



2020 State of the Artisanal and Small-Scale Mining Sector



DELVE

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Cover photo:

A miner in Zimbabwe who participates in Pact's Zimbabwe Accountability and Artisanal Mining Program. The program works to formalize the sector, bolster safety and environmental standards and reduce the dangerous use of mercury in gold mining. (Credit: Maggie Dougherty/Pact).

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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 information contained in this report, the original source should be included; for example: McQuilken and Hilson, 2018, as cited in World Bank, 2020.

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Acronyms

ACP	African, Caribbean and Pacific Group of States	EU	European Union
AGC	Artisanal Gold Council	FFR	fatality frequency rate
AGM	Annual General Meeting	FGD	focus group discussion
AMV	Africa Mining Vision	FJ\$	Fijian dollar
ARM	Alliance for Responsible Mining	FPA	Forward Purchase Agreements
ASGM	artisanal and small-scale gold mining	GDP	gross domestic product
ASM	artisanal and small-scale mining	GEF	Global Environmental Facility
ASM18	International Conference on Artisanal and Small-scale Mining & Quarrying	GGB	Guyana Gold Board
AWIMA	Africa Women in Mining Association	GGMC	Guyana Geology and Mines Commission
BGI	Better Gold Initiative	GIA	Gemological Institute of America
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources)	GIS	geographic information system
BGS	British Geological Survey	GNASSM	Ghana National Association of Small-Scale Miners
CAR	Central African Republic	GNI	gross national income
CASM	Communities and Small-Scale Mining initiative	GOLD	Global Opportunities for Long-Term Development program
CBMS	Community Based Monitoring System	GPS	global positioning system
CG	Compassionate Gold	GTP II	The Ethiopian Growth and Transformation Plan II
CIF	cost, insurance, freight	GWMO	Guyana Women Miners Organization
CIRDI	Canadian International Resources and Development Institute	HDI	Human Development Index
CLFZ	Child Labor Free Zones	IBM	Indian Bureau of Mines
COMIKAGI	Coopérative Minière of Kababaru-Gikingo	IATWG	Inter-Agency Technical Working Group
COVID-19	corona virus disease 19	ICBF	Colombian Institute for Family Well-Being
CRAFT	Code of Risk-mitigation for ASM engaging in Formal Trade	ICMM	International Council on Mining & Metals
DENR	Department of Environment and Natural Resources	IDR	Indonesian rupiah
DFID	UK Department for International Development	IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
DMF	District Mineral Foundation	IIED	International Institute for Environment and Development
DOLE	Department of Labor and Employment	ILO	International Labour Organization
DRC	Democratic Republic of the Congo	IPEC	International Labor Organizations' Program on the Elimination of Child Labor
DSWD	Department of Social Welfare and Development	IPR	Izin Pertambangan Rakyat (Community Minin License)
EITI	Extractive Industries Transparency Initiative	km	kilometers
		km²	square kilometers
		LSM	large-scale mining
		MAD	Morocco dirhams
		MB	Minahang Bayans (people's mining area)

MDG	Millennium Development Goal		des Mines Artisanales et de Petit Echelle
MIA	Minamata Initial Assessment	SDC	Swiss Agency for Development and Cooperation
MICA	Migori County Artisanal Miners Co-operative	SDG	Sustainable Development Goal
MGB	Mines and Geosciences Bureau	SDG8	Sustainable Development Goal 8 Decent Work and Economic Growth
MEMSD	Morocco Ministry of Energy, Mines, and Sustainable Development	SDMR	Sustainable Development of Mining in Rwanda
MLNR	Ghana Ministry of Lands and Natural Resources	SGBV	sexual and gender-based violence
MMSD	Mining, Minerals and Sustainable Development Project	SHIELD	Strategic Helpdesk for Information, Education, Livelihood and other Development Interventions
MNFA	Mongolia National Federation of Artisanal Miners	SME	small and medium-sized enterprise
MNT	Mongolian tugriks	SUMM	Supporting the Ministry of Mines
MOEM	Peru Ministry of Energy and Mining	TAWOMA	Tanzania Women Miners Association
MRPAM	Minerals Resources and Petroleum Authority of Mongolia	TEMP	Technical Environmental Management Plan
MSHA	US Department of the Labor Mine Safety & Health Administration	TVE	Township Village Enterprise
MSME	micro, small, and medium enterprises	UK	United Kingdom
n.d.	no date given	UN	United Nations
NAP	National Action Plan	UNDESA	United Nations Department of Economic and Social Affairs
NCACL	National Council Against Child Labor	UNDP	United Nations Development Programme
NGO	nongovernmental organization	UNECA	United Nations Economic Commission for Africa
NGT	National Green Tribunal	UNEP	United Nations Environment Programme
NMS	National Mining Syndicate N	UNGCN UK	United Nations Global Compact Network UK
n.p.	no page numbers given	UNIDO	United Nations Industrial Development Organization
NSO	National Statistics Office of Mongolia	USA	United States of America
NSSO	National Sample Survey Organization	USAID	United States Agency for International Development
ODA	overseas development assistance	USBM	United States Bureau of Mines
OECD	Organisation for Economic Co-operation and Development	USDOL	United States Department of Labor
OHS	occupational health and safety	US\$	United States dollars
PACE	Partnership Against Child Exploitation	USGS	United States Geological Survey
PLS	Profit and Loss Sharing	VSLA	Village Saving and Loans Associations
PMMC	Ghana Precious Minerals Marketing Corporation	WFCL	worst forms of child labor
PPE	personal protective equipment	WIAMO	Rwanda Women In/And Mining Organization
PV	photovoltaic	WSJ	Wall Street Journal
RMB	Rwanda Mines Petroleum and Gas Board	YTS	Yayasan Tambuhak Sinta
RMO	Regional Mining Office		
SAEMAPE	Service d'Assistance et d'Encadrement		



ABOUT THE 2020 REPORT AND DELVE

In 2016, the World Bank’s Extractives Global Programmatic Support (EGPS) Multi-Donor Trust Fund and Pact committed to highlighting ASM’s contribution to global development through the establishment of Delve [<https://delvedatabase.org/>]. The initiative emphasizes building an evidence base on a range of topics related to ASM and global development. Beyond the global database [<https://delvedatabase.org/data>], Delve publishes an annual *State of the Artisanal and Small-Scale Mining Sector* report (referred to as the State of the Sector Report), which uses the United Nations (UN) Sustainable Development Goals (SDGs) as the framework for analyzing ASM’s contribution to the SDGs.

The 2020 State of the Sector Report builds on the analyses from the 2019 report to close further data gaps. It focuses on how ASM’s contribution to the achievement of Sustainable Development Goal 8 (SDG8) Decent Work and Economic Growth could be maximized. It does so through the analysis of five focus areas related to SDG8: (i) improve occupational health and safety (OHS); (ii) stimulate economic growth; (iii) make production sustainable and eliminate mercury; (iv) ensure gender equality; and (v) eradicate child labor and promote youth employment.

The 2020 State of the Sector Report uses mixed methods to demonstrate the richness of the ASM labor force: types of employment, diversity of the workforce, and the influence of social relationships both inside and outside the mine site. It shows how this global labor force contributes to efforts to improve the three key components of SDG8: i) economic growth; ii) productive employment; and iii) decent work. The 2020 report argues that once

ASM is understood as an ecosystem—with layers of socioeconomic activity operating via interdependent production networks (Henderson et al. 2002; McQuilken and Hilson 2018; McQuilken 2018)—solutions to some of the sector’s most pressing labor problems can be better conceived. It further demonstrates how holistic approaches to SDG8 in ASM serve as a platform for scaling up the critical agenda of ASM formalization.

Each focus area begins with an overview, positioning current knowledge and progress to frame the accompanying 22 case studies contributed by over 40 partner organizations. Drawn from a wide range of ASM practitioners and researchers, the case studies provide an inspiring collection of efforts to improve SDG8 in ASM, with the hope that inspiration will galvanize renewed interest and focus on achieving this important SDG for the millions of informal mine workers, and their families and communities, around the world.



EXECUTIVE SUMMARY

Global outlook

Those working in artisanal and small-scale mining (ASM) make up the world's largest mining workforce. Since the 13 million estimate put forward 20 years ago by the International Labour Organization (ILO), the number of people working in the sector has more than tripled. Today, ASM is the primary source of employment for at least 44.75 million people across 80 countries worldwide, according to this report's latest estimates.¹

Combining ASM's direct labor figure with its indirect one, the scale and possibility of ASM's contribution to livelihoods and economic growth assumes greater significance. It is estimated that at least 134 million people work in related industries that support the ASM sector (World Bank 2019, 71). ASM workers supply a wide variety of minerals, in significant proportions, to the world's raw material volumes—minerals that are critical to modern communication technologies, low carbon and clean energy technologies (World Bank 2020), and luxury jewelry goods. Consider that ASM mineral production makes up 25 percent of total global diamond supply, 20 percent of the world's gold supply, and 80 percent of the world's sapphires. ASM also supplies 18-30 percent of the world's cobalt—a key battery metal powering the world's clean energy transition (OECD 2019).

Despite these significant contributions to major global mineral supply chains, artisanal and small-scale miners are some of the world's most marginalized workers, and their contribution to the global economy garners little attention (Hilson and McQuilken 2014). Informality of the sector, an on-going problem, leaves ASM workforces around the globe exposed to dangerous working

conditions. From landslides to mercury exposure to intense manual rock crushing, miners enter the work site most days under-protected. These vulnerabilities have only been heightened by the current COVID-19 crisis where ASM typically takes place in rural areas without access to proper health infrastructure and a general lack of government support (Perks and Schneck 2021). With 80-90 percent of ASM activity operating informally, artisanal and small-scale miners join the 1.6 billion informal workers that the International Labour Organization (2020) estimates could lose their jobs because of the pandemic.

Whereas legal frameworks, standards, and commitments exist on important initiatives such as “conflict-free” minerals and the ethical production and responsible sourcing of materials, there continues to be a total lack of concerted global commitment to address decent work and economic growth in ASM. As the 2020 report intends to show, solutions to improving decent work in ASM can be straightforward, affordable, and highly effective, improving not only the health and safety of miners, their families, and communities but equally the balance sheet of mining entities and mineral sourcing companies.

Reflections on improved decent work and economic growth in ASM

This edition of the annual *State of the Sector Report* uses the Sustainable Development Goal 8 (SDG8): “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” as the framework for analyzing ASM’s contributions. It analyzes five focus areas of SDG8: (i) improve occupational health and safety (OHS); (ii) stimulate economic growth; (iii) make production sustainable and eliminate mercury; (iv) ensure gender equality; and (v) eradicate child labor and promote youth employment. Through the five themes, the 2020 State of the Sector Report illustrates these possibilities for enabling the achievement of SDG8 in ASM through a variety of practical case studies.

The case studies showcase the work of organizations to achieve decent work, even in highly informal and precarious ASM settings, in ways that are cost effective, while working in partnership with governments and other local actors to progressively improve standards. The examples in this report show that decent work in ASM is possible if prioritized and reveal six key findings or reflections on how best to advance decent work principles within ASM in the future. However, more data, attention, and investment in the sector will be needed to achieve SDG8 and springboard for decent work, productive employment, and economic growth.

Based on the data and case study examples provided in the focus area sections, six reflections close out the report accompanied by two case studies on collaborating for change. The reflections make a firm call for action to capitalize on existing international regulatory initiatives governing mine site practices to deepen global commitments on the decent work agenda. The reflections furthermore highlight the critical importance of partnerships, notably in-country and regional, in improving labor, social, and environmental standards in mine sites. Given Delve’s data focus, the reflections remind readers of the importance of baseline and monitoring best practices to ensure both quantitative and

qualitative data on the sector is recorded, shared widely, and used to improve policy and practice.

REFLECTION 1: INVESTMENTS IN HEALTH AND SAFETY ARE URGENTLY NEEDED FOR ASM, SINCE IMPROVED OCCUPATIONAL HEALTH AND SAFETY (OHS) IS A COLLECTIVE RESPONSIBILITY WHICH IS BOTH FEASIBLE AND BENEFICIAL TO ALL

Decent work leads not only to improved productivity but to better individual and communal well-being. Despite the evidence, however, miners and their communities continue to face multiple health and safety risks. Many of these originate from the common informality of ASM operations, including absence of technical and financial support for mine site improvements and OHS training for miners themselves. Common impacts of health and safety risks at sites include injuries, fatalities, and recurring illness in mining areas. Of all the safety issues, only mercury use in gold extraction and processing has received considerable attention over the years. Beyond mercury, the absence of in-depth studies and comprehensive data on OHS has made it impossible to identify the scale of the OHS problem and to therefore track progress.

The 2020 State of the Sector Report applies the fatality frequency model—used for industrial mining—to ASM, showing that in 1999, ASM was as unsafe as large-scale coal mining in the USA in the early 1970s, but safer than large-scale gold mining in South Africa in the 1980s. Increased mechanization, investment, and concerted efforts to improve OHS by governments and industrial mining companies has since led to dramatic safety improvements in the industry. This begs the question: if even a small fraction of the total budgets deployed for OHS improvements by the industrial mining sector were invested similarly in ASM operations, could the OHS record of ASM not equally improve?

The answer put forth in this report is yes. Market-driven approaches to OHS provide win-win opportunities for increased health and safety and financial outcomes. Partnerships, as shown in the case studies of the report, can involve governments, companies, international organizations, and end-user manufacturers. Responsible sourcing

initiatives provide an important building block for wider efforts on basic OHS to be made. In the absence of responsible sourcing initiatives, stand-alone, at scale OHS program can be implemented. Either way with modest investments in OHS, the right technical assistance can:

- **Improve productivity and reduce operating costs** through overburden stripping, provision of geological information, better work-place organization, better access to ore veins, properly locating material waste heaps, and improving transport pathways;
- **Narrow gender pay gaps** by lessening the physical performance requirements of many higher paying mine site jobs which traditionally favor men;
- **Improve worker health and female well-being** with provision of site sanitation (such as clean water and toilets); and
- **Increase local content opportunities** through new business starts ups who can respond to new demand for OHS services and products.

REFLECTION 2: BETTER DATA ON ASM'S ECONOMIC CONTRIBUTIONS THROUGH IMPROVED NATIONAL STATISTICS CAN PROVE THE VALUE OF ASM TO NATIONAL AND GLOBAL GROWTH

Data which underscore the economic importance of ASM are critical to understanding the ways in which finances fuel the sector's production and growth, create linkages to other industries, and crucially, bolster the case for formalization. Moving forward, more disaggregated economic data will be needed to showcase ASM's economic contributions, beginning with its contribution to GDP as well as more accurate figures linked to the value of exports. At present, there is an overreliance on export figures, declared production, and sales as the key sources of data for understanding ASM's contribution.

National reporting and accounting systems are critical instruments to capturing these data fields. Yet there are only a few countries to draw on where ASM's contributions to labor, revenues, and

exports can be effectively measured (Guyana, Rwanda, Central African Republic, and Tanzania). In the first three cases, ASM is the key scale of mining activity in the country making it easier to attribute ASM production to national statistics. However, in most mining countries where industrial and ASM activities take place, statistics on production, revenue, and exports get comingled at the national level. Tanzania is an outlier where its accounting systems have adapted to reflect small-scale mining production and export statistics separately from industrial statistics. This has helped to demonstrate the critical role of ASM and its related associations in the economy's development. The pilot efforts of the Extractive Industry Transparency Initiative (EITI) to disaggregate reporting by mining type held promise, though also demonstrated the need for new tracking and accounting systems that would allow for easy disaggregation of production statistics in national ledgers.

Gender disaggregated data has even more significant gaps. Take for instance data on Delve where 60% of countries with ASM data published on the Delve website do not have data published on basic female participation.

Enhancing better data on ASM and economic growth could be done as follows:

- **Standardize a "mining" field** into national household, labor, and poverty survey instruments, and where possible disaggregate between industrial and ASM;
- **Upgrade databases and cadastres** in Ministries responsible for mining to track production statistics by scale of activity and to delineate ASM permits;
- **Improve information technology** in regional field offices of mining Ministries to upload real-time data on ASM permits, production activity, and total number of miners at monitored sites; and
- **Pilot methodologies for a "multiplier calculator"** to capture the reach of development impact ASM has in local communities.

REFLECTION 3: TARGETED INTERVENTIONS IN RELEVANT AREAS CAN HELP TO IMPROVE MINERS' LIVES AND IMPROVE THEIR PAY, HEALTH, AND WELL-BEING

The 2020 State of the Sector Report showcases ASM formalization projects, centered on specific topics such as gender, mercury elimination, due diligence and traceability, or child labor. Observed across the various case studies and projects is the potential for a singular project topic to serve as an entry point to implement broader decent work reforms. Such an approach marks a departure from even a decade ago where niche formalization projects operated in silos and made little impact beyond the topic at hand.

Mercury elimination may be the most powerful example of such an approach whereby efforts to eliminate its use are combined with other formalization efforts meant to improve the lives of miners—securing mine titles and permits, access to financing, and environmental protection. Due diligence and responsible sourcing initiatives, as already highlighted in Reflection 1, offer another platform for reforms of a wide nature to do with decent work. Gender-focused projects, where a gender analysis is performed early on to identify gaps, can act as catalysts for improvements in pay, health, and well-being.

Practically, leveraging formalization entry points for improving decent work could:

- **Employ a holistic formalization model** to the decent work agenda which integrates the foundational pillars of formalization models to efforts to improve decent work in mine sites; and
- **Adopt universally a set of OHS standards** for application in any formalization project.

REFLECTION 4: ENGAGING THE SOCIO-ECONOMIC NETWORK OF ACTORS INVOLVED IN ASM CAN HELP OVERCOME ENTRENCHED BEHAVIORS AND CHANGE LABOR PRACTICES WHICH CONTINUE TO UNDERMINE OHS ADVANCEMENT IN THE SECTOR

A recurring theme throughout the 2020 State of the Sector Report is the ability of socio-economic

relationships in mining value chains and networks (that is the ecosystem) to influence—positively or negatively—outcomes on the decent work agenda. Take for instance the adoption of mine site standards, the lessening of gender inequality, the elimination of child labor, or the reduction of mercury use. Each rely in equal measure on individual behavior change and leadership influence on decision-making at mine sites. As raised in focus area five, who controls the gates, so to speak, of the mines is the determinant for what jobs women and men will perform at sites and the pay received. Equally in focus area four, it is noted how past failures of mercury elimination projects resulted from little understanding of the influence periphery social actors had on technology uptake (or lack thereof). Lastly, in focus area six, mapping of the social actors unearthed the cultural drivers to child presence and labor in mine sites, thereby enabling more practical solutions to child labor eradication.

Decent work outcomes can be amplified if the following is undertaken:

- **Conduct qualitative mapping exercises** during project preparations to identify actors in the local mining ecosystem; and
- **Design behavior change programs on decent work** which engage social actors outside the immediate mineral value chain.

REFLECTION 5: CONCERTED PARTNERSHIPS WITH ASM ASSOCIATIONS ADVANCE THE DECENT WORK AGENDA

Many of the case studies in the 2020 State of the Sector Report highlight the capacity and strength of national and regional ASM associations. This attention is long overdue. Mining associations possess extensive networks from the local to national levels. In some countries, they are already proactively engaged in advocacy with government to reform sector policies, as seen in the case study by the International Institute for Environment and Development (IIED) working directly with associations in Ghana and Tanzania. Mining associations' roles in advancing SDG8 are multiple: from messaging at the mine site level to establishing

commitments and policies on decent work across their membership to funding mine site improvement pilots and collecting data. Examples found in this report include: the Association of Women in Mining in Africa (AWIMA) efforts to survey women engaged in the jewelry value chains; the Pumahan Jaya Panners Collective efforts in Indonesia to secure access to finance and invest in sustainable, safe, and scalable business practices for their female gold miners; the work of the Tanzania Women Miners Association (TAWOMA) to expand female membership and connect members to international jewelry initiative such as Moyo Gems.

Further involvement of ASM associations in advancing the decent work agenda could include:

- **Develop national and even pan-regional commitments** to OHS and gender equality at all member sites;
- **Implement Champions of Change programs** where member mine sites are selected to demonstrate an integrated model of decent work standards applied;
- **Negotiate commitments as well as technical and financial contributions from international mineral buyers** to implement national level OHS standard programs in members' mine sites;
- **Conduct regular data collection** on implementation of the decent work agenda in members' mine sites; and
- **Use community of practice platforms like Delve** to broaden understandings and knowledge on effective formalization strategies to address decent work.

REFLECTION 6: FOCUSING ON WOMEN'S WORK IN ASM IS ESSENTIAL TO THE GOAL OF DECENT WORK FOR ALL

The 2020 State of the Sector Report shows how women remain largely invisible in the data on ASM. Yet, as powerfully outlined in the case studies, women make up significant portions of the ASM workforce and suffer from specific forms of workplace discrimination. Adverse side effects of mercury use, unequal pay for similar work, sexual harassment, and inability to own land or mining titles without permissions are but some of the ways in which women's decent work outcomes are hampered.






Advancing gender equality with respect to SDG8 and ASM is possible through the following measures:







- **Complete basic census data** on the number of women working in ASM, disaggregated by country;
- **Streamline gender disaggregated baseline surveys** into all ASM formalization projects to ensure that projects are aware of gender gaps and seek to close them;
- **Continue to reform laws** which discriminate against women's capacity to be entrepreneurs, access finance, and own assets; and
- **Make closing gender gaps a key reporting obligation** for all responsible sourcing initiatives and a key standard for any OHS system at mine sites.

END NOTES

- 1 See <https://delvedatabase.org/> (Accessed 24 March 2021)

FIGURE 1. Importance of ASM and Filling Data Gaps to Attain Goal 8

Target	SDG8 ASM and Quarrying Data Gaps	Indicator	Focus Area and Case Studies
 <p>8.8 Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment</p>	<p>Database of national labor associations, increased</p>	<p>8.8.1 Fatal and non-fatal occupational injuries per 100,000 workers, by sex and migrant status</p> <p>8.8.2 Level of national compliance with labor rights (freedom of association and collective bargaining) based on International Labour Organization (ILO) textual sources and national legislation, by sex and migrant status</p>	<p>Focus area 1: Improve occupational health and safety</p> <p>Case studies:</p> <ul style="list-style-type: none"> • How (un)safe is ASM? Counting and contextualizing fatality frequency rates • Mutoshi Cobalt Pilot Project, DRC: Transforming ASM for increased productivity, safer working conditions, and fairer female earnings • Using a market-driven approach to improve economic returns and mine safety
 <p>8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sector</p>	<p>Knowing the true value of domestic production and linkages to other sectors can reveal value addition and investment opportunities</p>	<p>8.2.1 Annual growth rate of real GDP per employed person</p>	
 <p>8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>Understanding informal sector relationships and access to finance can inform effective formalisation programs</p>	<p>8.3.1 Proportion of informal employment in total employment, by sector and sex.</p>	<p>Focus area 2: Stimulate economic growth</p> <p>Case studies:</p> <ul style="list-style-type: none"> • Data challenges in understanding material flows from ASM activities: cobalt case studies • Labor dynamics of Chinese artisanal and small-scale miners in Cameroon
 <p>8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products</p>	<p>Data on adventure, jewellery, and luxury tourism markets can help plan for post-mine community development</p>	<p>8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate</p>	<ul style="list-style-type: none"> • Supporting the Ethiopian Ministry of Mines to develop ASM • Reaping the economic benefits of formalization in Colombia • GemFair pilots Forward Purchase Agreements to provide access to finance for artisanal miners
 <p>8.a Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-related Technical Assistance to Least Developed Countries</p>	<p>Identifying investment opportunities for technical services, value addition, manufacturing, and buying agreements</p>	<p>8.a.1 Aid for Trade commitments and disbursements</p>	

Target	SDG8 ASM and Quarrying Data Gaps	Indicator	Focus Area and Case Studies
 <p>8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead</p>	<p>Data on domestic material production and consumption to identify national and regional markets and needs</p>	<p>8.4.1 Material footprint, material footprint per capita, and material footprint per GDP</p> <p>8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP</p>	<p>Focus area 3: Make production sustainable and eliminate mercury</p> <p>Case Studies:</p> <ul style="list-style-type: none"> • Phasing out river gravel extraction in Fiji • Improving national estimates of mercury use in ASGM • Recovering lost gold with improved efficiency, productivity, and environmental impacts in Kenya
 <p>8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value</p>	<p>Understand employment opportunities in ASM and barriers to equitable and equal access, labor conditions, and pay for all</p>	<p>8.5.1 Average earnings of employees, by sex, age, occupation and persons with disabilities</p> <p>8.5.2 Unemployment rate, by sex, age and persons with disabilities</p>	<ul style="list-style-type: none"> • Compassionate Gold: A multi-stakeholder approach to formalization and mercury-free production <p>Focus area 4: Ensure gender equality</p> <p>Case studies:</p> <ul style="list-style-type: none"> • Association of Women in Mining in Africa Jewelry Project
 <p>8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all</p>	<p>Data on access to finance, ability to pay, types of financing needs and to sensitize financial institutions on sector and gender specific dynamics</p>	<p>8.10.1 (a) Number of commercial bank branches per 100,000 adults and (b) number of automated teller machines (ATMs) per 100,000 adults</p> <p>8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money-service provider</p>	<ul style="list-style-type: none"> • Moyo Gems: Supporting women artisanal miners in Tanzania to achieve a fairer price • Effective Gender Mapping in the ASGM Sector: Central Kalimantan, Indonesia • Gender equity through access to finance: Pamuan Jaya Panners Collective Indonesia
 <p>8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training</p>	<p>Identifying practical and theoretical gaps in knowledge and existing capacities to inform appropriate training programs</p>	<p>8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training</p>	<p>Focus area 5: Eradicate child labor and create decent youth employment</p> <p>Case studies:</p>
 <p>8.7 Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms</p>	<p>Number and better understanding of the drivers and all forms of child labor to develop programs sensitive to local realities</p>	<p>8.7.1 Proportion and number of children aged 5–17 years engaged in child labor, by sex and age</p>	<ul style="list-style-type: none"> • Tackling child labor in artisanal gold mines in Uganda • The importance of perception studies in child labor prevention: Somos Tesoro, Colombia • Addressing Child Labor in ASM Through Formalization: The Philippines Case Study
 <p>8.b By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization</p>	<p>Demonstrate the current and future diverse and sustainable job and skills opportunities</p>	<p>8.b.1 Existence of a developed and operationalized national strategy for youth employment, as a distinct strategy or as part of a national employment strategy</p>	<ul style="list-style-type: none"> • Finding Effective Approaches to Reduce the Worst Forms of Child Labor: Introducing PACE

INTRODUCTION: ARTISANAL AND SMALL-SCALE MINING (ASM) AND SUSTAINABLE DEVELOPMENT GOAL 8 (SDG8)

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INTRODUCTION

People are at the heart of how artisanal and small-scale mining (ASM) organizes, functions, and succeeds as a significant contributor to major global mineral supply chains. Consider the labor and trade networks involved from an alluvial diamond mine in western Central African Republic to the capital Bangui and onwards to a diamond buying house in Antwerp. For diamonds alone, artisanal production makes up 25 percent of the total global market. Also consider the labor and trade networks that are required to supply 18-30 percent of the world's cobalt, 20 percent of the world's gold, and 80 percent of the world's sapphires. Yet, the role of artisanal and small-scale miners in producing these substantial percentages of the world's minerals garners little attention. Even less so is attention paid to the conditions in which most of this informal economy's laborers operate, except for emotive topics such as child labor or conflict. The *2020 State of the Artisanal and Small-Scale Mining Sector* report fills some of these important gaps in understanding and identifies how ASM's contribution to the achievement of Sustainable Development Goal 8 (SDG8) Decent Work and Economic Growth could be maximized.

The review here of ASM and SDG8 begins this task by laying out an understanding of ASM as more than linear supply chains. Rather the concept of ASM as a productive ecosystem is suggested; one that is replete with overlapping and interdependent social and economic relationships. The purpose of this conceptual vision is to assist readers in imagining the layers of labor which converge to create many of the world's major mineral supply chains. The section then examines the three main elements of SDG8—economic growth, employment, and decent work. What are the challenges and opportunities in fostering these SDG8 elements within the current ASM space? How could the global community envisage maximizing ASM's contributions to attaining SDG8 in the future? The section concludes by framing the methodology and approach to the five focus areas and their supporting case studies that follow.

ASM: an ecosystem

44.75 million people working across more than 80 countries make their living directly in ASM. While most of the world's large-scale miners enjoy relative security, artisanal and small-scale miners work almost exclusively in difficult and dangerous conditions, and their contributions to the supply minerals into global supply chains for everyday use remain hidden. Indeed, artisanal and small-scale miners are vital in providing raw minerals for modern day communications, low carbon and clean energy technologies (World Bank 2020), and luxury jewelry goods. Illustrative examples include gold and gemstones found in women's jewelry; tin and tantalum for laptops, smartphones, and electronic devices; cobalt used in the batteries of electric vehicles; phosphates for fertilizers vital to agriculture; and stone aggregate for road construction and housing.

When combining ASM's direct labor figure with its indirect one—at least a further 134 million and perhaps as many as 269 million people depending on the multiplier used are supported in service and downstream industries (World Bank 2019a, 71)—the scale and possibility of ASM's contribution to economic growth takes on greater significance. In

fact, with 80-90 percent of ASM activity operating informally, ASM joins the 2 billion people globally—over 61 percent of the world's workers—estimated to earn their living in the informal economy (ILO 2018). The ability of ASM to offer income in rural and impoverished settings, to propel global economic growth through mineral trade, and its high degree of informality, should motivate the international community to imagine the remarkable potential, if properly formalized, for more productive employment and decent work opportunities in ASM.

Alone, quantifying ASM's contribution to employment is persuasive enough to demonstrate its potential as a development catalyst. Imagine then the further development insights gleaned when quantitative data is combined with qualitative data on the types of employment and the diversity of the workforce. Illustrative examples include young college graduates who find it easier to work in ASM than finding a job in Ghana's capital, Accra (Hilson and Potter 2005); teachers who earn more as a full-time ASM laborer in Rwanda (Perks 2019); and women leaving difficult relationships or widowed as a result of civil war who can find economic autonomy in the shadows of an artisanal mine in DRC and Burkina Faso, respectively (Kelly et. al. 2014; Werthmann 2009). In fact, mixed-methods research, as captured in a range of academic works (Banchirigah 2008; Fisher 2007; Van Bockstael 2014; Perks 2014; Verbrugge 2015; Lahiri-Dutt 2018; McQuilken and Hilson 2018), illustrates the methodological value in understanding not only how many people work in ASM but who they are, their motivations, and their relationships to one another. For instance, in Rwanda, the search for a 'better life' (the closest that miners come to using the word development) drives their participation in a productive economy, despite mines being replete with labor-related risks and other negative impacts (Perks 2020). By drawing on the voices of miners, efforts to improve development outcomes in ASM communities can more effectively align with the personal goals of miners themselves.

Yet beyond the mine site lay a range of indirect labor activities still in need of better documentation and understanding. For ASM activities depend on, and support, a variety of services and liveli-

hood activities through the indirect labor demand linkages. Examples include: foresters managing woodlands and woodcrafters making sieves and sluice boxes for gold and diamond panners (McQuilken and Hilson 2018; Vlassenroot and Van Bockstael 2008); metal workers forging picks and shovels, alongside importers of mechanized equipment including generators and floating pontoon dredgers (Aspinall 2001; Bulkan and Palmer 2016; Jonkman 2019); and finally, the local farmers and service people making and selling food and other basic provisions at mine sites, or in their adjacent, bustling local markets. As stated at the start of this review, people are at the heart of the ASM economy; this brief snapshot alone presents the scale and diversity of their labor.

Once ASM is understood as an ecosystem—with layers of socioeconomic activity operating via interdependent production networks (Henderson et al. 2002; McQuilken and Hilson 2018; McQuilken 2018)—solutions to some of the sector’s most pressing labor problems can be better conceived. It is fair to say that many of the past attempts to address ASM’s most glaring decent work challenges have fallen short in part for lack of an appreciation of the social factors that influence personal and familial decision-making. With hindsight, such a shortcoming is hardly surprising given that as McQuilken and Hilson (2018) explain most of the global supply and value chain methodologies are grounded in the business and management literature that adopts a linear and value focused approach to mapping products to the market. One glaring case with respect to ASM was first generation mercury elimination programs in the 1980s and 1990s, where artisanal gold miners were encouraged to adopt new technologies that substituted the need for mercury as an amalgam. Whilst entirely correct in their technical solutions, the disregard for understanding why mercury was used, how it arrived in mining communities, and by whom, rendered these programs guilty of delivering overly technical solutions that, due to the absence of understanding of the drivers to mercury use, left them to largely fail (Yakuba, 2003; Veiga, 2004; Hilson, 2007). As Veiga and Fadina (2020) point out, the high degree of social influence held by gold buyers over miners’ use of mercury

compounded by superstitions held of equipment introduced to substitute mercury, were equally, if not more, responsible for stalling early progress on the mercury elimination agenda in ASGM. A further case is that of child labor where banning children from sites has done little to curb their entry, and only crippled in many instances women’s ability to work (Hilson 2012). Rather by working to understand the drivers to child presence at mine sites, as has been the case in the Democratic Republic of the Congo (DRC), options for childcare, after school programs, and incentives to families to keep children in school, have proven profoundly successful policy measures in permanently keeping children out of the mines and keeping women in the ASM workforce (World Bank 2019b; Pact 2016).

Indeed, it is proposed that with a much richer understanding of how the ASM economy is influenced by social relationships both inside and outside the mine site, attempts to improve economic growth, productive employment, and decent work outcomes stand a better chance of success. Through the five themes, the *2020 State of the Sector Report* illustrates these possibilities for enabling the achievement of SDG8 in ASM through a variety of practical case studies. Before examining the five themes, the remainder of this section briefly explores the role of formalization in cementing SDG8 progress, followed by a final section outlining the methodology of the report.

ASM formalization: economic growth, employment, and decent work

The 2020 State of the Sector Report argues that if harnessed effectively, ASM has the potential to offer more inclusive and sustainable economic growth, productive employment, and crucially, decent work for tens of millions of people worldwide. It is important first to clearly state the meaning of these three components which make up SDG8, and to explore briefly how they are linked. Box 1 outlines their definitions.

What can be said about these three components of SDG8 in the context of ASM? Mineral producing countries often sustain higher economic growth

BOX 1: **SDG8 Key Components**

Economic growth is defined as per capita economic growth in accordance with national circumstances, and in particular, at least 7 percent gross domestic product (GDP) growth per annum in the least developed countries (Ritchie et al. 2018).

Productive employment is defined as employment yielding sufficient returns to labor to permit the worker and her/his dependents a level of consumption above the poverty line. The deficit of productive employment consists of those who are in the labor force but do not have productive employment (ILO 2012).

Decent work means opportunities for everyone to get work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration. It is also important that all women and men are given equal opportunities in the workplace (UN 2018).

rates than those whose economies do not depend on resource extraction. In this regard, the development of mining sectors in emerging economies has certainly been an important contributing factor to rapid growth, with sub-Saharan Africa during the 1990s and 2000s as an illustrative case (Africa Mining Vision, 2009). With the exception of very few mineral economies, growth has been attributed exclusively to large-scale, industrial mining with its capacity to generate revenues through exports and taxation. Given the informal nature of most ASM, its contribution is either: (i) lost (across borders) or (ii) subsumed (as industrial mining) in national statistics. Imagine then the potential to contribute even further to annual growth rates, should ASM be brought more comprehensively into the national economy. Section 3 opens by underscoring the economic importance of ASM and makes a clear

call for better accounting and disaggregation of ASM related data in national statistics.

On the other hand, there is an abundance of evidence pointing to ASM's contribution to SDG8's second component, that of employment. In fact, employment-generation is likely ASM's most universally acknowledged and defining feature. Since the 1980s, low educational and financial barriers to entry alongside easy recruitment from peers has made ASM a burgeoning economic activity in rural areas across the world. Rich and poor, male and female alike converge in the ecosystem, each finding an occupation. Yet, debate remains on whether ASM provides *productive* employment, namely as academics and practitioners alike (Nöestaller 1994; Hilson and Pardie 2006) recognize the strong potential for miners to become trapped in cycles of poverty after entering the sector. The causes of poverty abound: unfair mineral pricing in favor of traders; high rent extraction performed by financiers and pit owners on money lending; and inflation of basic goods transported at a high cost into remote, isolated mining areas. Yet evidence also points to the above-average earnings those in ASM make in places such as the DRC, Myanmar, and Uganda respectively (Perks 2011; Prescott et al. 2020; UNDP 2018) raising questions about how distorted local markets can increase household expenditure and impede savings as well as the need for micro-saving and credit facilities that are tailored to miner's income and spending patterns. Evidence on the value of financial literacy programs to miners suggests there is more scope to solidify outcomes of employment. Many of these topics—improving transparency of pricing, financial literacy and savings education, and disruption of trade chains in favor of miners' greater share—all emerge in the case studies throughout this report. They shed light on successful approaches and models to improve SDG8, worthy of replication and scaling up.

Decent work is by far the most glaring and immediate SDG8 area where ASM should improve. As explored in the thematic sections, the negative social and environmental impacts of ASM are portrayed frequently enough in the media to cement the sector's reputation as risky and dirty. Whether fatalities through landslides and explosions or chil-

dren mining alongside their parents or mercury leaking unabated into local river streams, there are many ways in which ASM falls short of decent work objectives. It would not be wrong however to admit that many of these impacts are continuously overlooked by governments and to a certain extent sourcing companies due to ASM's other features: job and wealth creation. Miners themselves would perhaps even admit that these risks come with the territory, a “fait accompli” position on the working conditions they find themselves in. By opening the report's focus area sections with that of occupational health and safety (OHS), the report intends to draw attention back to the considerable work left to improve ASM working conditions. It is not for lack of legislation and policies, as the International Labour Organization (ILO) eloquently describes in Box 3. Here the ILO reminds us of the various international frameworks and legislation governing the work of mining, but equally draws attention to the lack of formalization of this economy as the major stumbling block to improvements on SDG8. In the section on gender equality, the gendered nature of the decent work agenda emerges, bringing to light a range of topics disproportionately affecting women in ASM.

The topic of formalization of ASM is then, in fact, a very good entry point for examining the challenges facing SDG8 implementation. Over the past 40 years, the concept of “ASM formalization” best embodies the many different attempts made to capture, galvanize, and improve the sector's relationship to formal economic structures. Since discussions first emerged on formalization in the late 1980s, the process has centered on three main pillars: (i) regulatory framework; (ii) financing and technological support; and most recently (iii) minimum labor standards and social organization (Davidson 1994; ILO 1999; Hentschel et al. 2002; Hilson and McQuilken 2014; Hilson et al. 2017; IGF 2018; Perks 2014). Though early formalization attempts tended to treat different topics related to decent work and economic growth in silos and focused largely on introducing technology to improve mining techniques, new models of formalization that focus more on social development aspects are emerging which take on the range of concerns in a more holistic approach. Many of the case studies in the report illustrate this well. Yet, despite this increased recognition and understanding, the challenges to achieving SDG8 targets in ASM remain significant.

BOX 2. International Labour Organization: Labor Standards and Instruments Covering ASM

Camila Meireles, International Labour Organization

Since its founding in 1919, the government, employer, and worker constituents of the International Labour Organization (ILO) have developed and adopted over 400 international labor standards and instruments that establish an international legal framework on labor issues covering all sectors of the economy, including large-scale and artisanal and small-scale mining.

The ILO Declaration on Fundamental Principles and Rights at Work (1998) (ILO, 1998) commits all member States to eliminate child labor, forced

labor and discrimination, and to respect and promote freedom of association and effective recognition of the right to collective bargaining. These fundamental principles and rights at work apply to all people in all States—regardless of the level of economic development—and are also widely used by investors and mining companies in their policies and processes related to responsible business conduct.

However, effective implementation and enforcement of national laws, including those based on ILO standards, remain a critical challenge. Most women, children, and men in ASM operate in the informal sector, and in many mining countries, they are not covered by labor legislation. This prevents them from enjoying and realizing their fundamental principles and rights at work.

Given the hazardous nature all mining entails, the tripartite constituents of the ILO have adopted the Safety and Health in Mines Convention, 1995 (No. 176) (ILO, 1995a). This Convention applies to all forms of mining, including surface and underground sites, as well as to machines and structures used for the exploration, extraction, and preparation of minerals. It sets out the responsibilities of employers and the rights and duties of workers and requires ratifying member States to prescribe measures in national laws and regulations to ensure its application, which should be supplemented by technical standards, guidelines, or codes of practice where appropriate. The Convention requires the designation of a competent authority to monitor and regulate safety and health in mines as well as to compile and publish statistics on accidents, occupational diseases, and dangerous occurrences.

Convention No. 176 is accompanied by the Safety and Health in Mines Recommendation, 1995 (No. 183) (ILO 1995b), which provides practical guidance for the implementation of the Convention. It states that measures should be taken to encourage and promote specific assistance by the competent authority to small mines to assist in the transfer of technical know-how; establish preventive safety and health programs; and encourage cooperation and consultation between employers and workers and their representatives.

To provide practical guidance in support of the provisions of Convention No. 176 and Recommendation No. 183 on Safety and Health in Mines, the ILO published a *Code Of Practice On Safety And Health In Opencast Mines* (ILO 2018) and a *Code Of Practice On Safety And Health In Underground Coalmines* (ILO 2006). Similarly, the *Safety & Health In Small-Scale Surface Mines: A Handbook* (ILO, 2001) was produced as a practical tool setting out simple principles for use in the absence of specific regulations, or in conjunction with them.

The ILO has also adopted many other international labor standards relevant to ASM. These include standards on occupational safety and health, working conditions, child labor, forced labor, freedom of association, right to organize and collective bargaining, equal remuneration, social protection, human resources development, labor inspection, discrimination, and violence and harassment in the world of work.

The ILO Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204) (ILO 2015) is particularly relevant to ASM formalization efforts. The standard provides guidance for member States to facilitate the transition of workers and economic units from the informal to the formal economy, promote the creation, preservation, and sustainability of enterprises and decent jobs in the formal economy, and prevent the informalization of formal economy jobs.

The application of international labor standards may seem overly challenging in the context of ASM, which is largely informal and/or illegal. However, the recognition of small-scale mining as an important economic sector that contributes to domestic growth should encourage the development of a sound legal and regulatory framework that can help overcome the social and legal constraints it faces (ILO 1999b). The sector should be encouraged 'to operate within and be protected by the law, enhancing its prospects of being safe, efficient, productive and, above all, sustainable' (ILO 1999a, p.56).

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Methodology and report structure

The 2020 State of the Sector Report is structured according to five focus areas, which assemble a selection of the 12 SDG8 targets. The focus areas were developed through consultation to identify the most pressing topics with respect to SDG8. They include those that have received extensive attention but remain critical, such as eliminating mercury (Section 4) and ensuring gender equality (Section 5) to addressing occupational health and safety (OHS) in the sector (Section 2), a topic with little coverage to date. Each focus area begins with an overview, positioning current knowledge and progress on the focus area to frame the accompanying case studies. Drawn from a wide range of ASM practitioners and researchers, the case studies provide an inspiring collection of efforts to improve SDG8 in ASM. Contributions were solicited through a range of public forums and communication channels, including an invitation to contribute during the 15th Annual General Meeting (AGM) of the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development in Geneva and an open call through the Delve newsletter and social media channels. Interested contributors were asked to complete a short online form to submit the title and topic of their case study and relevance to SDG8 before then participating in an online presentation by Delve of the case study development process. The presentation and discussion shared more details of the different contribution formats (project case studies, short analysis of particular topics, qualitative or quantitative data, and recommendations and ideas for enhancing collaboration). All of those who submitted their proposed inputs via the online form were accepted for publication. Editorial support was provided by Delve through two rounds of review to develop the final text.

The first SDG8 focus area tackled by the report focuses on improving occupational health and safety, asking how unsafe is ASM? The section boldly opens its first case study by suggesting that the ASM sector in 1999 was as unsafe as large-scale coal mining in the USA in the early 1970s but safer than large-scale gold mining in South Africa in the 1980s. A key message emerging from the case study's data analysis is to urge the global ASM

community to reconsider the fatalistic position that ASM is just inherently unsafe. Instead, the authors challenge policy makers, practitioners, companies and governments alike to consider how, if in the case of American coal and South African gold injury and fatality rates have appreciably improved over the decades, it is possible to galvanize global efforts to improve OHS in order to save lives. Indeed, with appropriate long-term investment and support programs, and with approaches as demonstrated in the section's other case studies, there is no reason why decent (and safe) work for all cannot also be a reality for the 44.75 million people engaged directly in ASM worldwide.

The second focus area is that of sustained economic growth and productivity. The section's strongest contribution is on highlighting the enormous data gap impeding efforts to measure the economic importance of ASM, its contribution to GDP, and the multiple linkages to other industries and services. The section takes a more methodological lens. While the case studies clearly show these important aspects of ASM as a powerful driver of economic growth and increased productivity, the chapter concludes with a clear call for better data at the national level in ASM producing countries.

The third focus area examined is that of sustainability, noting that whereas a contradiction may lie in imagining extraction of a nonrenewable resource as potentially sustainable, ASM can advance many areas of SDG8's sustainability agenda, particularly in rural economies. For example, with better data on locally produced construction minerals and an understanding of opportunities for value addition, and circularity in production and manufacturing processes, ASM assists in supplying materials for much needed infrastructure, such as roads, affordable housing, and health facilities. Another important angle of sustainability relates to the environment. Most significantly Section 4 deals with mercury elimination from artisanal and small-scale gold mining (ASGM), given this activity is the world's biggest mercury polluter. The case studies on mercury elimination show how data can be used to estimate this impact as well as develop more environmentally sound working practices. The objective being to help miners meet the highest levels of

environmental stewardship in ASGM while simultaneously enjoying financial efficiencies through new mercury-free methods of processing gold.

The fourth focus area discusses gender equality. Here women's "invisibility" in ASM is discussed up front and made evident by the lack of updated statistics of women's participation in the sector. The case studies show how data methods, which improve baseline understandings of gender gaps in ASM sites, can be powerful evidence bases for more targeted behavior change programs.

The fifth focus area is eradication of child labor and promotion of youth employment. With respect to child labor, the section explores the need for better understandings of the drivers to child participation in ASM. The youth employment discussion focuses on identifying the types of skills and training

needed to create decent youth employment in ASM and related service sectors. The case studies illustrate some important approaches that focus on filling the gaps in national educational systems and opportunities for prioritizing local employment and upskilling in the sector needed to realize SDG8.


Finally, the report concludes with six reflections accompanied by two further case studies on the theme of collaborating for change: a central aim of producing this report. The reflections bring together salient points raised across the various sections and further reflect on the value of partnership and collaboration during the pandemic. The analyses serve to demonstrate the critical importance of ASM to achieving SDG8 and highlight the resilience, innovation, and determination of communities and their supporters to strive for economic growth, productive employment, and decent work.

