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BANRO MINING SITE IN THE DEMOCRATIC REPUBLIC OF THE CONGO. PHOTO

SECTOR ENVIRONMENTAL GUIDELINE: ARTISANAL AND SMALL-SCALE MINING

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ABOUT THIS DOCUMENT AND THE SECTORAL ENVIRONMENTAL GUIDELINES

USAID has developed sector-specific environmental and social guidance to support activity design, pre-implementation environmental review (including the identification of potential impacts and the design of mitigation and monitoring measures), and the development of environmental mitigation and monitoring plans. **This document presents USAID's *Sector Environmental Guidelines – Artisanal and Small-Scale Mining***. The Sector Environmental Guidelines for all sectors are accessible at USAID's Sector Environmental Guidelines & Resource webpage.

Purpose. The purpose of this document is to support environmentally and socially sound design and management of common USAID sectoral development activities by providing concise, plain language information regarding:

- The typical, potential adverse impacts of activities in these sectors (e.g., mining, agriculture, construction, fisheries, health care), including impacts related to environmental, social, and climate change;
- How to prevent or otherwise mitigate these impacts, both in the form of general activity design guidance and specific design, construction, and operating measures;
- How to minimize the vulnerability of activities to climate change, as well as the greenhouse gas (GHG) emissions associated with activities;
- How to minimize social impacts and maximize the benefits to beneficiaries and the local community in an equitable manner; and
- More detailed resources for further exploration of these impacts.

Environmental Procedures. USAID's mandatory environmental procedures, as described in Automated Directives System (ADS) 204, require that the potential adverse impacts of USAID-funded and managed activities be assessed prior to implementation via the Environmental Impact Assessment (EIA) process defined by Title 22, Code of Federal Regulations (CFR), Part 216 (Reg. 216)[1]. They also require that the environmental management and mitigation measures identified by this process be written into award documents, implemented over the life of the project, and monitored for compliance and sufficiency.

The procedures are USAID's principal process to ensure environmentally sound design and management of USAID-funded activities and, thus, to protect environmental resources, biodiversity, ecosystems, ecosystem services, and the health and livelihoods of beneficiaries and other affected groups. These procedures strengthen and sustain development outcomes and help safeguard the good name and reputation of USAID.

The SEGs directly support environmental compliance by providing information that is essential to assessing the potential impacts of activities and helping identify and design appropriate mitigation and monitoring measures, as necessary and appropriate based on capabilities.

However, the SEGs are not specific to USAID's environmental procedures. They are written for general application and are intended to support an EIA of these activities by all actors, regardless of the specific environmental requirements, regulations, or processes that may apply.

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[1]USAID. 1980. Reg. 216 (22 CFR 216). https://www.usaid.gov/environmental-procedures/laws-regulations-policies/22-cfr-216.

Limitations. This document serves as an introductory tool for Agency staff when initiating the design of projects related to artisanal and small-scale mining. This document is not intended to act as an exhaustive summary of all potential impacts because site-specific context is critical for identifying impacts. Furthermore, the SEG is not a substitute for detailed sources of technical information or design manuals. Users are expected to refer to the accompanying list of references for additional information.

USAID Guidelines Superseded. This SEG replaces *Small-Scale Mining: Cleaner Production Fact Sheet and Resource Guide* (2017).

Comments and Corrections. Each of these SEGs is a work in progress. Comments, corrections, and suggested additions are welcome. Email: environmentalcompliancesupport@usaid.gov.

Advisory: The Sector Environmental Guidelines are advisory only. They are not official USAID regulatory guidance or policy. Following the practices and approaches outlined in the Sector Environmental Guidelines does not necessarily assure compliance with USAID environmental procedures or host country environmental requirements.

CONTENTS

ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use Carbon Calculator
AGM	Artisanal gold mining
ASGM	Artisanal and small-scale gold mining
ASM	Artisanal and small-scale mining
BEO	Bureau Environmental Officer
C-TIP	Countering Trafficking in Persons
CASM	Communities, Artisanal and Small-Scale Mining
CFR	Code of Federal Regulations
CIFOR	Center for International Forestry Research
CLEER	USAID's Clean Energy Emission Reduction Tool
CO_2	Carbon dioxide
COTECCO	Combatting Child Labor in the Democratic Republic of the Congo's Cobalt Industry
CRM	Climate Risk Management
DRC	Democratic Republic of the Congo
EARF	East Africa Research Fund
ECOS	USAID's Environmental Compliance Support Contract
EIA	Environmental impact assessment
EJ	Environmental Justice
EMMP	Environmental mitigation and monitoring plan
ESDM	Environmentally sound design and management
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization
FCA	Fair Cobalt Alliance
FPIC	Free, Prior, and Informed Consent
FY	Fiscal Year
GBV	Gender Based Violence
GCAP	Global Climate Action Partnership
GHG	Greenhouse gas
GIS	Geographical information system
GRM	Grievance Redress Mechanism
HIV/AIDS	Human Immunodeficiency Virus/Acquired immunodeficiency syndrome
ICOMOS	International Council on Monuments and Sites
IEE	Initial environmental examination
IFC	International Finance Corporation
IGF	Interngovernmental Forum on Mining, Minerals, Metals and Sustainable Development
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
ILO	International Labor Organization
IP	Implementing Partner
IPCC	Intergovernmental Panel on Climate Change
IPEC	International Programme on the Elimination of Child Labour

