold mining areas—Indonesia—Sulawesi and Kalimantan. CETEM's Technical Final Report to UNIDO-Reserved; 2004. 211 pp.
- Geraldine, M. 2019. “Socially responsible jewelry entrepreneurship.” In B. Amor (Chair) *Workshop on Gender Mainstreaming in Indonesia’s Extractives Industry*. Workshop conducted by World Bank and Women in Mining and Energy, Jakarta.
- Hentschel, Thomas, Felix Hruschka, and Michael Priester. 2002. “Artisanal and Small-Scale Mining - Challenges and Opportunities.” *Zhurnal Eksperimental’noi i Teoreticheskoi Fiziki*, 94. www.iied.org.
- Hilson, Gavin and James McQuilken. 2014. “Four Decades of Support for Artisanal and Small-Scale Mining in Sub-Saharan Africa: A Critical Review.” *Extractive Industries and Society*. Elsevier Ltd. <https://doi.org/10.1016/j.exis.2014.01.002>.

- Hinton, Jennifer J, Marcello M Veiga, and Christian Beinhoff. 2003. "Women and Artisanal Mining: Gender Roles and the Road Ahead." *The Socio-Economic Impacts of Artisanal and Small-Scale Mining in Developing Countries*, 1–29. <http://siteresources.worldbank.org/INTOGMC/Resources/336099-1163605893612/hintonrolereview.pdf>.
- Hong, Doohee, Sung Hwan Cho, Soo Jung Park, Su Youn Kim, and Sat Byul Park. 2013. "Hair Mercury Level in Smokers and Its Influence on Blood Pressure and Lipid Metabolism." *Environmental Toxicology and Pharmacology* 36 (1): 103–7. <https://doi.org/10.1016/j.etap.2013.03.007>
- IGF (Intergovernmental Forum on Mining, Mineral and Sustainable Development). 2017. "Global Trends in Artisanal and Small-scale Mining (ASM): A review of key numbers and issues." Winnipeg: IISD.
- ILO (International Labour Organization). 2015. "Sectoral survey of child labour in informal tin mining in Kepulauan Bangka Belitung Province, Indonesia 2014." Geneva: ILO. accessed from: http://www.ilo.org/ipecc/Informationresources/WCMS_IPEC_PUB_27535/lang--en/index.htm
- International Tin Association. 2018. "Unconventional Mining in Bangka-Belitung, Indonesia." United Kingdom. Accessed from <https://www.internationaltin.org/wp-content/uploads/2018/02/Unconventional-Mining-in-Bangka-Belitung-Indonesia.pdf>
- IMI (Indonesia Mining Institute). 2018. "Indonesia Mining Sector Diagnostic." World Bank Other Operational Studies 33087, The World Bank. <http://documents1.worldbank.org/curated/en/704581575962514304/pdf/Report-on-Indonesia-Mining-Sector-Diagnostic.pdf>
- IPEN (International Pollutants Elimination Network). n/d. "International SAICM Implementation Project (ISIP)." Accessed from: <https://ipen.org/sites/default/files/documents/BaliFokus%20final%20ISIP%20Mercury%20Country%20Situation%20report%203.pdf>
- Ismawati, Yuyun. 2010. "Policy Brief: ASGM in Indonesia." Denpasar: BaliFokus.
- Jejak Rekam. 2017. "Tertimbun Tanah Pendulangan Intan, 2 Orang Tewas, 3 Penambang Luka-Luka [Buried in diamond mining soil, 2 dead and 3 injured]." Accessed from <https://jejakrekam.com/2017/04/03/tertimbun-tanah-pendulangan-intan-2-orang-tewas-3-penambang-luka-luka/>
- Jennings, N. 1999. "Social and Labour Issues in Small-Scale Mines: Report for Discussion at *Tripartite Meeting on Social and Labour Issues in Small-Scale Mines*." Geneva: International Labour Organization.