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IMPROVE OCCUPATIONAL HEALTH AND SAFETY

Target	SDG8 Improve Health and Safety Data Gaps	Indicator
 <p>8.8 Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment</p>	<p>Database of national labor associations, increased</p>	<p>8.8.1 Fatal and non-fatal occupational injuries per 100,000 workers, by sex and migrant status</p> <p>8.8.2 Level of national compliance with labor rights (freedom of association and collective bargaining) based on International Labour Organization (ILO) textual sources and national legislation, by sex and migrant status</p>

AUTHOR: James McQuilken and Dylan McFarlane
ORGANIZATION(S): Pact

OVERVIEW

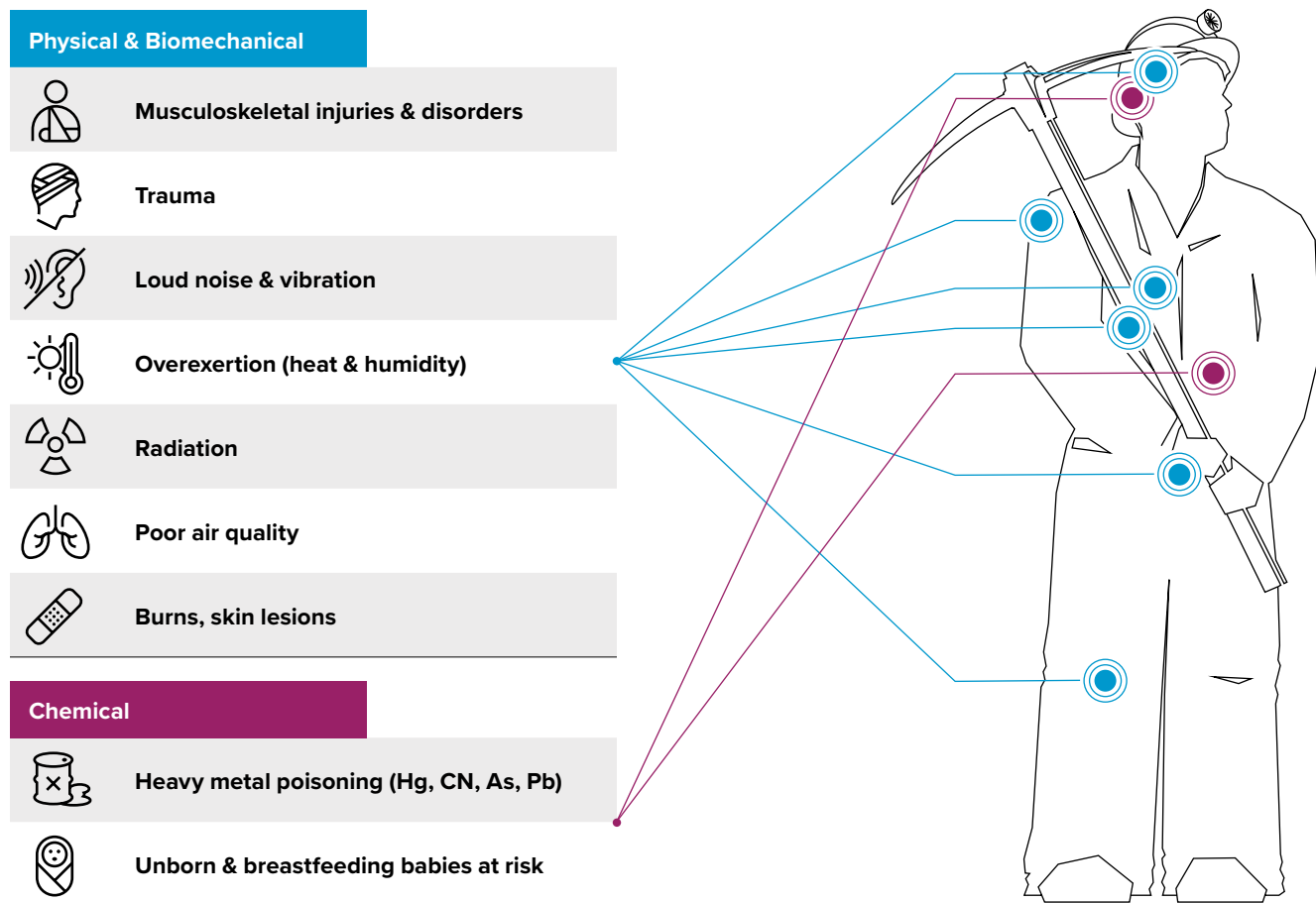
All mining is inherently dangerous whether large, small-scale, or artisanal. Hazards and risks include blasting, rockfalls, landslides, flooding, machinery, toxic chemicals, and poor air quality. In the context of SDG8, the need to improve health and safety at ASM sites is paramount to achieving decent work for all through safe and secure working environments. The impacts of poor safety measures at ASM sites not only directly affect workers but also have negative spillover effects on local communities.

Too often it is the sector’s health and safety record that makes media headlines, serving to further stigmatize an already marginalized informal economy. Rather than reporting on the positive contributions ASM makes to local employment, wealth creation, and community resilience, it is the landslide that “buries at least 54 jade miners” in Myanmar (BBC 2019), gold mine explosion that “kills eight and injures two miners in Zimbabwe” (Casey 2019), and the “three artisanal miners [that] died from inhalation of gases” in Nicaragua (Bnamericas 2017) that attract most attention. These preventable incidents capture public awareness for a short while and, rightfully so, acknowledge the tragic loss of life. But, as is often the case, when these articles are accompanied by negative language that criminalizes “illegal miners” in an “industry with few regulations” that “kills dozens” every year, the apathetic reporting places blame squarely onto miners themselves and does little to garner sympathy or

generate long term committed actions from governments and companies alike. Instead, the reports of fatalities in ASM are normalized.

Certainly, miners and communities face multiple health and safety risks (Figure 2). Many of these originate from the common informality of ASM operations. Poverty and general lack of technical and financial support and training for miners is also frequently suggested as further causes of injuries, fatalities, and recurring illness in mining areas (Hilson and McQuilken 2014). Of all the possible safety issues, only mercury use in gold extraction and processing has received considerable academic and programmatic attention over the years (Bose-O’Reilly et al. 2008; Hilson et al. 2018; Veiga and Fadina 2020), namely through interventions over the last three decades funded by the Global Environmental Facility (GEF), including the ongoing large multi-year GOLD program (GEF

FIGURE 2. Summary of Typical Occupational Health and Safety Risks in ASM Operations

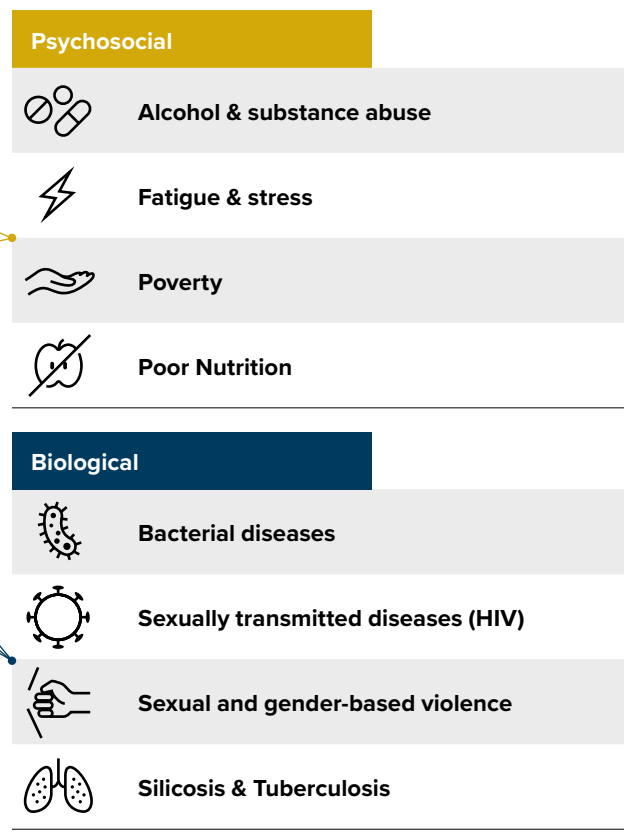
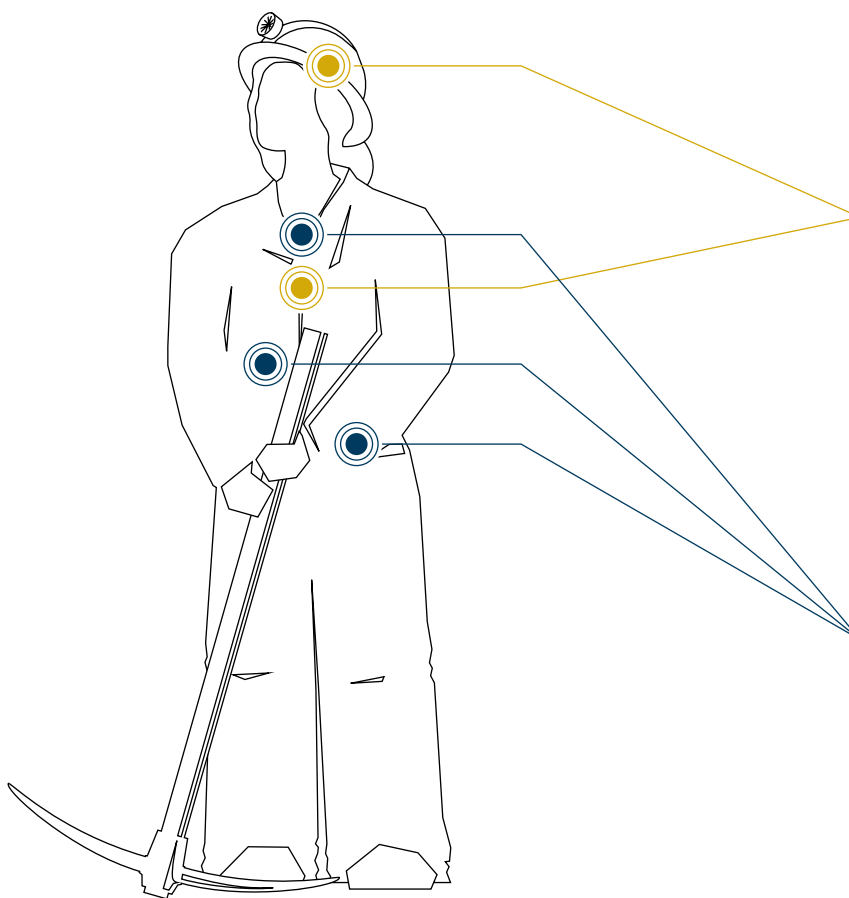


2020). Beyond mercury, the absence of in-depth studies and comprehensive data on OHS has made it impossible to track progress (or lack thereof) over the years. The sheer absence of data therefore makes it challenging to answer fundamental questions such as: how (un)safe is ASM and what can be done to improve its safety record?

The three case studies in this section go some way to answering the two questions. The first case study from James McQuilken and Dylan McFarlane takes an in-depth look at the data behind the numbers to better calculate and contextualize how dangerous working in ASM is by calculating fatality frequency rates, a method commonly used for industrial mining operations. Most striking from their exercise is the finding that the ASM sector in 1999 was as unsafe as large-scale coal mining in the USA in the early 1970s, and safer than large-scale gold mining in South Africa in the 1980s. The

authors point to increased mechanization as well as significant investment and concerted efforts from government and mining companies to improve health and safety over the past four decades that has since led to dramatic safety improvements in large-scale mining operations. But in doing so, they also highlight how little attention and support safety issues in ASM have received. If even a small fraction of the hundreds of millions of health and safety dollars ploughed into industrial mining were invested in ASM, the gains to decent work and productive employment would be substantial and could act as foundation for progressive formalization and professionalization of working standards.

The second and third case studies help illustrate this point well. At the Mutoshi Cobalt Pilot Project in Kolwezi in southern Democratic Republic of the Congo (DRC), Stephanie Shumsky reports that, since the start of Pact and Trafigura’s interventions



Source: Adapted from WHO (2019).

in February 2018 to improve the mine site, no fatalities among participating artisanal miners have been recorded. Through a package of technical assistance, the local ASM cooperative received assistance to improve the site's overall safety in addition to personal protective equipment (PPE) for miners. An important conclusion drawn from the project was how these simple, yet effective, improvements to site and personnel safety generated positive economic and social spillovers in the rest of the mining operations and further into the local community. The suggestion, through the pilot project's outcomes, is that decent work leads not only to improved productivity but better individual and community well-being.

Similar positive economic impacts from improved safety measures have also shown to be possible at artisanal and small-scale mines in Rwanda. As explained in the third case study by Daniel Limpitlaw and James McQuilken, the Sustainable Development of Mining in Rwanda program has been piloting a novel way to enhance safety through

simple and cost-effective measures that can also increase profits—an important incentive for ASM companies to make changes. It is this market-driven approach combined with practical guidance and easy-to-implement safety improvements that make the intervention successful. For example, by calculating and installing the precise number of timber supports needed in tunnels mining companies can reduce costs, while properly locating material waste heaps connected with safe stable paths can enhance efficiencies in transportation saving time and freeing up labor for more profitable tasks such as digging and processing.

With very limited existing data on the OHS issues in ASM and therefore the ways to address them, the section's case studies make an important contribution to gaps in knowledge and best practice. Crucially, they show that with appropriate and targeted interventions and financial resources it is possible to make significant improvements as a basis for increased productivity and formalization.

ACKNOWLEDGMENTS

This overview is posthumously published by and dedicated to Dylan McFarlane who was a passionate and dedicated champion of improving OHS in ASM. His leadership, enthusiasm, and expertise applied to Delve since its inception were critical in turning the platform into a reality.

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CASE STUDY #1

Credit: James McQuilken/Pact

HOW (UN)SAFE IS ASM? COUNTING AND CONTEXTUALIZING FATALITY FREQUENCY RATES

AUTHORS: James McQuilken and Dylan McFarlane

ORGANIZATION(S): Pact

INTRODUCTION

In February 2020, one of America’s largest newspapers, the Wall Street Journal (WSJ), ran the article “Many Miners Die, and It Never Shows Up in Safety Data” (Macdonald and Pokharel 2020). Citing the Delve 2019 ASM employment figure of 40 million people (World Bank, 2019), the exposé highlighted the “widely acknowledged” issue of underreporting of accidents in ASM (ILO 1999a, p13). The authors report that in India the official death toll from mining in 2018 was 120 people but could reach as many as 20,000, and in DRC unofficial figures suggest up to 2,000 artisanal and small-scale miners die each year. But while these numbers are stark and highlight the challenges of reliable data and reporting, the scale and drivers of the health and safety issues in ASM remain unclear. As rightly pointed to in the WSJ article, the “lack of data” and underreporting of incidents “distorts mining’s safety record and makes it harder to detect and improve potential hazards” (Macdonald and Pokharel 2020, 1).

The greater public attention and high-profile campaigns from the likes of Human Rights Watch (2015) and Amnesty International (2016) could also be distorting the picture. Exaggerated reporting focused mainly on the negative impacts of ASM gives the impression that the sector has a worse health and safety record than perhaps it does. These reports combined with availability and negativity biases—whereby a person’s perception of an event is judged on how easily memories of similar instances come to mind and for negative events to be retained more readily than positive ones—can compound the narrative further. Meanwhile, without comparison to other industries or an examination of the evolution of health and safety in mature mining economies, such as Australia, South Africa, and the USA, it is difficult to make a robust and fair assessment of the labor conditions endured by small-scale miners. Indeed, the labor-intensive mining methods, risks, and fatality rates over the last century in those countries are the same as those observed in developing countries like Colombia, Ghana, and Indonesia today.

To better assess how (un)safe ASM conditions are, the first step is to collect data according to SDG8 Indicator 8.8.1—the frequency rates of fatal and non-fatal mining injuries. A second step is to then contextualize and benchmark this information against other occupations and industries as well as large-scale mining operations, which are more heavily regulated and for which better data exists.

Counting fatalities in ASM

One source of data is from the ILO’s seminal report “Social and labour issues in small-scale mines” (ILO 1999a) (see appendix Table 11). The report includes a section dedicated to OSH as well as the results of a survey that asked government agencies, chambers of mines, and trade unions across Africa, Asia, and Latin America to estimate the number of fatalities attributable to ASM in their countries each year. Used to inform discussions at a meeting between governments, employers, and workers on ASM held by the ILO in Geneva in the same year, the report was instrumental in placing health and safety squarely on the agenda. Participants of the

meeting “unanimously adopted” 34 conclusions. One of which made clear the need for better data on the issue:

‘8. Occupational safety and health (OSH) are important issues for small-scale mines and their communities. The lack of reliable data and difficulties in its collection makes it more difficult to develop effective assistance programmes and to improve safety and health performance.’

(ILO 1999b, 21)

Yet despite this recognition and the call made 20 years ago for governments to “establish a regime for effective reporting on safety and health performance in small-scale mining” (ILO 1999b, p.22), to date, no comprehensive databases that compile statistics from multiple data sources on fatalities in ASM exist.

To begin to address this data gap, a useful start point is a data set compiled by McFarlane (2020) for this report. Using a combination of relevant search terms in Google, an Excel pivot table disaggregated by nine categories including date, country, cause, and mineral being extracted was populated.¹ The initial results, though limited, are powerful.

The data show that for the year 2019 there were 592 ASM fatalities in 37 separate incidents across 20 countries reported in online English language news media (Figure 3). The deadliest, and most common fatal ASM accident, is from landslides and falls of ground which combined account for 73 percent of fatalities and 57 percent of incidents. After this, gas explosion, gas inhalation, and explosion accounted for 73 fatalities resulting from 9 incidents. Of these, approximately three quarters were attributed to coal mining in Afghanistan, China, Pakistan, and Ukraine. This corresponds with the ILO’s observation that “the three countries with the highest number of underground coalmines (China, India, Pakistan) have significantly higher numbers of fatal accidents” (ILO 1999a, 13). Underground coal mining has always been the most hazardous type of ASM, and even in developed nations there are history of coal mining disasters, such as Courrieres in France in 1906 (1,099 fatalities), Senghenydd in the United Kingdom in 1913 (439 fatalities), and

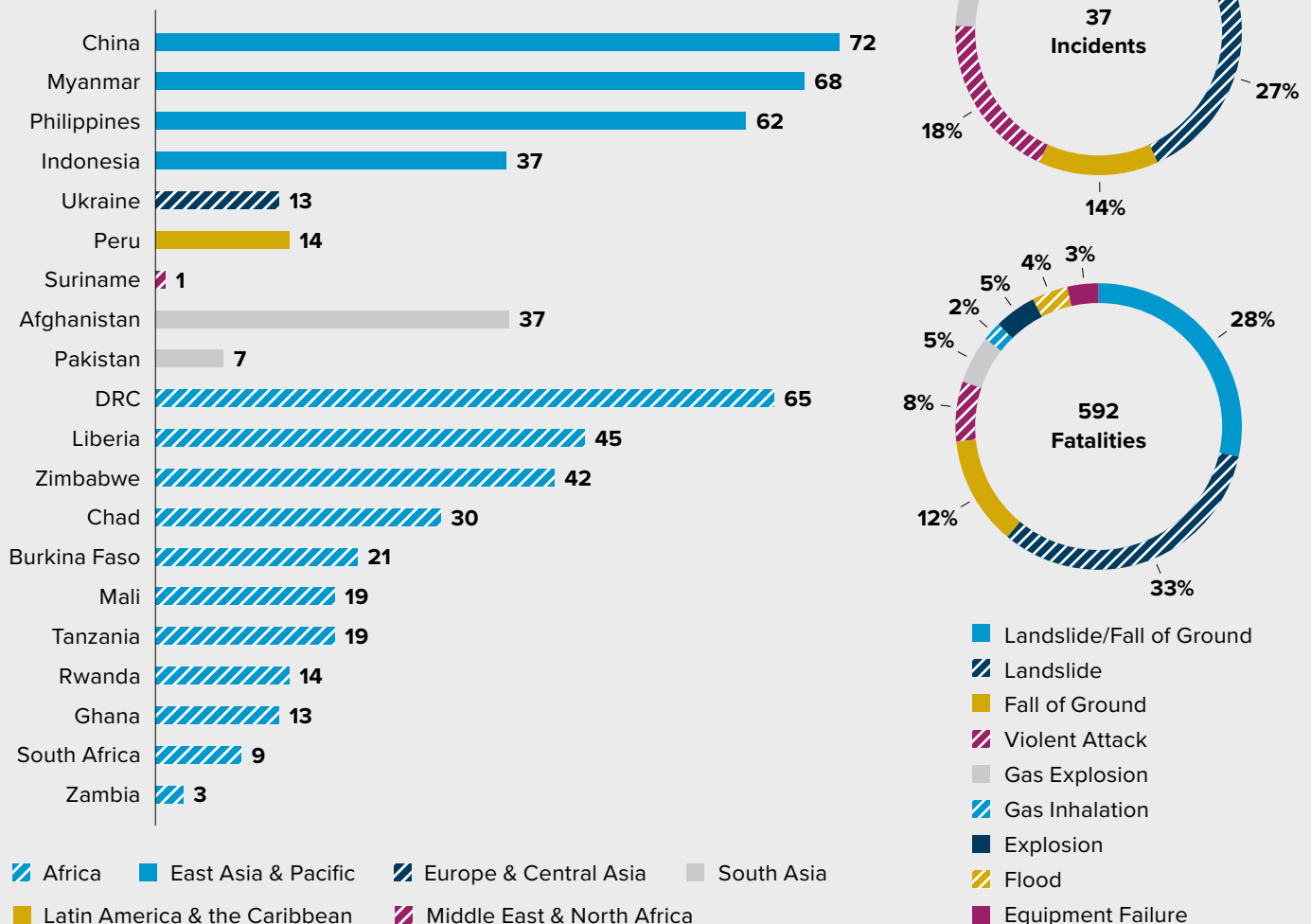
Coalbrook in South Africa in 1960 (435 fatalities) (Mining Technology 2014). These miners were using similar techniques as modern ASM use today.

The data reinforces the need to have a nuanced approach to addressing specific health and safety issues depending on the type of ASM activity. For example, coal mining, regardless of scale, carries the risk of explosions caused by fine dust particles being ignited by heat sources as well as risks due to inhalation of carbon dioxide, carbon monoxide, methane, and other hydrocarbons. Mining for alluvial gold and construction minerals carries a greater risk of flooding and landslide due to the unstable soil and opencast extraction methods in often water-logged soils. However, the greatest overar-

ching risk factor was underground mining which accounted for 35 of the 37 fatal incidents in 2019. For gold mining, this included 13 fatalities in Ghana when blasting by a large-scale operator created a smoke cloud that killed nearby small-scale miners working underground (Hazardex 2019) and 8 fatalities in Zimbabwe when small-scale miners that had encroached into the tunnels of a large-scale concession were killed by explosions set off by another ASM group (Casey 2019). These events also show the operational safety risks when large- and small-scale mining operators unexpectedly meet.

Despite the limitations of this data mining exercise, it shows the types of inferences that can be made when data sets on the sector are compiled. If this

FIGURE 3. Distribution and Type of Fatalities in ASM According to Online News Media for the Year 2019



Source: Graph and table extracted using McFarlane (2020) data set on ASM fatalities.

process could be automated and combined with artificial intelligence applications, including “text data mining” by extracting new information from multiple written sources and in different languages, powerful insights could drive better targeted ASM interventions. This would substantially reduce the manual labor to compile such a database while also improving its accuracy by ensuring the dataset is more complete. In turn, such an automated database could be made a public good through platforms such as Delve. It could then be possible to establish disaggregated frequency rates of fatalities and injuries in ASM (SDG indicator 8.8.1) and make significant discoveries to guide policymakers and practitioners to develop more appropriate and targeted initiatives to improve safety.

Contextualizing fatality rates in ASM

A key source of information that can be used to contextualize the health and safety record of the ASM sector is the fatality frequency rate (FFR).² This is defined as the number of fatalities per 1 million hours worked. Using the high and lower limits of the annual fatality data and employment estimates derived by the ILO (1999a) from their questionnaires for 23 countries and an assumption of 1,650 hours worked per miner per year, an approximate FFR for ASM in 1999 is calculated to be 0.47-0.64 (see the appendix, Table 11). The model assumptions on average annual number of hours worked are based on a range of project and published data regarding seasonality and rural livelihood patterns (ILO 1999a; Pact 2015; Dreschler 2001; Hentschel, Hruschka, and Priester 2002; Mwaipopo 2004; Kühn 2017; Barreto et al 2018; Republic of Sierra Leone 2018; Chupezi, Ingram, and Schure 2009).

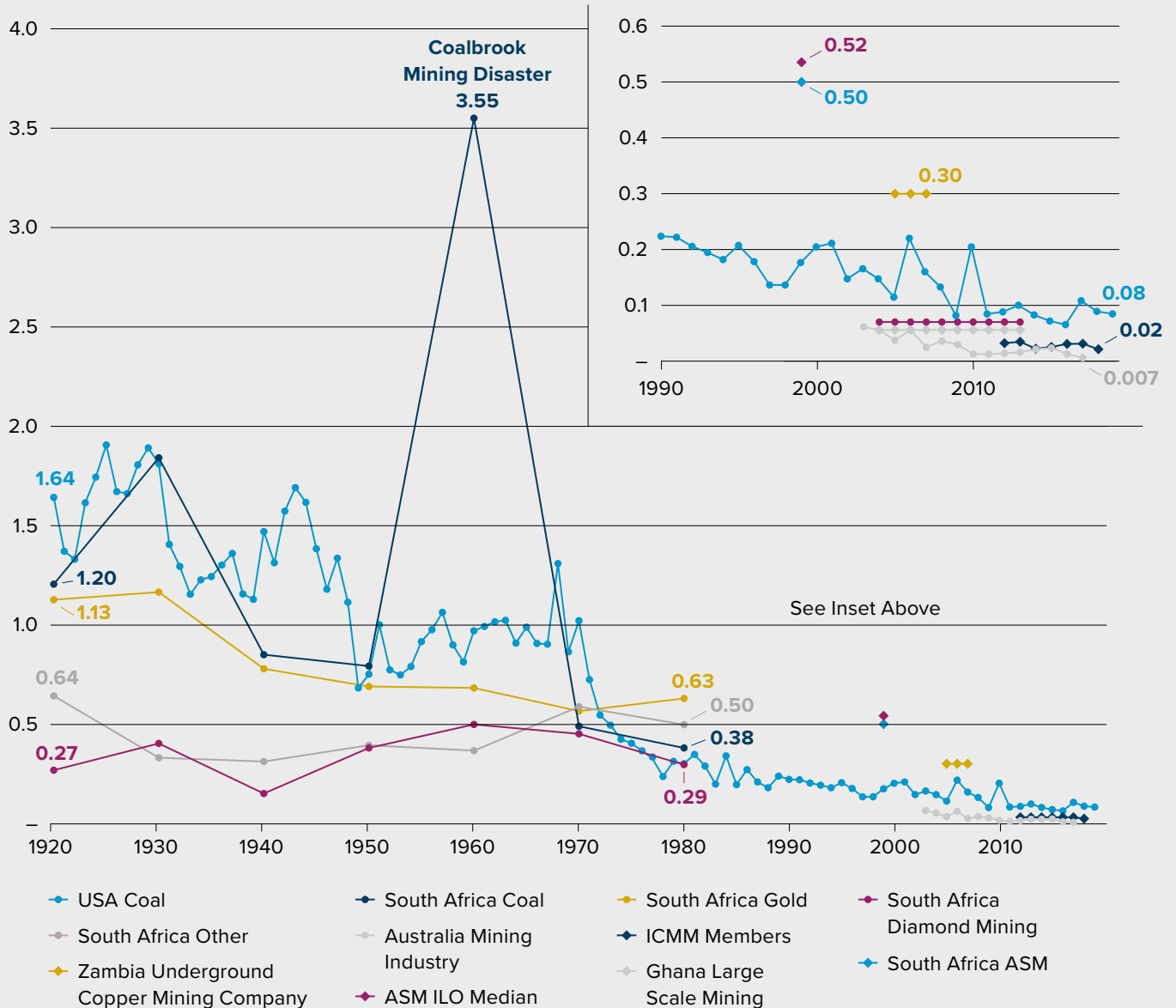
Another method to estimate, and as per the Delve “best practices for reporting ASM data” (World Bank 2019, 71), triangulate the FFR for the ASM sector is based on the assertion that small-scale mining has “a workplace fatality rate up to 90 times higher than mines in industrialized countries” (ILO 1999c). Meaning that depending on how this quote from the ILO’s press release accompanying the report is interpreted, an FFR for ASM can be crudely estimated based on it being 90 times greater than the

FFR for large-scale mining (LSM). A recent data set published by the International Council on Mining & Metals (ICMM 2019, 5), which represents 27 of the world’s largest mining companies and accounts for most of the world’s large-scale mining workforce, offers a useful measure for the LSM sector.

For the years 2012-2019, the mean FFR for ICMM member companies was 0.04 based on 748 “recordable fatalities” and over 18 billion work hours—this includes the catastrophic failure of a tailings storage facility at Vale’s Corrego do Feijão mine in Brumadinho, Brazil, which killed at least 248 people (ICMM 2019, 1). Using ILO’s assertion that ASM is up to 90 times more fatal than LSM, this produces an FFR for ASM of 3.62 which is impossibly high. In context, this would equate to 250,000 fatalities in ASM every year and for an artisanal miner who spends 40 years mining and works 2,000 hours full time per year, it would represent a one in three chance of a fatal accident.

A second measure for the FFR of large-scale mining is to use a mean calculated from a range of available sources for Ghana (Stemn 2019), South Africa (Leger 1991; Hermanus 2007), Ukraine (ILO 2018), USA (USDOL 2020a; 2020b), and Zambia (Michelo, Bråtveit, and Moen 2009) (Figure 4). The average is 0.516 and produces an even higher FFR for ASM of 47, which when extrapolated would imply 3.3 million ASM deaths per year. While ASM is certainly more hazardous than LSM, the idea that it is “90 times more deadly” is therefore inaccurate. Using the Google search exercise and ILO data as benchmarks, an FFR for ASM of approximately 0.5 is much more likely. As the graph shows (Figure 4), this also correlates with the FFR for LSM in Australia, the USA, and South Africa for much of the 20th century (Figure 4), as well as the current FFRs for poorer countries such as Brazil (0.83) and Zambia (0.13) that can be calculated from the ICMM data (ICMM 2019). Further triangulation is also possible using the best approximate FFR of 0.5 and the Delve 2020 global employment estimate, which suggests approximately 30,250 fatalities in ASM per year (Table 1). A sobering, but not unlikely number.

FIGURE 4. Comparing the Fatality Frequency Rate of ASM versus LSM (1900-2019)



Sources: Hermanus 2007; ICMM 2019; ILO 2018; Leger 1991; Michelo, Bratveit and Moen 2009; USDOL 2020a
 Notes: Different number of hours worked per miner per year have been used to calculate the FAR from reported fatality rates: USA coal = 1,768; South Africa = 2,209; Australia = 2,000; South Africa ASM, ILO ASM = 1,650; Mutoshi Cobalt Pilot Project = recorded number of hours.

TABLE 1. Number of Fatalities in ASM Per Year Based on Fatality Frequency Rate of 0.52

Global ASM employment in 2020	42,000,000
Part-time employed total hours (1,000 hours per miner per year)	14,500,000,000 (65% of global employment)
Full-time employed (2,000 hours per miner per year)	56,000,000,000 (35% of global employment)
Total ASM hours per year	70,500,000,000
Estimated ASM fatalities per year using FFR of 0.52	30,250

Source: Delve (2020)

COMPARING FATALITY RATES IN ASM TO LARGE-SCALE MINING

On their own, however, these FFRs mean little, and extrapolating in this way from such limited data is risky. But when compared with estimates for industrial mining and other sectors, it is possible to derive some initial insights and demonstrate what could be possible if better data on fatalities in ASM was collected.

A first useful comparison is against USA coal mining for which there is a rich data set stretching back to 1900 (USDOL 2020a). Figure 4 illustrates a declining FFR of industrial coal mining in the USA over the last century with a peak in 1907 of 2.69 to a low of 0.08 in 2019. It was not until 1972—with over 60 years of safety improvements—that the FFR for USA coal

mining dropped to the same level that ASM was operating at in 1999. For a sector that has received limited support to improve health and safety, it is remarkable to consider that ASM lags just 30 years behind the large-scale mining industry of the USA. While the FFR reduction for the USA’s coal mining industry is likely due to increased mechanization (Table 2), it is also noteworthy to consider what impact the significant investment spearheaded by the establishment of the US Department of Labor’s Mine Safety & Health Administration (MSHA) in 1977 has also had. Today, the MSHA runs a sophisticated program including online quarterly training calls and has an annual budget in excess of US\$376 million (MSHA 2019)—a figure that would undoubtedly yield significant improvements in safety if also invested into ASM each year.

TABLE 2. USA Large-Scale Mining Coal Production and Employment Data 1985-2015

Year	Total employment	Number of coal mines	Total production (million short tons)
1985	169,300	3,355	878,500,000
2000	71,500	1,513	1,073,900,000
2015	65,900	834	896,900,000

Source: CRS (2017)

A second comparison is against the similar trends in declining mining industry FFRs can be seen in South Africa. Here, for gold, diamond, coal, and ‘other’ types of mining, the FFR had declined to the same level as estimates for ASM in 1980. Not only do these comparisons help contextualize that ASM, while it remains a hazardous occupation, is no different from the risks and poor labor conditions suffered by miners in developed countries in recent history; but it also demonstrates there is a pathway for improvement. This is especially true given that many of the more labor-intensive mining methods used in large-scale mining 30 years ago are exactly the same as those used at artisanal and small-scale mine sites today.³ With even a fraction of the level of funding, high-level support, and dedicated programming the large-scale mining sector has received to address health and safety, there is no

reason why the ASM sector could not also substantially improve its safety record.

The case studies accompanying this section of the report demonstrate this well. At the Mutoshi Cobalt Pilot Project in Kolwezi, DRC since the start of Pact and Trafigura’s interventions to improve mine safety in February 2018 until the temporary suspension of activities on site in March 2020, Shumsky (2020) reports that no fatalities among participating artisanal miners have been recorded. Meanwhile, as explained by Limpitlaw and McQuilken (2020), the Sustainable Development of Mining in Rwanda program has been piloting a novel way to enhance safety through simple and cost-effective measures that can also increase profits thereby incentivizing ASM companies to make changes.

TABLE 3. **Fatality Frequency Rates for Other Industries and Activities Per Million Hours Exposure**

ASM	
ILO 1999 data set range	0.47-0.64
ILO 1999 data set average	0.52
USA (2018) ¹	
Fishers	0.50
Logging workers	0.42
Aircraft pilots & flight engineers	0.24
Roofers	0.23
Activities (1973) ²	
Travelling by car	0.57
Travelling by bicycle	0.96
Travelling by air	2.4
Rock climbing	40
Canoeing	10

Source: 1 - U.S Bureau of Labor Statistics (2018); 2 - Bulloch (1973); Gibson (1973)

A final benchmarking and reappraisal of the ASM safety narrative is to compare to fatality rates in other occupations, industries, and activities. To put it into perspective, the FFR of ASM is comparable to the fishing and logging industry in the USA and less risky than travelling by bicycle or air was 30 years ago (Table 3).

Conclusion

There are significant methodological limitations of the FFR calculations for ASM presented here, most notably due to limited data. Comparisons against coal mining, which as outlined has much higher risks than other minerals, also skew the relative risk of ASM, as does the inclusion or exclusion of disasters. This analysis is, however, the first systematic attempt at modelling FFR in ASM. The initial findings suggest that while unreasonably high, the rates of fatal incidents in ASM might not be as staggering as some narratives about the sector suggest. From the available data, a FFR for ASM of 0.47-0.64 was calculated, which is ten times higher than LSM, although it is comparable to LSM rates in the 1960s as well as with many modern occupations like fishing and logging in the USA today. Changing the narrative and demonstrating that, like LSM, with sufficient attention and investment improvements to safety can be made, and it will also help unlock more support for formalizing ASM. With better data, the modelling could be improved further. This will promote evidence-based policy making, more targeted and sustained interventions, and improve health and safety of the sector as well as track progress against SDG8.

ACKNOWLEDGMENTS

This overview is posthumously published by and dedicated to Dylan McFarlane who was a passionate and dedicated champion of improving OHS in ASM. His leadership, enthusiasm, and expertise applied to Delve since its inception were critical in turning the platform into a reality.

END NOTES

1 This search and analysis were performed by Dylan McFarlane of Pact and the results were collated into an Excel pivot table. Where specified in the news article, the data were disaggregated to note the date, country, number of fatalities,

mining method (underground/open pit/ unspecified), mineral, cause, notes, and internet link to the source. The search terms were in English only and used variations and combinations of the following terms: ASM, artisanal, small-scale, mining, death, fatality, disaster etc.

2 Also referred to commonly as the Frequency Accident Rate (FAR). However, the term FFR is used here to recognise that through improved measures such as fatal incidents can be prevented and thus are not accidental.

3 For example, deep South African gold mining by the likes of AngloGold Ashanti, Goldfields, and Randgold used the same equipment and techniques

as neighboring ASM in Zimbabwe for similar underground deposits.

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CASE STUDY #2

Credit: Stephanie Shumsky/Pact

MUTOSHI COBALT PILOT PROJECT, DRC: TRANSFORMING ASM FOR INCREASED PRODUCTIVITY, SAFER WORKING CONDITIONS, AND FAIRER FEMALE EARNINGS

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ORGANIZATION(S): *Pact; **Independent Researchers; *** Pole Institute

INTRODUCTION

A significant proportion of global cobalt production originates from artisanal and small-scale mining (ASM) in the Democratic Republic of the Congo (DRC). An estimated 20-30 percent (Clowes and Kavanagh 2020) of the 100,000 metric tons of cobalt produced in DRC in 2019 (USGS 2020) comes from ASM, providing an essential livelihood for approximately 150,000-200,000 people (BGR 2019; OECD 2019).¹

While ASM cobalt production can come with significant health, safety, and human rights risks, it is vital to the world supply and required to meet the growing demand for battery metals as part of the clean energy revolution (World Bank 2020). Rather than ignoring the issues or shunning ASM, the global commodities trader Trafigura chose to work to improve the situation and integrate responsible ASM into their mineral supply chain. The Mutoshi Cobalt Pilot Project in Kolwezi, DRC aims to transform working conditions and the lives of those impacted, while also controlling supply chain risks for Trafigura's business.

Built into the marketing agreement for Mutoshi's cobalt hydroxide from the start (Shalina Resources 2018), and with strong collaboration from the DRC government agencies including the Service d'Assistance et d'Encadrement des Mines Artisanales et de Petit Echelle (SAEMAPE),² in February 2018 the mine operating company Chemaf partnered with Trafigura to officially provide site access and technical support to a local ASM cooperative COMIAKOL, that had been operating informally on the site for more than 20 years. A comprehensive package of practical assistance was designed to enable COMIAKOL to safely conduct semi-mechanized mining and increase their productive capacity. It includes geological support through locating minerals, analysis, and mine planning; mechanized assistance such as preparation and cleaning of the site to allow safe access; as well as training, provision of safety equipment and amenities. The package was supported by the international non-profit Pact to manage the overall delivery of the pilot project, as well as Kumi Consulting as independent assessors against Trafigura's responsible sourcing policies and expectations.

The original objective was to ensure that the minerals sold by COMIAKOL to Chemaf were sourced in accordance with both the OECD *Due Diligence Guidance for Responsible Mineral Supply Chains* (OECD 2016) and *Trafigura's Responsible Sourcing Artisanal and Small-Scale Mining Expectations*. However, as the pilot project progressed notable additional positive impacts on the local, social, and economic conditions as well as health and safety emerged which are directly related to SDG targets 8.5 and 8.8, respectively. These improvements were particularly felt by female miners participating

in the project. The clearest achievement has been for COMIAKOL to record over six million work hours without a lost time incident and no fatalities between the start of the pilot in February 2018 and the temporary suspension of activities on site due to COVID-19 in March 2020.

An independent analysis of the pilot model found a strong positive impact on participating miners

To understand the impacts of the pilot project better, in mid-2019 Trafigura commissioned an independent analysis. Interviews and focus group discussions were conducted with miners and key informants among participating stakeholders (Pilot Project Group). A quantitative survey was also administered to 319 artisanal miners from this group, and a Comparator Group comprising 110 artisanal miners from Kapata—an informal ASM site several hours drive from Mutoshi (Table 4). This case study provides a summary of these findings from the full research report (Johansson de Silva, Strauss, Morisho 2019) to highlight the positive impacts on SDG8 in two key areas: decent work through increased productivity and health and safety.

Key socio-economic findings

The analysis showed that when implemented with all its components, the project had a strong positive impact on participating miners and contributed significantly to the local economy, but it has not insulated COMIAKOL's members against the dramatic fall in the price of cobalt.³ Many positive effects, for both male and female workers, have nonetheless endured.

First is improved productivity. Overburden stripping, provision of geological information, and better work-place organization has helped increase output per hour worked of participating artisanal miners when they are on site. Second is reduced operating costs. As a result of open-pit mining procedures and Chemaf being the only buyer, the project reduced the costs incurred by miners to safeguard their sacks of minerals while transported

TABLE 4. **Biographical Data of Artisanal Miners in Pilot Project Group versus Comparator Group**

Artisanal Miners	Pilot Project Group			Comparator Group		
	Men	Women	Total	Men	Women	Total
Number	196	123	319	60	50	110
Gender share of total (percent)	61%	39%	-	55%	45%	-
Age (years)						
Average	34	40	37	35	37	36
Youngest			19			20
Oldest			69			63
Education (highest level completed)						
Below secondary	75%	96%	83%	70%	96%	82%
Households (average number of persons)						
Average household size	5.9	6.2	6.0	6.0	7.2	6.5
Age dependents (<15 or >64 years)	2.9	3.2	3.0	2.8	3.5	3.1
Other household members contributing to income	0.6	0.8	0.7	0.8	1.2	1.0

Source: Johansson de Silva, Strauss, Morisho, 2019, 19

to trading places by two thirds and eliminated bribes paid to corrupt military and security forces (which some estimated at US\$1.20-1.80 per day). The third positive effect is that female artisanal miners have diversified their roles. This includes moving to better paid positions and earning approximately two and a half times more than before. While 94 percent of women in the Comparator Group worked in the lowest paid role as washers earning an average US\$34 per month, through the pilot women at Mutoshi have moved into higher paid, once typically male dominated roles. Now a total of 77 percent of women work in non-washing roles, as collectors (39 percent), diggers (31 percent), and team leader diggers (7 percent) earning over close to and above US\$100 per month (Figure 5).

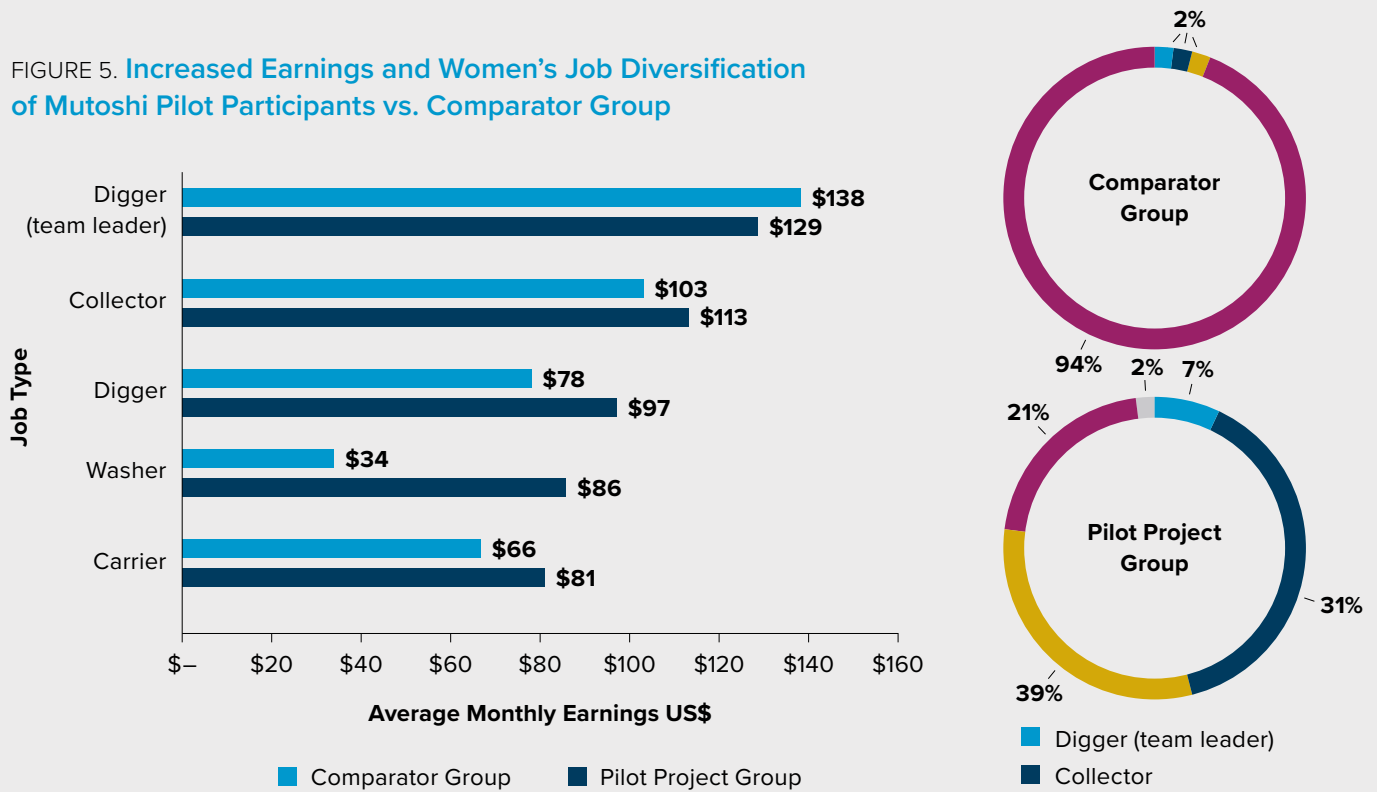
Fourth is a reduction in mine site harassment. Women working at the Mutoshi project report that workplace harassment from male colleagues has decreased and that improved site sanitation, such as clean water and toilets, has had a positive impact on their health and well-being. Fifth are the positive economic and social spillover effects to the local community. There have been noticeable impacts on the local economy, including the creation of new businesses in response to higher demand for

goods and services. Miners spend an estimated three quarters of their total spending on goods that have been locally produced. For every 1,000 miners at the site, the local economic impact is estimated at around US\$1 million per year.⁴ Meanwhile, the majority of new businesses started in the area were owned by women evidencing greater confidence and freedoms as a result of the reduced harassment and bribes sought by government agents.

Key health and safety findings

To ensure a safe operating environment for COMIAKOL, expert identification and management of risks by Chemaf’s Health and Safety management are combined with simple site rules. A site risk register is regularly updated, and a mixed team of miners, Pact staff, government agents, and experts from Chemaf conduct inspections multiple times per week to ensure compliance, train miners on best practices, and gather information. Every Monday morning the cooperative management team meets to reinforce key safety topics for the workers, from the importance of wearing steel-toe boots, to how to prevent the spread of illnesses like cholera, and most recently COVID-19.

FIGURE 5. Increased Earnings and Women's Job Diversification of Mutoshi Pilot Participants vs. Comparator Group



Source: Johansson de Silva, Strauss, Morisho, 2019

Access to the site is limited to COMIAKOL members, all of whom have been verified to be over 18 years old, alcohol tests are conducted at random to prevent miners from working under the influence, and pit depths are limited to 10 meters or less with most miners working in the open on the surface using simple hand tools while wearing personal protective equipment (PPE). Free healthcare is also available on site, where a doctor treats small injuries and common illnesses such as malaria and diarrheal diseases. Clean drinking water and sanitary facilities provided by Chemaf mean that the miners can apply these important hygiene lessons, reinforcing the practices, and preventing disease outbreaks in the workplace and local community. As found by the independent analysis, this collaborative approach with COMIAKOL has resulted in notable improvements in health and safety.

First is that working conditions have been remarkably improved. Artisanal miners now work in much more hygienic and less dangerous conditions, and they work fewer hours versus the comparator group; on average 1 hour less per day according to survey results. Second is that artisanal miners feel safer at their workplace. They also report being able to spend more time with their families. These improvements

have even been sustained during price fluctuations due to the improved working conditions and stability from joining COMIAKOL cooperative enabling them to return home daily. A third improvement in terms of health and safety is that miners working at the project site are healthier. This is particularly true of participating female miners. They are also less absent from work due to illness⁵ and spend less on medication and hospital bills as compared to the control group due to the strict safety and hygiene measures and access to free healthcare on site. Finally, there is an overall improvement in safety at the site. Over 70 percent of the Mutoshi Pilot Project participants stated that they joined to improve their working conditions with respect to safety. This demonstrates safety is a priority for the workers as well as other actors in the supply chain.

Conclusion

During a favorable price context when all the project deliverables were being implemented, the pilot

project functioned very well in terms of improving the livelihoods of miners. The independent analysis shows that the model has had tangible positive economic, health, and safety impacts for artisanal miners and their communities and thus could have significant potential to be replicated elsewhere, although more information is needed to ascertain full impact and cost effectiveness. Crucially, these improvements are the result of a unique partnership approach with each organization bringing something different to the table.

The first is technical expertise. By working closely with large-scale mining experts from Chemaf, the pilot project benefited from their extensive experience and continued guidance on identifying and managing safety risks. Chemaf also provides some of the resources necessary to manage safety, such as medical professionals and machines to remove waste rock and open the pits to eliminate cave-in risks. A second key to the partnership was high expectations and cross-sector experience. Trafigura holds the pilot to high standards through their responsible ASM sourcing expectations and

audits by Kumi Consulting, pushing COMIAKOL, Chemaf, Pact and SAEMAPE to improve conditions, mitigate risks, and continuously improve. Representatives from the commodities trader also regularly visit the site and participate in bi-weekly management calls where safety risks are discussed and proactive solutions proposed.

Strong political networks and on-the-ground action have also been essential. SAEMAPE also provides technical guidance and ground-level monitoring, alongside Pact's own employees, to train miners and support compliance with Chemaf's regulations and Trafigura's expectations. The agency also provides a crucial link to regulators, ensuring that communication channels remain open and the project maintains its political license to operate. Fourth and finally is a commitment to zero harm which COMIAKOL has integrated into every aspect of its business, prioritizing safety training and practical management across its operations. From mineral diggers and washers to transporters and businesspersons, every member of the cooperative undergoes a safety induction and is subject to the site's regulations.

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END NOTES

- 1 This figure is for cobalt mining only. Across all metals, 1.5-2 million people are estimated to directly work in ASM in DRC (World Bank, 2019)
- 2 Translated as the 'Assistance and Management Service for Artisanal and Small Scale Mines' in English, SAEMAPE a technical service of the National Ministry of Mines and is mandated to support artisanal miners by providing information, resources, training, and technical assistance.
- 3 London Metal Exchange cobalt prices crashed from an all-time high of US\$90,000 per ton in early 2018 to below US\$30,000 in mid-2019 and remained at this lower level due in part to oversupply from ASM, industrial mining in DRC, and a surplus of cobalt chemicals. In June 2020 the price slumped again to US\$28,500 due to impacts of the COVID-19 pandemic disrupting

manufacturing in China and the resultant economic downturn reducing global car sales including for electric vehicles (Barrera, 2020; Desai, 2019; Johansson de Silva, Strauss, Morisho, 2019; LME, 2020).