LSM	Large-scale mining
LTPR	Land Tenure and Property Rights
NAP	National Action Plan
NDC	Nationally Determined Contributions
OECD	Organization for Economic Cooperation and Development
PASS	Parks and Protected Areas Social Safeguards
PE	Permis d'Exploitation
PPE	Personal protective equipment
PRO-IP	USAID's Policy on Promoting the Rights of Indigenous Peoples
PRADD	Property Rights and Artisanal Diamond Development
RAI	Responsible Agricultural Investment
RAP	Resettlement Action Plan
SEA	Strategic environmental assessment
SEE-AM	Social, Economic, and Environmental Accountability Mechanism
SEG	Sector Environmental Guideline
SEP	stakeholder engagement plan
SFOAA	State, Foreign Operations, and Related Programs Appropriations Act
SIRS	Social Impact Risk Initial Screening Tool
TB	Tuberculosis
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USEPA	U.S. Environmental Protection Agency
WHO	World Health Organization
ZEA	Zone d'Exploitation Artisanale

1. INTRODUCTION AND PURPOSE OF THE GUIDELINE

An estimated 45 million people worldwide work in artisanal and small-scale mining (ASM), or *informal mining conducted by individuals, groups, families, or cooperatives who use rudimentary processes to extract minerals or gems, often with no or very little mechanization*; an additional 134 million people (three times that number) indirectly receive support from ASM activity.[2,3] While ASM is largely a poverty-driven activity[4,5], ASM and related activities contribute to poverty alleviation and economic development by providing jobs to millions of people around the world and offering diversification of livelihoods in developing nations. Communities and local economies throughout many developing nations often depend on the income raised through ASM-related jobs; in some areas, small-scale mines rival or outpace large-scale mining (LSM) in terms of local economic impact.

However, ASM can simultaneously create new or exacerbate existing environmental, health, and socioeconomic challenges when not properly managed, potentially increasing the risks for already marginalized populations and even perpetuating poverty. For example, ASM can involve the use of dangerous chemicals or practices for extraction and processing, resulting in unsustainable or unsafe conditions for the miners themselves, their families, and the surrounding community and ecosystem. The use of mercury in ASM (and, in particular, artisanal and small-scale gold mining [ASGM]) is the largest source of mercury releases to the environment globally; mercury emissions from the sector are transported through the environment on both local and global scales.[6] The occupational risks to miners from extraction and processing methods may require mitigation measures to reduce risks and improve overall health and well-being. Additionally, specific subpopulations (e.g., children, women) may face unique risks from ASM activity, both in terms of the direct impacts on those engaged in mining and the indirect impacts on those in surrounding communities. Human rights issues may arise in the sector, such as a lack of labor rights, especially among children or victims of human trafficking, and with issues such as gender inequality in access to resources, adverse or dangerous working conditions, and property rights. In many nations where ASM occurs, the right to exploit mineral resources can be a source of contention; for example, a lack of clarity on the rights to surface versus subsurface resources can lead to tensions and potential conflicts within ASM communities and between LSM and ASM stakeholders, especially in such cases when ASM occurs on LSM concessions. Finally, ASM practices can cause negative impacts on ecosystems due to the unsustainable use of natural resources, deforestation, degradation of land and/or waterways, or the alteration of valuable ecosystem services (e.g., food sources, water sources, soil nutrient cycles).

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[2] World Bank. 2021. *Better Working Conditions Can Improve Safety and Productivity of Artisanal and Small-Scale Miners Around the World*. https://www.worldbank.org/en/news/press-release/2021/05/03/better-working-conditions-can-improve-safety-and-productivity-of-artisanal-and-small-scale-miners-around-the-world#:~:text=WASHINGTON%2C%20May%204%2C%202021%20%E2%80%94%20A%20new%20World,over%2044.

[3] World Bank. 2020. *2020 State of the Artisanal and Small Scale Mining Sector*. Washington, D.C.: World Bank. https://delvedatabase.org/uploads/resources/Delve-2020-State-of-the-Sector-Report-0504.pdf.

[4] United Nations Environment Programme. 2020. "Chapter 3: Artisanal and Small-Scale Mining." In *Mineral Resource Governance in the 21st Century*, pp 79-104. https://www.un-ilibrary.org/content/books/9789280737790s007-c002.

[5] Tschakert, P., & Singha, K. 2007. Contaminated identities: Mercury and marginalization in Ghana's artisanal mining sector. Geoforum, 38(6), 1304-1321. https://www.sciencedirect.com/science/article/abs/pii/S001671850700084X?via%3Dihub.

[6] Global Mercury Partnership. 2022. *National Mercury Inventories: Insights and Latest Trends*. https://www.unep.org/globalmercurypartnership/news/blogpost/national-mercury-inventories-insights-and-latest-trends.