- Jyotishi, Amalendu, Kuntala Lahiri-Dutt, and Sashi Sivramkrishna. 2018. "Historical Trajectory of Gold-Mining in the Nilgiri–Wayanad Region of India." In *Between the Plough and the Pick: Informal, Artisanal and Small-Scale Mining in the Contemporary World*, 235–59. Canberra : ANU Press. <https://doi.org/10.22459/bpp.03.2018.11>
- Katadata. 2019. "Ragam modus batu bara ilegal di kalimantan timur [Various motives of illegal coal mining in East Kalimantan]." Accessed from <https://katadata.co.id/berita/2019/02/11/ragam-modus-batu-bara-ilegal-di-kalimantan-timur>
- Krisnayanti, Baiq Dewi, Christopher W.N. Anderson, Wani Hadi Utomo, Xinbin Feng, Eko Handayanto, Nurul Mudarisna, Hadiman Ikram, and Khususiah. 2012. "Assessment of Environmental Mercury

- Discharge at a Four-Year-Old Artisanal Gold Mining Area on Lombok Island, Indonesia.” *Journal of Environmental Monitoring* 14 (10): 2598–2607. <https://doi.org/10.1039/c2em30515a>
- Krisnayanti, Baiq Dewi, Ivano Vassura, Maywin Dwi Asmara, Ardiana Ekawanti, and Herman Suheri. 2016. “Analysis of Artisanal Small-Scale Gold Mining Sector in West Sumbawa Regency, Indonesia.” *Pure Earth Journal of Health and Pollution* 6 (12): 26–33. <https://doi.org/10.5696/2156-9614-6.12.26>.
- Lahiri-Dutt, Kuntala. 2004. “Informality in Mineral Resource Management in Asia: Raising Questions Relating to Community Economies and Sustainable Development.” *Natural Resources Forum* 28 (2): 123–32. <https://doi.org/10.1111/j.1477-8947.2004.00079.x>
- Lahiri-Dutt, Kuntala. 2008. “Digging to Survive: Women’s Livelihoods in South Asia’s Small Mines and Quarries.” *South Asian Survey* 15 (2): 217–44. <https://doi.org/10.1177/097152310801500204>.
- Lahiri-Dutt, Kuntala. 2017. “Mining the Land, Mining People.” accessed from <https://www.insideindonesia.org/mining-the-land-mining-people-3>
- Lahiri-Dutt, Kuntala and Martha Macintyre (Eds.). 2006. *Women miners in developing countries: Pit women and others*. Ashgate Publishing, Ltd.
- Larasati, R. Setyono, P. and Sambowo, K.A. 2012. “*Valuasi ekonomi eksternalitas penggunaan merkuri pada pertambangan emas rakyat dan peran pemerintah daerah mengatasi pencemaran merkuri* [Externality economic evaluation in the use of mercury in people’s gold mining and the role of regional government in solving mercury emission (A case study of people’s gold mining in Kokap Subdistrict, Kulon Progo)].” *Jurnal EKOSAINS*, 2012, 4(1). Accessed from <https://www.semanticscholar.org/paper/Valuasi-Ekonomi-Eksternalitas-Penggunaan-Merkuri-di-Larasati-Setyono/69fcf9629cf4d6ac3fdd4b8af5d1a323424b5d2d>
- Lebak Sub-national Government. 2020. “*Rencana Aksi Daerah Pengurangan serta Penghapusan Merkuri (RAD PPM) pada Pertambangan Emas Skala Kecil di Kabupaten Lebak, 2017-2019*. [Sub-national action plan in mercury reduction and abolishment in ASGM activities in Lebak, Banten, 2017 – 2019].” In *Puslitbang Kualitas dan Laboratorium Lingkungan (P3KLL) Webinar*. Webinar conducted by P3KLL, online. Accessed from: https://drive.google.com/drive/folders/1_BY_fRWHSil9mBYW02CA3ZarezdXu4RN
- Lestari, Nina Indriati. 2013. “Mineral Governance, Conflicts and Rights: Case Studies on the Informal Mining of Gold, Tin and Coal in Indonesia.” *Bulletin of Indonesian Economic Studies* 49 (2): 239–40. <https://doi.org/10.1080/00074918.2013.809847>.