- 4 The additional local spending attributable to the project is measured as the difference in local spending between the project group and the comparator group.
- 5 On average, the miners in the pilot project group estimated they were absent about four days while the Comparator Group were absent more than twice this number. It is also noteworthy that women in the Comparator Group were absent almost three times more than the women in the Pilot Project Group.

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CASE STUDY #3

Credit: Daniel Limpitlaw

USING A MARKET-DRIVEN APPROACH TO IMPROVE ECONOMIC RETURNS AND MINE SAFETY

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ORGANIZATION(S): *Limpitlaw Consulting, **Pact

INTRODUCTION

There is a financial bottom-line to everything in artisanal and small-scale mining (ASM). The main concern for most people running and laboring in ASM operations is to make enough money to put food on the table, send their children to school, and if possible, invest in their futures. So, what if it was possible to increase economic returns while also improving mine safety through a package of low-cost and easy-to-implement measures? This is the approach that the Sustainable Development of Mining in Rwanda (SDMR) program¹ took in one of its interventions; the lessons from which can help achieve part of SDG target 8.8 to “promote safe and secure working environments for all workers.”

Why is a market-driven approach needed?

Artisanal and small-scale miners can be faced with meeting stringent criteria as part of their licensing conditions, sometimes at levels similar to expectations for large-scale mining companies. Yet ASM communities lack the capital, additional technical knowledge, and incentive to meet these regulations. While the remote and informal nature of many ASM operations also makes it challenging for government to monitor and enforce them. The limited information available to miners is usually focused on what not to do and addresses one issue at a time. The cost of training and ongoing technical support to ASM from government agencies and development partners is high and can be unsustainable long-term. Taking a market-driven approach in ASM addresses these systemic failures (McQuilken 2018) by providing tailored and practical guidance to improve mining practices that also have clear and direct economic benefits. It is this combination that makes the approach useful.

Drawing on experience over a 30-year career, SDMR Consultant and Director of Green Horizons Environmental Consultants Limited Paul Mitchell² has developed a written guide in the form of a Technical Environmental Management Plan (TEMP) specifically for ASM. The TEMP provides practical solutions an ASM company can implement to increase efficiency and productivity while simultaneously addressing the damaging social and environmental impacts. Tailored each time for a specific ASM site, the TEMP has two components: 1) The “general guidance and operational principles” provide an overview on topics including occupational and community health and safety, upskilling, and water, sediment, and waste management; 2) The “site-specific mitigation measures” provide clear actionable recommendations for ASM operators to follow.

Working with its partner, Coopérative Minière of Kababaru-Gikingo (COMIKAGI) a small-scale mining cooperative, SDMR along with Paul Mitchell and Daniel Limpitlaw, a mining engineer, has over the course of the program developed and piloted a TEMP for its three mine sites. Based on this experi-

ence, this case study provides details on the practical market-driven approach taken to address mine safety and operational efficiency at the same time.

Why is better mine planning needed?

Mining in Rwanda is now the second greatest foreign exchange earner after tourism (New Times, 2019). The country’s green rolling terrain, earning it the pseudonym “The Land of a Thousand Hills,” and temperate tropical highland climate with frequent year-round rains presents unique challenges to mining. Employing a total 60,000 workers in all mining and quarrying activities in 2019 (NSIR 2019), of which at least half are estimated to be artisanal and small-scale miners (Barreto et al. 2018),³ ASM activities currently dominate the sector accounting for 70 percent of production. Focused mainly on the extraction of tin, tungsten, and tantalum (3Ts) ores, total mineral exports from Rwanda were worth US\$377 million in 2017-2018 (Lesser and Habyarimana 2019). Through an ambitious development program, the government intends to treble the sector’s economic contribution and to transform many of the country’s small-scale mines.

To reach this target, however, significant improvements in planning and organizing underground artisanal workings is needed (O’Neill and Telmer 2017). Prior development of a mine plan is key to ensuring safe and efficient development, operation, and closure. Optimal resource use and timing of production activities can significantly affect profitability by lowering cut-off grade,⁴ extending deposit lifespan, improving work conditions and productivity, increasing incomes, and stimulating the economy through job security. But in ASM, inappropriate mining methods, poor layouts, and limited division of labor and coordination are often evident (Priester, Hentschl, and Benthin 1993). These issues can result not only in inefficiencies but also dangerous working conditions. For example, ground failures can often be attributed to a lack of planning, limited knowledge of rock characteristics, and inappropriate mining methods (Bansah et al. 2016). Well planned ground support is essential because the rock conditions may change greatly over the length of a tunnel; the first few meters

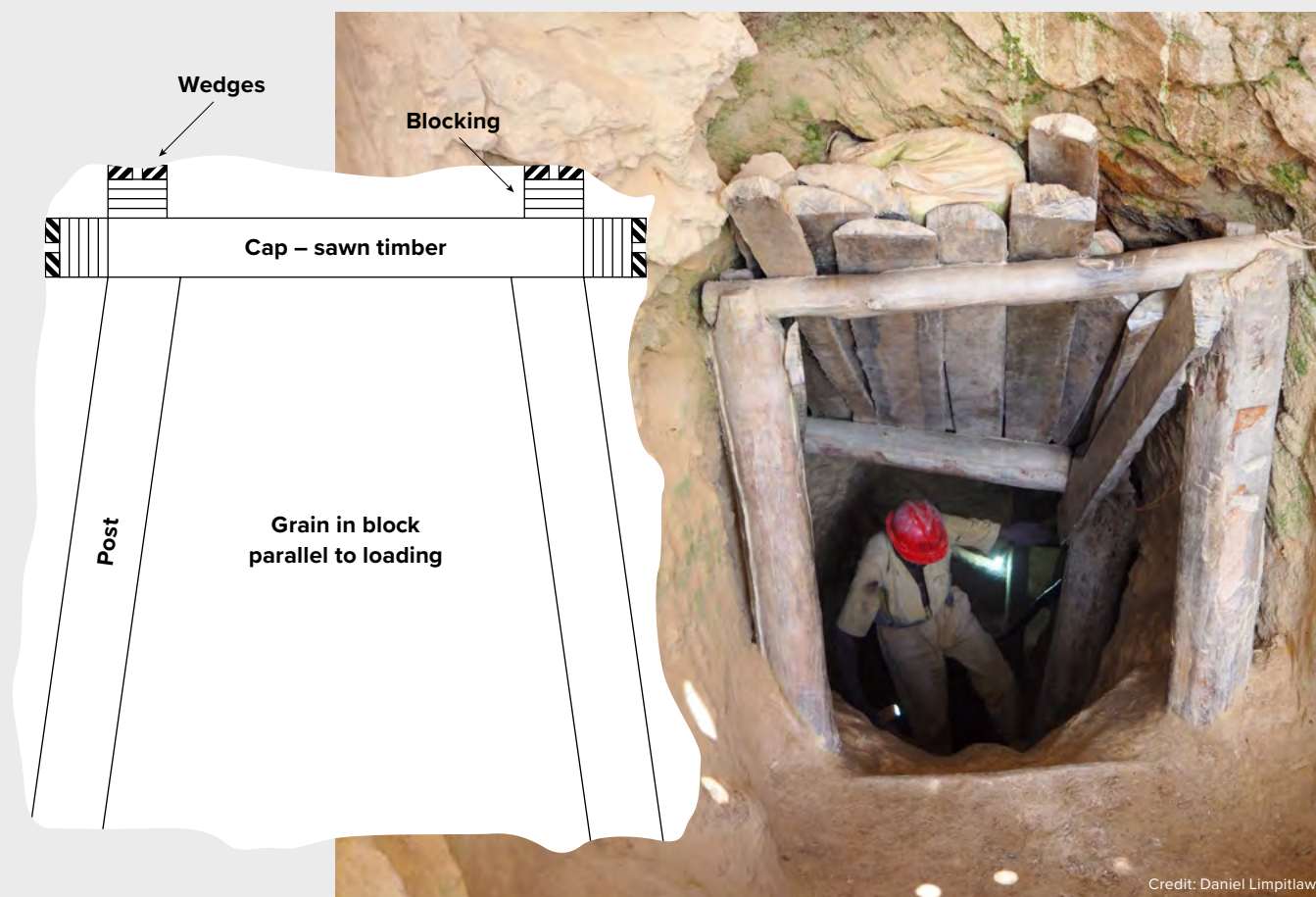
through unconsolidated material near the surface being particularly dangerous.

In Rwandan tin-tantalum deposits, mineralized vein width generally varies between 0.3 and 2.0m, and most development is on-ore, meaning that the miners follow thin veins and do not excavate the waste rock surrounding the orebody. The advantage of this is that all rock broken underground has value, but the disadvantage is that the excavation tunnels are restricted by the shape of orebody. These narrow openings present challenges to materials handling and safety as while used to remove rock ore, they are also essential escape ways needed to leave the mine quickly and should be at least 1.8 m high (Rupprecht 2015). It is essential therefore that underground workings are well supported, free of obstructions (like ore sacks), and included in the mine plan from the outset.

What practical safety solutions can miners implement?

After reviewing the extensive body of Rwandan mining literature, the SDMR program team assessed the underground workings of COMIKAGI to identify ways to improve production efficiencies and practical safety measures. Excavation measurements were made using a 30m tape measure, a compass, and an inclinometer. A low-cost GPS was used to record portal locations. Rendering this spatial information in 3-D with Plotly, a free, on-line drawing package⁵, several recommendations for increasing extraction, optimizing support spacing, and locating materials handling infrastructure were developed and implemented as part of the TEMP. By visualizing the workings in 3-D, better planning is possible, although still limited by the absence of exploratory drilling and, consequently, information

FIGURE 6. **Underground Timber Supports at COMIKAGI and Proposed Method of Installation**



Source: Photo D.Limpitlaw; Diagram reproduced after Stanley 1962.

about the ore grade ahead of the mine face. For example, in one of the workings, recommendations for a room and pillar extraction method were made. This would effectively increase the extraction ratio (the ratio of the volume of ore extracted to the volume left in-situ) from 9.5 percent to 28 percent—still low by large-scale industry standards, but a substantial improvement for ASM.

The first key improvement was to streamline the timbering—a simple and low-cost ground support method in incompetent rock (Priester, Hentschl, and Benthin 1993). Ideally timber mine poles should yield slightly under the weight of the hanging which can be achieved using headboards (Staley, 1962). Headboards provide softer support and show signs of damage before the poles fail therefore acting as a warning sign that can be replaced before failure of the main support.

At COMIKAGI, miners already make extensive use of timber supports (Figure 6). Using simple techniques developed in the USA in the middle of the last century (see Staley 1962), the SDMR team hosted a workshop where technicians from COMIKAGI and surrounding mines were shown how to properly calculate the number of wooden supports per length of tunnel needed for safe extraction. The calculations at COMIKAGI showed that, given the excavation dimensions, rock competence, and depth of the workings, support spacings could be increased to 1.2m from an average of 0.5m—reducing the amount of timber needed by over half. In addition to improved mine safety, the lower intensity of pole usage decreases operating costs and the labor needed to install timbering can be re-directed elsewhere, such as for more profitable extraction and processing activities. It also reduces environmental pressure on Rwanda's limited timber resources helping reduce deforestation and forest degradation.

A second improvement in both mine safety and efficiency was to address materials handling. Inefficient methods are employed at many ASM sites: loose material is re-handled multiple times through reloading, re-dumping, and relocating it. Properly locating these heaps through advance mine planning can reduce and eliminate the need

to move mineral ore and waste multiple times when opening new tunnels and processing areas. As is common in many ASM operations, at COMIKAGI's sites small sacks, each around 25 kg, are transported to surface from the rock face. Sacks are often stored temporarily in the travelling ways—a safety hazard to miners moving between working places and restricting ventilation. For workings less than 30m in depth, sacks can be loaded into buckets and hoisted up small shafts using a windlass (Rupprecht 2015).

Another improved materials handling measure implemented at COMIKAGI was the clearing and building of stable paths inside and between excavation tunnels, storage and processing areas at site using inexpensive crushed stone that is readily available as a waste by-product. These make transporting ore easier and quicker increasing efficiency and productivity while also having positive health and safety benefits for workers by reducing the risk of trips, slips, and falls and making carrying the heavy barrows and loads less strenuous.

Ore and waste are not the only materials that require handling—the timber and equipment for underground workings must also be moved. To improve efficiency, SDMR helped COMIKAGI plan and install a simple mono-winch and haulage system to transport ore from hillsides and steep valley bottoms up to processing sites and timber down to the mine portals. Mechanized materials transport (two people with a mono-winch and zip line) replaces large teams of miners hand-carting ore up slope to the sluices in the afternoons thereby increasing efficiencies and reducing the need for repetitive manual labor which has long-term health impacts and a higher risk of accidents when carrying heavy loads.

SDMR has also helped COMIKAGI investigate the feasibility of replacing inefficient ground sluices (used for ore washing) with a small treatment plant. Fewer miners are therefore required for ore washing which requires them to stand on slippery loose slopes bending and twisting to turn over heavy ore with spades as water travels downhill. By reducing the labor burden for materials handling, again, these miners can then be redeployed elsewhere

such as for the construction of tailings storage facilities and the maintenance of silt dams—two tasks that are currently under-resourced.

Helping policymakers and practitioners introduce a market-driven approach

Although a TEMP needs to be developed and tailored to each ASM site, the measures introduced at COMIKAGI and the novel approach of identifying improvements in health and safety that also increase productivity and profitability are key lessons from this case study. The efficiency gains made by removing large manual labor teams from transport and processing at SDMR and elsewhere are expected to more than compensate for the cost of redeployment to other service tasks. Increased production time and a healthier workforce due

to reduced ore transport requirements as well as fewer lost time incidents and injuries translates into potentially increased profitability.

By unlocking market-based levers for ASM companies to introduce improved health and safety measures based on simple century-old techniques, the burden on government for monitoring and enforcement is reduced. This leaves more resources to support ASM to fulfill its development potential across all 17 SDGs. Communicating these market-based approaches to improved economic returns and mine safety simultaneously is key to achieving wider uptake. It is also needed to reach the policymakers and practitioners that could facilitate training and knowledge transfer as well as the ASM communities and workers that would benefit immediately from a safer and more secure working environment.

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END NOTES

- 1 Contact details: pbm@green-horizons.co.uk; +44(0)7720 375855.
- 2 Sustainable Development of Mining in Rwanda (SDMR, 2020) was a three-year (April 2017-September 2020), GBP 4.3 million market systems development program funded by the UK Department for International Development (DFID) and implemented alongside partner Rwanda Mines Petroleum and Gas Board (RMB). It aimed to create a more professional, transparent, open, efficient and

economically viable mining sector with environmental best-practice, increased private sector investment, and improved incomes of artisanal miners. It was managed and implemented by Cardno in partnership with Pact, Projekt-Consult GmbH, and Rwanda Women In/And Mining Organization (WIAMO).

- 3 30,000 artisanal and small-scale miners were estimated to work in Rwanda in 2015 (Barreto, 2018).
- 4 The cut-off grade is the lowest concentration of the target mineral in the ore that can be mined profitably. Ore with concentration below the cut-off grade must be excluded from the mine plan as it is not profitable to mine.
- 5 <https://plotly.com/>

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Credit: Daniel Limpitlaw

STIMULATE ECONOMIC GROWTH

Target	SDG8 Stimulate Economic Growth Data Gaps	Indicator
 <p>8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7% gross domestic product growth per annum in the least developed countries</p>	<p>Accurately estimating the contribution to GDP can demonstrate to governments return on investments for support programs and policies</p>	<p>8.8.1 Annual growth rate of real GDP per capita.</p>
 <p>8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sector</p>	<p>Knowing the true value of domestic production and linkages to other sectors can reveal value addition and investment opportunities</p>	<p>8.2.1 Annual growth rate of real GDP per employed person</p>
 <p>8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>Understanding informal sector relationships and access to finance can inform effective formalisation programs</p>	<p>8.3.1 Proportion of informal employment in total employment, by sector and sex.</p>
 <p>8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products</p>	<p>Data on adventure, jewellery, and luxury tourism markets can help plan for post-mine community development</p>	<p>8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate</p>
 <p>8.a Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-related Technical Assistance to Least Developed Countries</p>	<p>Identifying investment opportunities for technical services, value addition, manufacturing, and buying agreements</p>	<p>8.a.1 Aid for Trade commitments and disbursements</p>

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OVERVIEW

A formalized ASM sector is the embodiment of SDG8 in its entirety. The precarious working conditions, which have come to characterize large segments of ASM, have long attracted public scrutiny. It has sparked discussion about whether policies can be developed that can facilitate sweeping changes in work practices across the sector. Formalization, it is believed, provides a much-needed platform from which ASM operations can be monitored regularly and efficiently. Moreover, if carried out effectively, formalization creates an environment in which ASM can innovate on its own and become an engine of local economic development in ways that speak to SDG8.

Formalization of ASM, however, has proved elusive worldwide. In most cases, this has been due to individuals being unable to obtain legal titles, secure mineralized lands, and access the crucial finance and support services needed to innovate (ILO 1999; Hentschel et al. 2003; Hilson et al. 2018; IGF 2018). The case for ensuring more effective policy and regulatory structures are in place for formalizing ASM, therefore, is based almost entirely on experiences in the informal sector as well as the small group of cases where the sector is comprised almost entirely of licensees. There are several points to consider here that underscore ASM's economic impact and which justify why more attention needs to be paid to formalizing the sector's activities.

Data which underscore the economic importance of ASM are critical to understanding the ways in which finances fuel the sector's production and growth, create linkages to other industries, and crucially, bolster the case for formalizing and supporting its activities. To explore how, there are several data gaps relating to stimulating economic growth that need to be addressed. The first is the sector's contribution to GDP, although at times, due to limited data even this must be estimated. Overall, there are only a small number of examples to draw from beginning with Guyana, where for a period of two decades (1996-2015), all gold was produced by indigenous small-scale miners. In 2012, at the peak of the country's gold boom, buoyed by a rise in the metal's international price and spike in production, output from these operations accounted for more than 17 percent of national GDP (Hilson and Laing 2017). In Rwanda, where mining operations "are small as measured by investment," none of which "would be considered either medium sized (cumulative investment of about US\$250 million to US\$750 million, though less for gold) or large (investment of more than US\$750 million)" (World Bank 2014, 27), in 2018 the sector contributed 2.5 percent of GDP generating US\$237 million in earnings (at 2014 prices) making mining a top export earner for the country (Government of Rwanda 2019; Lesser and Habyarimana 2019; Republic of Rwanda 2019). The key takeaway with Rwanda, however, is that the government is looking to provide support to miners, with the goal of accelerating the mining sector's contribution to exports to US\$1.5 billion by 2024 (Government of Rwanda 2019). Gathering GDP and complementary data from Rwanda and Guyana, where ASM has been supported more than most countries, illustrates the potential economic contribution the sector can make if its formalization is prioritized.

It would, for example, pay immediate dividends in a country such as Uganda, where the country's North-East Karamoja subregion clay brick and gold production from ASM are estimated to inject US\$500 million and US\$15 million into local economies each year. If ASM were to be included in the formal sector, it is projected that the country's GDP would increase by 5 percent (Barreto et al. 2018). This is consistent with findings from the Central African Republic, where research has shown that

a lowering of the US\$105 licensing fee to US\$5 could lead to the legalization of 60,000 artisanal diamond miners (or >80 percent of the workforce), which would yield official diamond exports of an estimated US\$82.4 million or 4.2 percent of the nation's GDP. Even with a low royalty of 1.5 percent and export rates of 3 percent, it is believed that as much as US\$3.5 million could be generated in tax and nontax revenue (Hinton et al. 2010). This makes monitoring closely a case such as Ethiopia worthwhile which, much like Rwanda, has limited potential to support a fully-fledged large-scale mining economy. As Priya Bala-Miller, Rahel Gatachew, and Munisha Tumato highlight in their case study accompanying this challenge overview, the Government of Ethiopia seeks to increase mining's share of GDP from its current 2 percent to 10 percent by 2025. Since launching in April 2019, the Delve platform has attracted, in a very short period of time, a wealth of social and economic data on ASM. But moving forward, more disaggregated economic data will be needed to showcase ASM's economic contributions, beginning with its contribution to GDP as well as more accurate figures linked to the value of exports. This applies to Ethiopia, where efforts to showcase ASM will ultimately lead to more data being captured and where formalization efforts can provide an umbrella under which operations can be more accurately tracked.

This leads to the second data gap on economic growth, which concerns its linkages to other sectors such as services and agriculture. While recent research has captured the diversity of ASM economies, the complete picture of financial flows across sites and through ancillary industries has yet to emerge. Data that capture the true value of ASM production and which showcase specific linkages to other sectors should be prioritized. The latter promises to be particularly challenging, as the case of Cameroon presented in this chapter by Lingfei Weng and Chris Margules reveals. Their case study illuminates how, in many countries, the sector's linkages are transboundary and international, in this particular instance, to Ghana and China. It has long been claimed and supported, in many cases with anecdotal evidence and qualitative findings, that ASM has a very visible multiplier effect when it comes to job creation. "Quantifying the multiplier effect"

was a challenge highlighted in the 2019 State of the Artisanal and Small-Scale Mining Sector Report (World Bank 2019a, 71)—that, “while the multiplier effect is an accepted and highly important feature of ASM, its quantification remains largely based on the 1982 USBM (United States Bureau of Mines) report of small-scale mining activities in the U.S.” It has generally been assumed, albeit with limited empirical analysis, that ASM has a multiplier effect of six.¹ The most visible linkage which ASM has with another sector is agriculture, which several commentators have drawn attention to over the years (African Center for Economic Transformation 2017; Mkodzongi and Spiegel, 2019; World Bank 2019b; Ofosua et al., 2020). As is the case in a country such as DRC, “The positive synergies between mining and agriculture are significant,” where there “is evidence of mining wages being recycled back to smallholder households—some of which is used for agricultural investment” and “the difficulties of transporting agricultural produce to urban consumer markets, the emergence of buoyant demand for food in rural areas provides an important boost to farmers in areas surrounding mines” (Mitchell and McQuilken 2020, 4).

The ASM sector also creates demand for other services, which rapidly surface as activities expand and become established. It has long been identified that “Small-scale mining can generate significant local purchasing power and lead to more demand for locally produced goods and services (food, tools, equipment, housing, infrastructure)” (Hentschel et al. 2003, 28), even in informal settings. This group of services also extends to transport, luxury items, accommodation, equipment provision, infrastructure, and housing (Kramcha 2004), as well as domestic services usually provided by women such as laundry, cleaning, and catering (World Bank 2019b). Quantification of this multiplier effect, however, has been sporadic, although when efforts have been made to do so, they have been informative. In the village of Migori in Kenya, for example, the demands of the 2,000-3,000 people estimated to be engaged in some capacity in small-scale gold mining has led to the opening of more than 50 shops, five hotels, and 37 restaurants (Barreto et al. 2018). But most accounts are nowhere near as detailed, nor offer much of a breakdown of ancillary economic activities according to demographics;

they are rather general claims or observations made about how individuals engaged in ASM reinvest monies or create demand for other services locally (see for example Werthmann 2009; Brottem and Ba 2019). There is therefore a need for more precise data which show linkages between ASM activities and ancillary activities, from which accurate multiplier effects can be calculated, even for specific cohorts and groups such as the elderly, youth, and women. As a starting point, a detailed picture could be constructed for some of the more established ASM localities across the world where linkages are visible and likely readily measurable. The list of potential study locations include Kono (Sierra Leone), Mahdia (Guyana), Tarkwa (Ghana), Nieuw-Koffiekamp (Suriname), Geita (Tanzania), and Diwalwal (Philippines).

More accurate production data from ASM are also required. This is the third data gap on economic growth. At present, there is an overreliance on export figures, declared production, and sales. The data presented in Table 5, which draws on examples from selected developing countries, do not particularly inspire. On the one hand, they do provide a picture of the scale of production ASM accounts for worldwide. The figures provide justification for regulating operations more tightly with a view to capturing more production in-country and enhancing the tax-base. On the other hand, these figures are likely vast underestimates of total production and provide little indication of the level of output at individual sites, nor much of an idea of where minerals are moving to, a major concern in the case of operations which have cross border (parts of their supply chains that traverse country borders, either legally or illicitly) elements. There is a need to enrich the Delve database with data on declared production, export figures, and sales, alongside information gathered at the site and regional levels.

The fourth economic data gap is information on informal sector relationships, a detailed analysis of which is a key to understanding how the sector functions and the foundation on which it is built. There is ample evidence which points to ASM activities being highly heterogeneous, comprised of multiple layers and divisions of labor and produc-

TABLE 5. **Estimated Production Data from ASM in Selected Countries in Sub-Saharan Africa**

Country	Commodity	Year	Output	Data Source
Ghana	Gold	2015	Production: Total Production 3,618,234 oz. (28.35% from ASM)	National production data (MLNR 2017, 7)
Guyana	Gold	2016	Purchased: 214,447 troy ounces	Gold purchased by Guyana Gold Board (government unit) (MNRE 2017, 17)
Zimbabwe	Gold	2019	Purchased: Total Gold Deliveries 27,650.26 kg ASM Gold: 17,478.45 kg (63%)	Gold purchased by Fidelity Printers and Refiners (government-owned) (ZELA 2020)
Liberia	Diamonds	2016	Production: 104,449 carats (gem & industrial, estimated 60% gem quality)	(Perez 2019a, 22)
Sierra Leone	Diamonds	2016	Production: 549,086 carats (gem & industrial)	(Perez 2019b, 32)

tion (Ferring et al. 2016; Libassi 2020). Where less is known, however, is about the bonds, connections, and relationships between those operating at sites, and how these dynamics ultimately drive activities. Successful formalization of ASM hinges upon better identification of the different actors at sites and the gathering of more information about the context of their interactions. Licensing alone will not yield formalization; it is rather about making those employed in the sector more autonomous—putting them in an improved position to renegotiate access to the minerals they are working, and the individuals they have come to rely on to support their activities. Policies and regulatory frameworks are too often being implemented with little understanding of how the informal economy in which so many ASM activities are embedded functions. A compilation of profiles of those working here, a mapping of their connections with one another, and greater understanding of the context on which these relationships are based is a key starting point to address this glaring weakness.

Data which paint a picture of the organizational structures of sites and those populating each of their nodes is thus badly needed. For guidance, the Delve Standardized ASM Questionnaire could be used to construct these profiles, and simplified charts—similar to that produced by McQuilken and Hilson (2018) for artisanal diamonds in Ghana—which depict the positions of actors and the

connections between them at sites. In the case of the country examples profiled in this section of the report, this would entail more rigorous analysis of the labor structures seemingly embedded in the sector. For example, in DRC, there is need for greater understanding of the interface between informal operators and the licensees they forge bonds with, in spaces devoid of strict regulation. The case presented here by Evi Petavratzi and Carolin Kresse on cobalt offers rich reflections on the complexities of measuring local commodity markets and a flavor of the local economic impact its extraction on a small scale has. More information, however, is needed on the network of trust-based relationships between the actors found at the bottom of the pyramid whose energy and work ultimately yield a substantial amount of the ore which finds its way to local buyers. The case study on GemFair, a program of De Beers Group, which is piloting forward purchase agreements to provide access to finance for artisanal diamond miners illustrates this well. As the authors Konstantin Born and Ruby Stocklin-Weinberg explain “trust is key (on both sides)”—there was need to develop trusting relationships between miners and GemFair as new buyers and financiers in the local marketplace in Kono, Sierra Leone. This importance of trust in ASM and especially between miners and middlemen is also explored and mapped in-depth by McQuilken (2018) in diamond and gold mining communities in Ghana.

Similarly, more analysis is needed to determine whether in countries such as Colombia where there are layers of interlinked informal and illegal activity, there are specific segments of ASM that could be managed with regulations that are operator friendly. The case study presented by Peter Doyle offers a timely reminder of how the ASM sector is often intertwined with other underground activities, in this case narcotics. But at the same time, the USAID-funded Artisanal Gold Mining Program “Oro Legal” in Colombia, under which hundreds of operators have been formalized, illustrates how, with the correct information, change can be facilitated in even the most challenging of environments.

The fifth and sixth data gaps that must be addressed to better support the case for formalizing ASM on economic grounds are the sector’s linkages and impact on downstream markets and community development, and demand for technical services and downstream activities, respectively. Thus far, the data retrieved on both subjects are limited, and most information overall is anecdotal. Often, unfair comparisons are made to large-scale mining, which operates in largely an enclave manner and therefore, impacts economies and societies very differently. Formalization of ASM ultimately creates economic opportunities for other parties, beginning with suppliers of equipment and finance. With formalization providing a platform for innovation and creating a demand for more advanced machinery and more finance, the likelihood of licensed operators turning to international markets for supplies will be high. But what services are available, and how well-calibrated are those providing them with the needs and capabilities of ASM operators in different areas of the globe?

Looking ahead, and in keeping with SDG target 8.9, it is also important to integrate and plan for future post-mine economies from the outset of the mining life-cycle. Data on adventure, jewelry, and luxury tourism markets can help in this regard to ensure that the positive economic impacts of ASM can create additional economic opportunities and remain within communities for sustained longer term development. There is therefore a need for detailed analyses of downstream markets and potential linkages with other sectors of the economy; information which would complete the broader picture of the sector’s impact.

As much as there is a need for more data on ASM activities and operations, so, too, is it imperative to gather more information about the dynamics of the markets they are currently tied to, and which they would potentially tap into locally and internationally in scenarios where formalization becomes a reality. It begins with rapid surveys of the financial landscapes in countries but must extend to analyzing market opportunities for suppliers based nationally and internationally. A more detailed understanding of existing connections and potentially new market opportunities paints a fuller picture of ASM’s potential to be a catalyst for local economic development.

The case studies that follow in this challenge overview go some way to helping fill the economic data gaps highlighted here and provide an illustration of the wide range of ASM formalization strategies underway in different parts of the world. They show how despite the complexities and challenges, through better economic data which reveal a greater understanding of the functioning of ASM markets and labor dynamics, it is possible to harness the potential of the sector as an engine of economic growth and development.

END NOTES

- 1 For an in-depth review of the multiplier effect in ASM see Delve (2019, 70-71).

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CASE STUDY #1

Credit: Boliden

DATA CHALLENGES IN UNDERSTANDING MATERIAL FLOWS FROM ASM ACTIVITIES: COBALT CASE STUDY

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ORGANIZATION(S): British Geological Survey

INTRODUCTION

Cobalt is used in a diverse range of applications. However, of total annual global mine production estimated at 168,000 metric tonnes in 2018 (Brown et al. 2019), only about two percent is from mines that extract cobalt as the main product. Cobalt is primarily produced as a by-product of copper or nickel mining, and about 65 percent of the global mine production comes from the Democratic Republic of the Congo (DRC) (Brown et al. 2019).

Demand for cobalt is currently driven by the global energy transition and especially the need to decarbonize transport. Here, the use of cobalt in batteries in electric vehicles represents the largest application of this metal. Forecast scenarios suggest a further increase as the global automotive industry moves towards electrification.

Artisanal and small-scale mining (ASM) is an important contributor to overall cobalt production from the DRC. According to the NGO Pact through a direct communication with local government in 2018 (SAEMAPE 2018), between 60,000-80,000 cobalt miners in DRC rely on this activity for their livelihood (Pact UK 2020). Other estimates place this figure at 140,000-200,000 or more depending on seasonal, economic, and price fluctuations (Kara 2018; Johansson de Silva, Strauss, and Morisho 2019; OECD 2019). ASM operators commonly extract cobalt using very basic techniques from numerous small sites located alongside larger industrial operations. ASM plays a significant role in national mineral production and economic activity in the DRC. Some reported figures estimate that between 20 and 40 percent of the cobalt mined in the copper-cobalt belt of Katanga Province in Southern DRC is produced by ASM (Sanderson 2019; Trafigura 2018; Petavratzi, Gunn and Kresse 2019). Although it is difficult to determine the certainty of these figures, they illustrate the significant contribution of ASM to overall global cobalt production.

It is very likely that ASM will continue to play an important role in future cobalt supply as demand from the automotive sector grows. Because of the human and environmental problems which are often associated with ASM in the DRC, this brings challenges to manufacturers in ensuring that the ASM sector adheres to social responsibility and sustainability objectives (Amnesty International 2016; 2017). It therefore becomes an imperative to quantify the ASM cobalt flows to enable a valuation of the ASM contribution to supply and thus provide evidence to inform traceability and sustainability assessments.

In this regard, the British Geological Survey's (BGS) "Decarbonisation and resource management" challenge area, which undertakes world-leading research on security of supply and sustainable and responsible sourcing of raw materials, has published a series of documents covering a range of critical raw materials needed for a low carbon future, including cobalt (BGS, 2020a). This case study summarizes key findings of the BGS Cobalt Commodity Review (Petavratzi, Gunn and Kresse 2019) and reflects on the data challenges that must be overcome to better track the role of ASM in

achieving global resource efficiency (SDG Target 8.4), and accurately measure material footprints, production, and consumption (SDG Indicators 8.4.1 and 8.4.2)

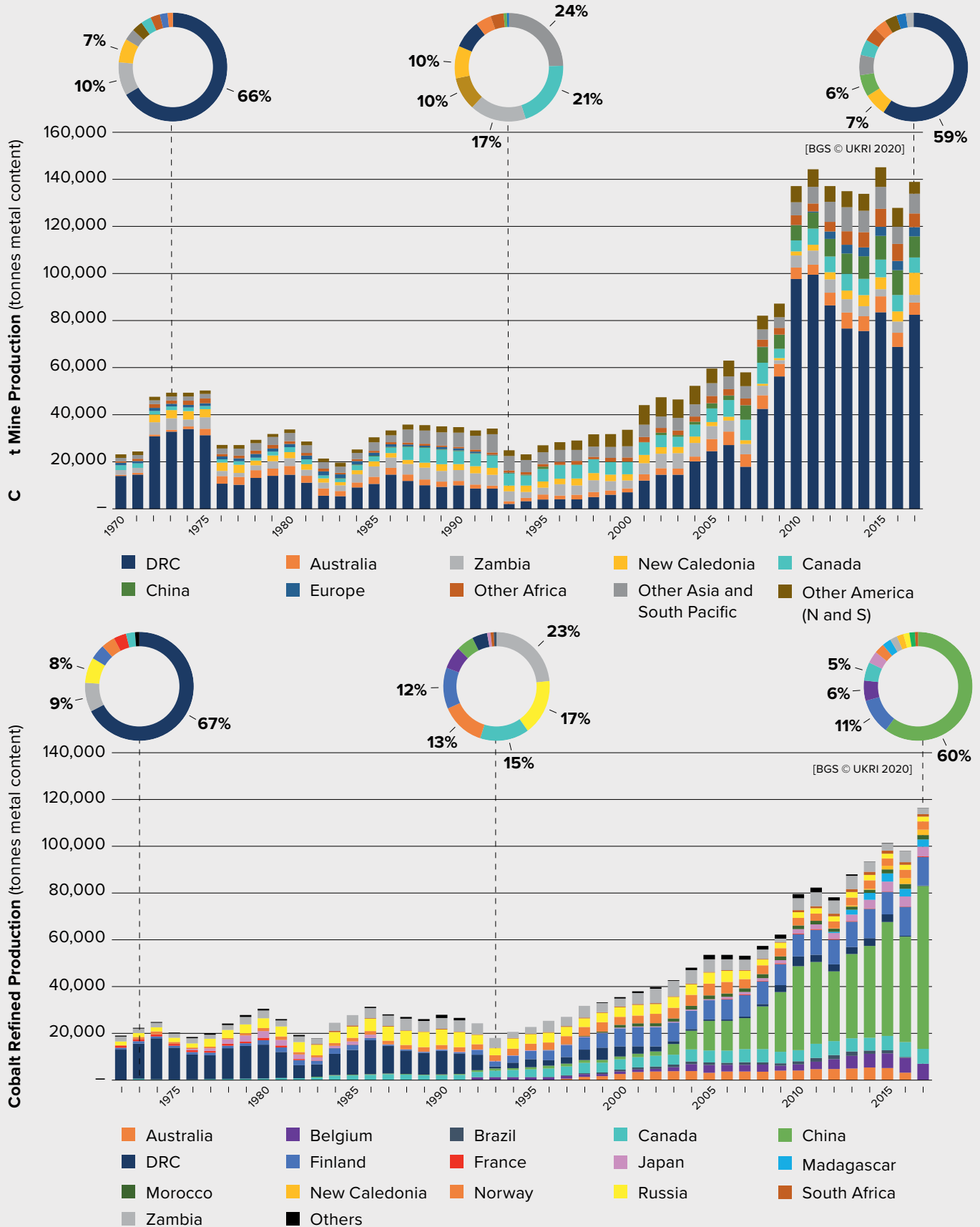
Key challenges in understanding ASM cobalt flows

Cobalt production in the DRC broadly consists of three different components: established large-scale mining (LSM) projects; "formal" (licensed) ASM operations; and "informal" (unlicensed) ASM. However, our knowledge of the contribution of each of these components to the total cobalt production in DRC is limited. This is because the production statistics available do not clearly distinguish between LSM and ASM production, and even less so between formal and informal ASM production. Although studies have taken place to assess the ASM cobalt flows, their outputs include significant levels of uncertainty and most likely an underrepresentation of the ASM contribution (BGR 2019; OECD 2019).

For example, the results of a recent survey undertaken of 58 active ASM sites in the DRC estimated an annual production of cobalt of approximately 12,500 tons from these sites in 2019. This equates to 12 percent of the cobalt mined in DRC (BGR 2019). According to BGR, the DRC Ministry of Mines reported production of 17,960 tons of mined cobalt from artisanal mines in 2018 (BGR 2019). This equates to 16 percent of cobalt mined from the DRC. However, it is likely that these published figures underestimate actual ASM production. This is because they are based on selective surveys of ASM operations and very likely exclude production from informal activities. The latter production figures are hard to capture and thus represent a significant gap in knowledge.

Similarly, time series data on global mine cobalt production is showing that while DRC's cobalt output has rebounded over the past 30 years, the country's capacity to add value through exporting of refined cobalt has diminished (Figure 7). Mine production figures derived from national statistics bulletins, along with global mineral production

FIGURE 7. Distribution of Global Cobalt Mine Versus Refined Production from 1970s to 2017



Others includes Albania, Czech Republic, Germany, India, Uganda and USA

Source: Reproduced from Petavratzi, Gunn and Kresse, 2019, 35-36; Data Source: British Geological Survey World Mineral Statistics Database

datasets, which are based on extensive surveys of national authorities and industry (BGS 2020b; USGS 2020), are unable to provide sufficient resolution and metadata in their reported figures to enable a distinction between ASM and LSM cobalt production in DRC. Currently, the extent to which reported data on DRC cobalt production includes figures from ASM production is unknown.

There are several reasons that may contribute towards these data issues when determining the contribution of ASM. The first is insufficient explanations in production statistics from mine sites due to potential lack of well-defined reporting standards. The reporting procedures from the mine site to national public authorities are not well documented, and it is therefore not possible to assess the resolution of data reported. Second is lack of capacity (for example human and financial resources, technology) to collate these data. This is a particular challenge for ASM, which often lacks the organization, systems, and technology to allow for rigorous data reporting, and for public authorities who also experience difficulties in capturing such data. The third issue is data interpretation and aggregation procedures used by reporting authorities in DRC, which may also have a role to play in overall data availability. National authorities may have access to data that distinguishes between the supply coming from LSM and ASM, but these are not publicly reported. However, even if data from ASM supply become publicly available at some point, capturing such data from informal ASM activities will remain very challenging.

Another important issue involves the continuity and frequency of the ASM cobalt data reported from DRC. A number of single studies reporting data on the ASM production for one or two years are available, but there is no continuity between them, and their frequency is not regular. The DRC ASM sector is very dynamic, and in most cases, it can respond more quickly to market demand changes than the LSM sector. This means that annual fluctuation in cobalt production from ASM are likely to be high. Unless a monitoring program is established that collates data with good continuity and frequency, then uncertainties around the ASM contribution to supply will remain high.

Aside from the difficulty in gathering and collating ASM cobalt production figures from the DRC, there are important gaps in knowledge regarding the nature and quality of the cobalt-bearing materials produced by ASM. For example, if beneficiation takes place, then this will alter the form of the material supplied to the market. Information on the metal contained in the ore produced by ASM is essential to report the quantity of cobalt produced and estimate its value. Without key metadata, such as the metal content, assumptions made may be flawed and thus potentially over- or underestimate the ASM contribution to overall cobalt production.

Finally, it is not just production data that is problematic, but also understanding the fate of ASM produced cobalt in the markets. Trade data on cobalt does not differentiate on whether it was produced by LSM or ASM, or whether ASM supply is captured at all or in part in trade statistics. The working assumption is that the ASM cobalt production is included in these datasets, as the majority of the cobalt refining capacity takes place outside DRC. However, because of the current nature of trade reporting, the ASM-derived proportion of cobalt contained in traded material is unclear, as is its form. This is a significant barrier to providing more transparency in the cobalt supply chain, in turn a key requirement of the various ethical and responsible sourcing schemes in operation.

Overcoming the challenges

There are a variety of actions required to overcome the challenges outlined above. The most important of all is implementation of rigorous data collection and reporting systems for DRC. These should be capable of delivering clear, robust data, along with associated uncertainty analyses. It is likely that additional capacity strengthening is required in the DRC to enable the development of such a system. However, its delivery would provide substantial benefits to the government by allowing it to understand better the ASM contribution and evaluate its socio-economic impacts. Ultimately, such a system could be rolled-out beyond cobalt to all ASM activities, delivering substantial development and reputational benefits. An important element in the

delivery of such a system is in ensuring its sustainability. This requires the development of reporting standards and quality assurance procedures that are formalized within the mining policy framework of DRC to ensure consistency and continuity.

Another contribution to addressing these challenges might be the establishment in DRC of a nationwide responsible supply chain program for cobalt. This program would work closely with both ASM and LSM to delivery traceability and transparency of the domestic cobalt supply chain. This would provide multiple benefits including understanding the ASM contribution, increasing knowledge of the structure of the cobalt supply chain, as well as gathering information on the impacts of

cobalt mining on sustainable development. Only by monitoring and understanding the whole supply chain can suitable points of entry for interventions be identified and well-informed decisions made.

Discussions between global data providers (UN Statistics 2019) and national authorities are important to ensure that reporting of cobalt in trade statistics clearly identifies the ASM contribution. This problem is not just applicable to cobalt, but many other minor metals, which are poorly represented in trade data. Finally, to enable production and trade statistics to align properly, there needs to be a systemic approach which clearly outlines the point in the supply chain that data are reported.

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CASE STUDY #2

LABOR DYNAMICS OF CHINESE ARTISANAL AND SMALL-SCALE MINERS IN CAMEROON

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INTRODUCTION

In 2013, China's president Xi Jinping launched "the Belt and Road Initiative." The tightened relations between China and Africa that have accompanied this initiative are already reshaping the development landscape in rural Africa. Most studies on this topic focus on Chinese investment and trade in large-scale infrastructure, industry, and mining (Weng et al. 2013, 2020). The impacts of Chinese investment in artisanal and small-scale mining (ASM) have been largely ignored, leaving gaps in our understanding.

This case study summarizes the findings of previous field research designed to understand how Chinese miners build their business models for gold mines, how and why social conflicts intensified following the influx of Chinese miners moving from Ghana to Cameroon in 2014, and further, to reveal the impacts of these two factors on local community development (Weng et al. 2015). Given the significant role of Chinese nationals in ASM across many countries in sub-Saharan Africa, it is essential to understand these labor dynamics in order to inform appropriate development-oriented policy responses for creating decent jobs, supporting sustainable production and achieving more prosperous local communities (SDG8).

ASM legal framework

The mining sector in Cameroon was governed by Law No001-2001 of April 16, 2001, and its application decree No2002/648/PM of March 26, 2002 (Mertens et al. 2012). The Mining Code, designed to attract foreign investment and promote fiscally sound development, also explicitly targeted poverty alleviation. At that time, the law recognized artisanal mining, defining it as “any mining activity consisting in extracting and concentrating mineral substances by means of manual and less mechanized methods and techniques” (CAPAM 2012). According to the law, artisanal exploitation was restricted to areas of less than one hectare and depths of less than 30m, and limited mineral rights only to Cameroonian nationals, who can apply for up to four permits per application.¹

Under this earlier legal framework, small-scale mining companies could not legally operate under artisanal licenses. To formalize the sector while promoting economic development by offering tools and legislative support, in 2010 the Government amended the 2001 Mining Code, adding provisions for foreign investment and opening the door for foreign companies to legally operate “small-scale” mines, albeit with a minimum 40 percent stake held by “national interests” (CAPAM 2012). The ambiguity inherent in “national interests” therefore paved the way for foreign companies to operate small-scale mines “legally.”

Origins of Chinese small-scale gold miners in Cameroon

ASM activities in Cameroon are predominantly located in the East of the country, especially around the areas of Betare Oya, Batouri, Yokadouma, and Garoua Boulai (Weng et al. 2015). The first foreign small-scale gold mining company was reported to have entered Betare Oya in 2006; by 2007, there were already twenty more (Weng et al. 2013). These foreign operators, most of which are owned by investors in China and South Korea, are far better capitalized than local artisanal miners. Equipped with imported bulldozers, scrapers, sieves, and separators, and collaborating with local Cameroonians to acquire artisanal mining permits, the companies extract gold from placer deposits along the Mari River.² The investment is reported to have mostly been collected from friends and relatives from the same villages in China, mainly in Guangxi province, Fujian province, and Zhejiang province. The number of people employed by these companies varies between 6-20. Most of them own at least 2-5 machines for gold extraction, including vibrating screens and sluice boxes, and excavators. One Chinese miner reported at least US\$500,000 or more had been invested at one small-scale operation.³ By 2013, according to the Ministry of Industries, Mines and Technological Development in Bertoua, there were 30 companies working there. However, the actual number of foreign miners in Betare Oya observed during the field study is far greater than the official reports.

Shifting labor: from Ghana to Cameroon

In 2013, Ghana's Ministerial Task force led by President Mahama launched a crackdown on informal small-scale gold mining in Ghana—largely targeting foreigners who by law are not able to hold an ASM license (Hilson 2014; McQuilken and Hilson 2016). Some expatriates deported from Ghana went to Cameroon to continue their gold mining activities in Betare Oya. The Chinese miners among them had mostly been farmers in their home country with only primary education.

This resulted, in part, to language barriers and cultural differences which can undermine relations between local people and foreign miners under what one Chinese miner interviewed referred to as “special mining activities.”⁴ A lack of skills among local Cameroonians further encouraged Chinese miners to employ workers from their home countries. As such, most of those employed from local communities work as drivers, excavator operators, guards and, occasionally, geological technicians who had local knowledge.⁵ Thus, while mining investments have provided increased employment opportunities for local people they have been limited to low-skilled lower-paid roles with few responsibilities.⁶

Regulating ASM migrant labor to support sustainable development

It is anticipated that this trend of foreign Asian-led small-scale mining investment in Cameroon and elsewhere in the region will continue and that without intervention will result in an uncontrolled and dispersed pattern of development in remote rural areas of sub-Saharan Africa (Weng et al 2013; 2015). The potential for ASM to provide benefits to local economies in remote areas will therefore not be realized without significant regulatory improvements (Hilson 2009). Properly regulating this growth of migrants is also needed to mitigate conflicts.

To this end, in 2014, the Cameroon Ministry of Mines announced a suspension on the issuance, renewal, and transfers of artisanal mining licenses for up to six months. The Mining Code was revised, limiting the use of equipment in “semi-mechanized non-industrial mining” to a maximum of three excavators, a backhoe loader, and any other instrument such as washing machines for alluvial sands. The use of chemicals is prohibited. The legislative clarifica-

tions and reforms, culminating in a new 2016 Mining Code (Republic of Cameroon 2016), introduced definitions for a new gradation of mining permits (non-industrial; semi-mechanized non-industrial; small-scale; and industrial). At the same time, regulation terms allowing foreign partnerships in ASM were introduced.

Conclusion

In Cameroon prior to the introduction of the new 2016 Mining Code, informal gold extraction by foreign small-scale gold mining companies operating under artisanal permits was rampant due to the lure of large profits and the persistence of regulatory and legislative loopholes, poor governance in terms of ineffective implementation of existing regulations and limited transparency. This all led to negative impacts of small-scale mines on local communities. There is evidence of widespread failure to comply with national mining regulations, and that to date, few benefits, such as sustainable production and job opportunities, are flowing either to the national government or to local communities. If the revised mining code and government regulations are enforced, foreign small-scale mining companies and investment could improve livelihoods and living conditions in remote areas. But without good governance, foreign-owned and operated small-scale mines risk further facilitating enclaves of uncontrolled resource exploitation.

This case study of Chinese artisanal and small-scale gold miners working in Cameroon highlights that there is still a significant research gap in data and understanding on the role of Chinese businesspersons working abroad in ASM. If ASM is to make a positive contribution to sustainable development in rural Africa, it is essential that understanding the dynamics and role of Chinese engagement in these activities is prioritized in future research agendas.