Despite the risks described above, project managers have a unique opportunity to positively impact ASM activities or communities through development interventions. USAID and other development funders or practitioners have a history of supporting ASM communities through miner formalization programs, reforestation projects, mercury-reduction activities, and other capacity-building efforts. Emphasizing best practices, contamination mitigation, and overall good governance in mining communities can translate into more effective development interventions and more sustainable communities and livelihoods. Toward that end, development specialists and USAID project managers working in the ASM sector can use this *Sector Environmental Guideline* (SEG) to understand the complexity of the ASM sector, including general risks and impacts, and apply this understanding to improve ASM practices for environmental, economical, social, and public health outcomes.

This SEG for ASM introduces the range of possible impacts, particularly environmental, health, and sociopolitical, and explains how project managers and others can support prevention and/or mitigation through project design, environmental analyses for initial environmental examinations (IEEs), and during the development of site-specific environmental mitigation and monitoring plans (EMMPs). A focus on best practices and mitigation measures for environmentally sound design and management of USAID projects will help Missions comply with Section 117 of the Foreign Assistance Act and Regulation 216, which require that environmental impacts assessments (EIAs) be conducted and mitigations implemented for all USAID projects. This guideline is also intended to help USAID partners, staff, and other practitioners understand climate change impacts on and from ASM activities. Finally, the references section of the document lists cited documents, as well as additional resources and references on this topic. The annexes address common ASM-related terminology in a glossary; the general ASM production phase, processing, and related technologies; and considerations for the life of the project, including, design, implementation, and closeout.

DOCUMENT PURPOSE

This document is designed for project managers, project implementers, practitioners, or others working on development or environmental management projects that could impact ASM projects or communities that engage in ASM. This document addresses the following main components of ASM, after introducing the sector:

- The impact of development projects on ASM;
- The impacts of ASM on the environment, health, and socio-political systems on multiple scales;
- The social impacts of ASM;
- GHG emissions associated with ASM;
- The impact of climate change on ASM; and
- Best practices and mitigation measures for minimizing detrimental impacts of ASM.

1.1 HOW TO USE THIS DOCUMENT

This document is meant to be used as a tool to understand and respond to various challenges related to ASM. When referring to this document and working within their specific projects or interventions, project managers should recognize the complexity of the ASM sector and the diversity of influencing factors. ASM communities can be impacted by development projects, whether the projects focus on the mining sector specifically, or are focused on another sector but located in proximity to ASM communities. With an understanding of what defines ASM, managers should account for the specific local context, acknowledge issues to address, and identify means to prevent (if possible) or mitigate them, with an understanding that interests must be managed within the boundaries of project scope and administrative ability.

Project managers should conduct a thorough assessment of local conditions before engaging in any work accounting for the existing environmental, health, sociopolitical, and economic characteristics of an ASM community and the drivers of change. Underlying community health issues may be exacerbated by ASM activities or project activities in areas where ASM takes place. Thus, establishing a baseline understanding of the project context is critical prior to engaging in any activities.

Additionally, project managers should consider the life cycle of the mine (discussed below and in) from mine initiation to site closure. Ideally, new ASM-related projects will be designed to encourage the implementation of best practices at each of the stages. Impacts on the environment, health, and surrounding socioeconomic systems can occur throughout the life cycle, and mitigation measures may also vary based on the life cycle stage. USAID does not generally fund mining exploration or development; however, it can assist with formalizing existing mining activities or be involved in work during the mining closure or remediation phase. USAID may also be involved in purchasing equipment for use during production, especially as it relates to cleaner production, such as mercury capture technologies for gold shops, retorts, or alternative processing technologies, such as centrifuges or shaker tables. Or USAID may fund non-ASM-related projects in an area where mining site development is taking place. More on USAID's traditional role in ASM projects will be explored in the next section.

Regardless of the stage of the mining process during which the USAID project takes place, where possible, project managers and practitioners should focus on the implementation of sustainable practices (i.e., prevention) rather than remediation. Remediation is expensive—in some cases, not financially feasible—and less effective overall. For example, instead of focusing on *removing* mercury from the surrounding environment, project managers should emphasize methods that avoid mercury use in the first place, and in particular, those actions called for in a country's ASGM National Action Plan (NAP), as discussed in the Contextual Considerations in ASM Communities section. Furthermore, restoration of a former mining site, which is a common activity that many might associate with the reclamation of former mining lands, may actually increase risk as it opens potentially contaminated areas to farming, cattle grazing, or other public uses. When necessary, legacy mining issues should be referred to the appropriate bureau environmental officer (BEO) for further analysis.

Project managers should always understand that some impacts cannot be fully addressed by project activities; instead, they should pursue positive outcomes of engagement and intervention in communities. Improved practices should be drawn into project planning from the onset. Users of this guide are encouraged to consider how ASM practices can be made more sustainable throughout project activities.

Finally, project managers should note that projects are taking place within a value chain and existing landscape of relationships and networks built over time, both formally and informally. Projects may have impacts on those relationships in unintended ways, which project managers should try to anticipate during project design and implementation. These concepts will be introduced and explored in more detail in subsequent sections.

KEY MESSAGE: PREVENTION VERSUS MITIGATION

Avoiding impacts is more effective than remediating them, and prevention of contamination or unsustainable practices should be emphasized from the project start. Changing technologies or practices used during the development or production stage maximizes reduction of future impacts.