- Limbong, Daniel, Jeims Kumampung, Joice Rimper, Takaomi Arai, and Nobuyuki Miyazaki. 2003. “Emissions and Environmental Implications of Mercury from Artisanal Gold Mining in North Sulawesi, Indonesia.” *Science of the Total Environment* 302 (1–3): 227–36. [https://doi.org/10.1016/S0048-9697\(02\)00397-2](https://doi.org/10.1016/S0048-9697(02)00397-2)
- Lutfillah, Kiki 2011. “*Kasus Newmont (Pencemaran di Teluk Buyat)*[Newmont case (Pollution in Buyat Bay)].” *Jurnal Kybernan*, 2(1). Accessed from: <http://jurnal.unismabekasi.ac.id/index.php/kybernan/article/view/662>
- Lynas, Danellie. 2018. “A Good Business or a Risky Business: Health, Safety and Quality of Life for Women Small-Scale Miners in PNG.” In *Between the Plough and the Pick: Informal, Artisanal and Small-Scale Mining in the Contemporary World*, 151–70. ANU Press. <https://doi.org/10.22459/bpp.03.2018.07>

- Maia, Fabricio, Marcello M. Veiga, Ruby Stocklin-Weinberg, Bruce G. Marshall, Caetano Constanzo, Nickolaus Harijati, and Cristina Villegas. 2019. "The Need for Technological Improvements in Indonesia's Artisanal Cassiterite Mining Sector." *Extractive Industries and Society* 6 (4): 1292–1301. <https://doi.org/10.1016/j.exis.2019.07.010>.
- McGrew, Linda. 2016. "Artisanal and Small-Scale Gold Mining: A Sector of Problems and A Sector of Promise." Asia Pacific Foundation of Canada. At <https://www.asiapacific.ca/blog/artisanal-and-small-scale-gold-mining-sector-problems-and>
- Media Indonesia. 2019. "Pemerintah Daerah Berencana Tata Tambang Intan Rakyat [Regional government plans to manage diamond community mining]." Accessed from <https://mediaindonesia.com/read/detail/230129-pemerintah-daerah-berencana-tata-tambang-intan-rakyat>
- MEMR (Ministry of Energy and Mineral Resources) One Map. 2020. "Mineral dan Batubara [Mineral and Coal]." Accessed from <https://geoportal.esdm.go.id/minerba/>
- Miharja, Meggi Okka Hadi, Setyo, Andreas Dwi and Hadi, Herbowo Prasetyo. 2015. "Implikasi Hukum terkait pertambangan rakyat dalam Bidang Minerba di Indonesia. [Law implications regarding people's mining in Indonesia's coal and mineral]." *Privat Law*, 7, 103. Accessed from: <https://www.neliti.com/publications/26601/implikasi-hukum-terkait-pertambangan-rakyat-dalam-bidang-minerba-di-indonesia>
- Mirdat, Yosep S.Patadungan and Isrun. 2013. "Status logam berat merkuri (Hg) dalam tanah pada kawasan pengolahan tambang emas di Kelurahan Proboya, Kota Palu. [Mercury status in the soil within gold mining processing area in Proboya, Palu]." *e-Journal of Agrotekbis*, 1(2), 127-134. Accessed from: <https://www.neliti.com/publications/242414/status-logam-berat-merkuri-hg-dalam-tanah-pada-kawasan-pengolahan-tambang-emas-d>
- MoEF (Ministry of Environment and Forestry). 2020. "Geoportal Pesk-Merkuri [Geoportal ASGM – Mercury]." Accessed from <https://sitkb3.menlhk.go.id/merkuri/index.php>
- MoEF (Ministry of Environment and Forestry). 2015. "Jenis Tambang Rakyat [Types of people's mining]." Accessed from: http://sitkb3.menlhk.go.id/infomerkuri/?page_id=466
- North Sulawesi Bureau of Statistics. 2011. "Sulawesi Utara dalam angka. [North Sulawesi in Figures]." Manado: Central Kalimantan Bureau of Statistics. Accessed from: <https://sulut.bps.go.id/publication/2012/02/08/b14bea108c457bd617d2f998/sulawesi-utara-dalam-angka-2011.html>
- Nurtjahya, Eddy, and Fournita Agustina. 2015. "Managing the Socio-Economic Impact of Tin Mining on Bangka Island , Indonesia - Preparation for Closure." *The 10th International Conference on Mine Closure*, no. June: 1–10. https://www.researchgate.net/publication/282134174_Managing_the_socio-economic_impact_of_tin_mining_on_Bangka_Island_Indonesia_-_preparation_for_closure.