ACKNOWLEDGMENT

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END NOTES

- 1 Interview with Ministry of Mines in Bertoua, 2012.
- 2 Interview with technical engineer of Chinese small scale mining company (No.5) in Betare Oya, 2012
- 3 Interview with site manager of Chinese small scale mining company (No. 12) in Betare Oya, 2012
- 4 Interview with Chinese miners from Ghana, 2014.

5 Interview with manager of Chinese mining company from Ghana, 2014.

6 Interview with community leader of Betare Oya, 2014.

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CASE STUDY #3

SUPPORTING THE ETHIOPIAN MINISTRY OF MINES TO DEVELOP ASM

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ORGANIZATION(S): *Canadian International Resources and Development Institute

PROJECT OVERVIEW

Ethiopia is rich in mineral resources; however, the sector makes a marginal contribution to the country's economy, which is currently over-weighted towards the agricultural sector (between 30-40 percent of GDP) (World Bank 2019). The Ethiopian Growth and Transformation Plan II (GTP II) sets out ambitious development targets for the country as well as the mining sector seeking to increase its share of GDP from 2 percent to 10 percent by the year 2025 (Government of Ethiopia 2016). To achieve this target, the Government of Ethiopia's Ministry of Mines and Petroleum (MoMP) recognizes the importance of establishing accountable and informed institutions that can facilitate investment, build shared value, and ensure equitable access to benefits for vulnerable populations.

The Canadian International Resources and Development Institute (CIRDI), through the Supporting the Ministry of Mines (SUMM) Project, is working closely with the MoMP to improve policies, practices, and capacity for mineral sector public administration. This six-year project (2016-2022) funded by Global Affairs Canada is also providing technical support on the formalization of what is termed in Ethiopia the “artisanal, special and small-scale mining” (ASSM) sector¹ and defining environmental and social performance requirements that will support the people of Ethiopia to benefit fully and equitably from their natural resources (Government of Ethiopia 2010). The SUMM Project is being delivered in line with CIRDI’s in-house approach to public sector and administrative reform projects, underpinned by three design principles: (i) National Ownership; (ii) Partnership and Inclusion; and (iii) Capacity Development (CIRDI 2020).

Why is ASM a critical input for achieving Ethiopia’s growth and transformation plan (II) and national SDG8 targets?

The Ethiopian Extractive Industries Transparency Initiative (EITI) estimates that over 1.26 million people in Ethiopia are engaged in ASM activity (EITI 2016). Given this scale, the Government of Ethiopia recognizes the sector’s significant potential contribution to the Ethiopian economy through employment creation, an increase in export earnings, and growth in average household income (Beyene 2014; Government of Ethiopia 2010). The Government of Ethiopia has also identified a pressing need to ensure these livelihoods are adequately protected and advanced prior to the expansion of a nascent large-scale mining industry as a conflict-prevention strategy. Given these factors, the Ethiopian Government has prioritized the ASM sector as part of its national economic reform agenda (Woldetinsae et al. 2018). The Ethiopian ASM strategy, developed through the CIRDI-SUMM Project aims to formalize the sector and promote responsible, inclusive, and productive operations that contribute to sustainable development. With gender as a cross-cutting priority in the

strategy, effective implementation could contribute to multiple SDG8 targets.

What are the current challenges for ASM formalization in Ethiopia?

Baseline analysis conducted in 2018 by CIRDI and the MoMP categorizes the challenges for ASM formalization in Ethiopia according to four dimensions. The first is governance. The current ASM licensing regime lacks transparency and accountability mechanisms. The 2-year non-renewable licensing period is unsustainable from a livelihoods lens as it is too short to enable miners to invest in sustainable operations. In addition, ASM miners lack awareness of the policy and regulatory framework. Limited controls on gold flows have resulted in limited supply to the national bank. Although there is a regional task force at the ministerial level, a significant lack of governance coordination exists at all levels, with issues of mandate clashes. In general, family based ASM groups are not well-organized and lack leadership and formal governance structures (Gebre et al. 2017).

The second barrier to formalization identified is human and financial capital. Women in ASM cooperatives are less involved directly in the critical extraction and processing stages of mining activities, making it hard for them to have equal share of benefits. There are also disproportionate barriers for women in accessing finance and technical training (Cassady et al. 2019). There is a shortage of skilled labor and training opportunities for licensed miners. Access to finance for ASM operators is a challenge as the country’s financial system has limited flexibility, and current microfinance schemes are insufficient in meeting demand. The ASM sector does not benefit from small and medium-sized enterprise (SME) incubation or promotion strategies, posing added barriers for scaling smaller operations (Getachew 2018b).

Economic linkages are the third barrier to formalization as there is currently limited value addition occurring at the domestic level (Kyngdon-McKay et al. 2016). Regulatory uncertainty is also creating

market distortions, and there is no clear fiscal regime for the sector. Lack of infrastructure (including roads, energy, water, processing, and market centers) linking ASM sites with processing facilities and markets is also a barrier to the supply of local goods and services by local firms (Geipel 2019). Information asymmetries on efficient and cleaner processing techniques, mineral quality and value, and fair market value means operators often receive low prices for their minerals. Cluster-based development strategies are not being leveraged to support economic diversification.

Fourth and finally, are social, environmental, and health and safety barriers that prevent formalization. Currently, ASM licenses are issued without regulatory guidance on environmental obligations, and there is a lack of financial and technical support to raise awareness and build the capacities of miners on rehabilitation. Abandoned pits present risk of accidents that put human life and livestock in danger. Mining pits also accumulate standing water and create health risks for malaria outbreaks. Widespread deforestation is evident in ASM areas. The use of toxic chemicals also contaminates water sources and air (Getachew 2018a; 2018b; Melaku 2018).

How can governments create “bottom-up” buy-in for ASM formalization for “top-down” national growth targets?

Since its inception, the SUMM Project activities were designed to align with the Ethiopia’s *Growth and Transformation Plan (GTP II)* and industry priorities. To this end, the project piloted a *National Artisanal, Special Small-Scale Mining Strategy* to curb youth unemployment, promote import substitution, and generate foreign currency. To drive the development of this strategy, a taskforce was formed composed of nine high-level members from eight Directorates within the MoMP and a SUMM-CIRDI Project Officer (MoMP and CIRDI 2019). The

strategy was developed in three phases: (i) baseline analysis; (ii) prioritization; and (iii) stakeholder consultation. The baseline analysis delineated the scope of the strategy. The analysis focused on ASM activities related to key commodities that demonstrate inherent, multi-tier sustainable value propositions for Ethiopia. The selection process considered several criteria including potential mineral reserves, national and global demand, ability to be extracted and processed in a cost-effective and efficient manner, job and wealth creation, and the ability to boost economic growth and sustainable development. The taskforce and technical team developed a brief commodity analysis for the selected strategic commodities as part of a baseline analysis.

To lay the groundwork for a consultative process, the taskforce then conducted a workshop to establish a preliminary framework and priorities. This roadmap of the strategy defined the Government’s strategic vision, objectives, and thematic areas for prioritization. With technical support, the taskforce held a two-day consultation with key stakeholders from the capital and mining regions across the country. These consultations aimed at “ground-truthing” the National ASSM Strategy, complementing existing information compiled through various studies and previous consultations. The strategy is also coupled with an implementation framework that articulates a clear long-term vision and objectives for the formalization of ASM in Ethiopia.

Conclusion

With a fully formed roadmap now in place, the next phase of implementation will be critical to ensuring ASM can contribute to sustainable development in Ethiopia and help reach targets of SDG8. Key to this success, as outlined, will be the continued multi-agency approach that is well connected to local communities and the realities faced by ASM operators.

ACKNOWLEDGEMENTS

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END NOTES

1 In Ethiopia, the ASM sector is commonly referred to as the ASSM sector, and inclusion in the sector is defined by the type of mining license an individual or SME has, which in turn depends on the size of their mining operation.

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CASE STUDY #4

Credit: Chemonics

REAPING THE ECONOMIC BENEFITS OF FORMALIZATION IN COLOMBIA

AUTHOR: Peter Doyle, Chief of Party, USAID Colombia Artisanal Gold Mining—Environmental Impact Reduction Activity (Oro Legal).
ORGANIZATION(S): United States Agency for International Development (USAID); Chemonics International.

INTRODUCTION

Legalization and formalization of artisanal and small-scale gold mining (ASGM) in Colombia is too important to ignore, both for its challenges and large potential environmental and economic benefits. ASGM has a long tradition in Colombian history and culture. Its ease of access, informal operating context, and the chance to earn incomes that are typically higher than the “next best” rural option,¹ have attracted some 300,000 families to the sector (Veiga and Marshall 2019). ASGM makes up 94 percent of total gold mining operations nationwide of which 60 percent are illegal operations, often financed by organized crime (UNODC 2016). The Colombian artisanal and small-scale mining (ASM) context is unique in this way, with gold mining generating approximately US\$2.4 billion in revenue for mine leaders, equivalent to three times the amount generated from trafficking Colombian-produced cocaine (ANM 2018). Like cocaine, illegal ASM operations run by organized crime syndicates pose significant security concerns as well as governance, social, and environmental challenges. Given the backdrop of consolidating a historic peace agreement and addressing other security threats from organized crime groups, the challenge facing the Colombian gold mining sector is how to best exploit the potential of ASGM in a legal, responsible way while strengthening governance and promoting licit economic development.

The response

The USAID-funded Artisanal Gold Mining Program “Oro Legal,” implemented by Chemonics International, represents a bold effort to work with the Colombian government, private sector, and mining communities to begin to address the multiple challenges of ASGM. Since October 2015, Oro Legal has followed a three-pronged strategy that responds to several Sustainable Development Goals, particularly those pertaining to economic growth decoupled from environmental degradation (SDG8 Target 8.4).

The first part of the strategy was to legalize and formalize ASGM and bring gold revenue into the licit economy. Since its inception, Oro Legal has reviewed more than 600 mining operations across the departments of Antioquia and Chocó where more than 70 percent of illegal ASGM in Colombia occurs. Based on a rigorous selection process, 11 formalization projects are underway involving 135 mines and 700 miners. Participating mines agree to a rigorous ‘formalization standard’, which drives improved mining, environmental, and economic performance. A strong collaboration with the Swiss-funded Better Gold Initiative (BGI) permits gold from formalized mines to be sold in legal Swiss gold markets with minimum intermediation, allowing miners to capture a larger share of international gold prices and earn a US\$1,000 per kg premium for BGI-certified gold. Supported mines have eliminated 45 tons of mercury from their production processes to date, a major achievement for cleaner production in a country that ranks among the world’s top mercury consumers (UNEP 2015).

Second was to develop economic incentives for restoring landscapes where previous illegal and informal mining has occurred. Land degradation is a growing problem in Colombia, and uncontrolled alluvial mining and river dredging are particularly problematic in Oro Legal’s geographies. However, most rehabilitation models are too expensive to implement and create few incentives for stakeholders to keep land under rehabilitation. Thus, Oro Legal developed a model that was both inexpensive to implement and created long-term economic incentives to maintain tree cover. In Antioquia,

2,000 hectares of land degraded by mining have been rehabilitated with *Acacia mangium*, a resilient and fast-growing commercial tree species adapted to highly degraded soils. This model kickstarts the restoration process in these fragile ecosystems for approximately US\$2,500 per hectare.² In the tropical Chocó region, the rehabilitation model is based on agreements with Afro-Colombian communities to prevent further mining encroachment and allow previously deforested areas to recover naturally. This has begun the rehabilitation process on more than 15,000 hectares for a cost of under US\$600 per hectare.

The third part of the strategy was to create economic alternatives for those who seek opportunities outside of ASGM. The economic return and work conditions for miners, many of whom are women at the bottom of the gold value chain, are low³ and unstable. These marginal miners frequently express their willingness to leave mining if reasonable alternatives were to become available. Via Oro Legal, USAID has invested in two livelihood alternatives that complement the landscape restoration interventions already described: (i) honey production in Antioquia; and (ii) annatto—a natural colorant—production in Chocó. More than 90 tons of honey produced to date have generated licit returns of US\$250,000 for more than 100 families, 35 percent of whom are single, women heads of household impacted by rural violence and displacement. Honey production requires access to only small land areas, thus overcoming the issue of highly unequal land distribution and tenure typically found in ASGM regions in the country. In Chocó, more than 600 hectares of annatto, a tree crop particularly well-suited to local tropical conditions, are coming into production to meet strong national and international demand, and a new US\$250,000 pilot processing facility is being built.

Conclusions

Five key conclusions from the Oro Legal project stand out. First is that legalization and formalization are at the heart of improving technical, environmental, and economic performance both on and off ASGM sites. Informality and illegality provide no

incentives for changing “business as usual,” and the bulk of economic returns generated remain illicit. Second is that ASGM formalization makes good economic sense. To date, a US\$20 million investment by USAID has generated over US\$155 million in legal gold sales and US\$10 million in taxes, royalties, and social security payments. This not only diverts significant financial resources away from illegal armed groups but also bolsters licit economic development. The third key conclusion is that the provision of alternative livelihood options to subsistence mining would allow thousands of Colombians to leave illegal mining. Experience with the development of two value chains has demonstrated that stable incomes marginally above Colombia’s current legal minimum monthly salary (US\$280)

are sufficient to move miners, particularly women, into less precarious means of earning a living. Fourth is that rehabilitation of degraded ex-mining land can generate sufficient economic returns for stakeholders to leave land under forest cover and avoid re-mining these same areas. Experience with *Acacia mangium* has demonstrated that measurable environmental and biodiversity impacts can be underpinned by net income each harvest cycle of US\$3,750 per hectare. Fifth and finally, it is clear that ASGM formalization writ large is enormously challenging. But, if done well, the potential payoff from improved environmental stewardship, productivity, profitability, and its contribution to licit economic and sustainable development dwarfs the return from most other sectors.

END NOTES

- 1 Agricultural wages in most areas where Colombian ASGM occurs are in the order of US\$8 per day
- 2 An Oro Legal review of Colombian rehabilitation models identified per hectare costs ranging from US\$4,000 at the low end to almost US\$10,000 for more sophisticated approaches.
- 3 Individual gold panners in Oro Legal geographies report falling incomes, typically expressed as extended periods without recovering gold. This occurs as illegal mechanized operations, motivated by the increased international gold price, increase the intensity with which the same area is mined.

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CASE STUDY #5

Credit: GemFair

GEMFAIR PILOTS FORWARD PURCHASE AGREEMENTS TO PROVIDE ACCESS TO FINANCE TO ARTISANAL MINERS

AUTHORS: Konstantin Born, Ruby Stocklin-Weinberg

ORGANIZATION(S): GemFair

INTRODUCTION

GemFair, a pilot program of De Beers Group, was launched in 2018 to support the formalization of artisanal and small-scale mining (ASM) by raising standards and capturing fair value. GemFair uses digital technology to trace ASM diamonds from the time they are discovered at the mine site to point of sale in international markets and requires all participating miners to meet minimum ethical standards aligned with the OECD Due Diligence Guidelines for Responsible Supply Chains of Minerals (OECD 2016). Ultimately, GemFair focuses on enhancing equal opportunities and raising working standards for artisanal miners. Miners receive many benefits from joining GemFair, including access to a transparent and respectful buyer, a fair and competitive price, and training to raise standards as well as increase their productivity. The pilot is taking place in Kono, Sierra Leone, where GemFair has established a diamond buying office and a suite of training opportunities for artisanal diamond miners in the region. This case study reviews GemFair's approach and some of the initial outcomes as they relate to stimulating economic growth and development (SDG8).

In Sierra Leone, a lack of access to formal finance means artisanal miners are reliant on middlemen to pre-finance their operations, often—although certainly not always—on unequitable terms. This is because in many instances the artisanal mining sector is not deemed suitable for conventional financing agreements due to a lack of geological information, leading to unpredictable returns on investment, and the sector is largely informal or semi-formal, making the risk for traditional investors much higher.

Given the challenges faced by artisanal miners to access fair financing arrangements, GemFair decided to pilot a program to provide eligible artisanal diamond miners in Kono district in Sierra Leone with a way to access financing for their capital and operating expenditures through an unconventional risk-based approach. This pilot thus supports SDG8 target 8.3, which facilitates the growth of micro-small and medium-sized enterprises by providing access to financial services.

There were four main objectives of the pilot. First was to design a mechanism that allows existing GemFair suppliers and artisanal diamond license holders (miners) to access finance without indebting them through a non-conventional financing approach. Second was to test the demand and desirability for such an approach with artisanal diamond miners. Third was to establish an operational framework that creates accountability for the monies paid, including a continuous mine site monitoring mechanism and the requirement that participants maintain formal records of their production, wages, and other operational expenses. Fourth was to understand whether access to finance can serve as an incentive to improve the wages of the artisanal workers employed by the license holder and their general working standards, including, but not limited to, environment, health, and safety.

Overview of approach

GemFair has developed a portfolio risk-based financing tool in which GemFair enters into Forward Purchase Agreements (FPAs) with selected license holders of artisanal mine sites. GemFair's innovative

and non-conventional approach enables GemFair to give artisanal miners access to formal financing and to become a trusted partner that shares in both profits and losses of the operations.¹ These miners become members of the GemFair program and must be in good standing with GemFair's Responsible Artisanal and Small-Scale Mining Assurance Programme (GemFair 2019a). The FPA lasts for at least one mining season of approximately nine months, but if the miner breaches any of GemFair's Core Requirements,² he or she would be disqualified from both the FPA and the GemFair Programme. Membership is free, and miners must participate in training workshops on the GemFair ASM Standard, followed by further on-site training concerning health and safety, employment, and environmental management (GemFair 2019b).

Under the contract, both parties agree on a work-plan and accompanying budget for the season, which gives the miner sufficient working capital for the duration in exchange for giving GemFair the right to forward purchase the miner's future diamond production from the area funded by the FPA during the contract period at a transparent, fair market value that is equal to the price that every member of GemFair's general program is offered. GemFair does not make any profit with the FPA scheme, and any potential future surpluses from the financing scheme will be re-invested into the FPA financing program.

How it works

There are four key steps. Step one is logging diamonds. Whenever diamonds are recovered, the miner logs each one on GemFair's traceability application. Logging a diamond takes place at each mine site within a few hours of recovery using a tablet with a dedicated app, which is provided to the miners free of charge with an accompanying solar charger as follows:

1. Photo taken of the miner with the diamond;
2. Photo taken of the diamond against a ruler;
3. Photo taken of the diamond being weighed;

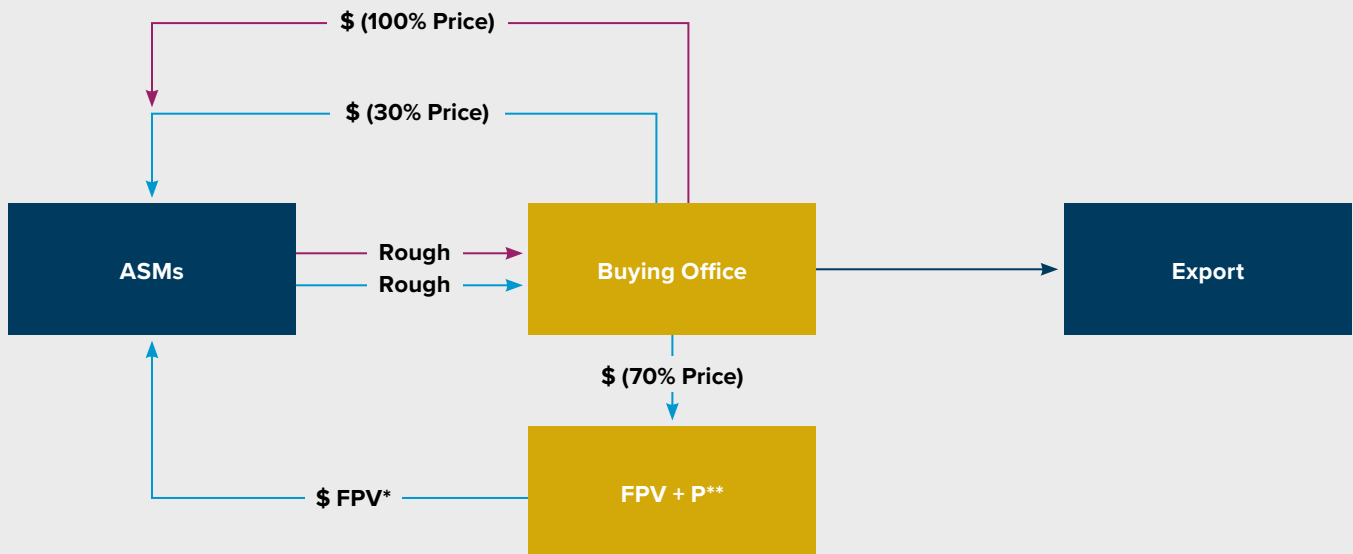
4. Input the weight and other observed diamond characteristics (4Cs—carat weight, cut, color, clarity) into the GemFair app; and
5. Diamond is put in a tamperproof QR-coded bag and sealed.

Step two is valuation. When the miner has logged the diamonds on the GemFair tablet app and comes within reach of the cellphone network, the record is uploaded to a secure GemFair server. The miner then brings the diamonds to GemFair’s buying office, where expert buyers ensure that the diamonds on offer are the ones recorded through the tablet app and then value them based on the De Beers Group price book. Step three is the repayment of the extended financing. After the valuation has been completed, GemFair communicates to the miner the value of the diamonds logged and offered for sale. To recover the forward purchased sum, GemFair then withholds 70 percent of the value of the diamonds up to the amount of the agreed upon sum of the advanced funds plus a risk premium, which is based on the historic default risk of the entire portfolio of license holders receiving financing. The risk premium is set at fair terms in line with comparable

development financing products. While the FPA and risk premium are still in the process of being repaid by the license holder, he or she continues to receive 30 percent of the value of the offer, enabling profit-sharing amongst his or her workers.

Finally, step four is full repayment. After the miner repays the advanced funds plus the risk premium, the miner then receives the full value of the diamonds. There is no issue if the miner is unable to recover enough diamonds to meet the forward purchase threshold and risk premium requirements. Provided GemFair’s assessment of the site shows no evidence of the miner’s breach of contract, the miner is under no obligation for further repayment. However, where a mine site’s production that season is significantly lower than would be required to repay the agreed pre-financed sum, the miner may not be granted access to financing for a further season. GemFair has set transparent and fair guidelines to decide whether a miner is eligible for future funding, ensuring an efficient and fair allocation of funds to interested miners and avoiding productive sites subsidizing unproductive sites. This ensures that the risk premium can remain as low as possible.

FIGURE 8. GemFair Transaction Flows During and After Repayment Phase



- Flow if sum of rough value < Sum of FPV+P
- Flow if sum of rough value > Sum of FPV+P
- GemFair

* FPV: Total rough value of Forward Purchase Agreement

** P: Premium in Forward Purchase Agreement

Enhancing standards

The goal of the pilot and FPA model is to create a win-win solution between the miner and GemFair where the miner receives financing under fair terms and GemFair can positively influence working and business practices of the participating miners. Miners participating in the FPA model agree to set ground rules. These include maintaining records of all payments made and paying all workers at least the national minimum wage, safe disposal of all waste from the mine site, and use of safe mining techniques, such as marking off potentially unsafe areas of the site and wearing role-specific personal protective equipment.

GemFair field staff monitor the working practices of the mine sites participating in the program on a weekly basis. Over two phases (May-July 2019 and January-September 2020), GemFair has entered into FPAs with more than 20 miners. The next section will discuss the key learnings thus far, as well as the challenges found during the pilot testing.

Results and learnings

Although the pilot has not yet been completed, the project has already seen some great progress that is worth sharing. As more data comes in, GemFair will share important findings and results in its annual report. The first result is organizational strengthening. The measures being taken to formalize the business practices of the miners are working. GemFair has been working with miners to introduce receipts, wage sheets, purchase logs of goods and services as well as rapid financial numeracy training. Training and support are given to the miners to help them implement these procedures and after several months the miners are adapting. This makes it easier for GemFair to verify that workers are receiving their fair share of the diamond proceeds and the miners are aware of the daily goings on at their sites.

Second is that miners are meeting and exceeding GemFair's minimum health and safety requirements in large part to the organizational strengthening and training. Weekly surveys have revealed

that no serious infringements of GemFair's health and safety requirements have occurred at the sites participating in the program. There is a visible difference in the operating practices between sites participating in the FPA model versus those that are not. Miners are utilizing benching, and there are visible mine site safety differences to sites in the same area that are not participating in the FPA program.

A third result is that miners are bringing more diamonds and using the forward purchased funds to mine more productively. The average amount of diamonds by volume brought to the GemFair office by FPA sites is currently two times higher than the average of non-FPA sites. The number of diamonds bought from FPA sites is even higher with FPA sites having sold almost five times as many diamonds as non-FPA sites during the pilot over the past two years. However, this is only a short-term trend, and data from several mining seasons will be required to make a statistically robust assessment.

Despite this limited data, initial results on program sustainability are promising. The fourth result is that there are early indications the program can become financially sustainable, meaning that the risk premium GemFair has set covers losses at sites with lower than expected output. Some miners will have an insufficient output to cover the sum extended under their agreements, but this is balanced out because other sites produce diamonds with a value in excess of the pre-financed sum plus the risk premium. These preliminary results indicate that the program can become financially sustainable in the future if strong selection criteria can be derived and applied based on various data points.

There are also some interesting learnings. The first is that trust is key (on both sides). Much of the program is trust-based, and there is risk involved. GemFair cannot be certain that the miners are bringing in all their diamonds for sale. However, GemFair maintains regular contact with the sites so that if any irregularities were to arise, GemFair could detect that quickly. It also takes time to gain the trust of the miners. Given their negative experiences with other buyers, GemFair has had to demonstrate that the offering is not predatory and the terms are

fair. GemFair's diamond buyers are transparent with their valuations, they explain the terms of the offer, and miners are given every opportunity to ask questions. Thus far, there is an encouraging uptake of the participants, and early signs point to all their production being sold to GemFair.

Another learning was how to deal with the inaccessibility of artisanal mine sites. Some of the sites are far away from the regional headquarter town where the GemFair buying office is located, which makes it more difficult to monitor their activities. This results in a preferred selection of sites that are closer to the urban center and means that further work needs to be done to give more rural locations access to the program. A third learning was that miners are so underserved by electronic financial services that GemFair must deal in cash. This adds a greater risk, less transparency of use of funds, and increased and time-consuming supplier due diligence.

Conclusion

The early results of the FPA pilot are positive, showing that greater access to finance for artisanal miners can be an important tool to support formalization and improve standards at ASM sites. To improve and scale further, the FPA program could be combined with other efforts. This could include financing a mine site to provide more leverage over additional safety controls at participating sites, introducing more environmental controls such as providing onsite training to groups of miners on reclamation, equipment lending mechanisms to improve recovery methods and increase site productivity, and greater upskilling on financial numeracy so that miners are better equipped to manage their books and make sound long-term financial decisions. In addition, although it is still in its early stages and provided it was tailored to the local context and existing financing arrangements, the pilot shows great potential to be scaled across Africa and beyond because many of the challenges cross over to different ASM environments.

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END NOTES

1 In particular, the financing scheme uses a "participatory banking" or "Profit and Loss Sharing" (PLS) approach and follows a logic similar to established alternative financing approaches in the large-scale mining sector, such as offtake and metal-

streaming agreements. For a further theoretical background on the application of alternative financing approaches from large-scale mining to ASM see Perks (2016).

2 Which include gross human rights abuses, the worst forms of child labour, forced labour and human trafficking, direct or indirect support of non-state armed groups, violence and discrimination, sexual and gender-based violence, directly contributing to conflict, money laundering and terrorism financing, impeding traceability and otherwise bringing the industry into disrepute.

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MAKE PRODUCTION SUSTAINABLE AND ELIMINATE MERCURY

Target	SDG8 Make Production Sustainable and Eliminate Mercury Data Gaps	Indicator
 <p>8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead</p>	<p>Data on domestic material production and consumption to identify national and regional markets and needs</p>	<p>8.4.1 Material footprint, material footprint per capita, and material footprint per GDP</p> <p>8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP</p>

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OVERVIEW

Resource efficiency in production and consumption

Mining is the one-time use, non-renewable resource, and its impacts on the environment can be devastating. The term sustainable development—“development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UNGA 1987, 43)—is thus at first look often incongruous with mining activities, including ASM. However, as a largely poverty-driven sector, there are many ways in which ASM can act as a springboard for wealth creation, economic growth, and social inclusion in rural economies while at the same time minimizing its environmental impacts for current and future generations.

Using data to drive innovation in this area is essential to achieving this balance and meeting SDG target 8.4. Specifically, to ensure ASM operators are working as sustainably as possible with their resource inputs (for example water, wood, energy) and are equipped to meet high degrees of environmental stewardship, while at the same time policies are developed to foster downstream linkages to local industries and markets that can help maximize efficiencies in resource consumption.

Data on ASM resource consumption and pragmatic, affordable ways to improve sustainable production are therefore needed. For example, the installation of mini solar grids could be used to replace diesel generators used to power equipment, such as hammer drills, crushers, pumps for air and water, and lighting often found in more professionalized small-scale mining operations. Where ASM activities are in close proximity to permanent settlements, there is an added benefit of promoting more sustainable energy sources for communities' long term through surplus energy being sold back to communities and for the energy system to remain in place once mining activities have ceased. A research project by Ledwaba (2014) that models the potential for solar energy to replace diesel generators in small-scale mines of South Africa found that while photovoltaic (PV) systems remain expensive in terms of the net present cost (total cost of installation and operating the system over its lifespan), the rising cost of diesel fuel is beginning to make standalone or hybrid PV systems more affordable. More data can unlock financing mechanisms to cover initial capital costs for PV systems, understand the electric load needed for different types and intensities of ASM, and that consider the life of the mine are needed.

Other environmental production “costs” must also be considered to improve the efficiency of ASM consumption and production and decouple it from environmental degradation. In their life cycle assessment of artisanal sandstone mining in South Africa, Agwa-Ejon and Pradhan (2018) found that the two main energy sources were: (i) coal generated electricity to operate machines and cut blocks; and (ii) diesel fuel used by trucks to transport extracted stone blocks to the warehouse (Table 6). Meanwhile, the World Bank (2019) Forest-Smart Mining report

details a data driven analysis of the impact of ASM on forested areas through in-depth case studies across 13 countries. Combining desk and field-based research with satellite mapping, they find that “the location of ASM is driven by geology and the presence of mineralization and revealed no evidence of a tendency for ASM to actively target forest areas.” (World Bank 2019, 3). The data-driven findings from both studies therefore help to contextualize the negative environmental impacts of ASM better, change perceptions on the sector, and identify possible solutions. The authors point to areas that may not usually be considered when looking to enhance the sustainability of ASM, but that could have significant improvements, for example in transport where the introduction of renewable energy could have high positive impacts, and the need to take land-use based approaches that account for geology to better manage ASM activities in forested areas.

TABLE 6. Resource Consumption of Artisanal Sandstone Mining

Consumable	Amount used per 1 ton of processed sand-stone
Sandstone blocks	1.3 tons
Electricity	1.49 kWh
Water	12 liters
Diesel fuel (round trip)	4.32 liters

Source: Agwa-Ejon and Pradhan (2018)

Data is also key in illustrating the importance of ASM for the green energy transition away from fossil fuels to zero carbon technologies helping to enhance global resource efficiency in production and consumption. By using data to explicitly link the sector to global climate policies, such as the UN’s Paris Agreement to limit global warming to 1.5-2°C or below (UN 2015), the case for formalization and support programs that improve labor and environmental conditions at ASM sites can be made clear to policymakers. Lower carbon technologies, such as photovoltaics (PV), wind, and geothermal, are more mineral intensive than fossil fuel energy generation and will require an ever-increasing

variety and quantity of materials, some of which are near-exclusively currently mined by artisanal and small-scale miners. For example, a recent report from the World Bank (2020) estimates that annual demand for cobalt, an essential material in electric vehicle batteries, will increase a staggering 460 percent of 2018 production levels by the year 2050 requiring 644,000 tons each year.

However, while global demand may increase, the demand for cobalt from DRC that currently produces approximately 60 percent of the world's supply, of which 20-40 percent comes from ASM (Darton Commodities 2017) may drop. This is due to concerns over reliable supply, responsible sourcing, and so-called "African blood cobalt" (UKI 2019) as a result of the poor labor conditions found in ASM production in the DRC. As such, investors are looking to restart large-scale production in countries, such as the USA, that do not face the same governance, human rights, and labor issues, and also are funding research into next generation batteries that do not contain cobalt. With estimates on the number of people earning a direct livelihood in artisanal cobalt production in DRC ranging from 60,000-80,000 (Pact 2020) to 140,000-200,000 or more depending on seasonal, economic, and price fluctuations (BGR 2019; OECD 2019) there is a real need to address the labor issues to ensure productive and decent work for artisanal cobalt miners in DRC to protect their livelihoods and ensure that the DRC can benefit from its mineral resource endowment. Better data that makes these links clear to policymakers, encourages more investment and support to ASM as well as understand how the sector functions to design targeted interventions is therefore needed.

A final key data gap that needs to be addressed to enhance resource efficiency in ASM and decouple activities from environmental degradation concerns details on domestic material production and markets. These "development minerals" include minerals and materials such as sand, clay, and gravels that are "mined, processed, manufactured, and used domestically in industries such as construction, manufacturing, and agriculture" (Franks et al., 2016). An area of ASM and quarrying long neglected, the most recent data collection efforts came with

the launch of the African, Caribbean and Pacific Group of States, and European Union (ACP-EU) Development Minerals Programme in 2015, which is implemented in partnership with the United Nations Development Programme (UNDP). In Uganda, for example, a comprehensive baseline study funded by the program found that if "ASM Development Minerals, which amount to an estimated \$350 million USD per annum, were integrated within official statistics, the GDP would increase by 1.4% [sic]" (Hinton et al. 2018, 173).

Similarly, as Daniel Franks and coauthors report in their case study that follows, the program also funded a comprehensive baseline survey on development minerals in Fiji. Here, as the authors explain, the focus was on gravel, sand, and crushed aggregate. By mapping both regulated and unregulated sites, including details on production and environmental impacts, the study found that the value of the sector is up to seven times larger than previously reported. This data is now being used to better manage the sector and has led to a policy commitment to phase out river gravel extraction, which was found to be the most damaging ASM and quarrying activity, replacing it instead with a network of hard rock quarries.

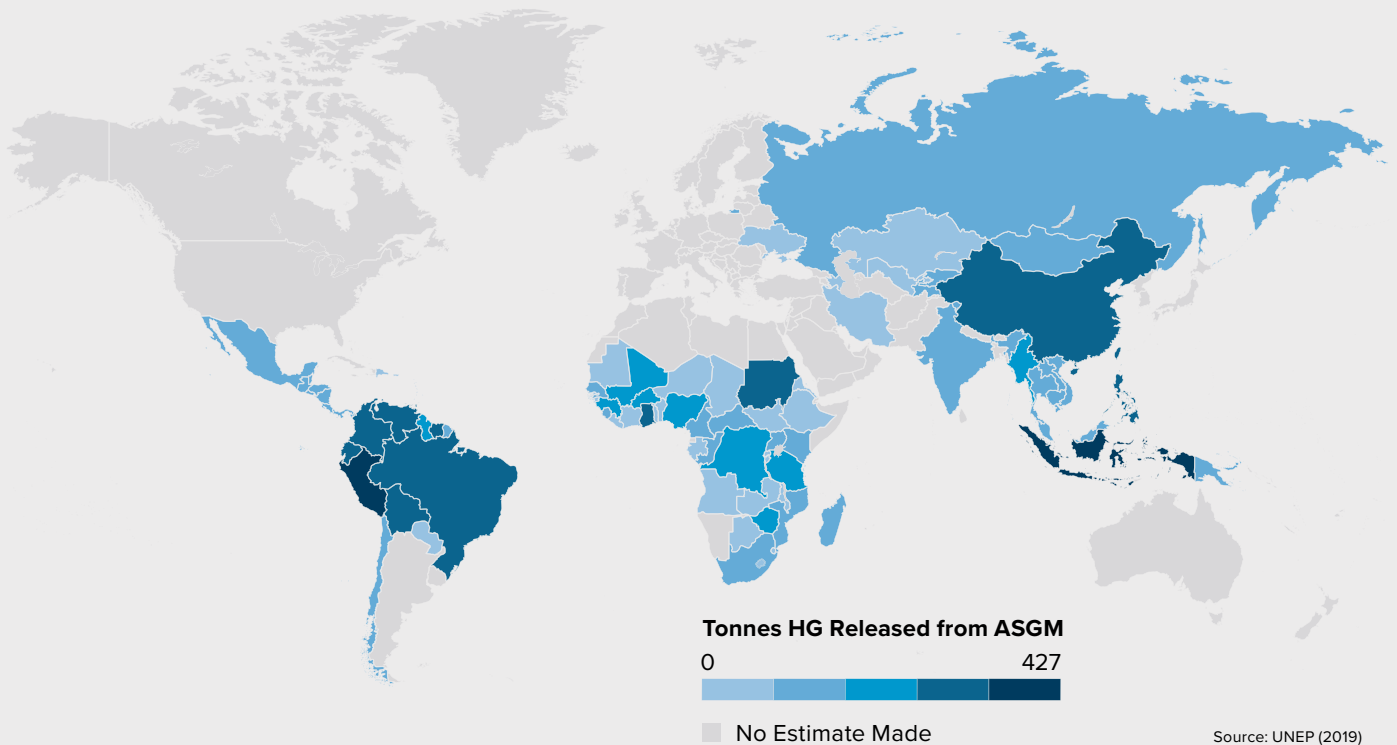
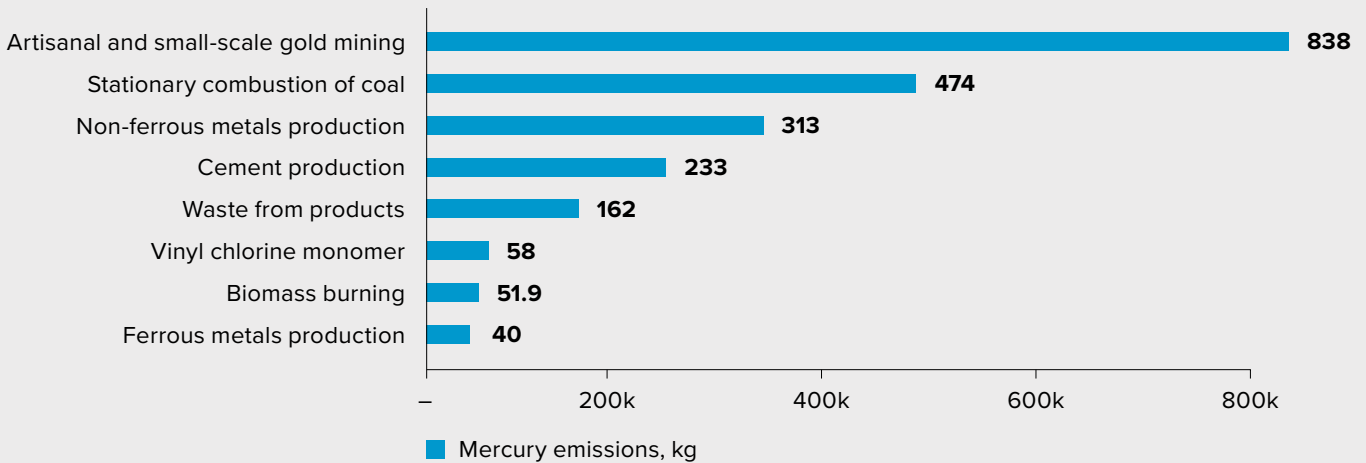
Promoting the use of development minerals, such as stone blocks to reduce the reliance on imported building materials including concrete that have very high environmental footprints in terms of transport and production, also has significant positive impacts on sustainable production and consumption. Much-needed local infrastructure, such as roads, affordable housing, and educational and health facilities, can all be built at a lower capital and environmental costs from locally sourced development minerals. By promoting linkages to downstream manufacturing and value addition activities, such as brick making, and stone cutting, crushing, and polishing needed to process these materials into building products, there is also the opportunity for further indirect job creation. Using data to demonstrate not only the economic importance of development minerals but also the potential to drive more sustainable production and consumption is therefore key to enhance investment and support in ASM and quarrying to improve working practices.

Eliminate mercury

When it comes to enhancing resource efficiencies and decoupling ASM production and consumption from environmental degradation, the issue of eliminating mercury from artisanal and small-scale gold mining (ASGM) would likely have one of the greatest positive impacts. The damaging impacts of mercury pollution from unsafe mercury use in ASGM has received perhaps the greatest amount of attention compared to other negative environmental impacts of ASM over the past

three decades from academics, policymakers, and practitioners alike. However, the data that has so far been generated focuses mainly on the ways in which mercury is used in operations and relatedly the health impacts of mercury directly to miners and surrounding communities through its unsafe handling and release into the natural environment (for example Mallas, and Benedicto 1986; Ikingura and Akagi 1996; Crispin 2003; Hinton et al. 2003; Hilson and Pardie 2006; Bose O'Reilly et al. 2008; Siegel and Veiga 2010; see Veiga and Fadina, 2020 for an in-depth review of the literature).

FIGURE 9. Global Mercury Use



Source: UNEP (2019)

ASGM is the world's largest source of mercury pollution (Figure 9), accounting for 37.7 percent of global emissions in the range of 675-1,000 tons (UNEP 2019). Miners use mercury to recover gold by mixing it with crushed ore, sediments, or concentrate while sluicing and panning at or around mines sites, and even near housing and water supplies in local communities. The resulting mercury-gold mixture, or amalgam, is heated, releasing mercury vapor into the air. This may then be breathed in when the amalgam is burned off with borax, usually out the back of small gold shops with limited ventilation, to smelt small gold bars. Significant amounts of mercury also remain in the tailings and are released into waterways or poorly managed impoundments. In some cases, mercury-containing tailings are reprocessed with cyanide. This practice can be environmentally disastrous, releasing highly soluble mercury-cyanide complexes which can lead to mercury travelling longer distances, increasing the probability of its transformation into methyl mercury and thereby entering the food chain and bioaccumulating. Not only is mercury a threat to ecosystems, but it also directly harms the health of miners and their communities.

The most recent data collection efforts to date have been through funding provided by the Global Environment Facility—a billion-dollar multi donor trust fund established in 1992 as part of the Rio Earth Summit to help address some of the world's greatest environmental problems (GEF 2020). As explained by Kenneth Davis, Malgorzata Stylo, and Ludovic Bernaudaut in their case study, the funding is in support of the Minamata Convention on Mercury which requires signatory countries with more than insignificant ASGM to develop and implement National Action Plans (NAP) to reduce, and where feasible eliminate, the use of mercury in the sector (UNEP 2017). The NAPs also serve as basis for wider ASGM formalization efforts supported by a “formalization handbook” (UNITAR and UNEP 2018). But in order to develop the NAP, there is a need for reliable data to establish baselines on ASGM mercury use across the country. Without reliable estimates of ASGM gold production, this, as the authors show, is no easy task made more challenging by the informality, seasonality, and dispersed nature of ASGM and processing activities. Nevertheless, the updated figures presented in the case study

on mercury use from the first six countries with completed NAPs show dramatic differences from previous estimates. This data can be used to direct policymakers, ultimately helping to reduce and, where possible, eventually eliminate mercury use in ASGM to the betterment of the environment and health for miners and their communities.

One such direction is through the introduction of good handling practices and technologies that reduce and eliminate mercury consumption for ASGM extraction and processing. For example, baseline data can show where and how most mercury is being used and therefore help policymakers target specific areas and types of ASM activities. However, baseline data tracking usage in ASGM is not enough on its own to eliminate mercury from ASGM. Additional data on mercury supply chains, accessible mercury-free technologies, and ways to best communicate risks and influence behavior change is needed. While there are some low-cost and low-tech solutions that have been developed over the years for ASGM operators to deploy themselves (Telmer and Stapper 2012), as outlined in a recent paper by Veiga and Fadina (2020, 1) “environmental and health monitoring, demonstration of cleaner techniques and formalization have not succeeded in eliminating mercury use” in the sector. The authors identify two main reasons why this may be the case.

First is that most environmental and health approaches, which aim to monitor levels of mercury in humans and the environment to call attention to the issues and encourage action, are unable to change behaviors of miner's long term. The information is not communicated in accessible and impactful ways, the health impacts of mercury poisoning are often cumulative building up over time so are often “invisible,” and with poverty as a main driver of ASM, many miners are more concerned with meeting their immediate needs for economic survival working in an already risky occupation rather than their long-term health. Government departments are also ill-equipped to be able to monitor, enforce, and undertake continuous education and sensitization programs so activities end once research and donor-funded projects finish. Second, technological solutions, such as the introduction of retorts and

mercury-free processing equipment like shaking tables that have not been designed with ASGM in mind, are often too expensive to purchase and keep running, inappropriate to the rough working environment and socio-cultural contexts (Yakuba 2003; Veiga 2004; Hilson 2007), and require skills to maximize production efficiencies and fix them when they break. To eliminate mercury from the sector, additional rich socio-economic data that reveals social drivers of mercury usage, supply chains, and behavior change in developing country contexts and specific communities is needed. Furthermore, there is need for greater collaboration between engineering and social science disciplines to tailor technological solutions to ASGM realities and ensure that where this data already exists it is being used to inform the design of technological solutions.

These issues are well illustrated in the two additional case studies accompanying this challenge overview. The first by Clive Mitchell, Tom Bide, and Cavince Odhiambo (2020) outlines how the British Geological Survey is collaborating with the University of Nairobi and the Migori County Artisanal Miners Co-operative (MICA) to promote ASGM good practice, reduce mercury use, and improve gold recovery using appropriate technology in Kenya. The case study highlights the technical challenges involved and high degree of expertise needed when trying to recover fine gold particles less than 100 microns using mercury-free gravity processing methods such as sluices. Having taken samples, the team of experts are developing practical tailored guidance culminating in a training workshop to provide advice on reducing mercury use and enhancing gold recoveries through easily implementable and affordable measures. The key to the success, and to avoid the earlier pitfalls described, is communication and working alongside local partners and directly with miners to build their skills and capacities, effect behavior change, and ensure the guidance is in local languages, prac-

tical, and accessible so that it may be distributed and used by others beyond the life of the project.

The second case study by Jashaf Lorenzo of the NGO Ban Toxics outlines their Compassionate Gold (CG) project working with ASGM communities to eliminate mercury in the Philippines. They have focused on a formalization model that also includes education and capacity building as well as innovating and unlocking new financial models for ASGM to be able to afford the upfront capital costs of mercury-free technology. Interestingly, the authors also raise the issue of mercury markets, which to date is one area that has received limited attention or engagement in the literature. The author notes how their initial research identified that some gold miners may be reluctant to switch from their existing gold buyers as they were also supplying mercury and feared they would lose access to gold markets and be unable to sell their gold. These dynamics have also been observed by researchers in Ghana (Hilson and Pardie 2006), again highlighting the importance of social data to inform the design of workable mercury-free ASGM interventions.

Clearly, while there is good data on mercury-free alternatives, and through the NAPs on mercury usage in ASGM countries, there are also significant data gaps that need to be addressed to eliminate mercury from ASGM and improve global resource efficiency decoupled from environmental degradation. These include data on existing buyer-miner relationships and new financing models, the production networks of mercury, affordable and practical measures to reduce and eliminate mercury use, and data that can develop improved knowledge and educational products that are easily accessible to miners and can affect long-term sustainable behavior change. Addressing these issues will ultimately also improve the health, safety, and labor conditions for ASM and communities making significant progress to achieving SDG8.

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CASE STUDY #1

© Daniel Franks and were taken in Fiji in 2016.

PHASING OUT RIVER GRAVEL EXTRACTION IN FIJI

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ORGANIZATION(S): *The University of Queensland, **United Nations Development Programme, ***The Pacific Community

INTRODUCTION

Sand, gravel, and crushed stone are the most commonly mined commodities in the world, and this is also true in Fiji. The mining and quarrying of construction materials in Fiji is overwhelmingly dominated by small-scale mining, 95 percent of which is majority Fiji owned. While construction materials are the foundation of a number of key economic sectors, the extraction of gravel from Fiji's perennial rivers has been a driver of environmental change, controversy, and conflict. A huge quantity of construction materials are required to build the infrastructure proposed in the Government of Fiji's "5 Year National Development Plan" (Republic of Fiji 2017). The pressures from existing extraction, combined with increased demands, present a significant sustainable development dilemma. But if better managed, small-scale mining and quarrying of construction materials could help achieve more efficient global resource production and consumption as well as assist efforts to decouple economic growth from environmental degradation (SDG Target 8.4).

Uncovering a neglected sector

To address this challenge, the African, Caribbean and Pacific Group of States, the European Union, and the United Nations Development Programme partnered with the Pacific Community and Fiji's Minerals Resources Department to undertake the first comprehensive assessment of Development Minerals in Fiji. The assessment in Fiji predominantly focused on gravel, sand, and crushed aggregate, used for construction materials, and to a lesser extent limestone, used for agriculture (Smith et al. 2018).

The study compiled the most comprehensive database of regulated and unregulated extraction sites in Fiji to date, identifying 86 regulated extraction sites; of which 76 percent are located in Fiji's rivers. The database was then complemented by a comprehensive field survey of extraction and beneficiation sites. The survey inspected a total of 104 sites: 46 regulated extraction sites (44 percent), 40 regulated beneficiation sites (39 percent), and 18 unregulated extraction sites (17 percent). During the study, 30 unregulated extraction sites were identified, of which 18 were inspected. Several stockpiles of coral sand were also observed, indicating the presence of unregulated small-scale beach mining.