1.2 ASM AND USAID

USAID has supported a variety of ASM-related projects; interventions in ASM typically occur in an existing ASM community and involve improving existing processes. As described above, ASM activities are normally not supported by USAID. However, USAID's role in ASM may continue to change over time, as global stressors (e.g., climate change, resource or food insecurity, conflict) are expected to continue to influence migration and/or the adoption of alternative livelihoods of direct ASM participants and their dependents; conversely, economic conditions may serve to increase or decrease participation in the ASM sector. In addition, continued local, national, and international efforts to apply risk mitigation methods to ASM and continued efforts to study the positive and negative impacts of ASM on economic development may further inform USAID's involvement in future ASM-related projects.

USAID has pursued several activities in ASM-related work, including the following:

- Working in coordination with the local government and relevant agencies or ministries.
- Leveraging existing networks, such as miner associations or Indigenous Peoples.
- Addressing environmental impacts, such as water contamination or forest cover change.
- Offering capacity building in coordination with technical assistance.
- Understanding social risks and impacts in ASM communities.
- Promoting the formalization of miners, mining networks, or mining value chains.

These projects may impact existing ASM activities at various stages of a mine life cycle or extraction process. Some interventions seek to address mining itself and reduce or eliminate the use of toxic chemicals, such as mercury, during production or processing. Other interventions seek to strengthen property rights and formalize the miners who are working within the extraction process in an effort to legitimize local value chains. Projects—and ASM-specific interventions in particular—should be carefully timed within the mine life cycle, extraction process, or value chain so that project managers or implementers understand and plan for the potential negative environmental, social, and climate impacts of the projects.

USAID projects range in scope from worker or process formalization to land rehabilitation. Some of these projects are summarized in Table 1.

TABLE 1. SAMPLE OF USAID PROJECTS IN THE ASM SECTOR

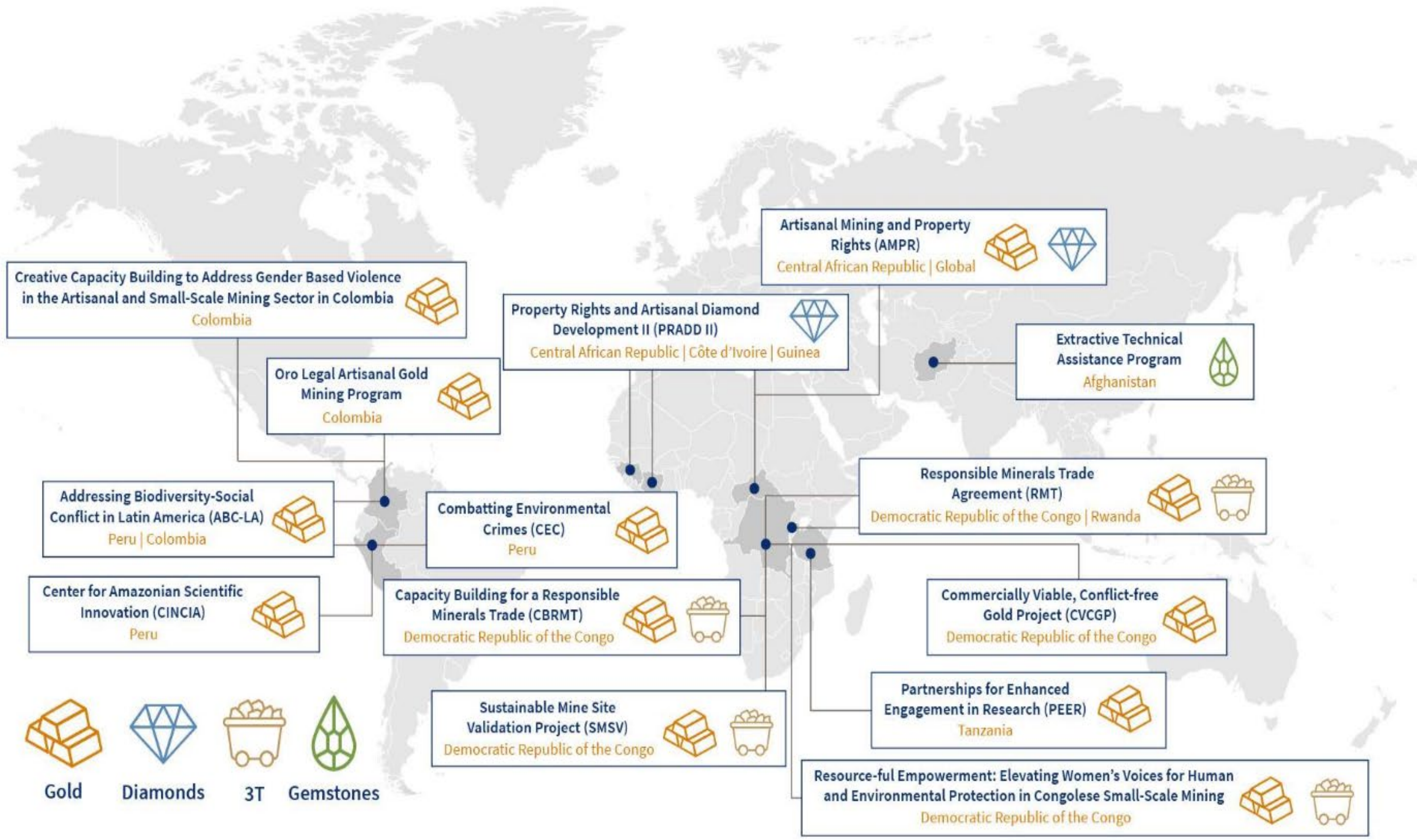
PROJECT NAME	LOCATION	SUMMARY AND KEY ELEMENTS
Zahabu Safi (Clean Gold) Project[7]	Democratic Republic of the Congo (DRC)	• Increase the demand for and co-investment in responsibly sourced ASGM gold from eastern DRC. • Increase the volume of exports of responsibly sourced ASGM gold from eastern DRC by strengthening the capacity of upstream and midstream supply chain actors to adhere to responsible supply chain traceability activities and comply with Organization for Economic Cooperation and Development (OECD) due diligence guidance. • Improve the commercial viability of ASGM gold cooperatives through targeted and participatory training.
Innovating Solutions for Gold Mining in the Amazon [8]	Colombia, Ecuador, Guyana, Peru, and Suriname	• Accelerate and scale-up 10 to 15 innovations to aid in more environmentally responsible and socially equitable ASGM practices. • Increase collaboration with local and regional non-governmental organizations to support the field testing of innovations and private sector scale-up of solutions. • Launch virtual and in-person science and innovation exchanges to foster the creation of a community of practice. • Launch the Amazon CoLab acceleration program to support innovator teams developing, testing, and advancing solutions to protect people and ecosystems in the Amazon. • Increase access to financial services and markets for artisanal mining solutions. • Promote more environmentally responsible and socially equitable ASGM operations in the Amazon.
Cooperative Agreement with Nongovernmental Organization, Capital Humano y Social Alternativo[9]	Peru	• Eradicate human trafficking and combat other gender-based violent crimes. • Train justice sector and care services officials to work with victims of human trafficking.
Oro Legal Artisanal Gold Mining Program [10]	Colombia	• Build governance capacity for gold mining activities by strengthening the Government of Colombia's enforcement capacity.