- Nurtjahya, Eddy, Fournita Agustina and Wike Ayu Eka Putri. 2008. "Neraca ekologi pertambangan timah di Pulau Bangka: Studi kasus pengalihan fungsi lahan di ekosistem darat. [Ecological balance of tin mining in Bangka Island: A case study in shift of land ecosystem function]." *Berkala Penelitian Hayati*, 14(1), 29-38. Accessed from: <http://berkalahayati.org/index.php/jurnal/article/view/296>

- Park, Jung Duck, and Wei Zheng. 2012. "Human Exposure and Health Effects of Inorganic and Elemental Mercury." *Journal of Preventive Medicine and Public Health* 45 (6): 344–52. <https://doi.org/10.3961/jpmph.2012.45.6.344>
- Perez, Romain. 2017. "Artisanal and Small-scale Mining and Sustainable Development Goals." Presented at the Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development on October 19, 2017. <https://www.igfmining.org/wp-content/uploads/2018/09/Session-19-ASM-and-SDGs-by-Romain-Perez.pdf>
- Pewarta Kassel. 2012. "Peti Marak Di Geronggang [Unlicensed mining blooms in Geronggang]." Accessed from <https://kassel.antaranews.com/berita/7888/peti-marak-di-geronggang>
- PSDMB (Pusat Sumber Daya Mineral Batubara dan Panas Bumi). 2016. "Manual Book of SIGNAS." Accessed from: <http://psdg.geologi.esdm.go.id/tutorial/Manual%20Signas%20Beta%202016.pdf>
- PSDMBP (Pusat Sumber Daya Mineral Batubara dan Panas Bumi). 2020. "Ugas dan fungsi pusat sumber daya mineral batubara dan panas bumi (Roles and Tasks of Center for Mineral, Coal and Geothermal Resources)." Accessed from: http://psdg.geologi.esdm.go.id/index.php?option=com_content&view=article&id=5&Itemid=28
- PSDMBP (Pusat Sumber Daya Mineral Batubara dan Panas Bumi). n.d. "Manual Book of GEORIMA (Geological Resources of Indonesia Mobile Application)." Accessed from: <http://psdg.geologi.esdm.go.id/tutorial/Manual%20Book%20GeoRIMA.pdf>
- PWC (PricewaterhouseCoopers). 2019. "Mining in Indonesia: Investment and taxation guide, June 2019." 11th edition. Jakarta: PricewaterhouseCoopers. www.pwc.com/id
- Rahavu, Derita Prapti, Faisal and Jamilah Cholillah. 2019. *Rekonstruksi partisipasi masyarakat dalam perizinan pertambangan rakyat berbasis nilai kearifan lokal*. [Reconstruction of community participation in ASM licensing based on local values]. Prosiding Seminar Hukum dan Publikasi Nasional (Serumpun) I 2019, 446-457. Accessed from: <http://prosiding.fh.ubb.ac.id/index.php/prosiding-serumpun/article/view/49>
- Rakhman, Fathul. 2019. "Penambangan Emas Ilegal di Lombok Meredup, Penertiban Efektif? [Illegal Gold Mining in Lombok Fades, Effective Control?]." Mongabay. Access September 9, 2020 at <https://www.mongabay.co.id/2019/10/03/penambangan-emas-ilegal-di-lombok-meredup-penertiban-efektif-2/>
- Ratnawati, Rosa Vivien (Directorate General of Waste Management, Ministry of Environment and Forestry). 2020. "Opening remark of Webinar on Responsible Management of People's Gold Mining." June 16, 2020.