In 2017, the total estimated Development Mineral production from regulated sites was 3,584,400 m³, approximately 8 times higher than the total reported official production of hard rock quarry, soft rock quarry, and river gravel extraction in Fiji. The study also revealed that the value of the sector is up to seven times larger than previously reported. The corresponding Gross Output estimate for 2017 is between FJ\$190.3M and FJ\$369.1M, which is substantially higher than the official Fiji Bureau of Statistics Gross Output record of FJ\$53.0M. Additionally, government records indicate average royalty payments of FJ\$1.9M per annum in recent years, this is 81 percent lower than the anticipated annual royalty estimate of FJ\$10.2M (based on the 2017 production estimate). It appears, therefore that significant gaps exist in the accounting of the sector and the potential revenues for the Fiji Government and Fijian communities. Collecting this data in Fiji and elsewhere is therefore essential to enhancing understanding of the significant economic contribu-

tion and potential of ASM and quarrying with which to develop appropriate policy responses.

What is the impact of river gravel extraction in Fiji?

The study identified significant and acute negative social and environmental impacts associated with river gravel extraction of Fiji's perennial rivers. Fijian communities depend on rivers for services including drinking water, food, washing, transportation, tourism, and agricultural irrigation. Inspections of 48 extraction sites and interviews with over 100 community members conducted as part of the study demonstrated that river gravel extraction in Fiji is inhibiting the critical function of a number of important river systems.

What alternative sources of construction material are available?

The environmental impact of hard rock quarries in Fiji were found to be moderate, with greater potential for effective rehabilitation than river extraction. Examples of rehabilitation of hard rock quarries in Fiji include Vuda Marina and the Colo-i-Suva Rainforest Eco-resort. The study also found that hard rock quarries have the potential to produce more consistent, high quality material, with the potential to improve the quality of construction and the durability of roads in Fiji.

During the course of the study and in response to the findings, Fiji's Minister for Lands and Mineral Resources committed to phase out river gravel extraction and to transition to a network of hard rock quarries, requesting the support of development partners to achieve this bold transition. The Fiji Roads Authority has also announced that it will no longer purchase river gravel for new road construction contracts. Sand extracted from major rivers on the main Island of Viti Levu remains a significant source of construction material.

The transition to a network of hard rock quarries will require major changes to the policy and business

operating environment. Initiatives are needed to improve access to finance (perhaps through the Fiji Development Bank), review royalty and licensing application fees (which currently favor gravel extraction), undertake business process mapping on licensing procedures, create templates for partnerships with iTaukei landowners, and promote domestic investment through a collaboration between the Mineral Resources Department and Investment Fiji. A “Land-use Master Plan” is also needed and should

incorporate assessments of geological reserves of quarried materials. In the absence of such a plan, conflicts are being generated over the impact of river gravel extraction on the supply of potable water; the safety of tourism enterprises utilizing rivers; damage to infrastructure located near rivers (for example bridges); subsistence functions of rural communities living adjacent to rivers; as well as the encroachment of urban infrastructure on established hard rock quarry sites and quarry reserves.

ACKNOWLEDGEMENTS

This case study is adapted from the Baseline Assessment of Development Minerals in Fiji (Smith et al., 2018) published by the ACP-EU Development Minerals Programme.

The ACP-EU Development Minerals Programme is a capacity building program that supports knowledge exchange across Africa, the Caribbean, and Pacific to improve the profile, and the management, of Development Minerals. The program is an initiative of African, Caribbean, Pacific (ACP) Group of States, coordinated by the ACP Secretariat, financed by the European Commission and United Nations

Development Programme (UNDP) and implemented by UNDP. In Phase I of the program (EUR13.1 million), more than 20,000 people have participated in capacity building activities on: mine and quarry management; environment; health and safety; human and labor rights; entrepreneurial skills; market analysis and investment promotion; geological data; and community relations and conflict prevention. Phase II of the program (2019-2021) will build on the above to: strengthen the business enabling environment; accelerate entrepreneurship; improve access to finance and markets; and promote responsible mining and quarrying. Forty-one countries participated

in Phase I, with six focus countries implementing in-depth capacity building activities (Zambia, Southern Africa; Uganda, East Africa; Guinea, West Africa; Cameroon, Central Africa; Jamaica, Caribbean; and Fiji, Pacific).

More details are available at: <http://developmentminerals.org/>

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CASE STUDY #2

IMPROVING NATIONAL ESTIMATES OF MERCURY USE IN ASGM

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ORGANIZATION(S): *United Nations Environment Programme

INTRODUCTION

Artisanal and small-scale gold mining (ASGM) is increasingly recognized as an opportunity to alleviate poverty, provide rural employment where little alternative exists, and contribute to local, national, and regional development. Nevertheless, mercury use in ASGM operations poses a threat to human health and the environment. Despite the impacts of mercury, data on its use and releases in ASGM as well estimates on the number of miners engaged is scarce in many parts of the world. ASGM is often informal, operates in remote areas, and can be seasonal or temporary, contributing to the high uncertainties in estimating mercury use. Mercury use estimates are critical to targeting assistance to miners and form a baseline against which the progress in mercury reduction can be measured. The UNEP Global Mercury Assessment 2018 (UNEP 2019a) includes estimates of mercury use in ASGM by country (Figure 9). However, for many countries data is scarce, old, or simply lacking, meaning that margins of error are high.

The Minamata Convention on Mercury, a global legally-binding treaty ratified by 123 countries¹ that entered into force in 2017, requires parties with more than insignificant ASGM to develop and implement National Action Plans (NAP) to reduce, and where feasible eliminate, the use of mercury in the sector (UNEP 2017). Out of the approximately 70 countries worldwide with ASGM activity, 41 have begun developing their NAP with funding from the Global Environment Facility (Figure 10).

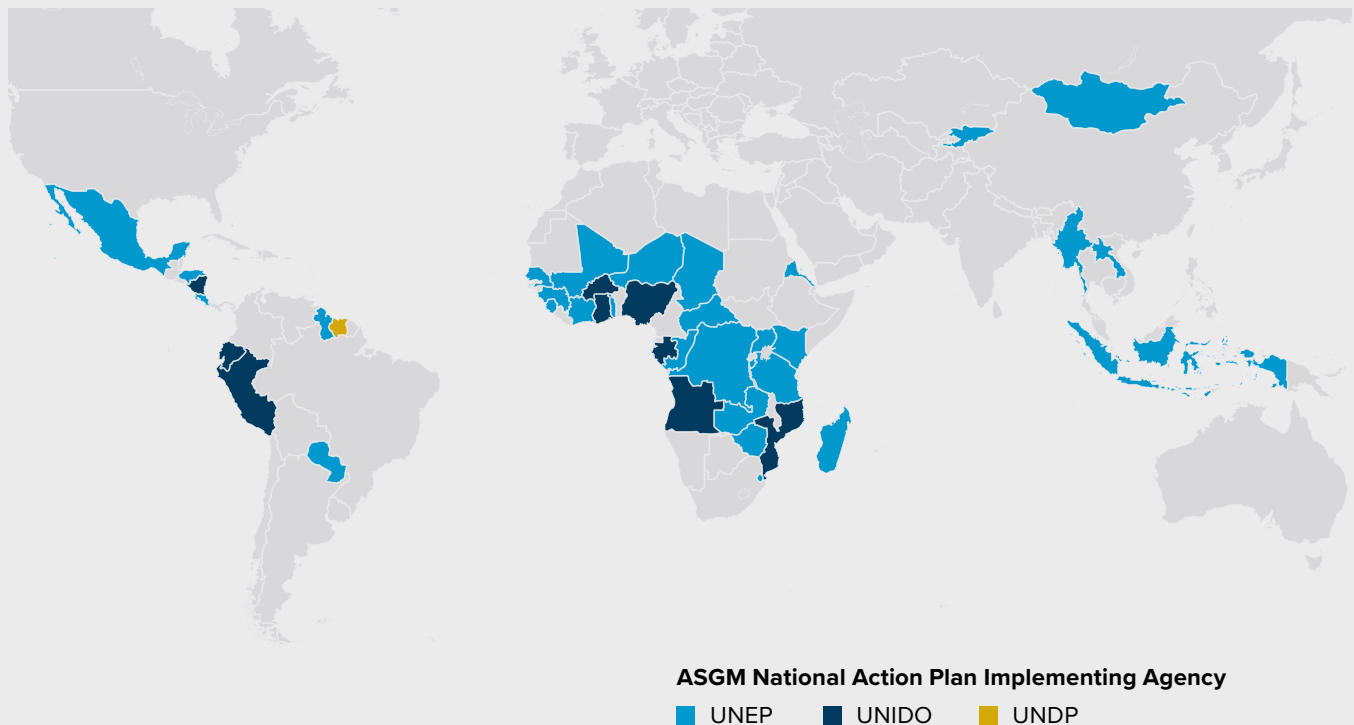
Recalibrating national mercury-use estimates

Before setting national strategies to reduce or eliminate mercury as part of their NAP, countries must understand, among other socio-economic and environmental factors, and the extent of mercury use by the sector. Desk and field studies are undertaken as part of the NAP to gather up-to-date local information on ASGM practices to estimate mercury

use. UNEP, in collaboration with partners, has created a series of tools and methodologies (O’Neill and Telmer 2017) for characterizing mercury use by the sector, including data collection, management, and analysis.

The data emerging from the NAP projects will allow for the recalibration of national estimates. For example, in most countries the data gathered by the first six NAP projects to be submitted to the Minamata Convention Secretariat (UNEP 2020) indicates a significant increase in the estimated amount of mercury use in contrast to previous estimates (AMAP and UNEP 2018). In Madagascar and Burundi, estimates increased by over tenfold (Table 7). The reported increase in mercury use in the ASGM sector does not necessarily mean that actual mercury use by miners increased by the same amount. Rather, the increase reflects, in part, the availability of better information collected through the nationwide field study undertaken by the NAP projects.

FIGURE 10. **Global Spread of Countries Developing NAPs and Implementing Agency**



Source: Data from UNEP, UNIDO and UNDP created for case study.

TABLE 7. **ASGM Mercury Use Estimates Before and After National Action Plans**

Country	Previous estimates (AMAP and UNEP 2019)		Country National Action Plan (UNEP 2020)	
	Reported range of mercury use in ASGM (ton per year)	Year	Reported mercury use in ASGM (ton per year)	Year
Burkina Faso	17.6-52.7	2011	77.6	2018
Burundi	0.1-0.5	2010	2	2018
Madagascar	0.4-2.6	2003	18.4-43.8	2018
Mali	5-20	2016	33	2019
Mongolia	5.8-17.3	2007	0.2	2018
Senegal	2.1-3.9	2015	5.2	2018

Sources: Ministère de L'Environnement, de l'Economie verte et du Changement climatique (2020, 22); MINAGRIE (2019); MEEF (2018); DNACPN (2019). MEADD (2020), Ministry of Environment and Tourism (2020).

Challenges with collecting reliable data on mercury use

Countries developing NAPs reported multiple challenges associated with the collection of reliable data (UNEP 2019b). Time and budgetary constraints that limit the possibility to visit all ASGM sites as well as the amount of time that could be spent in each locality is one key challenge. This can be compounded by further operational challenges, such as the decentralization of ASGM operations meaning ore extraction, processing, and mineral trade often take place in different locations requiring more time to visit all parts of the operation, seasonality meaning that the number of miners per locality is variable day-to-day and can also change, challenges with access to ASGM sites due to weather conditions and remoteness, and physical measurements of mercury use which can be difficult due to the long ore processing time.

Additional social challenges include the informality of the ASGM in contrast to the formality of the NAP field researchers, which may cause suspicion and distrust. Many miners and traders are reluctant to share information on mercury use and gold production, as they are suspicious of government intentions. Accessing ASGM sites can also be challenging due to illegal or criminal activity, such as in conflict or protected areas, or foreign-owned and operated sites.

Engaging directly with ASM through NAPs

To address these challenges, many countries have engaged miners, traditional authorities, and local informants from ASGM communities from the outset to build trust and obtain reliable information about the sector. Better coordination with academia and civil society, such as to further investigate the extent of mercury contamination or the mercury supply chain, was also highlighted as key to ensuring good quality data. The validation of the data collected and the use of this information by the key stakeholders at the national level is also an important part of the NAP process. Information sharing on the methodology used for data collection, estimation, and extrapolation is essential to ensure data accuracy and comparability.

For some stakeholders the NAP project is the first opportunity to visit ASGM sites and learn first-hand about the mining practices used. For others, it is an opportunity to recalibrate their approach, overcome previously encountered challenges, and deepen understanding of the sector. This new information will allow for more precise estimates and stronger baselines against which mercury reduction can be monitored.

END NOTES

1 As of 11th August 2020.

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CASE STUDY #3

RECOVERING LOST GOLD WITH IMPROVED EFFICIENCY, PRODUCTIVITY, AND ENVIRONMENTAL IMPACTS IN KENYA

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ORGANIZATION(S): *British Geological Survey; **University of Nairobi

Artisanal gold mining in Migori, Kenya

Artisanal and small-scale gold mining (ASGM) is a subsistence level livelihood for many rural communities across the world. In Kenya, it provides work for an estimated 40,000 people and produces 5 metric tons of gold per year (Barreto et al. 2018). The impact of ASGM is double-edged with the economic benefits offset by damage to the environment and the health of mining communities, particularly due to the widespread use of mercury to recover gold. As a signatory to the Minamata Convention on Mercury (UNEP 2017), Kenya has agreed to eliminate the use of mercury, formalize the ASGM sector, introduce good practice, and protect the health of mining communities.

Migori County is a major ASGM center in south-west Kenya where gold is produced from quartz–carbonate reefs in metamorphosed mudstones and volcanic rocks of the Precambrian Migori greenstone belt (Government of Kenya MoM 2016). Deep unstable mine shafts propped up with wood, the use of explosives in cramped tunnels, poor ventilation, and inadequate mine dewatering make the gold mines a grim and dangerous place to work. Ore is hauled out manually, crushed using hammers, and milled in Tanzanian-designed ball mills. These mills are deafeningly noisy and are the hallmark of ASGM in Kenya. The milled ore is processed using poorly built sluice boxes and the concentrates panned with mercury. Typically, the processing is done by women to sort the good ore from bad when it comes out of the mine and sluicing and panning to concentrate the gold from the ore. The gold-mercury amalgam is heated to drive off the mercury, and a small ball of “sponge gold” is the final product. Residual gold in the tailings is recovered by cyanidation. The local ASGM communities as represented by the Migori County Artisanal Miners Co-operative (MICA) are primarily concerned about the safety of the mining, the environmental impact of mercury, and poor gold recovery.

Making production sustainable through UK-Kenya research collaboration

In response to these concerns, the British Geological Survey (BGS) initiated a two-year collaboration in August 2019 with the University of Nairobi and MICA to promote ASGM good practice, reduce mercury use, and improve gold recovery using appropriate technology. During a field visit in November 2019, samples of gold ore, crushed and milled ore, concentrates, and tailings were collected from ASGM operations. On average hard rock gold is finer than 100 microns. This makes the use of a sluice box inefficient with expected recoveries as low as 20 percent for gold of 100 microns or finer (Mitchell et al. 1997). A key characteristic of the ore is the particle size distribution of the gold—the amount of gold particles in the rock according to their size. Understanding the particle size then

enables the liberation size at which the gold will be free of the ore to be determined. Initial size analysis of the milled material has shown that the gold is very fine grained. A significant proportion of the gold is smaller than ten microns in size. At this size simple gravity processing methods such as sluice boxes are very inefficient and only recover a small amount of the gold present in the milled ore.

This ongoing work will develop good practice guidance for ASGM that will be co-designed with MICA and experienced Zimbabwean Mining Engineer Terry Garde¹ that aims to align with the Kenyan Minamata Convention on Mercury National Action Plan. Direct engagement with the ASGM community will be facilitated by MICA and the University of Nairobi. This will culminate in a workshop to bring together ASGM miners; MICA and other ASGM related co-operatives (including MICRODEPRO and MICMA); Migori County and national government departments; the Migori County Geologist; and researchers from the University of Nairobi and BGS.

Workshop recommendations will inform the guidance and its dissemination. The guidance will include advice on the use of retorts to reduce mercury consumption; and the use of longer sluice channels (at least 3 meters), appropriate sluice box gradients, consistent sluice box feed supply, alternatives to manual crushing, modification to the milling, and alternative processing methods to improve gold recovery. Adopting improved ASGM practice will increase the recovery of fine-grained gold, reduce the amount of mercury consumed, and may even lead to a reduction in the use of cyanidation to recover the gold lost into the tailings. This aligns with multiple targets of SDG8 (8.2, 8.4, 8.5) to promote sustainable economic growth with appropriately upgraded technology leading to improved resource extraction efficiency, reduced environmental impact, and increased ASGM productivity

This research is part of the project “From source to sink: Quantifying the local and downstream environmental impacts of ASGM” and is funded by the UK Government Official Development Assistance (ODA) research program of the BGS.

END NOTES

1 In April 2020 Terry Garde completed a PhD on ASGM in Migori County.

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COMPASSIONATE GOLD: A MULTI-STAKEHOLDER APPROACH TO FORMALIZATION AND MERCURY-FREE PRODUCTION

AUTHOR: Jashaf Lorenzo

ORGANIZATION(S): BAN Toxics Inc.

ASGM in the Philippines

The Philippines is considered one of the world's most mineral-rich countries, with significant deposits of gold, nickel, copper, and chromite (Chaves 2012). Mining for gold, especially, is a lucrative venture—gold reserves in the country are projected to be worth around US\$150 billion (PHP7.36 trillion) (Jennings 2015).

An estimated 500,000 individuals and their families, including 18,000 women and children are directly employed in artisanal and small-scale gold mining (ASGM) communities in the Philippines (Mayuga 2017; Pasion 2017). Among these small-scale miners, roughly 75 percent are engaged in subsistence mining (Escudero, 2015), for example miners whose daily income is barely enough for the day's needs. Overall, ASGM in the Philippines is believed to support the livelihoods of around 2.3 million people (Planet Gold 2020).

The informal status of the ASGM sector has paved the way for a supply chain that relies heavily on illegal and informal networks. The sector drives a strong black market for mercury (Staples and Rumore 2013), and most of the gold produced is smuggled and sold illegally across the globe. Estimates suggest that as much as 95 percent of the gold produced in the Philippines is smuggled out of the country (Black 2012). The proliferation of these illegal networks as well as their control over the sector has made it difficult for small-scale miners to work in safer environments and sell their gold for fair market values (McGrew 2016).

Understanding the production and market of ASGM to eliminate mercury

BAN Toxics—a Philippines-based non-government environmental organization established in 2006—initially began working with ASGM communities to focus on reducing mercury emissions and use in the sector. However, it was difficult for miners to stop using mercury due to several factors associated with poverty and informality.

For one, miners are unable to access alternative technologies due to the lack of purchasing power. A study conducted by BAN Toxics in 2018 (Lorenzo, Macabuhay, and Ferrer 2018) revealed that 7 out of 10 miners in two of the biggest mining hotspots in the country (Camarines Norte and T'boli in South Cotabato, respectively) earned a daily average of just US\$3.74 (PHP200) to US\$5.59 (PHP299).¹ These are lower than the minimum wage rates of US\$6.21 (PHP310) in Camarines Norte and US\$6.31 (P315) in T'boli. To put this into context, mercury-free processing equipment equivalent to their needs was found to cost approximately US\$6,000 (PHP300,000) at the time of the study.

Additionally, the lack of financial and legislative support provided by governments leaves miners with limited options. Miners remain largely unrecognized by the state and as such lack access to basic social services and have little protection from crimes such as extortion and theft. As miners

remain subsistent and dependent on daily production for their needs, mercury (which allows them to process gold daily) is the only real choice.

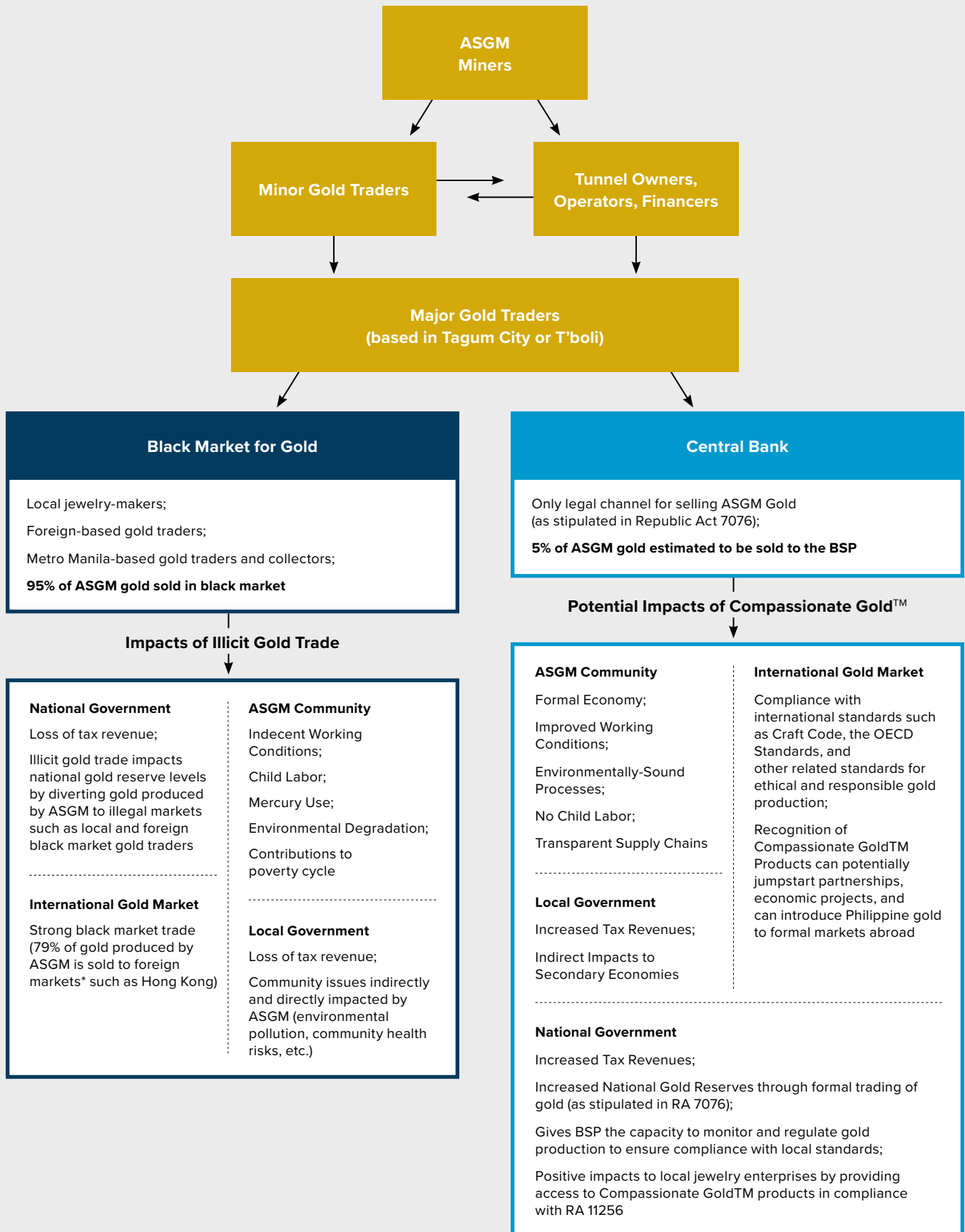
In the rare case that a miner can afford to produce gold without using mercury, industry and market structures may also serve as obstacles. The black market for gold in the Philippines is closely linked with mercury trade, with most gold traders selling mercury to miners to augment their incomes (Lorenzo, 2019). With the majority of gold being sold to the black market, miners who may choose to stop buying mercury may lose their primary gold trading market. Data from the United Nations reveal that illegal gold trading in the Philippines from 2005 to 2015 amounted to losses of as much as US\$2.5 billion for miners and the government alike (Tiglao 2017).

The continued use of mercury in ASGM is therefore aggravated by several interlinked factors. Most importantly, it is tied to informality and the illicit trade of gold (Figure 11). As such, formalization efforts should not focus merely on ensuring that gold production provides decent work but also that miners can access formal gold trading markets and fairer commodity prices. Long-term, this will help ensure productive employment as well as providing more accessible economic services for miners helping to achieve various targets of SDG8.

Compassionate Gold Project: a multi-stakeholder approach to formalizing ASGM

To address these issues, BAN Toxics launched the Compassionate Gold (CG) Project in November 2018 to contribute towards formalizing the sector and advocate for strengthened linkages between ASGM communities and legally-accredited gold buying institutions by incentivizing responsible gold production (Compassionate Gold 2020). The CG Project follows on from the earlier CARING Gold Mining Project funded by the US Department of Labor and implemented by Ban Toxics and the International Labour Organization (ILO) to address child labor, exploitation, and working conditions in ASGM communities in the Philippines.

FIGURE 11. Philippines ASGM Supply Chain and Impacts



CG includes a branding, monitoring, and standard-setting mechanism that is applied to gold produced under ethical and environmentally responsible processes. For gold to be certified by CG as produced under ethical conditions, gold-producing communities must meet nine key requirements of the Compassionate Gold Standard. These are: part of the formal economy, legally operated, no child labor, does not use mercury, no gender inequality, transparent supply chains, does not contribute to armed conflict, promotes decent working conditions, and has environmentally sound practices.

The development of these requirements was guided by three main considerations: (i) existing international and local standards for the ethical production of gold;² (ii) key issues in ASGM communities as documented in BAN Toxics' research; and (iii) the immediate community needs and opportunities present in ASGM. Using a multi-stakeholder approach, a self-monitoring system is implemented by mining groups based on these requirements, while external monitoring and regulation is conducted by local government and civil society partners. This is to empower mining groups to manage and implement changes while also ensuring that ASGM operations adhere to national standards for formalization and environmentally-sound production.

Progress to date

Compassionate Gold is in the early stages of implementation but has had numerous successes. The branding and certification mechanism is gradually being implemented in partner communities, and a multi-stakeholder monitoring and evaluation team

was established in T'boli South, Cotabato (one of the country's biggest producers of gold) with support from BAN Toxics.

As part of the accompanying advocacy work, BAN Toxics has also been educating mining communities and government stakeholders about the benefits of formalization and the dangers of mercury use. An exchange program named the South-to-South Exchange was undertaken in late 2018. This involved flying mining stakeholders from the Philippines to Indonesia to engage in meaningful discussions and learning activities regarding formalization and alternative mercury-free technologies.

An initial line of responsible CG jewelry was also launched in 2018 in partnership with mining communities, local government, and the Philippine Fashion Week. CG jewelry and CG-related products are expected to hit the market in the next two years.

Conclusion

Formalization and projects such as the CG are an important first step towards bridging the gap between ASGM and legally accredited gold traders and financial institutions. This allows miners to benefit economically by selling gold at fair prices while contributing to local and national development through increased tax revenues and gold reserves.³ Proper monitoring of data trends, such as income and production levels and accessibility of formal services, will be helpful towards ensuring that shifting to producing CG is contributing towards solving key socio-economic issues.

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END NOTES

- 1 Conversion rates calculated for 4th September 2018 the report completion date using OANDA: <https://www1.oanda.com/currency/converter/>
- 2 These standards include the OECD Due Diligence for Responsible Supply Chains guidelines (OECD, 2016), the World Fair Trade Organization Fair Trade Standard (WFTO, 2017), and the CRAFT Code (CRAFT, 2018).
- 3 Philippine law states that gold produced by ASGM may only be

sold to the Central Bank of the Philippines.

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ENSURE GENDER EQUALITY

Target	SDG8 Ensure Gender Equity and Equality Data Gaps	Indicator
 <p>8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value</p>	<p>Understand employment opportunities in ASM and barriers to equitable and equal access, labor conditions, and pay for all</p>	<p>8.5.1 Average earnings of employees, by sex, age, occupation and persons with disabilities</p> <p>8.5.2 Unemployment rate, by sex, age and persons with disabilities</p>
 <p>8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all</p>	<p>Data on access to finance, ability to pay, types of financing needs and to sensitize financial institutions on sector and gender specific dynamics</p>	<p>8.10.1 (a) Number of commercial bank branches per 100,000 adults and (b) number of automated teller machines (ATMs) per 100,000 adults</p> <p>8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money-service provider</p>

AUTHOR: Rachel Perks
ORGANIZATION(S): World Bank

OVERVIEW

The visibility crisis

Hinton (2011) first used the term “visibility crisis” to describe the general lack of knowledge on the ASM sector. It is true that despite enormous strides made in filling some of the sector’s most basic information gaps, data remains elusive in many realms, not least concerning gender¹ and by consequence, gender equality² in the sector (World Bank 2019).

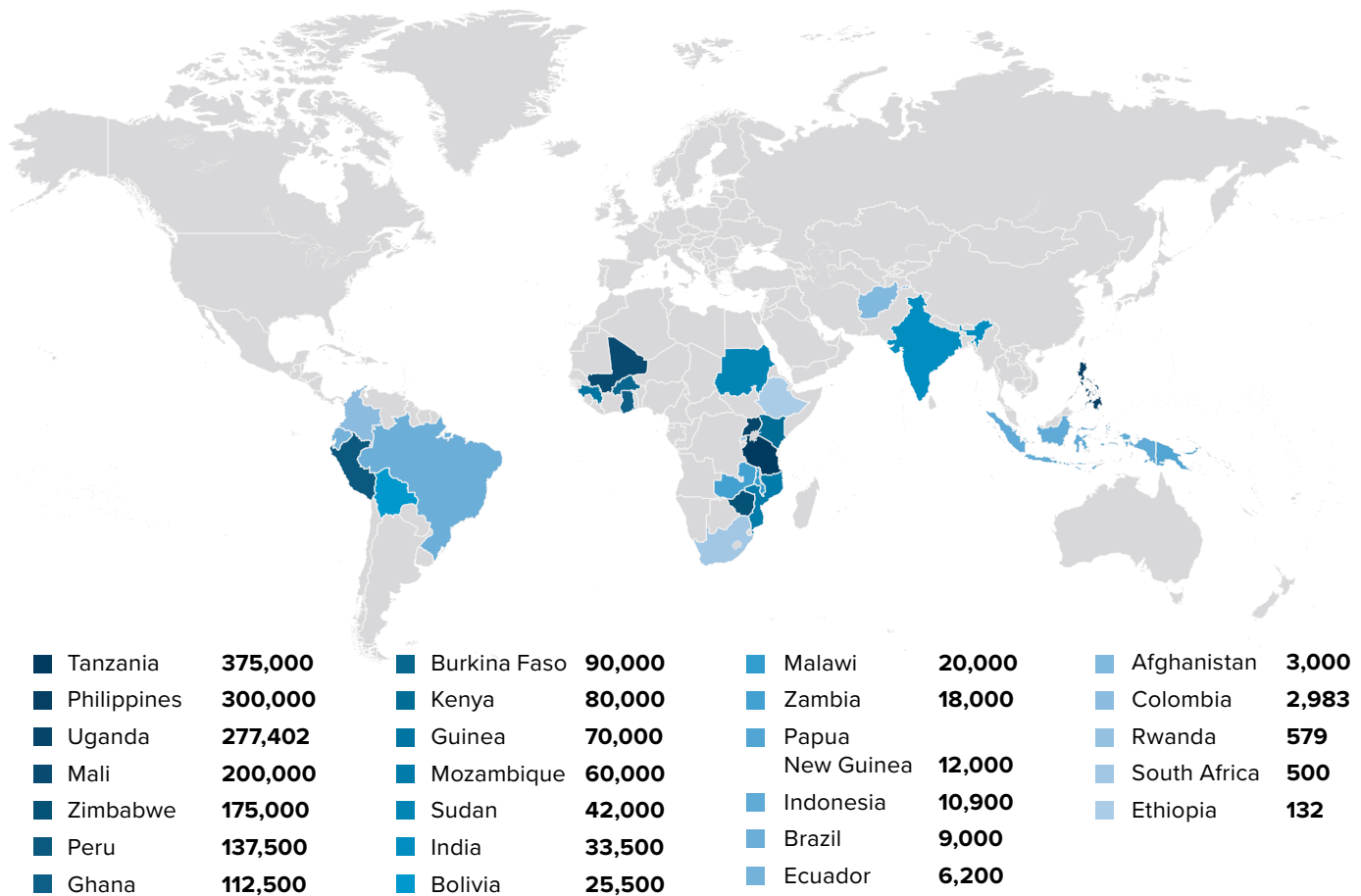
As Perks and Schulz (2020, 382) recently noted: “When it comes to the extractive industries, statistics on a variety of challenges facing men and women are not universally available, reliable or comparable.” Going further to discuss ASM and gender, the authors observe that, “Much of the data available on women’s participation in ASM... is approaching 20 years old” (Perks and Schulz 2020, 383).

Quite simply, women are not being counted. A recent attempt by Delve to recalibrate past data points puts current female participation rate in ASM at 18 percent,³ almost half of the 40 percent figure frequently quoted in the literature (Figure 12). The discrepancy signals not so much a reduction in real terms of female participation. Rather it suggests several unresolved issues in how to collect and account for female labor in ASM. Indeed, methodological challenges abound: wide variations in

female participation statistics based on the mineral mined; classifications on the type of employment performed; and disagreement on whether certain types of tasks found in a mineral value chain are indeed “mining” (that is pounding rock, washing material, or carrying sacks of ore). In essence, why women are, or are not, accounted for in ASM statistics rests on a fundamental question: who is a miner? Only the men who enter mine shafts and extract? Or also the women who process the material downstream? Who makes these determinations in data collection initiatives matters.

This chapter maps the discussion on gender equality in ASM to targets 8.5 and 8.10 and accompanying indicators outlined in the SDG8 graphic. With reference to ASM, these are best expressed as: 1) the means by which one gains entry into a mine; 2) the ability one has to freely exercise their

FIGURE 12. **Map Showing Number of Women in ASM for Each Country for Which There is a Data Point in Delve**



Data is presented for illustrative purposes only. Not to be used as accurate figures for the number of women in ASM in each country.

Multiple sources, see: www.delvedatabase.org/gender

labor at site and the price one can extract for that labor; and 3) the extent to which one can own a mine site, operation, or equipment, and hence by extension, possess bank accounts and access financing. In each instance, reducing the gender gaps of these targets would significantly improve individual, household, and community development outcomes ranging from income earned to improved health and well-being to ownership of assets.

As with other productive sectors, however, policies and practices to narrow gender labor gaps in ASM rely on individuals and groups for implementation. Therefore, improving gender equality requires understanding the social context in which efforts to meet SDG8 targets are introduced. Here, social norms, institutions, and networks greatly influence male and female's participation in ASM. Indeed, the structure of ASM labor networks determine how entry to sites is gained and by whom. In other words, who is "guarding the gates" of mine sites matters, as does their views on gender. It turns out then that power over decision-making can be a more critical factor than biology in determining roles carried out men and women in ASM. This statement holds true downstream along specific minerals' global value chains.

Hence in conceptualizing the discussion on gender equality in ASM in this present chapter, attention is paid to the processes and institutions which facilitate male and female labor participation in mining. A subset of gender equality issues then arise once in the mine relating to the roles assigned, the pay received, the health and safety risks faced, and the opportunities, if at all, for advancement up the value chain. Danielesen and Hinton (2020, 21) conceptualize well the inter-related areas leading to the determination of gender equality outcomes in ASM with their "gender relations" framework, which hinges on four areas of inquiry: 1) gender division of labor; 2) gender norms; 3) access to and control over resources and benefits; and 4) decision making.

Many of the most pressing research fields relating to gender in ASM have to do with these four subjects. Growing scholarship on gender in ASM illustrates quite practically how gender inequality plays out daily in mining areas, and the role played by

social norms and attitudes in discriminating against women's productive and equal employment. In related studies in the Great Lakes Region of Central Africa, Danielesen and Hinton (2020) and Buss et al. (2019) show how social views held (by men) on female labor forces women towards "peripheral" positions in the mine sites; positions which do not receive as high remuneration as those typically afforded to men. Werthmann (2009, 19) concluded that determination of the jobs along the artisanal gold value-chain in Burkina Faso "followed that of gendered patterns typical of wider society" with women and girls performing menial functions and by consequence receiving lesser pay. Lawson and Lahiri-Dutt (2020) and Reichel (2020) echo these findings from qualitative field work with female gemstone miners in Madagascar and female gold miners in the DRC, respectively. Rutherford (2020) explores the influence of the "conjugal contract" in the gold mines of Sierra Leone.

Beyond gendered roles determined by men for women, tragically, more violent forms of discrimination against women's employment in ASM do exist. In the 2014 study of select mining towns of eastern Democratic Republic of the Congo (DRC), the World Bank and Harvard University researchers show how female labor access in mine sites is intimately linked to sexual and gender-based violence (SGBV) (Perks, et al. 2015). The mixed-methods research conducted by these two institutions, with 1,100 respondents, demonstrate how power, biology, and violence combine to act as an explicit entry barrier for women in ASM. 30 percent of female respondents reported bartering sex for access to jobs in the mines, as compared to 0 percent for male respondents. Through this mixed methods research, we begin to appreciate how a laudable goal—such as achieving productive employment for both sexes—requires considerable attention paid beyond policy and legislation. Rather, and perhaps even more critically, attaining SDG8 will require rewiring the very norms and attitudes which selectively assign the types and value of women's labor. Inherent to this process is discrimination, that in its most extreme and physically violent form, violates women's basic human right to live free from harm. In the words of Danielesen and Hinton (2020, 30):

“Deeper understanding of the linkages among all four dimensions of gender relations [(i) gender division of labor; (ii) gender norms; (iii) access to and control over resources and benefits; and (iv) decision making] provides insight into how SGBV and other mechanisms are used to produce gender outcomes in an ASM context.”

Notwithstanding the immense challenges women face in equalizing opportunities in the field of artisanal mining, the benefits of work outweigh in most instances the alternatives: abusive relationships, income-less widowhood, a pre-determined marital fate by family; or economic enslavement. Mining towns can be refuges, as Werthmann (2009) concluded in the case of Burkina Faso artisanal gold mining, where women can recreate their identities and histories. If one accepts that the benefits of women’s participation in ASM outweigh the costs, then the question becomes: how to achieve equality? The following case studies provide us with some glimpse.

Voice and agency⁴ can go a long way in improving gender equality outcomes in ASM. In the case of ASM (and mining more generally), structures representing women’s interests—whether of a national or sub-national level—have proven an important vehicle for enhancing voice and agency, though they are by no means the only vehicle serving as mouthpieces for advocacy. In addition, they typically act as first-responders to treat problems facing individual female miners in mine sites. Lastly, they catalyze development progress by organizing training, education, and financial services for marginalized mining women (Reichel 2020; Hayes and Van Wauwe 2009; Danielesen and Hinton 2020; Werthmann 2009). Examples abound of female solidarity in the mines in a variety of shapes and sizes. In this chapter, two voice and agency structures seeking to improve gender equality outcomes for female gemstone miners are introduced. The first case study has an ambitious scope: to map and understand the challenges facing women in the gemstone value chains across sub-Saharan Africa. The pan-Africa Women in Mining Association (AWIMA) is the agent here, acting on behalf of millions of women working in the gemstone sector. The AWIMA Jewelry Project is an

excellent case study of how to undertake a regional approach to surveying national and local women associations to build up a picture of their numbers, work, and distribution at different levels of the ASM production network. The second case study—that of Moyo Gems—is a compelling initiative which demonstrates how fostering transparency and value-addition—through modernization and digitization of domestic trading systems—on volumes and pricing of select gemstones for export can immediately improve the financial gains of miners, and of women in particular. It is once again a vivid use of structures, that of the Tanzania Women in Mining Association (TAWOMA) to improve SDG8 outcomes and narrow the gender gaps found there within.

The third case study in this chapter is where we begin with an appreciation for a simple, careful methodology for analyzing gender gaps with respect to labor and benefits in select artisanal gold sites of Indonesia. It complements frameworks used by leading gender in ASM scholars such as Professor Kuntala Lahiri-Dutt, as well as those mentioned above in the Great Lakes region of central Africa by Katrine Danielesen, Professor Jennifer Hinton, Dr Rachel Perks and Assistant Professor Jocelyn Kelly. Here discussions outlined above on gendered roles and decision-making in ASM emerge vividly in the case study of the Dayak people of central Kalimantan, Indonesia. We learn that historical participation of women has been waning as mechanization has set in. We also learn that ownership and access to capital rest solely with husbands in these gold mining areas, even when women are pit owners themselves.

What is enjoyable about this case study is its immediate impact on pilot initiatives in these gold mining areas, as detailed in the fourth and final case study. Following the research results of the third case study, a pilot project was put in place with a local woman’s cooperative, designed to increase benefit derived from artisanal gold mining while simultaneously abandoning mercury use. The pilot’s success is promising in providing access to finance for these female cooperative members that also delivers on environmental outcomes. Results similar to those found in the work of IMPACT in Ituri, northeastern DRC (Reichel 2020).

As each case unfolds, an appreciation grows for the importance of local, place-based efforts as opposed to abstract policy making. Even in the case of the gendered research, it is used almost immediately to inform a series of programming interventions in those same ASGM communities of Indonesia. A refreshing approach where research is action-oriented and meaningful for

those it intends to serve. The gender case studies reinforce the potential for organizing structures to strengthen individual women's standing in ASM. The case studies equally inspire practitioners and policymakers alike to consider how improvements to SDG8 do not need to come at the expense of profitability. Rather, how improvements to SDG8 in fact benefit all in the value chain.

END NOTES

- 1 The report uses the World Bank's definition: "Gender refers to the social, behavioral and cultural attributes, expectations and norms associated with being male or female" (World Bank, 2011).
- 2 The report uses the World Bank definition: "Gender equality refers to how these factors determine the way in which women and men relate to each other and the resulting differences in power between them (World Bank, 2011).
- 3 Using the data points in the Delve database, which compiles secondary sources of published data that meet Delve's Data Standards, there are 2.75 million women across 44 countries for which there is a data point engaged in ASM. This compares to the estimate provided by Veiga and Baker (2004, 1) but solely for those engaged in artisanal and small-scale gold mining (ASGM). Their estimate, based on there being between 10-15 million people in ASGM worldwide, is that "as much as 4.5 million" women are directly employed in the sector. Including this global number for gold alongside the figures for the 44 countries

results in a total 7.25 million—or 18 percent of the global ASM workforce adjusted to be 40.6 million.

- 4 Voice and agency refers to the ability to enhance participation in decision-making—whether in society or in the household (World Bank, 2016; p56).

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**CASE STUDY #1**

ASSOCIATION OF WOMEN IN MINING IN AFRICA JEWELRY PROJECT

AUTHOR(S): Mzamose Gondwe,* Herizo *Harimalala* Tsiverisoa,* Salma Kundi**

ORGANIZATION(S): *Association of Women in Mining in Africa, **Tanzania Women in Mining Association

INTRODUCTION

African gemstones and metals contribute to a growing multibillion jewelry industry with global sales estimated at US\$279 billion in 2018 and expected to rise over 70 percent to US\$480.5 billion by 2025 (O’Connell 2020). The jewelry retail industry ranges from high-end luxury products, such as earrings, watches, and necklaces made of precious stones like diamond, ruby, and gold to fashion jewelry made of non-precious metals, stones, and other materials. Industrialization of Africa’s mineral wealth to capture a share of the burgeoning jewelry market can therefore be a driving force in catalyzing a range of regional development frameworks. These include the Africa Mining Vision (AU 2009), Agenda 2063 (AUC 2015), the African Continental Free Trade Agreement (AfCFTA 2018) and SDG8 to “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.” However, these continent-wide goals cannot be fully realized unless there are responsible jewelry supply chains that provide economic opportunities and decent work for women. The Association of Women in Mining in Africa (AWIMA) Jewelry Project is working to create regional jewelry value chains that economically empower women and give them a fairer share of the multi-billion-dollar global jewelry industry.

Association of Women in Mining in Africa

AWIMA is a network of African women in mining, oil, and gas national associations. It was created in August 2014 in Nairobi, Kenya during the African Women Business Linkages Forum organized by the African Union Commission and the United Nations Development Programme (AUC 2014). This network of over 30 national associations from all regions of Africa advocates for the participation, representation, leadership, and inclusive empowerment of women in the region's extractives sector. Given the large numbers of women engaged in the artisanal mining of metals and minerals found in jewelry—estimated to be between 30-50 percent of the global ASM workforce (UNECA 2002; Delve, 2020)—and that women are the main target market for jewelry, AWIMA has embarked on a jewelry project (Box 3). The first phase of which (March-September 2020) was to undertake an online survey open to all African women in the jewelry value chain to fill key data gaps.

Data gaps in the gemstone value chain

Across the Africa region, the majority of colored gemstones are mined artisanally and move through opaque value chains controlled by a limited number of companies with widespread informality and limited government oversight (Shortell and Irwin 2017). The colored gemstone sector varies significantly from other commodities—deposits are often small in very remote locations; estimating the potential and reserve require technical expertise; the variation in size and quality make standardized pricing difficult; and they can be low volume but high value. This combination results in thousands of small producers connected through a network of traders and dealers with producers mining in very hazardous conditions, receiving a fraction of the market value, and undervalued informal exports to Asian and Western markets where value is added (Chichester et al. 2018; Lawson and Lahiri-Dutt 2019).

BOX 3. The AWIMA Jewelry Project

The AWIMA Jewelry Project will establish an online jewelry hub and manufacture jewelry. The hub will connect producers, traders, and jewelers through a virtual marketplace for knowledge exchange, networking, and trade. AWIMA Jewelry products—brooches and earrings will be manufactured from responsibly sourced African gemstones and metals, mined and produced by African women, and sold domestically and internationally. The AWIMA Jewelry brand aims to celebrate the courage and resilience of African women in mining, showcase the diversity and splendor of African gemstones, highlight excellence in design skills, and demonstrate formidable craftwomanship with proceeds supporting economic and social justice for women in mining.

There are three phases of the AWIMA Jewelry Project:

1. An online survey open to all African women in the jewelry value chain. The survey will provide important data on the number, position, and challenges of women in the jewelry.
2. A jewelry design competition informed by phase one to engage African jewelers and select AWIMA Jewelry designs.
3. Production, marketing and sale of AWIMA Jewelry through responsible, regional, women owned jewelry value chains.

There is a lack of reliable and up-to-date economic, social, and technical country data on the artisanal colored gemstone value chain needed to answer fundamental questions:

- **Accurate data on gemstone quantities and quality.** How much is mined and where? How much is exported of rough stones, cut stones, and finished jewelry? What are the destination countries? What are the trading routes?¹
- **Accessible and up-to-date geological and gemological maps.** These are needed to estimate the reserve and gemstone potential.
- **Databases on gemological characteristics of African gemstones and their location of origin.** This is crucial as the origin of gemstones is one of the main criteria that influences the price and can allow tracking of gemstones in the global market.
- **Gemstone revenue.** How much do miners sell the stones for? How is the price determined? What are the margins for traders? How much tax does the government receive or is lost? What is the value of domestic jewelry industries?
- **Beneficiation.** What is the level of investment in and availability of equipment? Where are locations of value adding centers and market hubs? How many gemstone cutters and faceters are there and what is their level of skill and qualification? What are the existing training programs and the outcomes of trainees?
- **Market.** What are the market profiles of end consumers—both domestic and international?
- **Finance.** How are artisanal mines and businesses along the value chain financed? What is the level of financial literacy and business management of stakeholders in the gemstone value chain?
- **Women's participation.** What roles do women occupy in the jewelry value chain? What are the barriers to entry and success for women in the jewelry value chain?

Improving the availability of these data, disaggregated by gender, would not only help develop a deep understanding of how women engage in the sector, their barriers and enablers, but is also crucial in developing a responsible, transparent jewelry value chain that addresses the relevant targets and indicators of SDG8. For example, data on the level and type of investment needed for beneficiation equipment and training programs can support increased levels of economic productivity through technological upgrading, helping as per target 8.2. While gemstone sorting, cutting, and jewelry production can help achieve full and productive employment and decent work as per target 8.5 due to the fact that it can be a cottage industry suitable for women and persons with disabilities that enables them to work in productive and safe environments. Another example is target 8.9 to devise and promote policies for sustainable tourism through links to jewelry. Tanzania is well known for its tanzanite and wilderness adventures. Understanding market segments and creating tailored tourism campaigns that feature responsibly produced local jewelry value chains can support SDG 8.9—sustainable tourism.

Initial survey results—Tanzania

Paramount in efforts to understand African women in the jewelry value chain is involving women in mining associations in data collection efforts as well as in the design, implementation, and monitoring of program interventions from the outset. Indeed, an initial online survey conducted in March 2020 with the Tanzania Women Miners Association (TAWOMA) as part of Phase 1 of the AWIMA Jewelry Project provided rich insights on the number and role of women engaged at different levels of the supply chain. The survey found that among the TAWOMA membership there were 50 gold mines and 10 gemstone mines (extracting almandite, citrines, garnet, and tourmalines) owned by women, 40+ traders and buyers, 50 working in the fashion industry, and up to ten members working as lapidaries cutting and polishing gemstones.