[7] USAID. 2022. USAID's Zahabu Safi (Clean Gold) Project - Q4 and Annual Report FY 2022. https://pdf.usaid.gov/pdf_docs/PA00ZQ97.pdf.
[8] USAID. 2022. Innovating Solutions for Gold Mining in the Amazon, USAID. https://www.usaid.gov/sites/default/files/2022-05/CXLab_FS_English-March_2022.pdf.
[9] USAID. 2022. Illegal Gold Mining – Peru. https://www.usaid.gov/peru/our-work/illegal-gold-mining.
[10] USAID. 2021. "Artisanal Gold Mining Activity (Oro Legal) Performance Evaluation." https://pdf.usaid.gov/pdf_docs/PA00Z8GS.pdf.

PROJECT NAME	LOCATION	SUMMARY AND KEY ELEMENTS
		• Enhance miner formalization and the participation of Indigenous communities. • Provide training and technical assistance to artisanal miners. • Reforest degraded areas. • Generate alternative livelihoods, such as apiculture. • Improve drinking water in mining areas.
ENV/Mining Program [11]	Colombia	• Facilitate the legalization and formalization of gold mining. • Engage Government of Colombia decisionmakers in dialogue with international ASM experts. • Improve decision making on mining public policy and associated environmental issues. • Facilitate constructive and inclusive public discourse around addressing illegal gold mining. • Improve and facilitate knowledge management of ASM technical topics.
Property Rights and Artisanal Diamond Development (PRADD) II Program [12,13]	Central African Republic, Côte d'Ivoire, Guinea	• Reinforce property rights through a system of control and access for diamonds from mine to export. • Bring a greater percentage of diamonds into the legal chain of custody. • Increase legal incomes.

[11] USAID. 2022. "Mining Horizon Factsheet." USAID. https://www.land-links.org/wp-content/uploads/2022/01/Mining-Horizon-Fact-Sheet-508.pdf.
[12] USAID. 2017. *PRADD II Diagnostic of and Conflict in Artisanal Diamond Mining Communities – French*. https://www.land-links.org/document/pradd-ii-diagnostic-land-conflict-artisanal-diamond-mining-communities-french/.
[13] USAID. 2018. Property Rights And Artisanal Diamond Development II (PRADD II) Final Report 2013-2018. https://pdf.usaid.gov/pdf_docs/PA00TNVG.pdf.

FIGURE 1. USAID ARTISANAL AND SMALL-SCALE MINING ACTIVITIES (2014–2020)[14,15]



[14] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches*. https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.
[15] 3T consists of tin, tantalum, and tungsten.

2. OVERVIEW OF THE ASM SECTOR

2.1 DEFINING ASM

Defining ASM is challenging because definitions may vary from country to country and may be according to various legal frameworks. In many cases, the country-level definitions or criteria for defining ASM are tied to national legislation and local business metrics. Some countries define *artisanal mining* as occurring on a very small scale with manual labor or utilizing rudimentary techniques, while *small-scale mining* may be conducted on a slightly larger scale with some mechanization[16].