- Sanusi, Didi G. 2019. "Berisiko Tinggi, Penambang Intan Di Pumpung Akan Dialihkan Jadi Peternak Itik [High risk, diamond miners in Pumpung will be encouraged to be duck farmers]." Accessed from <https://jejakrekam.com/2019/04/09/berisiko-tinggi-penambang-intan-di-pumpung-akan-dialihkan-jadi-peternak-itik/>
- Sari, Rahma. 2019. "APRI: Pertambangan Rakyat Lebih Menguntungkan dari Freeport [APRI: Community Mining is More Profitable than Freeport]." Accessed from: <https://www.tambang.co.id/apri-pertambangan-rakyat-lebih-menguntungkan-dari-freeport-21816/>

- Seccatore, Jacopo, Marcello Veiga, Chiara Origliasso, Tatiane Marin, and Giorgio De Tomi. 2014. "An Estimation of the Artisanal Small-Scale Production of Gold in the World." *Science of the Total Environment* 496 (October): 662–67. <https://doi.org/10.1016/j.scitotenv.2014.05.003>.
- Siburian, Nova Yanti Siburian, Erdianto Effendi and Widia Etorita. 2016. "Penegakan hukum terhadap pertambangan pasir bahan galian C di Kabupaten Kuantan Singingi berdasarkan Undang-Undang Nomor 4 Tahun 2009 tentang Pertambangan [Law enforcement towards sandstone mining activities in Kuantan Singingi District based on Law No.4/2009 on Mining]." *JOM Fakultas Hukum, III(2)*, 1-15. Accessed from: <https://www.neliti.com/publications/183526/penegakan-hukum-terhadap-pertambangan-pasir-bahan-galian-c-di-kabupaten-kuantan>
- Sim, M. 2019. "Empowering women gold miners in Indonesia." Accessed from: <https://www.pureearth.org/blog/helping-women-gold-miners-in-indonesia/>
- Sousa, Rodolfo N., Marcello M. Veiga, John Meech, Janis Jokinen, and Aguinaldo J. Sousa. 2011. "A Simplified Matrix of Environmental Impacts to Support an Intervention Program in a Small-Scale Mining Site." *Journal of Cleaner Production* 19 (6–7): 580–87. <https://doi.org/10.1016/j.jclepro.2010.11.017>
- Subiman, Ninan Lestari and Budy P. Resosudarmo. 2010. "Tambang untuk Kesejahteraan Masyarakat: Konflik dan Usaha Penyelesaiannya [Mining for the people: conflicts and current efforts to resolve them]." In Azis, I.J., Napitupulu, L.M., Patunru, A.A., and Resosudarmo, B.P. (eds.), *Sustainable development: Roles and contribution of Emil Salim*, pp. 426 – 449. Jakarta: PT Gramedia. Accessed at https://www.researchgate.net/publication/256007489_Tambang_Untuk_Kesejahteraan_Rakyat_Konflik_Dan_Usaha_Penyelesaiannya
- Sulista, Sulista. 2019. "Tambang inkonvensional: peran masyarakat dan daya tarik ekonomi bagi penambang [The unconventional mining: Role of community and economical attraction for the miners]." *Jurnal Teknologi Mineral dan Batubara*, 15(1), 63-75.
- Sujitno, Suttedjo. (2007). "The Impact of Indonesian Tin Throughout History." Jakarta, PT. Gramedia Pustaka Utama.