In addition to this discrete data, the open-ended questions allowed for further details on the type of support needed to be captured in the survey:

“Our women are present in every point of the supply chain. The information our women need to help them have a more successful business are the following: geological survey data; knowledge on gemstones and metals; technical skills in mining, mineral processing, gemstone value addition jewelry making/ metalsmithing and business skills”

(SALMA KUNDI, GENERAL SECRETARY, TAWOMA)

The time is now

The AWIMA Jewelry Project and its quest to fill key data gaps to understand African women in the jewelry value chain come at a critical time. Growing global interest from consumers, jewelers (for example Chicago Responsible Jewelry Conference and Ethical Metalsmiths), and international organizations such as the OECD and Responsibly Jewelry

Council in responsible jewelry supply chains is creating the opportunity to change along the supply chain. However, among these stakeholders, governments are lagging behind. Oftentimes, governments are quick to enact bans on rough stone exports but fail to fully take on the responsibility of supporting collection of reliable and accurate data that can inform meaningful national and regional gemstone sector strategies. Many countries (for example Ethiopia, Madagascar, and Malawi) have sophisticated gemology labs, workshops, qualified gemologists, and lapidarists but political incentives to support these structures are lacking. Armed with the data needed to demonstrate their investment-potential and a better understanding of African women in the jewelry value chain, initiatives such as the AWIMA Jewelry Project can enable a transparent and responsible jewelry industry that creates safe, decent and economic opportunities for women.

END NOTES

1 National data on gemstones are available through some organizations such as the United State Geological Survey (USGS) and Gemological Institute of Thailand (GIT) as well as through paid for services and reports or through enquiries with mineral trade departments in exporting countries like Hong Kong, India, Sri Lanka, Switzerland, Thailand, and USA with export transactions reported annually. However, most African countries of origin lack credible data due to smuggling. To get data, one would have to look at different destination country databases to try and estimate export data which is further compounded by not all countries having national data or making them publicly available.

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CASE STUDY #2

Credit: Pact

MOYO GEMS: SUPPORTING WOMEN ARTISANAL MINERS IN TANZANIA TO ACHIEVE A FAIRER PRICE

AUTHOR(S): Norbert Massay, Cristina Villegas

ORGANIZATION(S): Pact

INTRODUCTION

Consumers are increasingly concerned about the labor conditions of miners who extract the precious metals and gemstones in the jewelry they buy. However, most jewelers cannot provide details about the conditions of the mineral supply chain associated with the colored gemstones they sell. This is because approximately 80 percent of all colored gemstones come from informal artisanal and small-scale miners (ASM) working in remote areas around the world (Shortell and Irwin 2017; IGF 2017). This case study introduces Moyo Gems—an ethical gemstone collaboration born in Tanzania (Moyo Gems 2020). Working mainly with women miners, the initiative provides training, traceability, and ensures a fairer price for artisanal gemstone miners. In doing so Moyo Gems provides a replicable model and step towards reaching SDG targets 8.5 and 8.10 by increasing the skill level, income earnings, and investment potential of female artisanal miners and their communities.

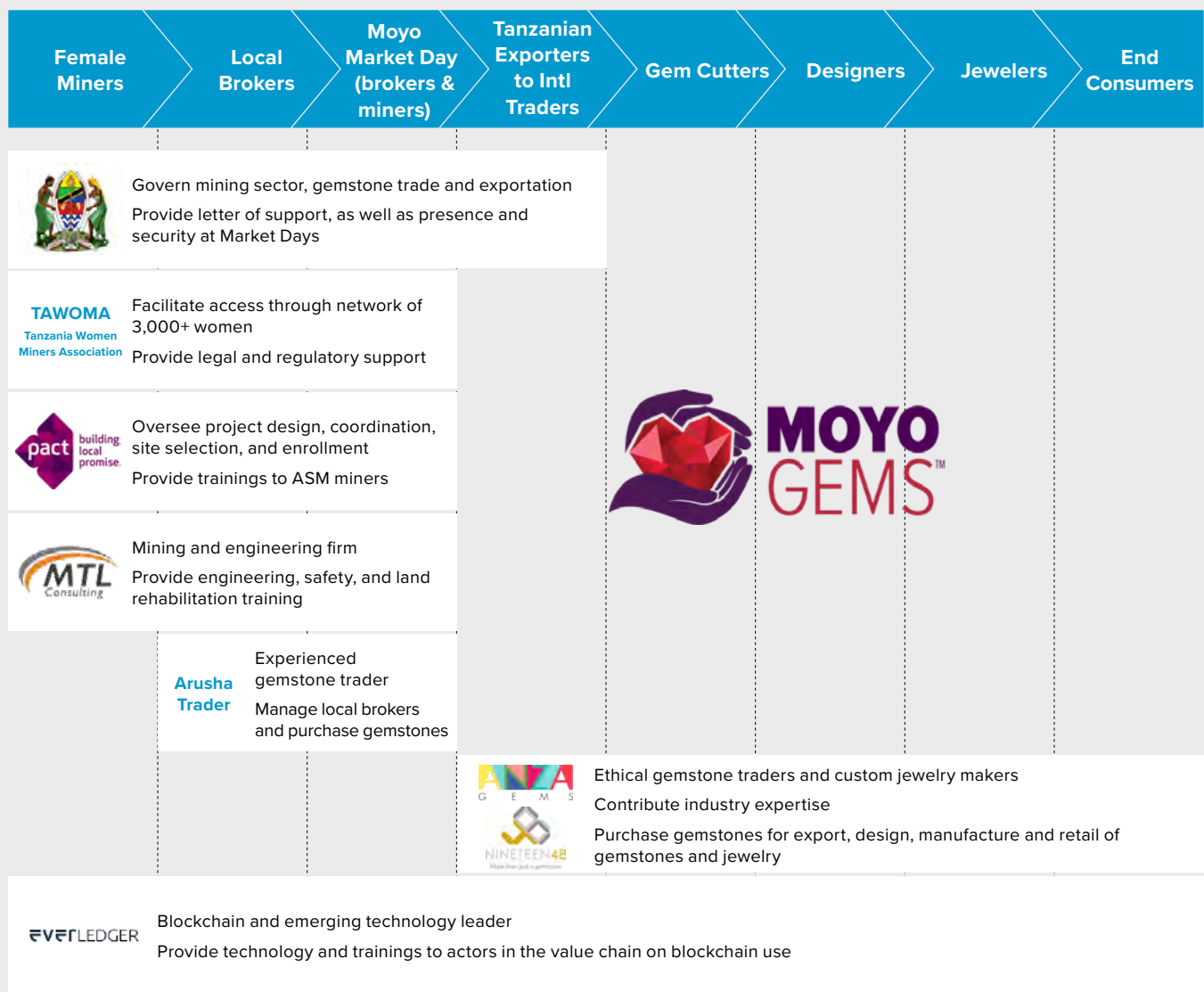
The Moyo Gems story

Moyo means 'heart' in Swahili and in several other languages in the East Africa region. Beginning officially in 2019, the collaboration works with female and male artisanal gemstone miners of the Umba Valley in North East Tanzania to assure fully traceable rubies, sapphires, tourmalines, and garnets from mine to market. With a focus on women, and a dedication to the 10 Principles of Fair Trade (WFTO 2017), Moyo Gems works to empower artisanal miners to work safely, mine better, improve financial security, and create stable, equitable markets. Key partners in the initiative include the Tanzanian Women Miners Association (TAWOMA), Pact Tanzania, ANZA Gems, Nineteen48, Everledger, MTL Consulting, and the Tanzania Ministry of Minerals that work across the entire value chain (Figure 13).

Nineteen48, Everledger, MTL Consulting, and the Tanzania Ministry of Minerals that work across the entire value chain (Figure 13).

The Moyo Gems partnership follows the success of an earlier pilot project initiated in 2016 between the Gemological Institute of America (GIA) and the NGO Pact. Together expert GIA gemologists and ASM specialists from Pact's Mines to Markets team held training workshops 45 women members of TAWOMA in Tanga Region. The training provided basic gemological and market knowledge to help artisanal miners properly prepare and value their rough gems and thus achieve a higher price at market. A comprehensive booklet *Selecting Gem*

FIGURE 13. Partner Roles Across the Moyo Gems Value Chain



Rough: A Guide for Artisanal Miners was also developed including pictures, practical information, and explanations in Tanzanian Swahili (GIA 2017).

How does Moyo Gems work?

All participating local miners and local brokers must meet minimum criteria to take part in Moyo Gems. These criteria are to be a member of TAWOMA, be Tanzanian and live in the inaugural participating villages in Tanga Region, Tanzania (Umba Valley) of which there are currently six participating villages, attend a free occupational health and safety (OHS) training in their area delivered by MTL Consulting, a Tanzanian engineering services firm contracted by Pact, and possess a current license in their name, are working on a group license, or have a written agreement with the license holder. Licenses are verified by the Tanga Regional Mining Office.

Miners and brokers participating in Moyo Gems trade their gemstones via a “Market Day” event held every two months. The precise date and time are communicated to the miners directly and as early as possible to ensure they can make the necessary travel arrangements. Market Days are held at government facilities within Tanga Region, Tanzania, and increasingly in the Moyo villages for participating miners who have and continue to meet the minimum criteria.

All sales to Moyo Gems are voluntary. No miner is ever required to sell their gemstones to Moyo Gems. On average, the miners participating in Moyo Gems

receive 95 percent of the gross pre-export price, with local brokers receiving the remaining 5 percent of that price. This was an increase of three to five times what miners had previously received for their gems and in some cases ten times as much. This is as reported by the miners themselves. Additionally, Moyo Gems have been working with three local cutters in Arusha to establish partnerships to cut some of the stones prior to export, adding even more value in country. Over time, the miners will also be guided by Pact to fully implement the Code of Risk-mitigation for ASM engaging in Formal Trade (CRAFT) which is a tool specifically designed for ASM to facilitate progressive improvement in environmental and social performance and ensure due diligence (CRAFT 2018).

Key results to date

The most striking result to date is that Moyo launched the world’s first market for sourcing responsible colored gemstones specifically from artisanal miners. Since March 2019, Moyo has held three market days with a total of 400 attendees. Of these attendees who were miners and agreed a sale, they received two to five times (and in some cases ten times) more in price paid by participating Moyo buyers compared to their previous buyers. Across the three Market Days 2,338 stones were purchased for a total value of over US\$30,000 (Table 8). As of December 2019, 2,035 individual stones¹ have been uploaded onto the blockchain by Everledger—providing proof of origin, payment, and mining conditions (Everledger 2020).

TABLE 8. **Market Days Transaction Data**

Market Day	No. Attendees	No. Stones	Total Sales TZS	Total Sales US\$
Market 1 (July 2019)	70	305	12,769,950	5,554
Market 2 (August 2019)	116	417	14,357,000	6,238
Market 3 (November 2019)	210	1616	42,826,000	18,627
Totals	396	2,338	69,952,950	30,420

Currency conversions (Xe.com, 2020): TZS1 = 31st July 2019 US\$0.0004349601: 31st Aug. 2019 US\$ 0.0004345: 30th Nov. 0.0004349601

In terms of the contributions to the wider governance of the ASM sector in Tanzania, Moyo helped to facilitate the first successful export of verifiable, responsibly mined gems in the Tanga Region. This also supported the government of Tanzania's strategy to establish Regional Gems Markets to facilitate effective commercialization of gemstones with Moyo becoming the first gem house in Tanzania. Finally, the lessons from Moyo are being shared worldwide and could act as a model from other gem producing countries. Moyo Gems is recognized as an innovative thought leader in responsible supply chains and has been invited to speak at the US Department of State, Chicago Responsible Jewelry Conference, Nairobi Gem Fair, and NYC Jewelry Week. It's also been featured twice in both British Vogue and Forbes.

Next steps and scaling up

Over the next two to three years, Moyo Gems will focus on building pathways to scale, including expanding more buyers (locally and internationally), developing partnerships with global financial and technology providers, and identifying new sites in Tanzania and across the region. With additional seed funding, Moyo Gems is aiming to reach 10,000 miners over the next five years in the target countries of Madagascar, Malawi, Nigeria, Rwanda, Tanzania, and Zambia.

Moyo Gems is specifically interested in working with technology partners to develop an online remote buying and training solution that would allow miners and buyers to trade responsible gemstones digitally. This would enable greater scale for both sides of the market and increase ability to deliver safety and value-added trainings remotely.

For more information visit www.moyogems.com

END NOTES

- 1 Some of the stones were sold in mixed parcels as such the total number of stones sold and those uploaded to the blockchain differs slightly.

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CASE STUDY #3

Credit: Yayasan Tambuhak Sinta

EFFECTIVE GENDER MAPPING IN THE ASGM SECTOR: CENTRAL KALIMANTAN, INDONESIA

AUTHORS: Vovia Witni* and Bardolf Paul*

ORGANIZATION(S): *Yayasan Tambuhak Sinta (YTS), Canadian International Resource Development Institute (CIRDI), Global Affairs Canada (GAC)

INTRODUCTION

Gender mapping¹ has rarely been applied to mining communities and even less so to the artisanal and small-scale gold mining sector (ASGM). In 2017, the NGO Yayasan Tambuhak Sinta (YTS) conducted an in-depth gender mapping exercise in three ASGM communities in Indonesia using a tailored four-stage methodology. This case study reports on the approach and findings of the mapping conducted in the province of Central Kalimantan which generated a deeper understanding of the gender dynamics in the ASGM sector.

The context of ASGM in Indonesia and Central Kalimantan

Indonesia is an archipelagic country consisting of 17,504 islands, thousands of tribes and local languages (Hananto 2010). It is rich in reserves of various minerals, including gold. In 2019, Indonesia was the world's 12th largest gold producer, extracting approximately 82.6 tons of gold (World Gold Council, 2019). Assuming 15-20 percent of this gold was produced by ASGM, this would be equivalent to 12.4-16.5 tons (Krisnayanti 2017).

ASGM and processing are significant sources of income for as many as 300,000 to 500,000 people in Indonesia—most of whom are miners working with informal operations in remote areas (PlanetGold, 2020). ASGM takes place in 27 out of 34 provinces in Indonesia (Balifokus Foundation 2015) including Central Kalimantan, the third largest province in the country by area with a population of 2,605,300 in 2017 (BPS-Statistics Indonesia 2018). Gold mining has been one of the main community livelihoods since ancient times and is spread across 12 regencies in the province (Inswiasri 2012).

Historical local Dayaks women miners in the ASGM sector

Historically, the indigenous Dayaks of Central Kalimantan practiced gold panning, with both men and women working the large and small rivers found throughout the province. At that time, and alongside other local livelihoods such as farming and tapping rubber, there was no gender difference between men and women in their gold panning activities. In accordance with Dayak beliefs “both women and men have a knife on their waist, and a *lontong*, a rattan bag pack, on their back” (AGC 2017a, 31). This means that both men and women can do all kinds of different occupations.

In the late 1980s, the ASGM sector in Indonesia was transformed with the introduction of dredges and hydraulic pumps. With the development of mechanized mining, a gender gap grew between women and men, as the ASGM sector became dominated by men. Women were rarely involved in this type

of mining as they were deemed unsuitable for mechanized labor due to being perceived as less physically strong and having lower skills to operate machinery as well as due to cultural and religious beliefs in some places that women should not be involved in mining.

Gender mapping methodology

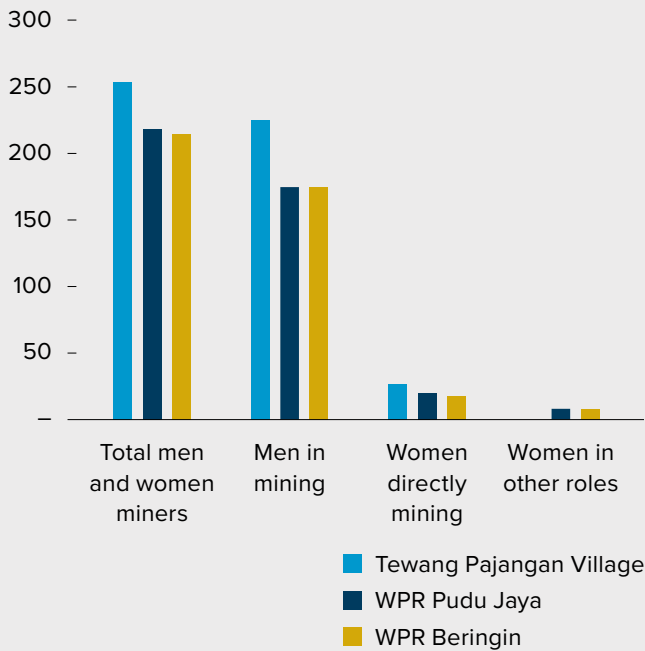
To better understand these dynamics, YTS conducted gender mapping in three ASGM communities in Central Kalimantan. These were Tewang Pajangan Village which was an alluvial site, WPR Beringin which was a hard rock site, and WPD Pudu Jaya which had both alluvial and hard rock mining. Each community has different characteristics, as they were populated by people from different ethnic groups and cultures, and the mining characteristics were different in each site. For more information on the studies and dynamics of each of these villages refer to publications by the Artisanal Gold Council (AGC 2017a; 2017b) and CIRDI (2017).

The gender mapping was used to map the gender dimensions of ASGM by identifying the division of labor, roles and responsibilities, participation, access to and control of resources and services, and decision-making powers between women and men in their assigned gender roles. The gender mapping process uses four analytical tools. First, an observation sheet is completed. Each research team member observes and conducts initial interviews with key informants. The results are consolidated to obtain an initial picture of the lives of the community and the ASGM sector in the target area. Next, focus group discussions (FGDs) with separate groups of women and men are held. The FGDs focus on the respective roles and responsibilities of women and men as well as access and control issues regarding resources and public services. The women's FGDs were facilitated by a woman and the men's group by a man. After the FGDs, semi-structured interviews are undertaken. Equal numbers of women and men are interviewed to cross-check the findings obtained in the observations and FGDs as well as provide qualitative data on various gender equality and equity parameters in the target area. The interviews were undertaken privately to ensure

FIGURE 14. Disaggregation of Number and Role of Women at ASGM Sites

Location	Type of mining	Total (men and women)	Men directly mining	Women	
				Directly mining	Other roles
Tewang Pajangan Village	Alluvial	225-280	200-250	25-30	0
WPR Pudu Jaya	Hard rock	195-240	150-200	15-25	10-15
WPR Beringin	Hard rock	195-235	150-200	15-20	10-15

Note: The ranges indicated are due to the dynamic conditions at ASGM sites where numbers working at mine sites change on daily and monthly basis.



the comfort and confidentiality of the participants. Finally, additional expert in-depth interviews are undertaken. Well-informed persons, such as village government officials, the owner of the Community Mining License (*Izin Pertambangan Rakyat* or IPR), and public health staff in the target area, were interviewed. The open-ended questions focused on policies and regulations related to their role and the presence of women in the ASGM sector.

Key findings of gender mapping in the ASGM sector in Central Kalimantan

A first key finding relates to the number and role of women and men miners. The number of women involved in ASGM is very small compared to men;

approximately 10-20 percent of the total miners (Figure 14). At all mine sites, approximately 20-30 women compared to several hundred men were engaged directly in mining through panning in rivers for alluvial gold or in digging in underground tunnels and open pits. The majority instead work as waste rock collectors, stone breakers, washing and putting ore into sacks, or loading the tailings for processing with cyanide. Many also work in ancillary jobs as food vendors, cooks, and shop keepers. In almost all cases, women accompany their husbands or male relatives who work as miners. It is very rare to find a single woman working in a mining site without a companion; even widows usually work accompanied by their children or male relatives.

Access and control of resources

A second key finding concerns access and control of resources. Women do not have equal access to or control of mining resources, such as mechanized equipment, because they do not have capital or know how to operate it. Their lack of expertise and physical strength mean very few women work in the tunnels or operate the trommels and heap leach cyanide units. However, if they perform the same type of work, women and men receive the same pay.

All mining resources are usually owned by men. If a husband and wife have resources, such as capital, land, and equipment, all are in the name of the husband, who in the context of the local mining community are called bosses. As a result, most

bosses are men, and they control the mining sector in an area, hiring workers, setting the gold price, and providing capital loans to miners.

One of the findings in the gender mapping showed that cultural factors can influence the level of access and control that women or men have to resources. For instance, Dayak men and women have the same rights and control over family inheritance and property, while in the Bugis, Sundanese and Javanese societies, these are more often controlled by men. Dayak culture also enables women to choose the type of work they prefer. Women are allowed to work in the tunnels and operate mining equipment, as long as they are able to do it. Other ethnic groups do not allow this because the work is considered inappropriate for women.

The third finding was that women miners have longer working hours and a greater workload than their male counterparts. Women undertake their mining work after completing their household chores. Some husbands help with household chores, but it is mainly undertaken by women. Initially, female respondents of the gender mapping felt that this was normal because they perceived their husband's work to be more important and the main source of income for the family. But the gender mapping revealed that women's income contributes significantly to the family finances and is sometimes greater than their husband's. For example, both women and men working as rock breakers can earn approximately US\$10 (IDR 150,000) per day, but a man will spend their income on meals, cigarettes, and drinks (energy drinks, coffee, and tea), so only brings home US\$6.80 (IDR 100,000) per day. Instead, women will usually bring home US\$8 or more (IDR 120,000) per day. This is because most women miners bring lunch boxes and do not smoke and so their daily spending is limited to snacks and drinks.

Decision making process

A final key finding relates to the differences in decision-making processes between women and men. The gender mapping found there are few Dayak women who are bosses, and that while they are involved in the decision-making process at the mining site, decisions are largely determined by the male bosses because they are the majority. In the village, women miners or bosses are rarely involved in decision-making processes, as they are dominated by village officials who are generally males.

Conclusion

The gender mapping revealed in detail the reasons for and types of differences and inequalities in the roles, responsibilities, workloads, work duration, and access and control of resources between women and men in ASGM. The methodology is therefore a useful and comprehensive tool that can help to capture a comprehensive picture of the gender dimensions at specific ASM sites as well as the overarching community dynamics and local governance context. It is important to note however, that the approach can only be applied by individuals who have good facilitation skills and understand the context of the ASGM sector. The tools use a lot of ASGM terminology, and these can be difficult to understand by someone not familiar with the sector.

The gender mapping found that women would benefit from low interest capital loans and skills training to support improved mining practices and micro-businesses and greater involvement at the mine site and in the local community. It is recommended that a gender mainstreaming program that includes sensitization of the issues for both women and men, and also empowers women in small-scale gold mining projects, should be developed and implemented. There is also a need to lobby local government to issue mining regulations that also consider human rights and gender equality and equity.

END NOTES

1 Gender Mapping is a methodology used to analyze roles, responsibilities, and access to resources of women and men.

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CASE STUDY #4

Credit: Yayasan Tambuhak Sinta

GENDER EQUITY THROUGH ACCESS TO FINANCE: PAMUAN JAYA PANNERS COLLECTIVE INDONESIA

AUTHORS: Witni Vovia,* Bardoff Paul,* Amar Nijhawan**

ORGANIZATION(S): *Yayasan Tamhahak Sinta (YTS), **Canadian International Resources and Development Institute (CIRDI)

INTRODUCTION

Indonesia's artisanal and small-scale gold mining (ASGM) sector is estimated to produce approximately US\$5 billion in gold each year. This economic activity is a vital source of income for some 300,000 artisanal gold miners and their families countrywide (McGrew 2016). However, as in many ASM communities across the world, women working in Indonesia's ASGM sector face many gender-specific challenges. These include unfair allocation of property rights and patriarchal social norms that can disadvantage them in pursuing ownership, education, enabling technologies, and secondary employment opportunities (CIRDI 2020).

Following a baseline study of ASGM in the village of Tewang Pejangan in Central Kalimantan Province as part of the CIRDI-led project *Capacity Building for Multi-level Governance of ASM in Indonesia*, a significant gap between women and men miners concerning access to and control of mining resources was found (CIRDI 2017). While traditional panning has been practiced by the indigenous Dayak people of the region for centuries, in the last 30 years ASGM in the village has become increasingly mechanized. The introduction of equipment, such as sluice boxes and hydraulic suction machines for gold processing, have increased productivity and incomes (Spiegel et al. 2018; CIRDI 2017). However, despite men benefiting from this technological upgrading, women miners in Tewang Pajangan have not. This is because women lack access to finance to purchase equipment and for skills training that would enable mechanization. Thus, they work solely as panners without the efficiency of machinery and make substantially less than their male counterparts (CIRDI 2017).

In late 2018, building on the collaboration with CIRDI, the NGO Yayasan Tamhah Sinta (YTS) developed a pilot project to address this gap by using a downstream buyer support model to enable access to finance for Pamuan Jaya Panners, a women panner collective in the village. This case study details the model and results to date. It makes clear the need to address gender-specific challenges as part of wider efforts to attain SDG8, especially target 8.3, which seeks the promotion of “development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.”

Access to finance: downstream buyer support model

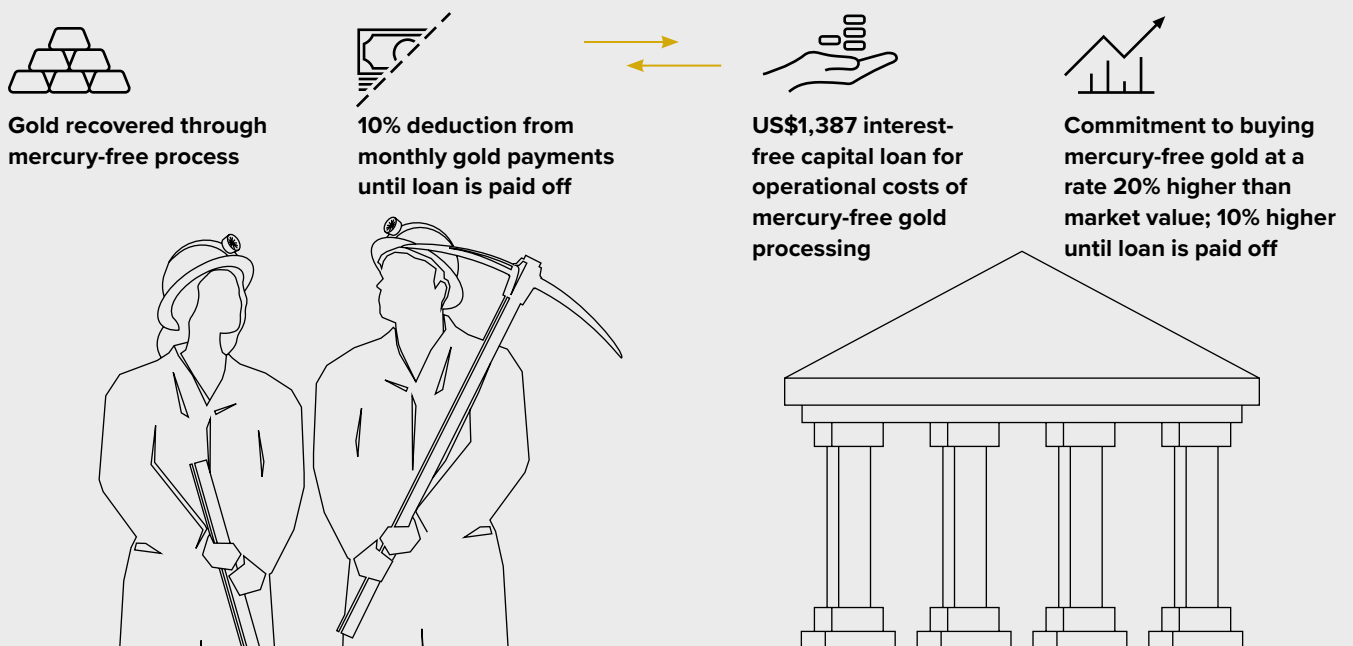
The goal of the project was to ensure that the Pamuan Jaya Panners were being paid fairly for their gold while simultaneously investing in sustainable, safe, and scalable business practices. Due to the instability, seasonality, and perceived illegality of ASGM work, financial institutions are generally

unwilling to provide capital loans to ASGM miners. As a result, miners in Tewang Pajangan borrow from capital investors or “miner bosses,” usually on loan repayment conditions that mined gold will be exclusively sold to the lending investor (CIRDI 2017; Vovia, Paul and Nijhawan 2020). Debt is then repaid from the sale of the gold obtained. This mechanism often causes losses for miners due to unequal power relations and a high rate of dependence on the investors who sometimes, as a condition of the loan, buy gold at a lower price than market-value (CIRDI 2017; Vovia, Paul and Nijhawan 2020).

To develop a workable access-to-finance model, the project partnered with Gardens of the Sun, a gold buyer and jewelry company in Bali committed to buying responsibly mined gold at a premium price. Gardens of the Sun has developed their own responsible sourcing principles that include commitments to traceability, continuous improvement, artisan support (including artisanal and small-scale miners), and purchasing mercury-free, panned gold (Gardens of the Sun 2020). Through active consultation with Pamuan Jaya Panners, Gardens of the Sun, and other relevant stakeholders, a mutually beneficial financing model was agreed upon.

As per the project’s downstream buyer support model (Figure 15), Gardens of the Sun offered to buy gold recovered through a mercury-free process at a rate 20 percent higher than local market value (Vovia, Paul and Nijhawan 2020). They also provided an interest-free capital loan amounting to US\$1,387 to the collective at the outset to cover the operational costs of equipment needed for mercury-free gold processing (ibid). Terms of repayment were set at a 10 percent deduction from the gold payment every month. Pamuan Jaya Panners were trained in administration, finance, and mercury-free gold processing, and kept a log of gold smelting techniques used (ensuring they were mercury-free), gold prices, sales, and revenues. To ensure accountability and the collective’s ability to manage finances independently, YTS and Gardens of the Sun developed a simple, transparent mechanism for shipping and paying for the gold. Monitoring was conducted through monthly “site” visits to Tewang Pajangan and regular check-ins with both the producers and the buyer (Vovia, Paul and Nijhawan 2020).

FIGURE 15. Buyer Support Model



The results

Within a year of the pilot's launch, the Pamuan Jaya Panners collective had paid off their initial loan and accrued group capital totaling US\$1,650 (as reported by YTS). Also, in the first year as news spread of the group's success, the collective grew from 10 to 25 women panners. The profit from the premium price obtained by the collective was used to buy gold, pay taxes, and cover operational costs. Recently, the collective requested and received an additional capital loan that will enable them to scale up their membership and production. The collective has also begun discussions on the possibility of developing a savings and credit cooperative that would allow members to develop businesses outside of the ASM sector (Vovia, Paul and Nijhawan 2020).

Looking ahead

The Tewang Pajangan case study, while context-specific, provides an illustrative example of how access to finance can have a positive ripple effect on poverty, gender inequity, and human and environmental health in mining-dependent communities. Local ownership over partnership-driven initiatives can spearhead innovation and entrepreneurship at the community level and provide pathways into alternative livelihoods, making access to finance a worthy consideration for policymakers and development organizations committed to achieving SDG8 of decent work for all.

ACKNOWLEDGEMENTS

This modified case study is adapted from an in-depth case study on the same project, written by Vovia et al. (2020). Input was provided on both cases by Dr. Priya Bala-Miller and Munisha Tumato of CIRDI.

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Credit: Yayasan Tambuhak Sinta

ERADICATE CHILD LABOR AND CREATE DECENT YOUTH EMPLOYMENT

Target	SDG8 Eradicate Child Labor and Create Decent Youth Employment Data Gaps	Indicator
 <p>8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training</p>	<p>Identifying practical and theoretical gaps in knowledge and existing capacities to inform appropriate training programs</p>	<p>8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training</p>
 <p>8.7 Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms</p>	<p>Number and better understanding of the drivers and all forms of child labor to develop programs sensitive to local realities</p>	<p>8.7.1 Proportion and number of children aged 5–17 years engaged in child labor, by sex and age</p>
 <p>8.b By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization</p>	<p>Demonstrate the current and future diverse and sustainable job and skills opportunities</p>	<p>8.b.1 Existence of a developed and operationalized national strategy for youth employment, as a distinct strategy or as part of a national employment strategy</p>

AUTHOR: James McQuilken

ORGANIZATION(S): Pact

OVERVIEW

Estimating children laboring in mining

Globally there are 152 million children—64 million girls and 88 million boys—in child labor. This 2016 estimate marks a considerable achievement toward eradicating child labor in all its forms considering there were 246 million children in child labor in the year 2000—a 38 percent decrease over 16 years (ILO 2017). Regionally, the available data show that only in Asia and Pacific has the number of children in child labor reduced significantly by almost half at 45 percent from 2008 to 2016. Concerningly, in sub-Saharan Africa, there has been an increase of 7,000 while in Latin America and the Caribbean the rate of decrease over this period has been steady at approximately 500 children removed from child labor per year.

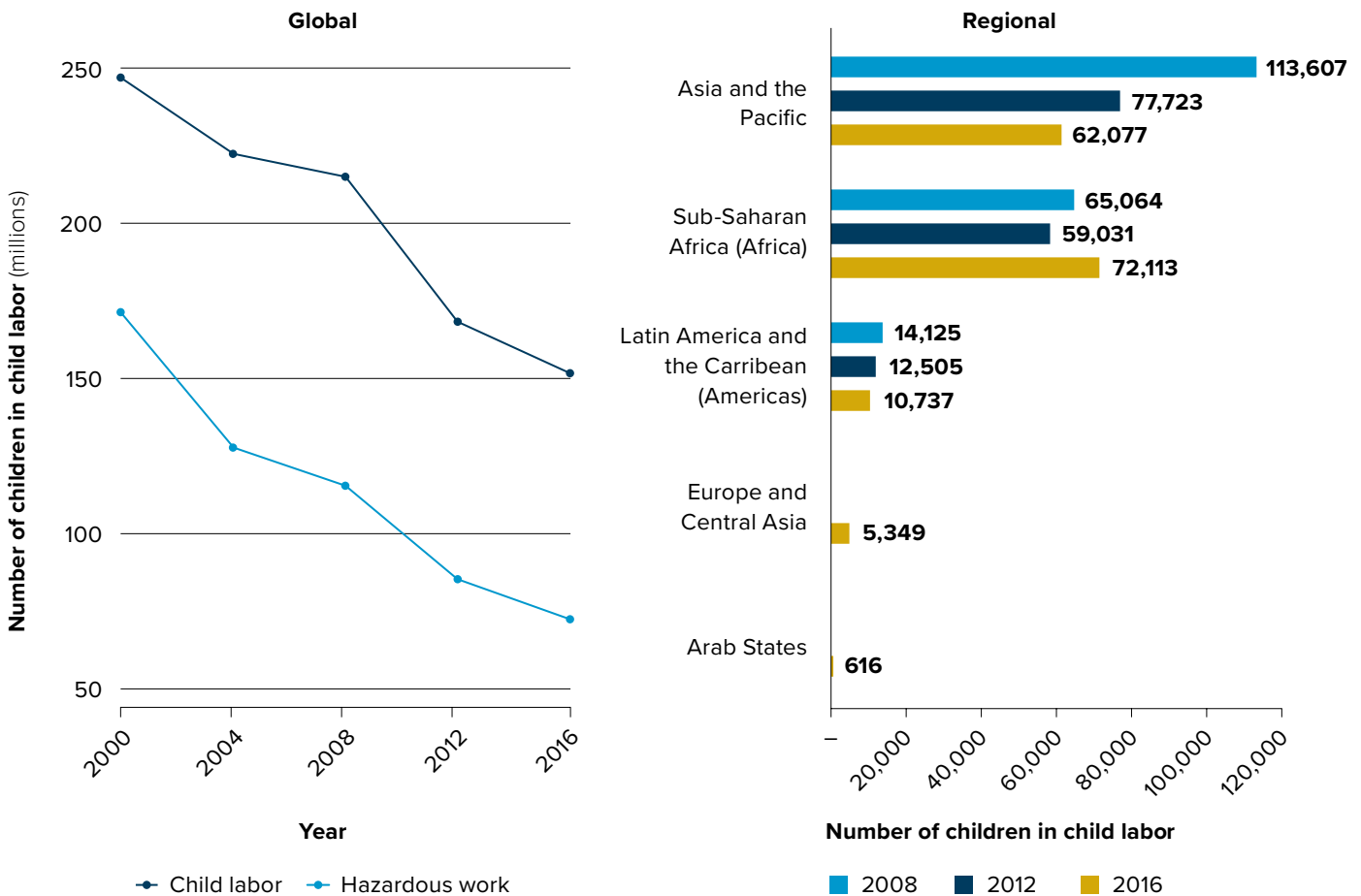
For ASM, however, charting the progress is less clear, but according to some estimates is also likely to have substantially reduced. Using the ILO’s estimates for hazardous work as a proxy, which includes mining and quarrying, and construction (Table 9), there were an estimated 72.5 million children engaged in hazardous work in 2016 compared to 171 million in 2000. This is a reduction of over half—a 57.8 percent decrease (Figure 16).

A more definitive estimate for the ASM sector provided by the ILO in 2006 and used to galvanize support for their international program *Minors out of Mining!* estimates there were 1 million children in small-scale mining. This figure, by their own account, would suggest that child labor in ASM is “not impossibly large” to eliminate (ILO 2006a, 1). A report by the United Nations Environment

Programme (UNEP) in 2010, however, suggests one to two million children may be involved in artisanal and small-scale gold mining (ASGM alone, including “children as young as 3-year-olds and working within or outside of a family unit” (UNEP 2010, 3). Meanwhile, a range of country-level estimates compiled as part of this challenge overview from different sources spanning multiple decades totals 1.6-1.8 million children working in child labor in ASM (See appendix 9.2, Table 12).

However, while this range would appear to support the other estimates, it is only for 19 countries, with significant gaps in the data. These include the types of minerals mined, with estimates mostly focused on gold and few (if any) accounting for the large numbers of children engaged in small-scale quarrying activities as well as coal mining in China

FIGURE 16. Global and Regional Numbers of Children in Child Labor 2000-2016



Source: ILO 2013; ILO 2017 Note: There is no ILO data for some regional estimates of child labor prior to 2016, and some regional groupings are slightly different. See original sources.

and Ukraine and brickmaking in India. Other “ASM hotspots” including Indonesia, Madagascar, and more recent figures for Mongolia and the Philippines as well as entire regions, such as the Middle East and North Africa, are missing data points or severely underrepresented. As the details from Table 12 in the appendix show, it is also important to examine how the estimates have been arrived at. Many are based on limited data sets and rather than being country-wide, are from select sub-national regions where organizations are working to address the issues, and few estimates are derived from comprehensive baseline surveys. Given this paucity of data, there is a real need for partners working through their programs on the ground to

ensure that they are capturing the scale of child labor in ASM and help develop a more comprehensive data set by uploading the results of their findings to Delve.

It would therefore be more accurate to assume that globally there are considerably more than two million children engaged in child labor in ASM and quarrying. Yet, this number is still likely a significant underestimate given that it is just 2.75 percent of the total number of children estimated by the ILO to be engaged in hazardous work (ILO 2017) and the same as the UNEP estimate for gold mining alone. In the context of remote and rural ASM communities with few income generating opportunities,

BOX 4. Global ILO Conventions on Child Labor

Camila Meireles, International Labour Organization (ILO)

Evidence shows that ASM is the most hazardous sector for children in terms of fatal injuries (ILO, 2011, p.39). ILO constituents have unanimously agreed that small-scale mining is “so hazardous that no child under 18 should work in this sector under any circumstances” (ILO, 2011, 47) not even in the case of youth employment. Nevertheless, the presence of children in mines is difficult to monitor and control due to its rural settings.

Using children in mining is illegal and exposes children to severe health and safety risks, for example from tunnel collapse, rock falls, explosives, heavy loads, musculoskeletal injuries, bone deformation, suffocation, strenuous work and exhaustion, poisoning from mercury, diseases such as silicosis, and harsh and psychologically hazardous environments (ILO, 2011). Additionally, child labor adversely affects children’s education, development, and future livelihoods.

Most countries have a statutory minimum age for admission to employment or work, normally 15 years of age, but it can be set lower (14 years) in the case of developing countries, or higher

(16 years). However, the minimum age for mining and other hazardous work—that is work that by its nature or the circumstances in which it is carried out, is likely to harm the health, safety, or morals of children—is 18 years everywhere, with no exception whatsoever.

The ILO has two fundamental child labor conventions, the Minimum Age Convention, 1973 No. 138 (ILO, 1973a) and the Worst Forms of Child Labour Convention, 1999 No. 182 (ILO, 1999c), both of which prohibit engaging children in hazardous work. Member states that have ratified the Conventions are required to determine the types of work that are hazardous, and the Worst Forms of Child Labour Recommendation, 1999 No. 190 (ILO, 1999c) states that, in identifying these types of work, consideration should be given, *inter alia*, to work that exposes children to physical, psychological or sexual abuse; work underground, under water, at dangerous heights or in confined spaces; work with dangerous machinery, equipment and tools, or which involves the manual handling or transport of heavy loads; work in an unhealthy environment which may, for example, expose children to hazardous substances, agents or processes, or to temperatures, noise levels, or vibrations damaging to their health; and work under particularly difficult conditions such as work for long hours.

eradicating child labor in all its forms and on such a scale is therefore no easy task. Regardless of the exact numbers, the presence of children in ASM is common and there is clear consensus it must be addressed, as illustrated by the global ILO conventions on child labor (Box 4).

Understanding child labor in mining

The quantitative data on the global number of children in ASM may not be a reliable estimate. However, the qualitative data documenting the drivers for their engagement and types of activities that children routinely perform at and around ASM sites is much clearer. A significant body of evidence developed through in-depth academic field studies (Hilson 2008, 2012; Huesca 2013; Maconachie and Hilson 2016; Gatsinzi 2019), programmatic research and interventions (ILO 2006a; 2006b; Schipper, de Haan, and van Dorp 2015; Pact 2016), and journalistic-style exposé (Human Rights Watch 2015; Amnesty International 2016; Sanderson 2019) have brought to light the deleterious labor conditions facing children engaged in ASM.

In accordance with international law, and two specific ILO conventions on minimum age and worst forms of child labor (WFCL) that prohibit hazardous work, it is illegal for a child (defined as under 18 years of age) to engage in any form of mining activity. However, as the case studies accompanying this chapter show, the often rural and poverty-driven context within which ASM takes place, diversity of operations, and challenges of monitoring and enforcement, have led to a wide range of activities performed by children being documented at and around sites, as well as at home.

On a spectrum, these include WFCL such as “compressor mining” in the Philippines. Here, as explained by Giovanni Soledad, Arleen Taguba, and Alexandre Soho in their case study on the CARING Gold Mining Project, children pull themselves down submerged 10m shafts with a breathing tube held tightly in their teeth and wound round their body to keep it in place while the other end is attached to a diesel compressor pumping air

from the surface. At the bottom, they wedge themselves in with their feet and scoop clay into sacks to be hauled upwards through the murky water. Driven largely by poverty, children also perform hazardous work including digging deep open pits and carrying heavy loads as explained in the case study by Yrene Rivera detailing the 5-year *Joint Forces to Tackle Child Labor—From Gold Mines to Electronics* project, which is taking an area-based approach that involves all local stakeholders and empowers communities in Uganda to remove children from mines. While as Benafsha Delgado and coauthors from the *Partnership Against Child Exploitation* (PACE) highlight in their case study, some 40,000-60,000 children are estimated to be engaged in WFCL and hazardous work cobalt mining in DRC with many sat above ground picking and sorting through toxic spoil heaps (Delgado et al., 2020). Children are also commonly found in WFCL and hazardous work in brickmaking as observed in Rwanda¹ and documented in India (ILO 2011). For the latter, the activity employs an estimated 10 million workers and contributes US\$4.2 billion to India’s economy each year but is often associated with forms of modern slavery including bonded labor (Walk Free Foundation 2018).

At the other end of the spectrum, children may be involved in lighter work in mining—many of which mirror tasks performed routinely in agriculture and rural community settings. These include taking care of other children and siblings, preparing and selling food and consumables, as well as transporting light loads, fetching water, and washing sediments while under adult supervision. There is also often a division of labor according to gender with young boys undertaking more manual tasks and young girls helping with food preparation and selling. For example, as is common in the town of Akwatia in Ghana’s Eastern Region, in the evenings and at weekends children can be seen sat at home with a sieve on their lap sorting through spoils of diamondiferous black sand which their parents may have received in exchange for renting simple panning equipment to artisanal miners earlier in the day (McQuilken and Hilson 2018).

Understanding the local contexts, drivers, and progressive routes out of all forms of child labor in

mining is therefore essential to support a transition away from ASM. The links of child labor to poverty, lack of decent schooling, social protections, workers organizations, and influence of culture and tradition are reflected in much of the literature (ILO 2011). Calling for this nuanced understanding and approach to the issue, Hilson (2012) argues that child labor in ASM is a combined product of cultural practices, household poverty, and livelihood diversification out of farming towards mining. Drawing on fieldwork in Southern Mali, the author notes the direct and indirect costs of education which ASM can help pay for, the cultural value placed on work at a young age in many African societies for broader skills development and move into adulthood, and the need for gradual change. There are several examples, including from the case studies and approaches taken in this report to addressing the issue of child labor, that have put this into practice.

The case study by David Fonseca and Astrid Villegas of the Somos Tesoro project implemented by Pact and the Alliance for Responsible Mining (ARM) in Colombia has so far benefitted over 4,000 households including more than 13,000 children, some of whom are engaged in child labor. As the authors report, key to this success has been to first understand the cultural drivers of child labor. An in-depth qualitative survey found that in rural areas communities value children's participation in farming and harvesting as essential tasks that help promote responsibility, discipline, and skills development needed in the future. As ASM has grown as a livelihood activity in what have traditionally been farming areas, the practice of engaging children in light work has translated over to the mining sector. Following a communications campaign by the project to address cultural practices and perceptions of child labor in mining and other hazardous sectors, the number of children working in the WFCL including ASM is reduced. However, there was also an increase in children undertaking light work in domestic services and as messengers, reflecting the cultural and economic importance placed on work for children.

Finding different ways to support the transition of children out of mines and, when appropriate, into

permitted forms of work that complement formal education is therefore essential to eradicating child labor in all forms in ASM (SDG target 8.7).

Creating sustainable youth employment and skills training in ASM

Eradicating child labor in all its forms from ASM, though absolutely a necessity, is however just one part of the challenge to achieving the SDG8 targets relevant to this topic. A second and more positive issue, where better data is also needed, is finding sustainable jobs and skills-creation opportunities for youth directly and indirectly related to ASM (Hilson and Osei 2014). This is needed to help reduce the proportion of youth not in employment, education, or training (SDG target 8.6), and could be part of wider efforts to develop and operationalize a global strategy for youth employment (SDG target 8b). ASM offers a wide range of employment opportunities with varying skill levels. These range from business and management skills for financing, bookkeeping, and running operations to geosciences, engineering, and even sustainability to maximize production while meeting license conditions. Developing training for existing miners and finding pathways for graduates to enter the ASM sector as professionals is key to wider formalization and upskilling. The creation of jobs in otherwise rural landscapes where youth unemployment is high, and few livelihood opportunities exist, means that ASM also plays a key role in stemming rural-urban migration.

In some mining jurisdictions, there are simply not enough jobs in large-scale mining and services for the cohorts of graduates each year, meanwhile licensed small-scale mines could benefit significantly from additional technical expertise. Furthermore, increasing mechanization of large-scale mining is leading to fewer direct jobs, although this is being partially offset by the creation of new indirect employment opportunities in mine service companies albeit that require different skill sets (Moolman 2017). Take Ghana as an example. In 2019, the total workforce engaged directly by mining companies² was 11,899 (Ghana Chamber of

Mines 2019), yet in the same year 485 students (9 PhD; 29 MSc and MPhil; 447 BSc)³ graduated from the University of Mines and Technology (UMaT 2019). Thus, four percent of the existing total mining workforce become newly available each year. As mandated by law, graduates must first complete a one-year national service placement before then entering the job market (NSS, 2020). Yet due to the limited positions in relevant private sector mining and service companies, it is reported⁴ that many graduates end up in companies and government departments with little direct relevance to their degrees. With better data on this issue, it could be possible to understand the scope for registered artisanal and small-scale companies to offer placements that would benefit both graduates and the companies by enhancing knowledge sharing and professionalization and equipping students with an array of first-hand experiences that may also inspire them to remain working in the ASM sector after their placements.

Creating links between local universities, educators, and ASM companies as well as collecting data on skills gaps and opportunities can therefore help identify training needs and ability and willingness to pay among existing miners. Indeed, a range of training, capacity building, and sensitization programs for artisanal and small-scale miners and governments have been implemented by development partners over the years. But training needs to be conducted on an ongoing basis, sustainable in terms of affordability and delivery, accessible to meet a variety of existing educational backgrounds, and appropriate to the local geological, organizational, and social contexts, as well as building on existing skills and capacities and covering a range of topics beyond just technical mineral extraction methods.