ASM, however broadly defined, should not be confused with large-scale or industrial mining activities, which USAID does not generally directly support. Other countries may utilize other criteria beyond the scale of the mining activities to distinguish what constitutes artisanal or small-scale mining, as demonstrated in Table 2.

TABLE 2. DEFINING CRITERIA FOR ASM IN VARIOUS COUNTRIES

COUNTRY	ASM CRITERIA
Cambodia	Depth below ground at which miners work; area of the extraction site[17]
Côte d'Ivoire	Level of mechanization
DRC	Designated geographic ASM zones, level of mechanization
Ecuador	Tonnage
Ethiopia	Annual production, level of mechanization
Ghana	Capital investment, number of participants
Guinea	Type of minerals exploited
Mozambique	Technical/financial capacity, concession size
Peru	Illegal versus informal, ASM in protected areas
Philippines	Level of mechanization
Senegal	Depth of working, crude production levels
South Africa	Capital investment
Tanzania	Investment, labor, and technology requirements
United Nations	Annual production capacity
Zambia	Size of concession area
Zimbabwe	Size of concession area, capital investment

Although numerous attempts have been made to come to agreement on a standard, internationally recognized definition, one has not yet been fully established. In a broad sense, ASM is defined as *informal mining conducted by individuals, groups, families, or cooperatives who use rudimentary processes to extract minerals or gems, often with no or very little mechanization*[18]. In other words, ASM activities involve low per capita productivity, require (or

[16] Mining, Minerals and Sustainable Development Project. 2002. *Breaking New Ground: Mining, Minerals and Sustainable Development*. International Institute for Environment and Development. http://pubs.iied.org/pdfs/9084IIED.pdf.
[17] Equitable Cambodia. 2023. *A Snapshot of the Gold Mining Industry in Cambodia: Rights Violations, and Environmental Damage*. https://equitablecambodia.org/website/data/LettersPress-Releases/2023/12/A%20Snapshot%20of%20the%20Gold%20Mining%20Industry%20in%20Cambodia_Eng%20Final.pdf.
[18] Mining, Minerals and Sustainable Development Project. 2002. *Breaking New Ground: Mining, Minerals and Sustainable Development*. International Institute for Environment and Development. http://pubs.iied.org/pdfs/9084IIED.pdf.

can only access) low-capital investment, and utilize mostly manual labor. Historically, the International Labor Organization (ILO) described ASM as *"… labor-intensive, with mechanization being at a low level and basic"*[19]. The definition established by the Minamata Convention on Mercury, a globally recognized treaty designed to protect human health and the environment from mercury contamination, is generally accepted by experts in the ASM field, despite its focus on ASGM. The Minamata Convention on Mercury defines ASGM as *"mining conducted by individual miners or small enterprises with limited capital investment and production"*. [20]

The Organization for Economic Cooperation and Development (OECD) defines ASM as formal or informal mining operations with predominantly simplified forms of exploration, extraction, processing, and transportation.[21] The World Bank distinguishes large-scale mining from ASM: LSM refers to the activities of major companies, as well as to mid-tier and junior-level companies or to any formal company that complies with international performance standards; ASM broadly refers to all types of local mining activity that larger companies could encounter.[22] Hinton (2005) in a report prepared for the World Bank Communities and Small-Scale Mining Initiative defined ASM characteristics as distinguished from formal (LSM) mining by a relatively low degree of mechanization, a high degree of labor intensity, poor occupational and environmental health standards, low capital investment, and lack of long-term planning.[23] A report by the United Nations Environment Program cites several academic studies which note that the increasing level of mechanization involved in ASM as practiced (e.g., Ghana, Philippines) has exceeded the legal definition of ASM in these countries' laws and regulations and, therefore, there may be a need to define a "medium-scale" category of mining to reflect actual mining practices in these countries.[24]

Development planners and implementing practitioners should familiarize themselves with all definitions. The value of having a working definition of ASM at the country level is that it allows the integration of ASM (and effective interventions) into the development strategy. Because of the potential local or regional ties to legislation and economic market trends, project managers must take note of and heed local definitions whenever possible. Project managers should be aware that despite international engagement to address ASM, countries regulate ASM; internationally defined working definitions do not supersede country-specific specifications but

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[19] International Labour Organization. 1999. "Social and labour issues in small-scale mines: Report for discussion at the Tripartite Meeting on Social and Labour Issues in Small-scale Mines." Geneva. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_dialogue/@sector/documents/meetingdocument/wcms_714371.pdf.

[20] UNEP. 2013. Text of the Minamata Convention on Mercury for Adoption by the Conference of Plenipotentiaries. https://wedocs.unep.org/bitstream/handle/20.500.11822/8458/-Minamata%20Convention%20on%20Mercury-2013Minamata%20Convention%20on%20Mercury_en.pdf?sequence=8&%3BisAllowed=y%2C%20Chinese%7C%7Chttps%3A//wedocs.unep.org/bitstream/handle/20.500.11822/8458/-Minamata%20Convention%20on%20Me.

[21] OECD. 2016. OECD Due Diligence Guideline for Responsible Supply Chain of Mineral from Conflict-Affected and High-Risk Areas: Third Edition, OCED Publishing, Paris. https://doi.org/10.1787/9789264252479-en.