- Sumual, Herry. 2009. "Karakterisasi limbah tambang emas rakyat Dimember, Minahasa Utara [Waste characteristics from people's mining gold in Dimembe, North Minahasa]." *Agritek*, 17(5). Accessed from: <http://sulutiptek.com/documents/STUDI-KARAKTERISASI-LIMBAH-TAMBANG-EMAS-RAKYAT.doc>
- Tribunnews. 2019. "29 Kasus Tambang Ilegal di Kaltim, Ternyata Begini Modus Operandinya [29 cases of illegal mining in East Kalimantan, this is the motive]." Accessed from <https://www.tribunnews.com/regional/2019/07/09/29-kasus-tambang-ilegal-di-kaltim-ternyata-begini-modus-operandinya>
- Umaira, F. 2019. "Does coal mining in South Kalimantan lead to prosperity or bring negative impacts?" Accessed from <https://matabanua.co.id/2019/12/18/pertambangan-batubara-di-kalimantan-selatan-sudah-mensejahterakan-atau-malah-banyak-mengakibatkan-kerugian/>
- UNDP (United Nations Development Program) Indonesia. 2020. "A snapshot of women miners in Indonesia." Accessed from:

<https://www.id.undp.org/content/indonesia/en/home/presscenter/articles/2020/Womaningoldmining.html>

- UNDP (United Nations Development Program). 2020b. “Indonesia’s Human Development Index”. Accessed from: <http://hdr.undp.org/en/content/2019-human-development-index-ranking>
- UNDP (United Nations Development Program). 2019. “Inequalities in Human Development in 21st Century – Briefing note for countries on 2019 Human Development Report: Indonesia.” Accessed from: http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/IDN.pdf
- Utama, Abraham. 2019. “Ibu kota baru: Ribuan lubang tambang terbengkalai di Kaltim, ‘cucu saya tewas di sana, saya harus tuntutan siapa?’ [New capital city: Thousands of mining pit left in East Kalimantan, ‘My granddaughter died there, whom I need to sue?’]” Accessed from <https://www.bbc.com/indonesia/indonesia-50184425>
- West Nusa Tenggara Bureau of Statistics. 2013. “Nusa Tenggara Barat dalam angka [West Nusa Tenggara in Figures].” Mataram: West Nusa Tenggara Bureau of Statistics. Accessed from: <https://ntb.bps.go.id/publication/2013/11/04/3030cc3fa44747950df27ce2/nusa-tenggara-barat-dalam-angka-2013.html>
- Yovanda, Oleh. 2019. “Lubang Tambang Batubara di Kalimantan Timur, Begini Rencana Pemulihannya [Coal mining open-pit in East Kalimantan, this is the reclamation plan]” Accessed from <https://www.mongabay.co.id/2019/10/26/lubang-tambang-batubara-di-kalimantan-timur-begini-rencana-pemulihannya/>
- YTS (Yayasan Tambuhak Sinta). 2019. “Women in Artisanal and Small-Scale Gold World.” In B. Amor (Chair) *Workshop on Gender Mainstreaming in Indonesia’s Extractives Industry*. Workshop conducted by World Bank and Women in Mining and Energy, Jakarta.
- Yunianto, Bambang and Saleh Ridwan. 2011. “Persoalan pertambangan rakyat pasca pemberlakuan Undang-Undang No. 4 Tahun 2009. [Issues in people’s mining after the implementation of UU No.4/2009].” *Jurnal Teknologi Mineral dan Batubara*, 7(4), 145-156. Accessed from <https://jurnal.tekmira.esdm.go.id/index.php/minerba/article/view/811/653>
- Zulkarnain, Iskandar, Tri Nuke Pudjiastuti, Eko Tri Sumarnadi, and Betti Rosita Sari. 2008. *Concepts of people’s mining within the framework of sustainable mining resources*. Jakarta: LIPI Press.
- Zulkarnain, Iskandar, Tri Nuke Pudjiastuti, Eko Tri Sumarnadi, and Betti Rosita Sari. 2007. *Dynamics and the roles of people’s mining in Indonesia*. Jakarta: LIPI Press.
- Zulkarnain, Iskandar, Tri Nuke Pudjiastuti, Eko Tri Sumarnadi, and Betti Rosita Sari. 2006. “Guidelines to empower communities around mining area.” *Program Kompetitif Pengembangan Iptek-LIPI*, Jakarta.