There is also a need to support youth working in mining and who wish to leave the sector's poverty trap to instead enter alternative formal education and training programs. This includes data to help better understand why youth have entered ASM in the first place. A study by Bryceson (2014) in Tanzania, for example, found that some youth miners decided to engage in ASM to gain greater financial autonomy from their parents, while

others were trying to pay for higher education. Interventions must therefore take account of these dynamics. In DRC, for example, a youth apprenticeship program, funded by partners including Eurasian Resources Group, Trafigura Foundation, Responsible Business Alliance and implemented by Pact, targets youth aged 15-17 working at ASM sites. Since 2015, each year the program undertakes a detailed market study to first identify appropriate 6-month vocational and business skills training needs and wishes among local youth. These include computer science, mechanics, soldering and metalworks, small animal husbandry, barbering, and tailoring. To date, 466 youth have graduated from the program equipping them with vocational and business skills, of which 99 percent have left mining and 98 percent earning more in their new line of work than before (Pact 2020). It is likely that the success is due, in part, to using data to understand the local job context and thus the type of training that is most relevant and exciting to youth compared to usual alternative livelihood programs that tend to focus solely on agricultural activities (Hilson and Banchirigah 2009; Siegal and Veiga 2010).

In addition to improving strategies to enhance professionalized job opportunities and skills development for youth both in and out of ASM, there is a need through data to better understand the opportunities for local content promotion that will generate decent jobs. To date, however, research and programming on local content in the extractives has focused exclusively on oil and gas and large-scale mining (Geipel 2017; Grice 2018). Yet there are clear opportunities for this approach to be mirrored in ASM. This is especially relevant given that in many countries the legislation governing the sector maintains it solely for national citizens aged 18 and above. Evidence-based policies and programs grounded in rich baseline data could include identifying linkages to other sectors, such as local manufacturing of affordable and appropriate ASM equipment to enhance production, opportunities for refining as well as value addition and beneficiation of minerals and materials in-country, and identifying business opportunities for the local provision of mine services including farming, catering, hand washing stations,

TABLE 9. Definitions of the Multiple Forms of Child Labor and 2016 Global Estimates

Form of child labor	Definition
218 MILLION Children in employment	Work in any form of market production and certain types of non-market production such as agricultural produce for own use. It includes both formal and informal work, inside and outside family settings, for pay or profit including cash, in-kind, full- and part-time, and paid or unpaid domestic work outside their own household.
152 MILLION Children in child labor	Excludes children in employment permitted to undertake light work, and those above minimum age not engaged in worst forms of child labor or hazardous work.
73 MILLION Children in hazardous work (often used as a proxy category for WFCL)	<p>Engaged in any activity by its nature or circumstances that is likely to harm the health, safety, or morals of children. Designated hazardous industries according to the International Standard Industrial Classification of All Economic Activities are mining and quarrying (codes 05-09) and construction (codes 41-43).</p> <p>Hazardous work includes:</p> <ul style="list-style-type: none"> • Night work; • Long hours; • Exposure to physical, psychological, or sexual abuse; • Underground, under water, at dangerous heights, or in confined spaces; • Dangerous machinery, equipment, and tools; • Manual handling and transport of heavy loads; and • Unhealthy environments causing exposure to hazardous substances, temperatures, noise, and vibrations.
Children in the worst forms of child labor (WFCL)	<p>Engaged in work outlined in Article 3 ILO Convention No. 182:</p> <ul style="list-style-type: none"> • All forms of slavery or similar practices; • Prostitution, pornography, pornographic performances; • Illicit activities including production and trafficking of drugs; and • Work that is likely to harm the health, safety, or morals of children.
Children in light work	<p>Article 7 ILO Convention No. 138 allows for national laws or regulations to permit light work for persons aged >13 years (or 12 years in countries that have specified a minimum working age of 14 years) that is:</p> <ul style="list-style-type: none"> • Unlikely to be harmful to health or development; and • Does not prejudice school attendance, or participation in vocational training and education programs.
Children per-forming house-hold chores	<p>Non-economic forms of production that are excluded from the UN System of National Accounts used to measure national economic activity. Includes domestic and personal services for consumption within their own households:</p> <ul style="list-style-type: none"> • Caring for household members; • Cleaning; • Minor household repairs; • Cooking and serving meals; • Washing and ironing clothes; and • Transporting and accompanying family members to school.

face masks, and other locally-made health and safety equipment. Combined with strengthening of workers unions and labor rights to ensure equal access to decent work opportunities, this approach could help make ASM an integral part of wider youth employment strategies nationally as well as regionally by generating production and manufacturing linkages across geographies (SDG target 8b).

Eradicating child labor from ASM and building on the enormous variety of job and skills development

opportunities that have relevance both in and out of mining are therefore key to achieving the relevant targets of SDG8. Better quantitative data combined with rich qualitative insights that can uncover the true scale of the issues at hand, understand the social, economic, and cultural drivers as well as the skill gaps and opportunities for partnerships will help ensure progress is appropriate to local contexts, and, that it is measurable. The final part of this overview provides details on the global policy framework and international conventions from the ILO that govern child labor in the sector.

END NOTES

- 1 Observed by the author James McQuilken on numerous occasions while out jogging in Kigali 2019-2020 and documented in Twitter post: https://twitter.com/J_McQuilken/status/1167713092987510784
- 2 Includes producing mining companies that are members of the Ghana Chamber of Mines.
- 3 Note the figures presented in the source article do not add up: "There were four hundred and ninety-four (494) graduands who received various degrees including nine (5) Doctor of Philosophy Degrees (PhD), twenty-nine (29) Master of Science and Master of Philosophy degrees, four hundred and forty-seven (447) Bachelor of Science degrees in different programmes of study."
- 4 Direct communication with UMaT students in 2015.

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CASE STUDY #1

Credit: Solidaridad

TACKLING CHILD LABOR IN ARTISANAL GOLD MINES IN UGANDA

AUTHOR: Yrene Coli Rivera*

ORGANIZATION(S): Solidaridad,* Fairphone, Philips, Fairtrade UK, Impact Facility, Hivos/Stop Child Labour Coalition, UNICEF

INTRODUCTION

In Uganda, it is estimated that 12,000 children under 14 years old are engaged in artisanal and small-scale gold mining (ASGM) (Schipper, de Haan, and van Drop 2015). These children undertake tasks such as digging in deep open pits, carrying stones to and operating grinding machines, and washing the ground ore (NRDO 2017). They also work in and around mines preparing and serving food and refreshments. Oftentimes boys and girls perform different tasks. This work in ASGM is considered by experts as a worst form of child labor (WFCL) due to the harsh working conditions, handling and exposure to toxic chemicals like mercury, and the vulnerability of young women and girls to sexual and gender-based violence (SGBV). The subsistence level wages of ASM miners leave many families in a poverty-trap often relying on incomes brought in by children to support household expenditures (Hilson and Pardie, 2006). However, poverty is not the only driver for child labor, a lack of decent work for adults, and lack of and access to quality education are also contributing factors. It often results in both children and parents placing a low value on education and opting by choice or need for economic gains instead.

In a joint effort to address these challenges, in 2017 civil society organizations Solidaridad, Hivos/Stop Child Labour Coalition, Fairtrade UK, and UNICEF together with the electronic companies Fairphone and Philips launched the 5-year project *Joint Forces To Tackle Child Labor—From Gold Mine To Electronics*. The project uses an area-based approach with interventions in both communities and ASM mines as a strategy to address child labor in ASM communities. This initiative directly contributes to SDG8 in the areas of decent work and economic growth by taking immediate action to eliminate the worst forms of child labor.

An area-based approach to tackle child labor in gold mining communities

To effectively tackle child labor in the ASM communities, an area-based approach was adopted which focuses on reducing and eliminating all types of child labor in a specific geographic area. The area-based approach towards the creation of CLFZ has been championed by the Stop Child Labour coalition¹ and is aimed at changing perceptions and attitudes towards child labor and improving access to education. The key point has been to combine the area approach whilst also supporting the transformation of unsafe artisanal mine practices to become more socially, environmentally, and economically sustainable. To do so, the project involved ASM sites, communities, and other stakeholders, including local and national government and supply chain actors.

The first part of the area-based approach was to involve community stakeholders for their buy-in. Busia, a district in Eastern Uganda, has a long history of mining, and the area has numerous artisanal mines. Results from the area mapping exercise conducted in Busia identified 786 households and showed that 412 children were at risk of child labor or were reported as working. To build consensus on the objectives of the project, a number of meetings were held with community stakeholders. This included members of various ASM sites, local council leaders, Community Development Officers both at District and sub-county levels, school heads, teachers, and

religious leaders. Together, a participatory Joint Action Plan against child labor was created as well as committees consisting of leaders from the various stakeholder groups and nominated due to their positive attitude, leadership, and commitment. These meetings served to inform all stakeholders about the CLFZ methodology and to build good relations with community members from the start.

Once the buy-in was achieved, the next part was to establish structures for mine associations. The project carefully selected three artisanal mining associations based on a set of criteria. With these associations, incremental improvement plans and policies with a specific focus on child labor eradication for each mine were developed based on assessments of their operations against international standards. The policy was endorsed by management and mine leaders, and sensitization trainings were held for mineworkers. This training focused on the policy and broader legislation as well as perceptions of child work and labor. It also established a child labor remediation process including a grievance redressal mechanism to allow mineworkers and management to notify community workers when children are working at mine sites. By directly engaging miners and mine managers in this way, it places ASM operators in a non-negotiable position to put an end to child labor and support children's right to education.

Next was to invest in education. A conducive learning environment is essential but often lacking in rural mining areas. The first step to address this through the project was to strengthen two existing local schools by training teachers in child-friendly schooling methods to create a positive learning environment. For children that have left school to work, motivation centers were created to transition and accelerate education so they can enter formal full-time school at a class appropriate for their age or vocational training programs. In total, 100 children from the 412 that were identified as being at risk, or 24 percent of them, were integrated in the formal school systems. A limiting factor, which inhibited the participation of more children, was the capacity of the motivation centers to host all of the children in need of education as the children require dedicated resources to successfully complete their program.

Finally, the area-based approach addressed income. The research undertaken as part of the project in Busia showed that working children usually come from large families where parents are not able to provide for all the schooling and other needs of the many children in one home. Children are therefore tempted or encouraged to work to be able to meet their personal needs as well as those of their households (NRDO 2017). The project therefore addressed income at two levels: (i) improving mine productivity; and (ii) improving household income. Mine productivity is affected by low volumes of gold extraction and poor access to markets. To address this, investments in adequate ore processing equipment were facilitated to enable the three mines to rent the equipment in exchange for a nominal fee. Demonstration workshops were also organized on the proper use of this equipment to maximize productivity. At the household level, spending patterns were addressed prioritizing the most important financial expenditures. This was undertaken through the Village Saving and Loans Associations (VSLA) established by the project and which helped the group members, and consequently the families, to improve their savings practices and learn basic bookkeeping, financial planning, and investment skills. As a result, families became more aware about the need to save for the educational needs of their children.

Conclusion

ASM has a poor reputation when it comes to child labor, but as the experience of the project showed, when mines and communities are properly supported, it can provide a major opportunity for economic and social development for many people. First, tackling child labor in ASM requires a thorough analysis to determine why child labor exists. It became clear as the project progressed that factors, such as existing norms, beliefs, quality of education, insufficient income, and lack of policy enforcement at community and mine level, play a major role in driving or stopping child labor. Second, involvement of all actors in communities, local authorities, schools, and mines is essential from the outset to create buy-in and ensure that monitoring of child labor is embedded in the communities and to hold them accountable. Third, transitioning children from work and into education not only requires children to become motivated, but there also needs to be an incentive for children to go back to school. That means that investing in child-friendly education by schools and authorities is essential to create a conducive learning environment for children. Finally, a support system needs to be established to enable parents to engage in economic activities and earn a higher income that will balance their household income when children stop working.

END NOTES

1 Stop Child Labour (SCL) is a coalition coordinated by Hivos. The coalition consists of the Algemene onderwijsbond (AOB), FNV Mondiaal, Hivos, the India Committee of the Netherlands (ICN), Kerk in Actie & ICCO Cooperation, Stichting

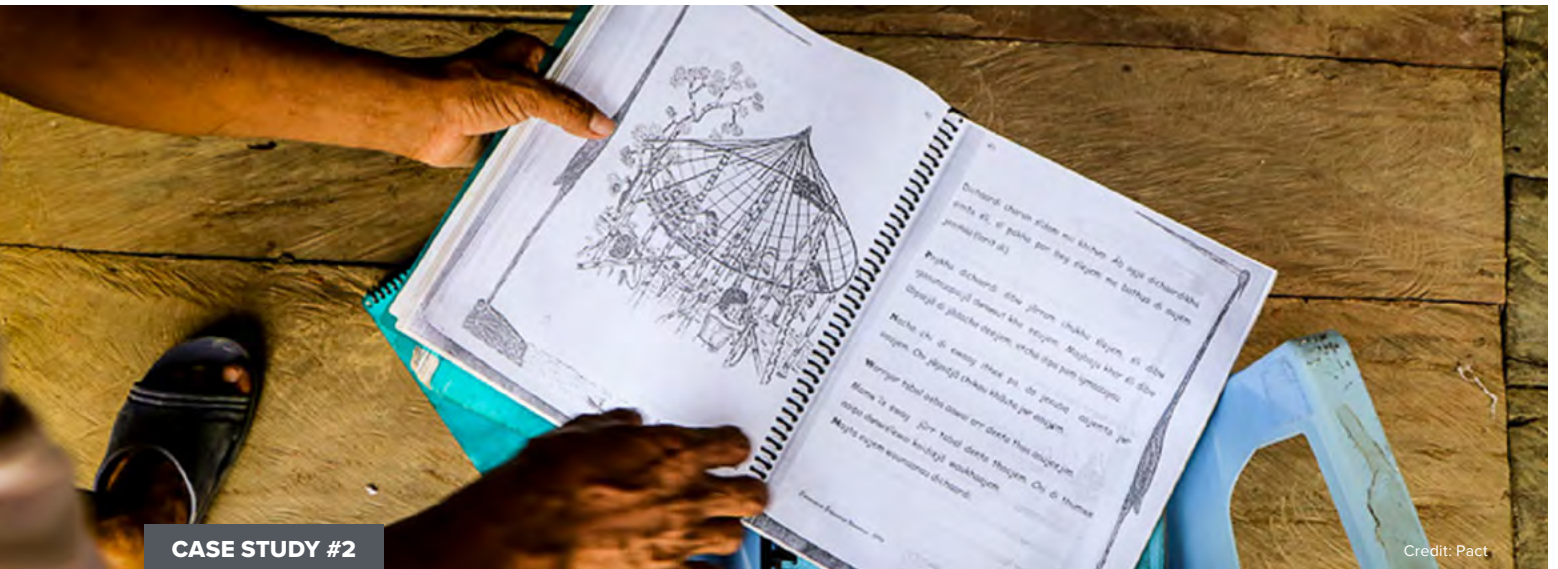
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CASE STUDY #2

Credit: Pact

THE IMPORTANCE OF PERCEPTION STUDIES IN CHILD LABOR PREVENTION: SOMOS TESORO, COLOMBIA

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ORGANIZATION(S): *Pact, Alliance for Responsible Mining, Fundación Mi Sangre, Fondo Acción

INTRODUCTION

Since 2013, the US\$11 million Somos Tesoro project has been a leader in the reduction of child labor in Colombia, including in the artisanal and small-scale mining (ASM) sector. To date, the project has benefited 4,312 households, 13,239 children, and 2,680 gold and coal miners across eight municipalities in Antioquia and Boyacá.¹ Using a comprehensive strategy which aims to strengthen mining communities and protect their children and adolescents, Somos Tesoro targets households, educational institutions, the ASM sector, and public policies. Somos Tesoro—Spanish for *We are Treasure*—is financed by the United States Department of Labor and is implemented by Pact, the Alliance for Responsible Mining, Fundación Mi Sangre, and Fondo Acción.

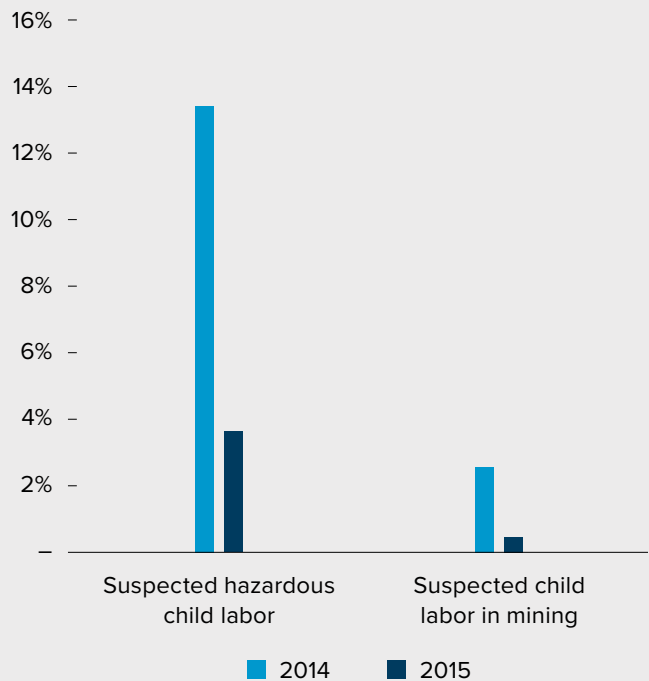
Children’s work in ASM is a tradition that is inherited and passed on from generation to generation in many regions of Colombia. Parents teach their children the trade, and mothers take the little ones to the river to *barequear*.² In these settings, child labor is often associated with discipline and responsibility. Understanding these cultural and societal perceptions is essential when designing and implementing projects to achieve the SGD8 Target 8.7: eradicating child labor in all its forms by 2025.

Strategies with cultural and societal consciousness

Although in the last seven years the prevalence of child labor in Colombia has declined overall across 10 sectors, from 10.2 percent in 2012 to 5.4 percent in 2019, it is estimated that there are still 586,000 underage workers (5-17 year-olds). Additionally, there are significant gaps at the regional level, particularly as the rate of child labor in rural areas is three times larger than in urban areas at 10.4 percent compared to 3.5 percent (Colombia National Department of Statistics 2020). These differences can be attributed to socioeconomic reasons but could also have societal and cultural explanations.

Certainly, the findings and success of Somos Tesoro in reducing child labor is due to understanding and addressing these key drivers. The baseline

FIGURE 17. Cases of Child Labor in Somos Tesoro Participants (2014-2018)



studies and ongoing monitoring of the project from 2014-2018 show that as a result of Somos Tesoro’s interventions suspected hazardous child labor was reduced by 73 percent from 13.5 percent down to 3.7 percent and child labor in mining from 2.6 percent (345 suspected cases) to 0.5 percent (66 suspected cases) in the target communities (Figure 17). To help better understand these results, in 2018, the team

FIGURE 18. Cojan Oficio: “Get Busy” Communication Campaign Posters to Address Child Labor



implemented a *Perception Study On Child Labor* in all of the municipalities where the project works.³ Through this exercise, the team analyzed the cultural practices and reasoning that justified child labor in rural households. One of the conclusions was that child labor is considered a part of the continuation of life cycles in these regions. The tasks of rural life that children and young people participate in from early adolescence enables the transmission of knowledge necessary for the regional economy and culture to be maintained. For example, parents view children’s participation in farming and harvesting as an essential task in rural life and a way to promote responsibility and discipline since early ages, and these perceptions also cross over to ASM.

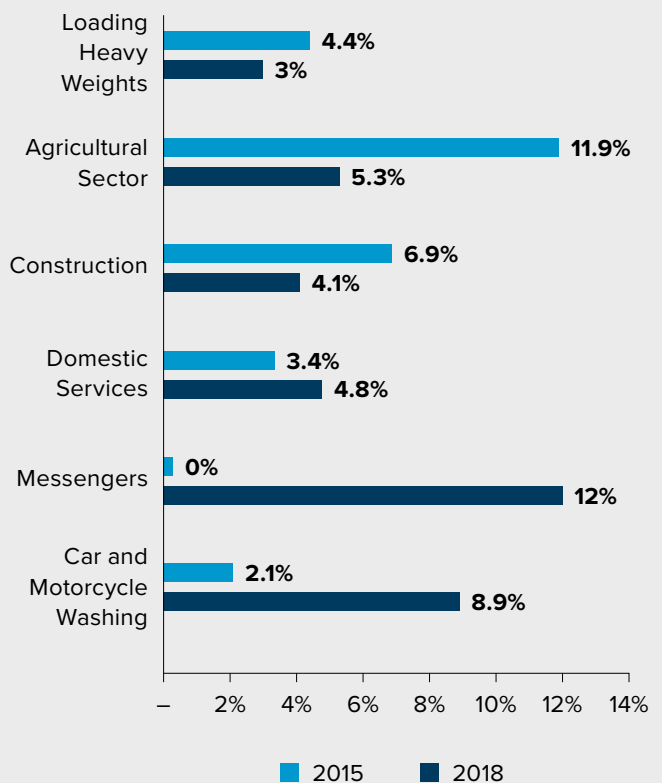
Somos Tesoro shared these conclusions with local and national authorities including the Ministry of Labor of Colombia and the Colombian Institute for Family Well-Being (ICBF), as well as with the beneficiary households. One of the most important resulting activities from sharing these insights was the *Cojan Oficio* (Get Busy) communication campaign, which used the results of the study to directly confront the cultural conceptions and practices of the communities in ASM.⁴ This campaign, addressed to parents, shows a series of images around appropriate tasks and “jobs” for children, such as playing the guitar, training in soccer, or taking care of their pets, which promote responsibility without the need to make children work (Figure 18).

The Ministry of Labor used *Cojan Oficio* as the centerpiece of the government’s national campaign to commemorate the World Day Against Child Labor in 2019. Additionally, the results of the study and communication pieces were shared with the regional offices and teams of the ICBF throughout Colombia.

Considering households may not view child labor as a pernicious activity, Somos Tesoro further tailored their activities to increase awareness of the health risks for activities that require excessive use of force or that could lead to accidents, and that are considered the most hazardous job functions. By doing so, the project presented a more relevant and compelling message to the target communities, ultimately increasing the likelihood of lasting impact from the intervention.

The impact of the project’s messaging campaigns was assessed as part of a study finalized in 2018 (Pact 2018). This study by Somos Tesoro established that raising awareness in families that certain tasks are especially risky for the health, both for adults and children, discouraged children’s participation in a number of dangerous activities, such as those related to construction, the agricultural sector, and loading heavy packages. For example, activities in the construction sector went from 6.9 percent to 4.1 percent, activities in the agricultural sector went from 11.9 percent to 5.3 percent, and loading heavy packages (usually associated with labor at the mines) went from 4.4 percent to 3.0 percent. Meanwhile, there was an increase in child labor in less dangerous activities, such as car and motorcycle washing from 2.1 percent to 8.9 percent, work as messengers from 0.3 percent to 12 percent, and domestic services from 3.4 percent to 4.8 percent. Thus, while the worst forms of child labor reduced, children moved to other forms of income generating activities showing the economic and cultural importance of such work (Figure 19).

FIGURE 19. **Child Labor by Economic Activity in Somos Tesoro (2015-2018)**



Conclusion

The eradication of child labor is central to the attainment of SDG8, and especially target 8.7 which calls for the elimination of the worst forms of child labor, one of which is child labor at mine sites. Somos Tesoro's actions are aligned with this, as the project provides different mechanisms to support families and their children out of mine work, while also creating cultural and societal changes that ensure that this transition is sustainable over time. Somos Tesoro has been successful in reducing child labor in ASM in Colombia because of a comprehensive strategy that addresses this problem by supporting families, improving the quality and relevance of education, promoting better health and safety conditions in ASM, and influencing public

policies for child labor prevention. The influence of these components has been further enhanced by studying and understanding how social perceptions of child labor shape the way communities confront it. By doing so, Somos Tesoro has been able to adapt and create more pertinent strategies to have a lasting effect in these communities and their children. In 2019, Somos Tesoro began the implementation of a second phase of the project in two additional municipalities in Boyacá (Paipa) and Antioquia (San Roque). In this new phase and building on the greater understanding of child labor drivers learnt from the survey undertaken in the first phase, the final project assessment will include specific questions related to changes in the social perception of child labor as a result of the project.

ACKNOWLEDGMENTS

Somos Tesoro is implemented by the consortium of Pact, Fondo Acción, Fundación Mi Sangre, and the Alliance for Responsible Mining and is financed by the United States Department of Labor. The content of this material does not necessarily reflect the views or policies of the United States Department of Labor. Mention of trade names, trade products, or organizations does not imply endorsement by the United States government.

END NOTES

1 Somos Tesoro initially developed activities in the gold mining municipalities of Remedios, Segovia, Zaragoza and El Bagre in Antioquia, and in the coal mining municipalities

of Sogamoso, Mongua, Tópaga and Gámeza in Boyacá. The project benefited 4,312 households, 13,239 children and 2,680 miners.

2 *Barequear* is an artisan technique that consists of washing gravel in a pan to separate out gold on the banks of rivers and in large open-cast veins.

3 The information analyzed here was collected from eight focus groups; three of them of women and five of adolescents from three mining regions of Colombia: the zone from Remedios and Segovia, in the Northeast of Antioquia; the Zaragoza and El Bagre area in Bajo Cauca, Antioquia, where gold is mined, and the province of Sugamuxi, in Boyacá, in particular the municipalities of Sogamoso, Mongua, Tópaga and

Gámeza, where coal is mined. In total, 30 women and 50 adolescents participated.

4 PlanetGOLD, a program led by the United Nations Environment Programme recognized this campaign as part of the Good Communications Practices in the Artisanal & Small-Scale Mining Sector.

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CASE STUDY #3

Photo shared by Arlene Galvez, 2020.

ADDRESSING CHILD LABOR IN ASM THROUGH FORMALIZATION: THE PHILIPPINES CASE STUDY

AUTHORS: Giovanni Soledad,* Arleen Taguba,* Alexandre Soho**

ORGANIZATION(S): *ILO CARING Gold Mining Project, **International Labour Organization

INTRODUCTION

The Philippines is considered as one of the most highly mineralized countries in the world with vast reserves of gold, silver, copper, nickel, and chromite. In a 2012 report, the US Department of State estimated the country's untapped mineral wealth at US\$840 billion (Esplenada 2012). It is therefore unsurprising that there are an estimated 200,000 to 300,000 workers engaged in artisanal and small-scale mining (ASM) in the country, including 18,000 women and children (BanToxics 2011). The sector is heavily informal and working conditions are not up to standards. Unique to the Philippines, a case in point is “compressor mining” often undertaken by young men and children where mining is done underwater for long hours with miners as deep as 10m breathing through a tube connected to an air compressor above ground. The law governing the small-scale mining sector in the Philippines, the “People’s Small-scale Mining Act of 1991—R.A. 7076” (Republic of The Philippines, 1991), and, the “Special Protection of Children Against Child Abuse, Exploitation and Discrimination Act of 2003—R.A. 9231” (Republic of The Philippines 2003), prohibit children from working in the industry. Despite this, however, and due to the factors noted, children can still be found in ASM sites all over the country.

Transformation of the ASM landscape

From 2016 to 2020, the Philippines took significant steps to accelerate its efforts to eliminate child labor in ASM. This has been anchored on the commitment and action to formalize ASM operations complemented by a variety of programs targeting the issue of child labor in the sector. One such undertaking is the CARING Gold Mining Project, which ran from December 2015 until March 2020 in the Philippines. The Project was implemented by the ILO in collaboration with BanToxics and with funding from the United States Department of Labor (USDOL).

Under the “People’s Small-scale Mining Act of 1991,” the State can declare specific “people’s mining areas” (Minahang Bayans [MBs]) where small-scale mining can be done.¹ In 2015, there were only three such designated zones since the law was passed in 1991—a rate of one declared MB every eight years. As of late 2019, however, 26 new MBs were opened, making the total number 29 and accelerating the rate to 8.7 MBs per year since 2015. This confirms the government’s commitment to formalize ASM. The country’s Mines and Geosciences Bureau (MGB) has set the target of 150 MBs by 2022, which is a realistic goal at the current rate.

A key approach taken by the CARING Gold Mining Project has been to enhance the capacity of small-scale miners and social partner organizations on one hand, to work with government duty-bearers on the other, while providing platforms where both groups can engage each other in social dialogue. The discussions and resulting actions have included streamlining the legalization process and tracking all MB applications in the pipeline. When the Project started working in the pilot province of Camarines Norte in 2016, for example, known to be a hotbed of illegal ASM, there were no MBs. The sector was in disarray and the status of pending applications were unclear. However, by 2020, there are now two MBs in the province, including the village of Malaya, with six other applications on the way.

Interventions to address child labor and working conditions issues

Along with social dialogue, another gap filled was the creation of a Strategic Plan for the development of ASM which, though called for in the 1991 law (R.A. 7076), was never formulated until the MGB collaboration with the Project. Child labor and protection of workers are key elements in this Plan. This document will also serve as guidance in the process of developing a National Action Plan (NAP) for artisanal and small-scale gold mining (ASGM) consistent with the Minamata Convention.

The country is also currently enhancing R.A. 7076 to address bottlenecks in the sector and unlock its potential further. Concerning working conditions specifically, the country’s Occupational Safety and Health (OSH) Guidelines now cover small-scale mining. This change was made possible by the Project’s partnership with the OSH Center to investigate risk factors in ASM. As such, OSH in ASM will be given more attention in the Implementing Rules and Regulations of the recently passed 2017 “Act Strengthening Compliance with Occupational Safety and Health Standards and Providing Penalties for Violations Thereof—R.A. 11058” (Republic of The Philippines 2017).

Along with the policy support, the coordination between the Department of Labor and Employment (DOLE) and the Department of Environment and Natural Resources (DENR) has been enhanced. DENR is now a member of the DOLE-led National Council Against Child Labor (NCACL), a move that clearly strengthens the multi-agency committee’s capacity to look into the sector. The DOLE is chairing the Sub-Committee on ASGM, which includes child labor in its remit, under the DENR-led and newly formed Inter-Agency Technical Working Group for Minamata Initial Assessment.

National programs have also been developed and used to specifically root out child labor from ASM. The Strategic Helpdesk for Information, Education, Livelihood and other Development Interventions (SHIELD) Against Child Labor of the Department of Social Welfare and Development was developed with Project support and piloted in ASM sites. With its national rollout this year, the system for monitoring and

mitigating child labor at the community level therefore already has the experience and specific expertise to tackle the issue in all ASM areas in the country. The Project also utilized the Community Based Monitoring System (CBMS), a mechanism for collecting poverty-related indicators for use in local government development planning and budgeting and added an indicator on child labor in ASM. With the CBMS now to be used by all local governments in the country through the recent passage of the CBMS Act, the additional indicator will enable all areas to consider child labor in ASM sites in their planning processes.

The case of Malaya (free)

Malaya means “being free” in Filipino, which is ironic considering that the community with this moniker was featured by a Human Rights Watch report in 2015 (HRW 2015) as being affected by various social ills associated with ASM, such as child labor, mercury contamination, widespread informality, and hazardous working conditions. Today, however, the village of Malaya is free from all the social ills, having been a pilot ASM community of the Project and a convergence point of all the interventions and programs outlined.

At the heart of Malaya’s success is the story of a group of informal miners who have formed an ASM association in order to coordinate their collective action and to facilitate access to government services, including the processing of their MB application. On the other side of the coin is the strong commitment and collaboration exhibited by government agencies and the local governments to eradicate poverty and support ASM development.

This surrounding, enabling environment has been key to success and is characterized by the convergence of all efforts of the different government institutions as well as social partners and other stakeholders. Crucially, the desire to change and the resilience of Malaya has led to the transformation of Malaya to a model mining community. Malaya miners now operate legally, ensure that children are not used in ASM activities with the help of SHIELD, use mercury-free technologies with the help of BanToxics, equitably share their income, engage in agricultural

activities to supplement their incomes from ASM with the help of the Department of Agriculture, Department of Trade and Industry, and DOLE, and provide education support to the community with the help of the Department of Education and the Technical Education Skills Development Authority.

From once being viewed as an ecologically degraded and disadvantaged area, the future is bright for Malaya as the doors for its full transformation to a responsible and vibrant ASM community have been opened, and along with it, its capacity to address child labor sustainably. The Malaya story is representative of the shift happening all over the Philippines where, after decades of ASM neglect and the consequent proliferation of child labor in the sector, small-scale mining communities are being given the required attention and help that they have long needed.

ACKNOWLEDGMENTS

The commitment, collaboration, and support of the following institutions and organizations have been essential for the transformation described: MAGKAMATAO (Miners' Association of Malaya), Department of Labor and Employment, BanToxics, Provincial Government of Camarines Norte, ILO FUNDAMENTALS Geneva and ILO Country Office for the Philippines, United States Department of Labor.

END NOTES

1 In 2012, Executive Order (EO) 79 was passed which accommodates small-scale miners through the “Minahang Bayan” (MB) scheme. Pursuant to the provisions of EO 79, a Revised Implementing Rules and Regulations (RIRR) of Republic Act No. 7076 was issued in 2015 designating additional areas to be declared Minahang Bayan. However, a huge number of small-scale miners are still unregulated particularly in the far-flung indigenous areas mainly due to the stringent permitting process and limited enforcement of R.A. 7076. The coalition of small-scale miners continued to push for the streamlining of the Minahang Bayan licensing process and amendment of R.A. 7076. Since the inception of the CARING Gold Mining project, several dialogues were organized between the miners and the Department of Environment and Natural Resources (DENR). These advocacy initiatives contributed to finalize the Minahang Bayan guidelines and fast track approvals of MB applications.

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CASE STUDY #4

Credit: Reuters, Siegfried Mondola

FINDING EFFECTIVE APPROACHES TO REDUCE THE WORST FORMS OF CHILD LABOR: INTRODUCING PACE

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ORGANIZATION(S): *UN Global Compact Network UK, **Thomson Reuters Foundation, ***CPC Learning Network/Columbia University, ****World Vision, *****Fifty Eight, *****War Child UK
All members of the Partnership Against Child Exploitation (PACE): www.pace-consortium.org

INTRODUCTION

Worldwide, 152 million children are estimated to be involved in child labor (ILO 2017). Much of this exploitation is defined by the International Labour Organization (ILO) as the Worst Forms of Child Labor (WFCL) (ILO 1999). In the Central African Republic (CAR) and the Democratic Republic of the Congo (DRC), it is estimated that between 30 percent and 40 percent of all children aged 5-14 are engaged in child labor (USDOL 2018a; 2018b), with underage labor in artisanal and small-scale mining (ASM) sites, children recruited into armed groups, and trafficking of girls into sexual exploitation among the most notorious examples. The extractives industry in particular is often singled out for criticism; with weak regulation in the two countries struggling with chronic conflict and poverty, the exploitation of children in the extraction of valuable minerals such as diamonds and tin, tungsten, tantalum, and gold (3TGs)—essential for the production of jewelry, mobile phones, computers, and renewable energy technology—is widespread. The economic uncertainty brought about by the COVID-19 pandemic is only likely to make this worse.

Working with national governments and industry stakeholders in the DRC, CAR, and Ethiopia, the Partnership Against Child Exploitation (PACE) is combatting the exploitation of children in ASM (Box 5). Specifically, the six-partner consortium—comprising World Vision, Columbia University, Fifty Eight, Thomson Reuters Foundation, UN Global Compact Network UK, and War Child—is working with vulnerable communities to empower children and their families to resist exploitation and improve access to education and economic opportunities, while simultaneously supporting governments and the extractives sector to strengthen industry regulation, improve supply chain due diligence, and bring those exploiting children to justice.

Through this work, PACE will generate new data on the nature of WFCL in ASM, and what approaches can be most effective in its prevention. Drawing on the unique strengths of each partner, the interventions will contribute directly to Sustainable Development Target 8.7 to eradicate forced labor, end modern slavery and human trafficking, and eliminate the worst forms of child labor (UNGA 2020).

A new model for mapping worst forms of child labor in ASM

To generate new data on WFCL in ASM, PACE partner Fifty Eight has developed a new model for supply chain mapping and due diligence that maps the chain from the bottom up and captures the contribution of informal economic activities—where child labor is most commonly found. In line with McQuilken and Hilson (2018) advocating for the need of more detailed knowledge of ASM production networks, the supply chain analysis follows a two-pronged approach. First tracing the chain from bottom-up identifying where and how children are involved both directly and indirectly at each stage. Second, from the top-down mapping existing traceability or due diligence practices and impacts, including unintended consequences for children and families. Although yet to be deployed, the model will also identify social norms and behaviors of different actors within the supply chain that might encourage or exacerbate the use of child labor and pilot grassroots led approaches to implementing international

policy such as the European Union Responsible Minerals legislation (European Commission 2017). By deploying this approach, alongside labor market and supply chain assessments, PACE aims to identify how local and global businesses can better combat WFCL and help vulnerable communities into safer livelihoods. Evidence generated through the trials in CAR and DRC will also inform how these approaches can be scaled to other countries and sectors.

A large percentage of DRC and CAR exports—and hence foreign exchange—come from a combination of legal and illegal mineral extraction. But the income received by these countries from these activities does not reflect this. For example, in DRC 40 percent of taxation on mineral extraction should be returned to regional and local governments which would have major impact on local economy and social service—particularly for children and families. PACE will seek to pilot interventions which directly address this challenge.

Consortium partners World Vision and War Child have decades of experience delivering child protection programs in PACE's target locations. Based on this, a package of local interventions has been launched over the years to reduce WFCL in a sustainable way. This includes identification of children at risk of, or involved in, the WFCL, working with local schools to reintegrate out-of-school children into education and investing in safe learning environments, supporting community-level advocacy against WFCL, and establishing savings and loans schemes alongside small business training to strengthen local economies.

The program design and decision-making processes behind these activities have been driven by a strong set of data from the analysis of existing secondary data sources. Most importantly they have also been driven by data generated during the co-creation and early implementation phase through community consultations, research, mapping, and assessments.

The truly holistic approach adopted by PACE—investigating the push and pull factors of WFCL at all levels—is designed to grow the global evidence base on how to reduce child exploitation, with Columbia University leading a range of mixed methods eval-

uations and longitudinal studies to ensure PACE activities contribute robust learning to the global fight against child labor. This is not without complications. Being illegal and typically conducted in areas of highly informalized economic activity, there is no commonly accepted standard for measuring levels of WFCL. Moreover, the relationship between child labor and social norms in the corporate world is largely unexplored. To address these gaps, PACE has developed a new methodology to triangulate findings from key informants with existing data to present a more accurate picture of the levels of WFCL. PACE is also working with corporate decision makers to design a bespoke analytical framework to examine social norms and how they relate to child exploitation at the most localized levels of global supply chains.

The engagement of national and international media is also key in the fight against WFCL. The media is uniquely placed to influence and shape the social norms that inform our attitudes and practice, whether as governments, corporations, or individuals. Led by the Thomson Reuters Foundation, PACE is supporting local radio stations to raise awareness of the WFCL and the dangers posed to children through a range of training, mentoring and broadcast development support.¹

Ensuring reliable data collection

Given the complexity of capturing reliable information about the WFCL in ASM, the PACE consortium is adapting research methods that can capture this hard-to-measure issue. One approach that has been adopted with some success is embedding researchers as participant-observers in program teams. While maintaining a level of objectivity, these researchers can systematically interact with children and youth, program team members, and community stakeholders and document the experiences of each of these respective groups and also connect to, and take part in, the community-level partnerships that are essential to effectively work in these fraught and fragile contexts.

PACE is also ensuring robust triangulation of data across multiple sources to ensure that a clearer

picture of the realities of the drivers of the worst forms of child labor emerge. For example, when exploring what factors promote children's involvement in ASM, the perceptions of parents and caregivers, children themselves, mine owners and managers, and others in the community are captured to then explore various hypotheses in analyzing the complex interactions that can lead to divergent data.

The program is also drawing upon age-old ethnographic tools to understand the lived realities of children involved in the WFCL. This includes open-ended life stories that can help understand the

BOX 5. PACE Engagement and Collaboration with the Private Sector

Throughout 2020-2021, the UN Global Compact Network UK (UNGCN UK) is hosting a series of business roundtables to collate examples of corporate best practice in tackling WFCL. A Private Sector Strategic Advisory Panel is acting as a conduit between the private sector and PACE by channeling company perspectives, experience, insights, and knowledge. A Child Labor Working Group has been meeting to discuss the challenges of combating WFCL in global supply chains. Both groups consist of international companies with global operations. Evidence and learning from these initiatives and the wider PACE program will be disseminated through the UNGCN UK's national and international networks to influence practice on a global scale.

PACE actively welcomes contributions from new partners who wish to support combating child exploitation; especially businesses working in ASM or the wider extractives sector. Companies who are interested in supporting PACE should contact the UNGCN UK representative: **Benafsha Charlick-Delgado**: *benafsha.delgado@unglobalcompact.org.uk*

For further details, see www.pace-consortium.org.

complexity of factors that can drive children into exploitative situations and what potential paths out of exploitation may exist. At a research design level, given the near-impossibility of conducting randomized-controlled trials, a number of different quasi-experimental designs are being combined to examine how interventions may impact children and families at school and community levels.

Conclusion

Ending child labor in ASM is an enormous challenge, requiring coordinated and sustained effort from governments, corporations, civil society, and families themselves. For PACE, working in such resource-scarce contexts, this challenge is magnified many times over. One of the primary challenges is related to the lack of reliable data, in fragile conflict affected contexts characterized by the presence of armed

groups, high levels of informality as well as the presence of illegal activities such as corruption. Accessing or generating reliable data is extremely complicated but also very important to be able to design evidence-based interventions and conduct the necessary analysis needed to monitor intervention outcomes and results and adapt activities and approaches throughout. The multi-pronged approach adopted by PACE is fundamental to bringing about real change; and a clear analysis of the impact brought about through these wide-ranging interventions is central to informing future work at scale.

Combatting the exploitation of children in some of the WFCL, such as ASM, is not the responsibility of governments or civil society alone. The private sector has extensive expertise and experience of the industries in which children are most commonly exploited; expertise and experience that are crucial to ending the exploitation of children.

ACKNOWLEDGMENTS

The PACE consortium is funded by UK Aid from the UK Government. However, the views expressed do not necessarily reflect the UK Government's official policies.

PACE actively welcomes contributions from new partners who wish to support combatting child exploitation; especially businesses working in ASM or the wider extractives sector. Companies who are interested in supporting PACE should contact the UNGCN UK representative: Benafsha Charlick-Delgado, UNGCN UK benafsha.delgado@unglobalcompact.org.uk

END NOTES

- 1 PACE will ensure that adequate safeguards are in place to protect children who may be at risk of stigma

or retaliation by anonymizing content among other safeguarding measures.

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REFLECTIONS: COLLABORATING FOR CHANGE

The in-depth analysis and case studies of the five focus areas related to SDG8 point to the need for more targeted ASM data at a global scale. Encouragingly, and as the compiling of the 2020 State of the Sector Report itself demonstrates, there is a strong basis for collaboration among a wide range of engaged ASM stakeholders willing to work together to share data, lessons, and help fill the gaps. Crucially, this also includes the voice of miners as expressed through the many case studies from partners on their programs working directly with ASM communities, associations, and cooperatives across the globe.

There are, however, clear data gaps that still exist. This includes data at the global and national level on production of all minerals and numbers engaged in activities, on the most hidden and marginalized groups, such as women and children working in an already obscured sector, and details on how the various arms and interconnected relationships of global ASM production networks fit together. However, there is already a vast array of data being collected at the local level and aggregated from existing dispersed datasets. But it is only through continued and even greater collaboration that helps to bring this data together in meaningful ways—as is undertaken in this report—that the narrative on ASM can be changed. This data is needed to build comprehensive and indisputable bodies of evidence, inform innovative formalization, and support programs that directly connect with, and are tailored to needs of, miners and their communities. SDG17 epitomizes this collaborative approach for change best.



Strengthen the means of implementation and revitalize the global partnership for sustainable development

This final part of the report provides key reflections to close the data gaps related to SDG8. It is based on the learnings from the body of evidence compiled in this report and accompanied by two illustrative case studies on collaboration. The first case study from Benjamin Katz and Luca Maiotti of the OECD asks: what collaborative policy responses and due diligence practices are needed to shift market expectations in support of ASM formalization processes? Their analysis mapping the production network of cobalt in the DRC shows the multitude of stakeholders involved, routes of trade, and the financial and commercial relationships that underpin it. Interestingly, the five recommendations made on collaboration to increase responsible ASM participation in formalized global supply chains, include the need to directly engage with “legitimate” ASM, empower cooperatives to be actors of positive change, enhance data collection and communication, and increase ASM site visits to ensure robust supply chain mapping.

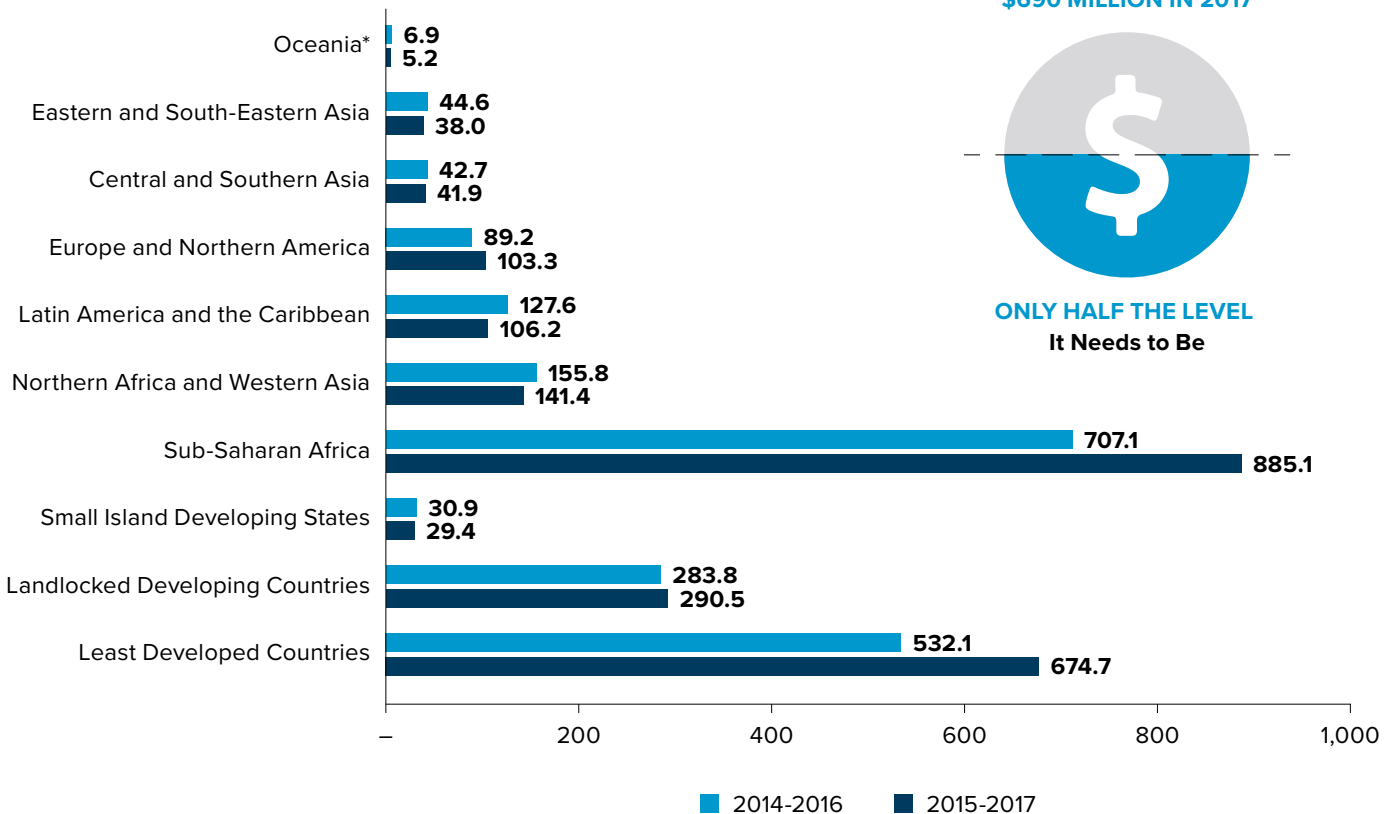
The second case study illustrates this point of engaging directly with ASM communities well, whether they are informal or otherwise. Gabriela Flores (2020) explains the approach taken by the Institute for Environment and Development (IIED) through their methodology for national multi-stakeholder “action dialogues.” These are designed to identify solutions that promote formalized, rights-based, productive ASM. Through a 3-stage iterative process of research, engagement and dialogue, and communications that sees mining community representatives join national and international policymakers for ASM site visits and dialogue discussions, positive collaborative change that helps reshape the narrative and develop concrete policy actions can be implemented.

A key part of both exercises is the collection and collation of data—both quantitative and qualitative—to develop a robust evidence base for change. These collaborative data collection efforts, like those of other Delve partners, contribute significantly to the gap in funding many of the world’s poorest countries face in collecting robust data. It is imperative therefore that it be communicated and made more freely available in accessible ways to national policymakers that need it most. This data is also valuable to miners and communities from whom it is from, and so that they may also use it to help empower themselves.