[22] World Bank. 2009. "Mining Together - Large-Scale Mining Meets Artisanal Mining: A Guide for Action." https://documents1.worldbank.org/curated/en/148081468163163514/pdf/686190ESW0P1120ng0Together0HD0final.pdf.

[23] Hinton, Jennifer J. 2005. "Communities and Small-Scale Mining: An Integrated Review for Development Planning." Washington, D.C. https://delvedatabase.org/uploads/resources/Communities-and-Small-Scale-Mining-An-Integrated-Review-for-Development-Planning.pdf.

[24] United Nations Environment Programme. 2020. "Chapter 3: Artisanal and Small-Scale Mining." In *Mineral Resource Governance in the 21st Century*, pp 79-104. https://www.un-ilibrary.org/content/books/9789280737790s007-c002.

may be complementary to country-specific laws and regulations (see the section below on International ASM Frameworks).

ASM may be further defined by the informal nature by which activities often occur. There is consensus across countries that ASM represents a spectrum of “informal” activities that are distinguished from “formal” mining by a relatively “*low degree of mechanization, high degree of labor intensity, poor qualifications and mining labor competence, poor occupational and environmental health standards, little capital and inefficient productivity, deposit exploitation, little consideration of environmental issues, limited access to land and markets, and chronic lack of capital”*[25]. While many ASM miners operate informally, in the absence of appropriate frameworks, some ASM miners operate within a “legal” or “formalized” framework, with established land titles and government permits, payment of taxes or fees, and compliance with social and environmental regulations imposed by the government.

ASM activities themselves can be disorganized but often operate via cooperatives, community groups, or other means of organization. Participation in ASM often fluctuates with commodity prices; as world markets fluctuate, people may shift livelihoods to take advantage of higher prices. ASM activity often occurs on the fringes of LSM leases, either coexisting knowingly or scavenging on LSM concessions. In some instances, ASM may be further characterized as potentially illegal; however, it is important to distinguish nuances in illegality. While some informal mining activities may be characterized this way because miners have not complied with administrative procedures governing formal licenses, permits, and rights to land and resources, other informal mining activities may be outright financing or otherwise supporting criminal activity (e.g., arms trade, drugs, warlords). This spectrum of legality is discussed in further detail in the sections below on specific impacts (in particular, see the Environmental and Social Impacts of ASM section). First and foremost, USAID does not condone or support any ASM activities that contribute to criminal activity. USAID may become involved in projects that support capacity building and interventions, and assisting current ASM projects in overcoming administrative burdens so they can legally operate.

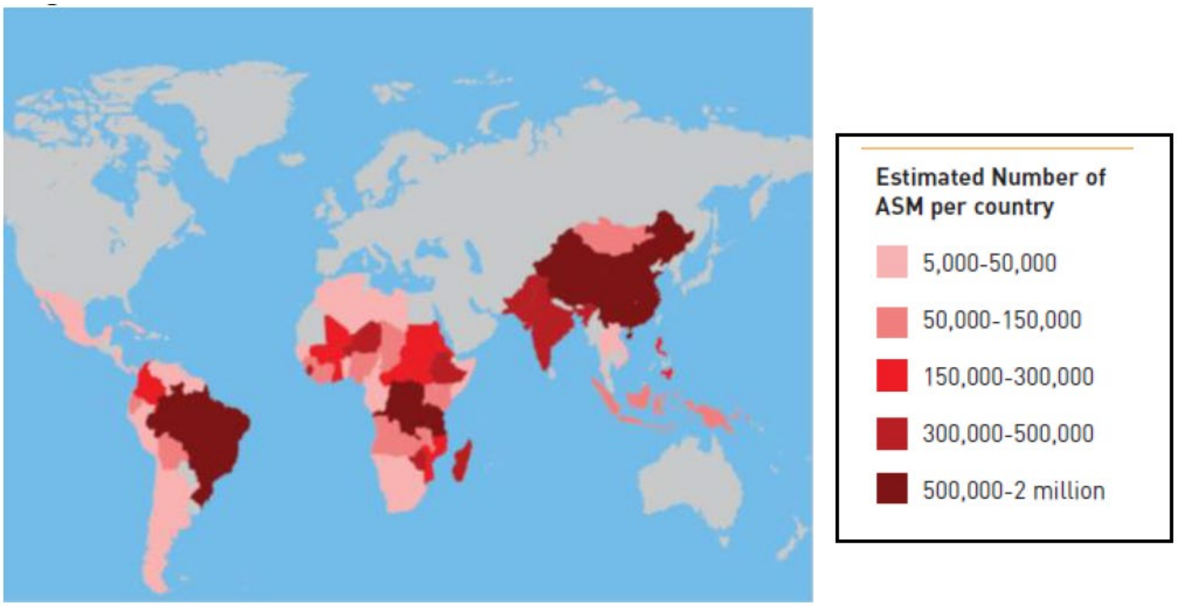
2.2 ASM GEOGRAPHY

As shown in , ASM is estimated to occur in more than 80 countries worldwide. While shifts in global market trends, among other factors, have altered the estimated number of operations or miners, ASM has become integral to the economies of many countries in the developing world, and it serves as a source of livelihood and income at the local and regional levels. Additionally, ASM significantly affects global markets because ASM production equals or exceeds that of LSM in many countries.