The UN (2020) reports that in 2019 most countries worldwide (141, up from 129 in 2018) were carrying out a national statistical plan. These are needed “to collect relevant, timely and usable data to set priorities, make informed choices and implement better policies for sustainable development” (Badiie et al., 2017, 1). But there are significant inequalities in national statistical systems, capacities, and the funding needed to implement them. For example, in sub-Saharan Africa only 25 percent of national statistical plans (9 out of 36 countries) were fully funded, compared with 95 percent (36 out of 38 countries) in Europe and North America. This shortfall is attributed by the UN to international funding through overseas development assistance (ODA) being only half the level it needs to be (Figure 20). In context, only 0.34 percent of ODA is being spent on data and statistics leaving a gap of US\$690 million “needed to ensure

FIGURE 20. Level of International Funding for Data and Statistics

Total Official Development Assistance Dedicated to Statistical Capacity-Building Activities, 2014-2016 and 2015-2017 (millions of current dollars)**



* Excluding Australia and New Zealand.

** Country-specific commitments only. Unallocated commitments to multiple countries/regions are excluded.

Source: UN (2020, 22 & 59)

that countries in developing regions are better equipped to monitor progress of their development agendas” (UN 2020, 59). The collaborative work of Delve and its partners to develop a global platform on ASM data is therefore essential to meeting these global data needs for sustainable development.

Reflections

Reflection 1: Investments in health and safety are urgently needed for ASM, since improved occupational health and safety (OHS) is a collective responsibility which is both feasible and beneficial to all

Reflection 2: Better data on ASM’s economic contributions through improved national statistics can prove the value of ASM to national and global growth

Reflection 3: Targeted interventions in relevant areas can help to improve miners’ lives and improve their pay, health, and well-being

Reflection 4: Engaging the socio-economic network of actors involved in ASM can help overcome entrenched behaviors and change labor practices which continue to undermine OHS advancement in the sector

Reflection 5: Concerted partnerships with ASM associations advance the decent work agenda

Reflection 6: Focusing on women’s work in ASM is essential to the goal of decent work for all

Investments in health and safety are urgently needed for ASM, since improved occupational health and safety (OHS) is a collective responsibility which is both feasible and beneficial to all

Decent work leads not only to improved productivity but to better individual and communal well-being. Despite the evidence, however, miners and their communities continue to face multiple health and safety risks. Many of these originate from the common informality of ASM operations, including absence of technical and financial support for mine site improvements and OHS training for miners themselves. Common impacts of health and safety risks at sites include injuries, fatalities, and recurring illness in mining areas. Of all the safety issues, only mercury use in gold extraction and processing has received considerable attention over the years. Beyond mercury, the absence of in-depth studies and comprehensive data on OHS has made it impossible to identify the scale of the OHS problem and to therefore track progress.

The 2020 State of the Sector Report applies the fatality frequency model—used for industrial mining—to ASM, showing that in 1999, ASM was as unsafe as large-scale coal mining in the USA in the early 1970s, but safer than large-scale gold mining in South Africa in the 1980s. Increased mechanization, investment, and concerted efforts to improve OHS by governments and industrial mining companies has since led to dramatic safety improvements in the industry. This begs the question: if even a small fraction of the total budgets deployed for OHS improvements by the industrial mining sector were invested similarly in ASM operations, could the OHS record of ASM not equally improve?

The answer put forth in this report is yes. Market-driven approaches to OHS provide win-win opportunities for increased health and safety and financial outcomes. Partnerships, as shown in the case studies of the report, can involve governments, companies, international organizations, and end-user manufacturers. Responsible sourcing initiatives provide an important building block for wider efforts on basic OHS to be

made. In the absence of responsible sourcing initiatives, standalone, at scale OHS program can be implemented. Either way with modest investments in OHS, the right technical assistance can:

- **Improve productivity and reduce operating costs** through overburden stripping, provision of geological information, better work-place organization, better access to ore veins, properly locating material waste heaps, and improving transport pathways;
- **Narrow gender pay gaps** by lessening the physical performance requirements of many higher paying mine site jobs which traditionally favor men;
- **Improve worker health and female well-being** with provision of site sanitation (such as clean water and toilets); and
- **Increase local content opportunities** through new business starts ups who can respond to new demand for OHS services and products.

Better data on ASM's economic contributions through improved national statistics can prove the value of ASM to national and global growth

Data which underscore the economic importance of ASM are critical to understanding the ways in which finances fuel the sector's production and growth, create linkages to other industries, and crucially, bolster the case for formalization. Moving forward, more disaggregated economic data will be needed to showcase ASM's economic contributions, beginning with its contribution to GDP as well as more accurate figures linked to the value of exports. At present, there is an overreliance on export figures, declared production, and sales as the key sources of data for understanding ASM's contribution.

National reporting and accounting systems are critical instruments to capturing these data fields. Yet there are only a few countries to draw on where

ASM's contributions to labor, revenues, and exports can be effectively measured (Guyana, Rwanda, Central African Republic, and Tanzania). In the first three cases, ASM is the key scale of mining activity in the country making it easier to attribute ASM production to national statistics. However, in most mining countries where industrial and ASM activities take place, statistics on production, revenue, and exports get comingled at the national level. Tanzania is an outlier where its accounting systems have adapted to reflect small-scale mining production and export statistics separately from industrial statistics. This has helped to demonstrate the critical role of ASM and its related associations in the economy's development. The pilot efforts of the Extractive Industry Transparency Initiative (EITI) to disaggregate reporting by mining type held promise, though also demonstrated the need for new tracking and accounting systems that would allow for easy disaggregation of production statistics in national ledgers.

Gender disaggregated data has even more significant gaps. Take for instance data on Delve where 60% of countries with ASM data published on the Delve website do not have data published on basic female participation.

Enhancing better data on ASM and economic growth could be done as follows:

- **Standardize a “mining” field** into national household, labor, and poverty survey instruments, and where possible disaggregate between industrial and ASM;
- **Upgrade databases and cadastres** in Ministries responsible for mining to track production statistics by scale of activity and to delineate ASM permits;
- **Improve information technology** in regional field offices of mining Ministries to upload real-time data on ASM permits, production activity, and total number of miners at monitored sites; and
- **Pilot methodologies for a “multiplier calculator”** to capture the reach of development impact ASM has in local communities.

Targeted interventions in relevant areas can help to improve miners' lives and improve their pay, health, and well-being

The 2020 State of the Sector Report showcases ASM formalization projects, centered on specific topics such as gender, mercury elimination, due diligence and traceability, or child labor. Observed across the various case studies and projects is the potential for a singular project topic to serve as an entry point to implement broader decent work reforms. Such an approach marks a departure from even a decade ago where niche formalization projects operated in silos and made little impact beyond the topic at hand.

Mercury elimination may be the most powerful example of such an approach whereby efforts to eliminate its use are combined with other formalization efforts meant to improve the lives of miners—securing mine titles and permits, access to financing, and environmental protection. Due diligence and responsible sourcing initiatives, as already highlighted in Reflection 1, offer another platform for reforms of a wide nature to do with decent work. Gender-focused projects, where a gender analysis is performed early on to identify gaps, can act as catalysts for improvements in pay, health, and well-being.

Practically, leveraging formalization entry points for improving decent work could:

- **Employ a holistic formalization model** to the decent work agenda which integrates the foundational pillars of formalization models to efforts to improve decent work in mine sites; and
- **Adopt universally a set of OHS standards** for application in any formalization project.

Engaging the socio-economic network of actors involved in ASM can help overcome entrenched behaviors and change labor practices which continue to undermine OHS advancement in the sector

A recurring theme throughout the 2020 State of the Sector Report is the ability of socio-economic relationships in mining value chains and networks (that is the ecosystem) to influence—positively or negatively—outcomes on the decent work agenda. Take for instance the adoption of mine site standards, the lessening of gender inequality, the elimination of child labor, or the reduction of mercury use. Each rely in equal measure on individual behavior change and leadership influence on decision-making at mine sites. As raised in focus area five, who controls the gates, so to speak, of the mines is the determinant for what jobs women and men will perform at sites and the pay received. Equally in focus area four, it is noted how past failures of mercury elimination projects resulted from little understanding of the influence periphery social actors had on technology uptake (or lack thereof). Lastly, in focus area six, mapping of the social actors unearthed the cultural drivers to child presence and labor in mine sites, thereby enabling more practical solutions to child labor eradication.

Decent work outcomes can be amplified if the following is undertaken:

- **Conduct qualitative mapping exercises** during project preparations to identify actors in the local mining ecosystem; and
- **Design behavior change programs on decent work** which engage social actors outside the immediate mineral value chain.

Concerted partnerships with ASM associations advance the decent work agenda

Many of the case studies in the 2020 State of the Sector Report highlight the capacity and strength of national and regional ASM associations. This

attention is long overdue. Mining associations possess extensive networks from the local to national levels. In some countries, they are already proactively engaged in advocacy with government to reform sector policies, as seen in the case study by the International Institute for Environment and Development (IIED) working directly with associations in Ghana and Tanzania. Mining associations' roles in advancing SDG8 are multiple: from messaging at the mine site level to establishing commitments and policies on decent work across their membership to funding mine site improvement pilots and collecting data. Examples found in this report include: the Association of Women in Mining in Africa (AWIMA) efforts to survey women engaged in the jewelry value chains; the Pumuan Jaya Panners Collective efforts in Indonesia to secure access to finance and invest in sustainable, safe, and scalable business practices for their female gold miners; the work of the Tanzania Women Miners Association (TAWOMA) to expand female membership and connect members to international jewelry initiative such as Moyo Gems.

Further involvement of ASM associations in advancing the decent work agenda could include:

- **Develop national and even pan-regional commitments** to OHS and gender equality at all member sites;
- **Implement Champions of Change programs** where member mine sites are selected to demonstrate an integrated model of decent work standards applied;
- **Negotiate commitments as well as technical and financial contributions from international mineral buyers** to implement national level OHS standard programs in members' mine sites;
- **Conduct regular data collection** on implementation of the decent work agenda in members' mine sites; and
- **Use community of practice platforms like Delve** to broaden understandings and knowledge on effective formalization strategies to address decent work.

Focusing on women's work in ASM is essential to the goal of decent work for all

The 2020 State of the Sector Report shows how women remain largely invisible in the data on ASM. Yet, as powerfully outlined in the case studies, women make up significant portions of the ASM workforce and suffer from specific forms of workplace discrimination. Adverse side effects of mercury use, unequal pay for similar work, sexual harassment, and inability to own land or mining titles without permissions are but some of the ways in which women's decent work outcomes are hampered.

Advancing gender equality with respect to SDG8 and ASM is possible through the following measures:

- **Complete basic census data** on the number of women working in ASM, disaggregated by country;
- **Streamline gender disaggregated baseline surveys** into all ASM formalization projects to ensure that projects are aware of gender gaps and seek to close them;
- **Continue to reform laws** which discriminate against women's capacity to be entrepreneurs, access finance, and own assets; and
- **Make closing gender gaps a key reporting obligation** for all responsible sourcing initiatives and a key standard for any OHS system at mine sites.

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Credit: Stephanie Shumsky/Pact

ANALYZING SUPPLY CHAIN COLLABORATION FOR ASM COBALT FORMALIZATION IN THE DRC

AUTHORS: Benjamin Katz, Luca Maiotti

ORGANIZATION(S): Organisation for Economic Co-operation and Development (OECD)

INTRODUCTION

A multiplicity of roles and relationships define artisanal and small-scale mining (ASM) production and trade of cobalt in the Democratic Republic of the Congo (DRC). This is a result of a highly developed upstream market but is also indicative of the parallel and sometimes conflicting operating models in use, leading producers and traders variously to contest the same resources, circumvent efforts to promote transparency, and play by different rules.

A central question then arises: what collaborative policy responses and due diligence practices are best positioned to shift market expectations in favor of an ASM formalization process that is robust, scalable, and allows the sector to support livelihoods? Based on in-depth mapping and prior research, the details of which can be found in OECD (2019), this case study demonstrates the importance of mapping the details of the cobalt supply chain in DRC and presents a set of policy recommendations to enhance ASM formalization.

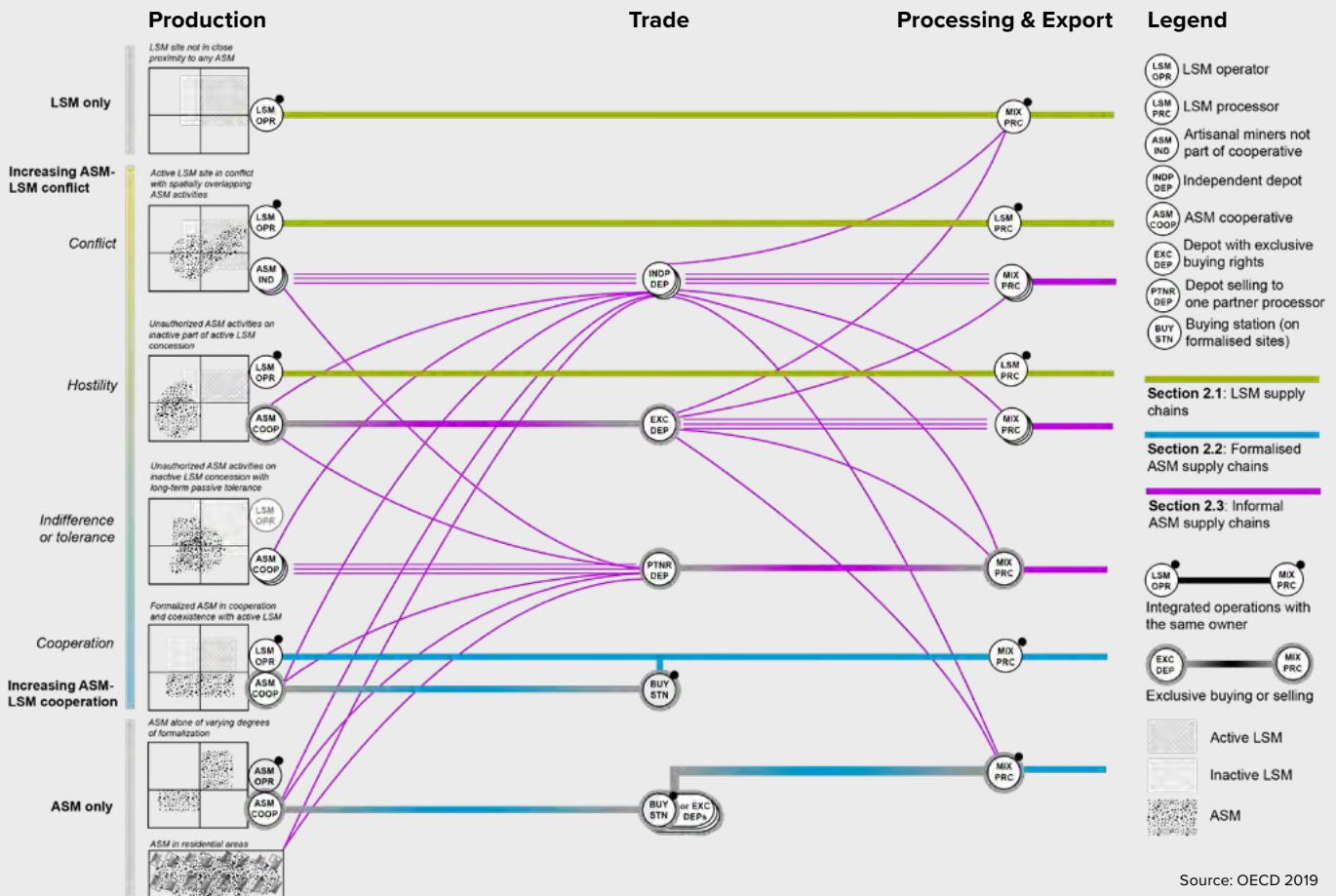
Supply chain structure

DRC supplies approximately 60-70 percent of the world's cobalt. Of this, large-scale mining (LSM) represents 70-80 percent of DRC cobalt production, while the rest (20-30 percent) is from ASM. This means artisanal cobalt production in DRC comprises 13-20 percent of world production.¹ Figure 21 illustrates how different operating models bring miners, traders, and processors in the DRC into contact through sourcing relationships and on-site interface. It is this level of data and detailed mapping that is needed to develop robust policy recommendations to improve ASM. Some of the largest LSM companies operating in the DRC have integrated supply chains in which the mine operator also owns and operates the facilities that process ore into products for export, typically cobalt hydroxide. The mapping shows such companies maintain custody of the minerals from production through to export, and sometimes beyond (Figure 21).

However, despite the perception of the downstream market, a significant number of LSM operators, processors, and refiners also source material produced by ASM, which may be blended with LSM material at various points in the supply chain.² This often takes the form of an LSM operator and refiner that also purchases ASM materials from *dépôts* (buying centers) because the operator or refiner does not have an active exploitation permit, or, when they do, in order to supplement their production (Figure 21, lines 1,3, 5, and 6).

The 2018 DRC Mining Code (*RDC Code Minier* 2018) limits ASM activity to Artisanal Mining Zones (ZEAs). However, due to the existence of few viable ZEAs and the concentration of deposits on private Exploitation Permits (PEs) intended for industrial mining, most ASM cobalt production currently takes place on PEs. ASM activities overlap with active LSM operations or occur on inactive or residential areas of the concession. This means that the extensive

FIGURE 21. DRC Cobalt Supply Chain Overview



LSM-ASM interface is variously contested, fraught with ambiguity, and managed through a combination of improvisation and regulatory workarounds.

Some LSM operators also operate ASM sites and blend material with ore from LSM sites to reach target grades and production volumes (Figure 21, lines 7, 8, and 9). In this configuration, ASM operations have recognition from mining regulatory authorities and explicit authorization of the permit holder or operator, which establishes a supply agreement with ASM cooperatives. The LSM operator carries out the overburden removal, distributes personal protective equipment, and performs safety checks in the pits. Among the nearly 100 known ASM mining sites³ (BGR 2019; Faber et al. 2017), at least four may be considered to have these features of formality.

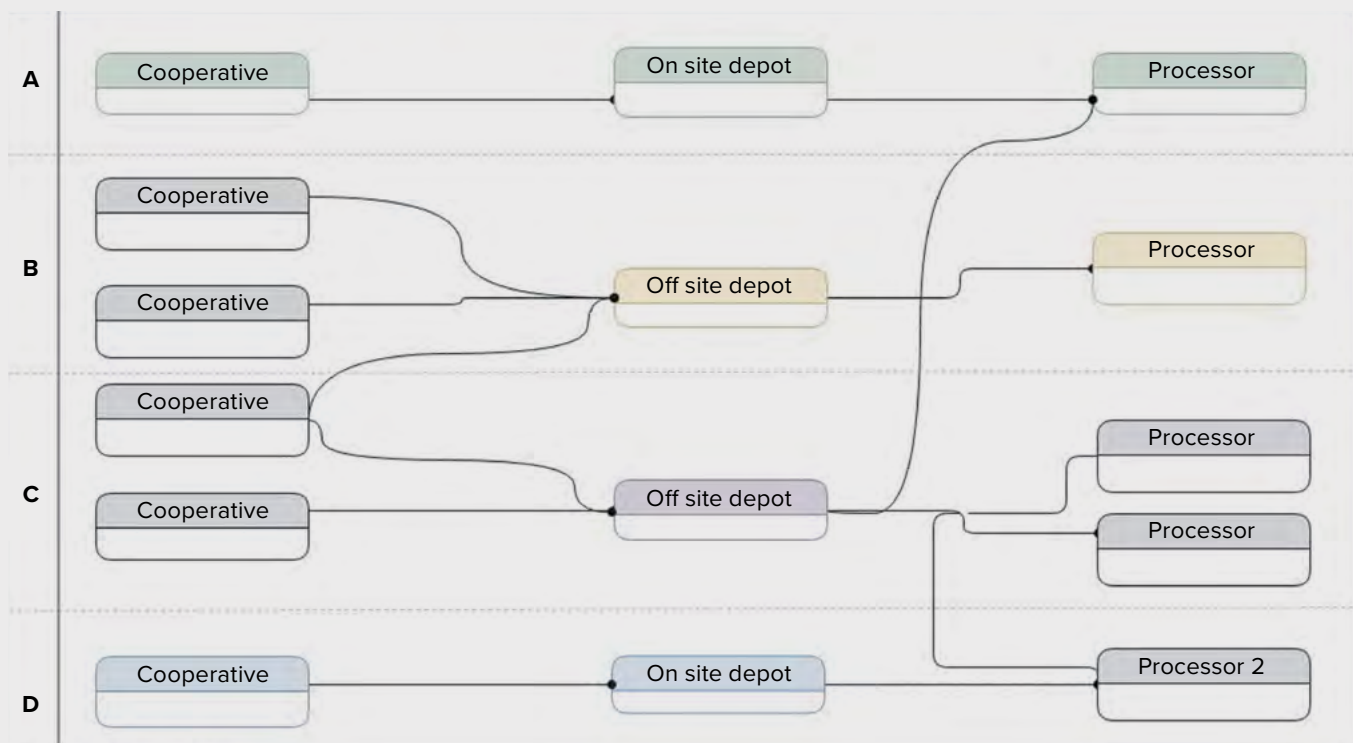
The ore extracted by informal ASM miners is brought to *dépôts*, which can be located directly on the mine site, along major roads, or sometimes in private homes. The relationships between processors, *dépôts*, and cooperatives are often complex. The leverage and visibility of each actor largely depends on political affiliations and financial ties,

as Figure 22 shows. Again, using data to map these relationships is key to developing robust policy recommendations and collaboration among ASM partners for change.

In line A, formalized ASM production, the processor supervises all commercial relations on the site through ownership of on-site *dépôts* and paying management fees to the cooperative. The same processor can also buy from the *dépôts*, with which it has no financing relationship to top up production. On-site *dépôts* also exist in informal ASM (Figure 22, line D), but the ability to set the terms of the relationship rests with whichever party is better connected.

For off-site buying centers, the *dépôt*-processor relationship can either be monopolistic, when the processor buys all the production of a *dépôt* (Figure 22, line B), or oligopolistic, when more than one processor (usually between two and five) buy material from the *dépôt* (Figure 22, line C). Even off-site *dépôts* are often not independent, but instead are part of vertically integrated supply chains through either ownership or exclusive buying relationships with processors.

FIGURE 22. Financial Links and Commercial Relationships within Different Trading Models



Source: OECD 2019

Resolving systemic impediments to formalization

Considering the complexity of the supply chain and the competitive incentives of various supply chain actors, ASM formalization faces four systemic challenges that, with further research and data, consultation, and policy action to resolve them, could significantly contribute to a paradigm shift in favor of ASM formalization sensitive to commercial and livelihood needs alike.

The first is the **regulatory environment**. Among wider governance challenges related to the extractive sector in the country, co-operation between entities involved in ASM production and LSM operators is not straightforward based on current regulations. There are exceptional approvals granted for this kind of co-operation, but the process for obtaining them should be made more transparent and accessible. Some form of co-operation is likely critical in order to address both the currently contested nature of mining concessions as well as the need for sufficient capital and expertise to invest in and maintain formalized ASM sites, including the removal of overburden.

A second systematic challenge is **inconsistent industry expectations**. The way leverage and pressure are currently applied by companies in the cobalt supply chain in support of due diligence practices is highly inconsistent and sometimes counterproductive. A significant share of downstream companies appears to be exercising either very little due diligence or compelling suppliers to cease sourcing ASM altogether, regardless of identified risk or considering at which sites risks are identified, and without first making attempts to mitigate risks. Besides being out of step with the OECD Due Diligence Guidance for Responsible Mineral Supply Chains (OECD 2016), this fosters an uneven playing field between ASM with formal features (which in many cases is being excluded from supply chains due to de-risking strategies and no-ASM policies) and informal operations (whose production is still being accepted by many companies without due diligence even being conducted).

Market volatility is the third systemic challenge that needs to be overcome to support ASM formaliza-

tion. International commodity prices and the cost structures they impose on mining operations are constantly changing. This is also true for ASM with formal features. Below certain international price thresholds, operating formalized sites may not be profitable. Simply relying on the contingency of switching operations on or off depending on market conditions, however, leaves the development of formalized ASM in a precarious place and could periodically foster redevelopment of informal activities with lower costs. Research and operational planning should give due consideration to leveraging capacity development as well as investments in complimentary—though not necessarily alternative—livelihoods to cushion the impact of employment disruptions for ASM workers and support a lasting framework for formalization even as market conditions change. Taking a similar approach, better mine planning, price transparency, and proactive communication with ASM workers could help reduce disruptions to employment, encourage a race to the top to attract miners to formalized sites, and reduce friction as miners shift between commodities.

A final challenge is the **opacity of informal operating costs**. The costs linked to due diligence in formalized sites are offset by lower prices paid to miners, who nonetheless enjoy safer working conditions. Artisanal miners at informal sites may be paid slightly higher prices for their minerals, but also face higher costs to be able to work, such as informal payments solicited by various state agencies, cooperatives, and traders. The pricing system for ASM material is more transparent at sites with formal features, but more work is needed on developing worker representation norms and labor management practices to ensure that ASM miners have the necessary information and a seat at the table regarding pricing decisions, even if most ASM workers remain independent contractors.

Recommendations

In light of the challenges outlined, stakeholders in the cobalt supply chain may consider the following measures to move towards robust and scalable ASM formalization. Potential benefits include improved labor conditions for ASM miners, more

predictable levels of responsible production, and reduced social conflicts that are both harmful to local communities and present security risks for LSM operators and their employees. The recently established state-owned enterprise *Entreprise Générale de Cobalt* could be an avenue for taking ASM formalization into the next phase, but naturally necessitates careful management as well as goodwill, and collaboration from the private sector. Further research and robust data could assist the DRC government and industry actors by testing these hypotheses and recommendations for incorporating them into industry and regulatory policies.

POLICY ENVIRONMENT—FOR CONSIDERATION OF THE DRC GOVERNMENT

Clarify requirements for LSM-ASM cooperation.

Clarify specific avenues and/or further institutionalize regulatory approaches that promote LSM-ASM cooperation on industrial concessions. This can help to ensure consistency for production sharing or supply agreements, reduce uncertainty around the business environment, and make it more attractive to LSM operators to work with artisanal miners on a commercial basis.

Create economically viable ZEAs. This includes providing official legal recognition to new ZEAs in areas that are already known to possess deposits that are favorable for artisanal extraction and are close enough to towns and population centers to be accessible by ASM miners. Viable ZEAs also require regulatory approaches that attract investors, partners, and customers to help carry out overburden removal and mine planning without compromising the integrity of a ZEA's purpose. In addition, state agents like the *Service d'Assistance et d'Encadrement des Mines Artisanales et de Petit Echelle* (SAEMAPE) and the Mining Division should be equipped with or have access to reliable sampling and weighing instruments. In addition, consider how concessions that do not fulfil the requirements of the Mining Code can be used to create ZEAs, with a particular attention to state-owned enterprises. Specific requirements of the Code include holding a maximum of 50 exploitation permits; paying surface rents, complying with all operational, social, and environmental requirements, demonstrating actual

commencement of work for renewal of exploration permits, and public tendering.

Empower cooperatives to be actors for positive change.

Apply clear criteria to the evaluation of cooperatives' applications for registration and the assignment of cooperatives to mining sites. While cooperative directors do not necessarily have to be drawn from among local artisanal miners themselves to provide value for miners working at sites under their supervision, authorization given to cooperatives should be based at least to some extent on the value they provide to miners. For example, in the form of services, representing collective interests, access to finance, or technical expertise.

MARKET ENVIRONMENT—FOR CONSIDERATION BY COMPANIES AND INTERNATIONAL PARTNERS

Engage with legitimate ASM. Consider formally engaging with legitimate artisanal and small-scale miners and progressively build capacity and improve practices by adapting know-your-customer protocols to the specific characteristics of ASM and setting realistic expectations for improvement within clear timeframes, as per the recommendations of the OECD Due Diligence Guidance for Responsible Mineral Supply Chains (OECD 2016).

For downstream companies, avoid pursuing ASM-free sourcing strategies as a form of risk mitigation. Pursue cross-industry collaboration among different segments of the supply chain in order to invest in and scale up ASM formalization projects to the critical mass needed to overcome competitiveness challenges with respect to informal ASM. It is therefore important for industry and multi-stakeholder initiatives in responsible sourcing to put in place accountability mechanisms for members against their own policies, commitments, and recommendations.

For upstream companies sourcing material from artisanal miners, help build capacity among ASM cooperatives in areas such as governance, access to finance, production techniques, and involvement in local procurement initiatives to increase financial stability for ASM workers and promote cooperatives' ownership of the formalization process.

Robust supply chain mapping. Step up site visits, data collection, and communication with suppliers to improve the integrity of chain of custody documentation for ASM material purchased through

depots and open markets, as an entry point for promoting formalization efforts at origin sites. This should be done hand in hand with the sector reform process underway by the DRC government.

END NOTES

- 1 The percentage of artisanal production of cobalt ranges between 18 percent and 30 percent. The discrepancy between these values stems from the degree of informality in ASM, which makes it difficult to measure the exact number of workers, and the mobility of ASM workers, which depends on factors such as the international price of cobalt (with workers switching to other commodities such as copper in the same provinces or other minerals in other parts of the country) and seasonality.
- 2 The research for this article case study did not attempt to corroborate specific companies' claims to source exclusively non-ASM material.

- 3 Due to the varying methodologies of studies and mapping exercises (BGR, 2019; CEGA, 2017), as well as the fluidity of the situation on the ground, it is difficult to indicate a precise number of informal ASM operations taking place on LSM concessions. Nonetheless, 100 is the lower bound for such estimates.

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Credit: Steve Aanu/IIED

BUILDING COLLABORATION FOR TRANSFORMATIVE CHANGE IN THE ASM SECTOR: WHAT CAN WE LEARN FROM “ACTION DIALOGUE” PROCESSES?

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INTRODUCTION

Collaboration is essential for all transformative change, not least in the artisanal and small-scale mining (ASM) sector. It is fundamental to putting technical solutions into practice, spurring action, and maintaining momentum to deliver better social and environmental outcomes. However, there are few documented examples of how collaborative processes that help realize the sector’s potential to drive sustainable development can be designed and rolled out, particularly at the national level. The International Institute for Environment and Development (IIED) developed a methodology for national multi-stakeholder “action dialogues,” which were held in Ghana and Tanzania in 2015-2018. These were designed to identify solutions that promote formalized, rights-based, productive ASM based on an iterative process of research, participation, and communication.

Using dialogue to build collaboration

There are many barriers to meaningful collaboration in ASM. Ensuring wide participation, meaningful inclusion, and continued engagement is a vast challenge throughout the ASM value chain, which ranges from artisanal producers to high-end jewellery and electronics consumers. For example, there are significant asymmetries in the power and voice of stakeholders in the sector, with miners and ASM communities remaining the least heard and able to participate. Underpinned by a lack of knowledge and understanding, negative perceptions of ASM are widespread, discouraging the constructive engagement of key players and the support of decision-makers. Policy and practice interventions in the sector tend to be fragmented, and usually driven by international agendas and market demand, failing to take into account local priorities in a meaningful way.

Against this backdrop, IIED designed a dialogue methodology to foster improved understanding, clearer roles, and collaborative relations between key stakeholders across the national production chain (IIED 2020). This methodology aimed to lead to a set of agreed upon priority actions co-designed by stakeholders, and to pave the way for effective collaboration at the country level to achieve a greater contribution from the ASM sector to local and national sustainable development. The methodology was built on three inter-connected components.

First is research. Evidence was marshalled to inform the national dialogues. Country diagnostic research in Ghana (McQuilken and Hilson 2016) and Tanzania (Mutagwaba et al. 2018) was undertaken with a focus on identifying political economy factors, key stakeholders, existing initiatives and programmes, and potential solutions that could be built upon.

Second is engagement and dialogue. Informed by the stakeholder mapping and initial diagnostic research, key stakeholders were briefed and consulted in their preferred spaces, be they mine sites or government offices. This was done

in collaboration with a national partner organization, building on their knowledge and networks in the countries where the dialogues took place. Stakeholders were also convened by sector—government, miners, academia, etc.—to validate emerging research findings and potential solutions in small workshops. Also informed by the research, strategies were developed to capture and ensure representation of “unheard” voices, for example miners themselves, communities, and local suppliers to ASM sites.

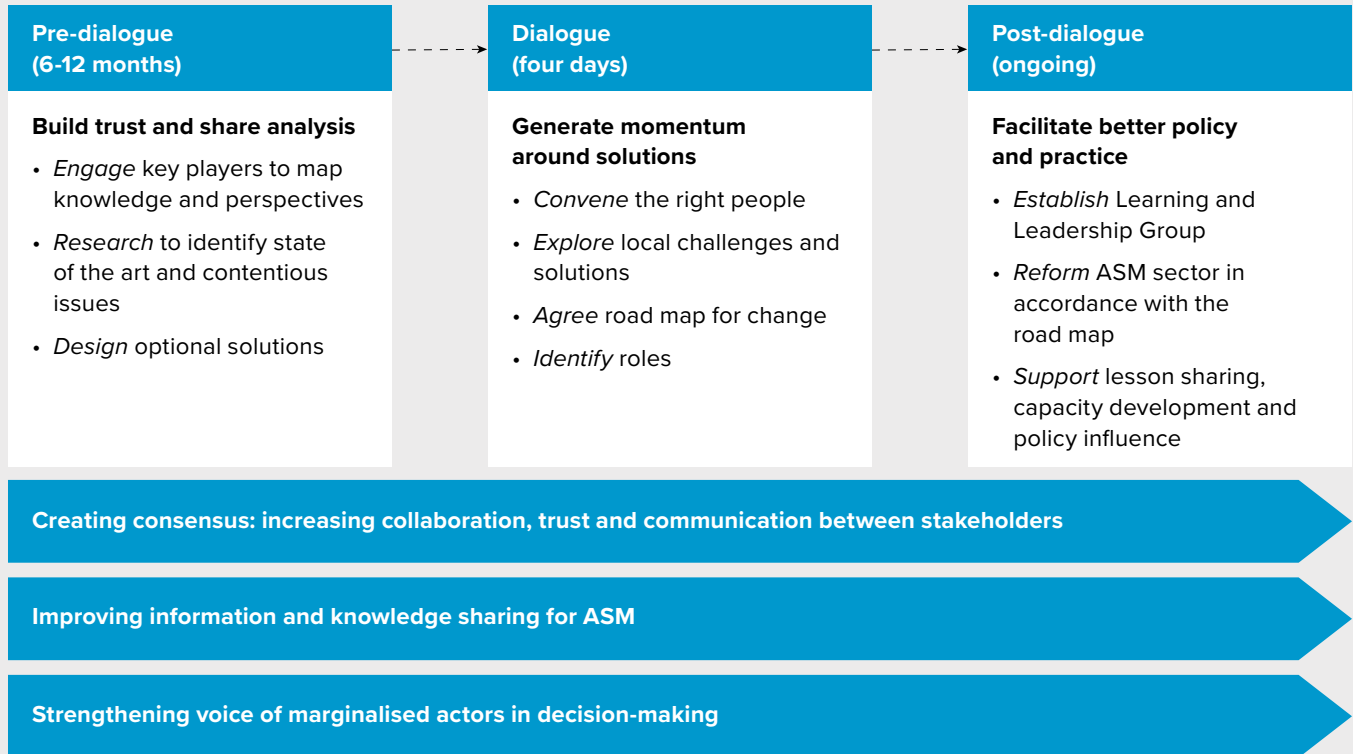
Third is communications. A communications strategy was developed to maintain steady information flows between stakeholders. Communications also aimed to raise the visibility of the sector as a potential driver for local sustainable development, highlighting accurate facts and figures about the sector’s economic contribution, good practices and local role models (IIED, 2017a and IIED, 2017b).

Each of the ASM dialogues was a four-day event. During the first two days, participants visited ASM sites and engaged with local stakeholders to explore the challenges and opportunities they face at the site and community level. A two-day workshop followed, where participants reflected on what they saw, and shared as well as challenged their commonly held perspectives. Informed by the field visit, participants identified the key challenges and barriers, prioritised potential solutions, and agreed on appropriate next steps. In Ghana and Tanzania, participants set clear roles and responsibilities and priorities for action. Each of these “roadmaps” is distinct and responds to local needs and perspectives (IIED 2016a; 2016b; Reynolds and Weldegiorgis 2018).

Local ownership and leadership over the process was crucial for continued engagement and collaboration. Dialogue participants appointed country-based, multi-stakeholder “Learning and Leadership Groups” to inform policy and continue to exchange ideas and information on the issues identified through the dialogue.

In practice, the dialogue activities were carried out over a 12-month period (Figure 23).

FIGURE 23. ASM 12-Month Dialogue Process



Building robust, collaborative processes in the ASM sector: lessons learned

Robust collaboration underpins sustainable change.

For this reason, the dialogues strived to address some of the particular challenges to participation and collaboration that exist in the ASM sector. Current and future ASM initiatives aiming to foster greater collaboration may draw some insights from IIED’s experience. For example:

Bringing unheard voices to the debate. Complete inclusion and participation in the ASM sector are not easy to achieve, and it may never be perfect. For this reason, there was an emphasis on making sure the voices of miners and ASM communities—women, men, and young people—were heard within the dialogue, to help move the discussion from abstract assumptions and pre-defined agendas towards concrete actions that take into account the future of ASM miners and communities and their local environment. Strategies to understand their information needs and preferred ways of engaging were put in place.

Building the capacity of local stakeholder groups to engage.

Despite their interdependence, there are limited opportunities for ASM stakeholders across the supply chain to come together and engage with one another in a neutral space and on an equal footing. This is essential to build mutual understanding and, eventually, collaboration. But ASM communities lack voice and power with decision makers, including government, donors, development agencies, and companies. The dialogues aimed to facilitate their engagement with these groups and support them in becoming better placed and able to share their concerns and perspectives and co-design national agendas alongside all other stakeholders.

Placing local realities at the centre. Local needs and realities usually draw the short straw, particularly in a context of mismatched stakeholders’ agendas and expectations. Starting any dialogue or collaborative process at the mine site, with local communities, can help make sure that local realities are not left behind. Meaningful engagement at the local level can also help other stakeholders appreciate these realities and take this understanding back to their respective communities of interest.

An evidence base that documents local realities, co-created with ASM communities, is also a helpful resource to draw on.

Building a solutions-focused shared agenda.

Stakeholder groups in the ASM sector and across the supply chain are very diverse and have different priorities, needs, and agendas. There is often little trust among them and sometimes even a negative history. The dialogues began with participatory, local research to unpick these complex agendas and identify solutions that build on participants' knowledge and experiences. Small workshops provided a space to identify and work through challenges in advance of the dialogue event, helping to allay participants' concerns and working with them to move towards solutions with shared responsibility and leadership. Focusing on solutions helps to generate confidence that barriers can be overcome.

Facilitating a locally owned process. Collaborative processes need to be locally owned and driven in order to achieve lasting impact. The dialogues were co-convened with national partner organizations,

Friends of the Nation in Ghana¹ and Haki Madini² in Tanzania, to build on their experience and aim to contribute to a broader process of change in each country. The dialogues generated “roadmaps” for action that summarized priorities identified collectively. Participants appointed Learning and Leadership Groups tasked with taking these priorities to their respective communities of interest and facilitating the continuation of the change process.

Prioritizing strategic communication. There is a great deal of misinformation about the ASM sector, particularly at the country level, which feeds misperceptions and mistrust. This can get in the way of building greater support for the sector and the collaboration needed for positive change. While negative practices exist aplenty, there is a need to build a more balanced view of the sector to highlight its potential and encourage action towards sustainable development outcomes. The dialogues were supported by communications strategies that drew on the research conducted, highlighting good practices, and supporting a greater understanding each other's perspectives and areas of convergence.

ACKNOWLEDGMENTS

This piece draws on IIED's experience convening and supporting dialogues in Ghana, Tanzania, and Madagascar between 2015-18, and on reflections from an internal review of these dialogues held in 2019. It also includes lessons from an institute-wide review of the way in which IIED uses dialogue within its work to create change towards a fairer and more sustainable world.

END NOTES

- 1 Friends of the Nation, <https://fonghana.org/>
- 2 Haki Madini, <https://hakimadini.org/>

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APPENDIX

Fatality frequency rate model

The model was designed and calculated by Dylan McFarlane. It is based on reported data on fatalities published in the ILO report “Social and labour issues in small-scale mines” (ILO 1999). The report includes a section dedicated to occupational health and safety (OHS) as well as the results of a survey that asked government agencies, chambers of mines, and trade unions across Africa, Asia, and Latin America to estimate the number of fatalities attributable to ASM in their countries each year.

The survey results are reproduced in the “fatalities reported” column of Table 11.

To calculate the fatality frequency rate (number of fatalities per million hours worked) an assumption of the number hours worked by a miner is needed. Given the informality and seasonal dynamics of ASM as well as to account for the fact that miners often interlock livelihoods with activities such as farming, the model used an average number of hours worked per year (Table 10). This was calculated based on a range of project and published data regarding seasonality and rural livelihood patterns (ILO 1999; Pact 2015; Dreschler 2001; Hentschel, Hruschka, and Priester 2002; Mwaipopo 2004; Kühn 2017; Barreto 2018; Republic of Sierra Leone 2018; Chupezi, Ingram, and Schure 2009).

TABLE 10. **Fatality Frequency Rates Model Assumptions**

2,000	hours worked per year for full-time ASM
1,000	hours worked per year for part-time/seasonal ASM
35%	estimate of global ASM workforce that is part-time/seasonal
1,650	hours worked per year for average ASM

TABLE 11. **Calculation of Fatality Frequency Rates using ILO Data from 1999**

Country	Fatalities reported			Number of minors (low-high)	Fatality Frequency Rate (FFR)			
	Range	Lower limit	Upper limit		Lowest (Low Fatality, High # Miners)	Low (Low Fatality, Low # Miners)	High (High Fatality, High # Miners)	Highest (High Fatality, Low # Miners)
Bolivia	>40	40	44	100,000	0.24	0.24	0.27	0.27
Chile	10-24	10	24	6,000-12,000	0.51	1.01	1.21	2.42
China	>6,000	6,000	6,499	4,300,000	0.85	0.85	0.92	0.92
Cuba	±1	0	2	5,000	0.00	0.00	0.24	0.24
Dominica	±1	0	2	125	0.00	0.00	9.70	9.70
Ghana	5->20	5	24	50,000-300,000	0.01	0.06	0.05	0.29
Guinea	±15	0	30	40,000	0.00	0.00	0.45	0.45

Guyana	±2	0	4	10,000-20,000	0.00	0.00	0.12	0.24
India	15-50	15	50	1,000,000-1,100,000	0.01	0.01	0.03	0.03
Kenya	±5	0	10	30,000-40,000	0.00	0.00	0.15	0.20
Malaysia	±2	0	4	4,600	0.00	0.00	0.53	0.53
Mexico	5-18	5	18	20,000-40,000	0.08	0.15	0.27	0.55
Myanmar	0-5	0	5	14,000	0.00	0.00	0.22	0.22
Namibia	±3	0	6	5,000-10,000	0.00	0.00	0.36	0.73
Nepal	1-3	1	3	500	1.21	1.21	3.64	3.64
Niger	0-27	0	27	440,000	0.00	0.00	0.04	0.04
Pakistan	45-90	45	90	90,000-370,000	0.07	0.30	0.15	0.61
Peru	±7	0	14	25,000-50,000	0.00	0.00	0.17	0.34
South Africa	±10	0	20	10,000	0.00	0.00	1.21	1.21
Tanzania	10-100	10	100	450,000-600,000	0.01	0.01	0.10	0.13
Thailand	<10	0	9	21,500	0.00	0.00	0.25	0.25
Zambia	5-7	5	7	20,000-30,000	0.10	0.15	0.14	0.21
Zimbabwe	10-30	10	44	50,000-350,000	0.02	0.12	0.05	0.36
Total	-	6,146	7,022	6,691,725-7,857,725	0.47	0.56	0.54	0.64

Source: Adapted from ILO (1999, 14).

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Country-level estimates of child labor in ASM

The estimates in Table 12 are from multiple sources and are presented to show the wide range of estimates in the literature for the number of children engaged in ASM. The figures are for illustrative

purposes only to show that, by combining multiple estimates of the number of children engaged in ASM from just 19 different countries, the result is almost double that of the one million global estimate provided by the ILO (2006), and similar to that of 1-2 million given by UNEP for artisanal and small-scale gold mining alone (UNEP 2010).

TABLE 12. Country-level Estimates of Child Labor in ASM

Country	Number of children in mining	Extract / description of estimate	Year
Africa			
Burkina Faso and Niger (not included in total)	Low: 60,000-100,000 High: 150,000-250,000	“Estimates have shown that children under 18 may constitute up to 30-50 percent of the entire <i>orpailleur</i> workforce (estimated at between 200,000 and 500,000 across the two countries). Approximately 70 percent of the children are under the age of 15, indicating that children start working from a young age.” (ILO 2006b, 2)	2006
Burkina Faso	60,000-100,000	“according to the government’s figures, over 200,000 people depend directly on artisanal gold mining for their livelihoods” (Berne Declaration 2015, 11) “30-50% minors. Children work at all stages of the production chain” (<i>ibid</i> , 15)	2015
Niger	22,000	Schipper, de Haan, and van Drop (2015) suggest 22,000 and cite a news article by Potter and Debroey (2014): “Below the diggers are the transporters, and those who pulverize the gold rock to very small pieces. Amongst the latter category many children—up to 44 percent—and women are found.”	2014
Ghana	7,000	“The GLSS 6 [Ghana Statistical Service 2014] puts the percentage of children working in mining and quarrying at 0.3 percent of all working children, which would translate into 7,428 children working in mining and quarrying.” (Human Rights Watch 2015) ¹	2013
	10,000	“An estimated 10,000 children are involved in various parts of the country, much of it in gold mining.” (ILO 2006b, 4)	2006
Mali	200,000	Gold only. “estimation of 200,000 by the Mali chamber of commerce. It is estimated that 20% of the ASGM miners are children.” (Schipper, de Haan, and van Drop 2015).	2015
DRC	40,000	“UNICEF estimated in 2014 that approximately 40,000 boys and girls work in all the mines across the whole of the former province, many of them involved in cobalt mining” (Amnesty International 2016).	2014
	600,000-800,000	Based on an estimate of 1.5-2 million people in DRC working directly in ASM (World Bank 2019): “In some mines visited during the course of this Study, up to 40% of the workers on any site could be considered children (acknowledging that it is hard to tell exact ages for teenagers between 16-19 years of age). Children and young people work in all aspects of artisanal mining in the DRC.” (Pact 2010). This is supported by Schipper, de Haan, and van Drop, (2015) who state that “As many as 40%	2010

		of workers in artisanal mining in the DRC are children.” However, the authors estimate a total 200,000 child miners in all minerals.	
Tanzania (not included in total)	30,000	“An ILO report on child labour in Tanzania (Africa’s fourth-largest gold producer), using survey data from 2014, states that there are 30,827 children (5-17 years old) involved in ASM in the country—13,493 boys and 17,334 girls (ILO, 2016).” (O’Driscoll 2017, 5)	2014
Uganda	12,000	Gold only. (Schipper, de Haan, and van Drop 2015).	2011- 2012
SADC Region (Malawi, Mozambique, Tanzania, South Africa, Zambia, Zimbabwe)	375,000 (25% of total employed)	<p>“There are no reasonable or trustworthy figures about numbers of children, working in the small-scale mining sector. However, various case studies carried out in several areas of the region, show that child labour [sic] is a big issue within the small-scale mining industry in the SADC.” (Dreschler 2001, 6)</p> <p>“There is about a total of more than 1,000,000 small-scale miners estimated to work within the 6 target countries (which should add up to about 1.5 million for the whole SADC region).” (<i>ibid</i>, 6)</p> <p>“More than 50 per cent of those employed in it are women and children.” (<i>ibid</i>, 21)</p>	2001
East Asia and Pacific			
Philippines	19,000	“ILO estimates in 2011 revealed that 19,000 children work in 45 artisanal and small-scale gold mines in the Philippines.” (ILO 2019)	2011
Mongolia	10,000-15,000	“A total of 100,000 people are engaged in this activity. Some 10–15 per cent of informal gold miners are children.” (ILO 2011, 39).	2005
Latin American and the Caribbean			
Bolivia, Ecuador, and Peru (included in total)	65,000	Gold only. Likely an underestimate—see Bolivia and Peru estimates. “As 65,000 children participating in Bolivia, Ecuador and Peru alone” (ILO 2006a)	2006
Bolivia (included in total)	120,000	“Research carried out by IPEC estimates that about 120,000 children and adolescents under the age of 18 may be involved in small-scale mining activities in Bolivia.” (Bocangel 2001, 12).	2001
Peru (included in total)	61,000	“A 2001 ILO study found that child labor was an issue in artisanal gold mines throughout Peru, with children working both independently, as well as alongside their families. The study found a total of 61,082 child laborers in artisanal gold mining, including 26,264 in Puno, 25,992 in Madre de Dios, 7,488 in Nazca, and 1,338 in Pataz.” (Verité 213, 22 citing ILO 2001).	2001
South Asia			
India	20,000	“According to ... Kate, Schipper, Kiezebrink, and Remmers (2015: 31) there are 20,000 children involved in mining mica.” (O’Driscoll 2017, 5)	2015
Total	1,624,000-1,872,000		

Note: Many of the numbers are reproduced from those compiled by Schipper, de Haan, and van Drop, (2015, 97-99).

END NOTES

1 In making this calculation, the Human Rights Watch (2015) report references: Government of Ghana and ILO (2013); Ghana Statistical Service (2014).

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