This document explores ASM on a global scale, despite the unique differences and contextual landscapes each ASM community may face. Therefore, while it is important to be aware of common practices among ASM communities, project managers should also gather and analyze site-specific information regarding underlying socioeconomic and political systems, relevant extractives (e.g., targeted ores, gemstones, industrial and construction materials), and physical environmental characteristics.

[25] Hentschel, Thomas, Felix Hruschka, and Michael Priester. 2003. "Artisanal and Small-scale Mining. Challenges and Opportunities." International Institute for Environment and Development and WBCSD, Nottingham. https://www.researchgate.net/publication/274138354_Artisanal_and_Small-scale_Mining_Challenges_and_Opportunities. and Hentschel, Thomas, Felix Hruschka, and Michael Priester. 2002. "Global Report on Artisanal & Small-Scale Mining." International Institute for Environment and Development and WBCSD. https://www.iied.org/sites/default/files/pdfs/migrate/G00723.pdf.

FIGURE 2. GLOBAL NUMBER OF PEOPLE WORKING IN ASM[26]



ASM IN COLOMBIA

Local ASM Activity: Colombia has a large ASM sector focused on gold and gemstones, such as emeralds. Gold, in particular, is gaining in popularity. In the Department of Antioquia in 2011, there were 17 mining towns and 15,000 to 30,000 artisanal miners. Antioquia was reported to have the world's highest per-capita mercury pollution.[27]

Challenges: Though mining is widespread in Colombia, ASM activities are largely unregulated. Small-scale mining operations correspond to almost 90 percent of total gold mining operations nationwide, of which 60 percent are untitled operations that are considered illegal and in many cases finance organized crime. Additionally, guerrilla and paramilitary activities (as a result of a long-standing political conflict in Colombia) may force miners to process their gold in locations where it is not possible to handle mercury appropriately during the processing stage. However, legal miners may also use high amounts of mercury due to whole ore amalgamation. For these reasons, mercury release/emissions in Colombia are exceedingly high, as a result Colombia is the world's foremost mercury polluter per capita as a result of ASM activity.

Development Interventions: USAID funded the "Oro Legal" program in Colombia from 2015 through 2021. The program objectives were to decrease environmental impacts and improve governance and address social conflict through the formalization of mining operations, recuperation of land, and decrease mercury use.

More on "Oro Legal" will be presented later in this document and is described in the footnotes.[28]

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[26] Delve. n.d. *Global Number of People Working in ASM*. https://delvedatabase.org/data.

[27] Cordy, Paul, Marcello M. Veiga, Ibrahim Salih, Sari Al-Saadi, Stephanie Console, Oseas Garcia, Luis Alberto Mesa, Patricio C. Velásquez-López, and Monika Roeser. 2011. "Mercury contamination from artisanal gold mining in Antioquia, Colombia: The world's highest per capita mercury pollution." Science of The Total Environment 410-411: 154-160. https://doi.org/10.1016/j.scitotenv.2011.09.006.

[28] USAID. 2021. "Artisanal Gold Mining Activity (Oro Legal) Performance Evaluation." https://pdf.usaid.gov/pdf_docs/PA00Z8GS.pdf. and USAID. n.d. "Final Report: Artisanal Gold Mining - Environmental Impact Reduction Activity (Oro Legal)." https://pdf.usaid.gov/pdf_docs/PA00XHVF.pdf.

ASM IN MOZAMBIQUE

Local ASM Activity: ASM in Mozambique is the second largest sector in terms of employment after agriculture. Estimates in direct employment in ASM in Mozambique range from 100,000 to 300,000, mostly related to gold and gemstone mining. ASM in Mozambique features little mechanization and heavy manual labor. Public health risks abound due to the lack of sustainable mining and processing techniques and low levels of environmental safety. ASM activities are reported in Manica Province, the most important region for ASM, and also Tete, Niassa, Sofala, Zambezia and Nampula Provinces. In Provinces where ASM takes place, farming is common. In some areas, ASM is practiced seasonally; agriculture being practiced during the rainy season and ASM being practiced during the dry season. Many resources, such as water, soil, and forests, have been negatively impacted by mining in these regions.

Challenges: The Manica region has experienced substantial health and environmental impacts from ASGM, partly due to the general lack of formal processes and training among miners. Combined with historical political conflicts associated with the Manica Gold Mines, these issues have made enforcement and compliance activities difficult. A large number of informal miners work in concessional areas and older surveyed areas, as well as within fields, agricultural areas, and conservation areas. Families and communities often work together but are often unaccountable to the authorities.

Development Interventions: Efforts are ongoing to formalize mining groups and cooperatives in an attempt to provide training and protect natural resources and human health. The Development Mining Fund, for example, is a public institution, created to assist miners and promote sustainable mining practices and mitigation. Mozambique has also established and is implementing requirements for miners to formalize their legal status, leading to establishment of larger-scale mining projects.

For additional resources, see the resources provided in the footnote.[29]

ASM IN THE DEMOCRATIC REPUBLIC OF CONGO (DRC)

Local ASM Activity: ASM is a key source of revenue for hundreds of thousands of people in the DRC. In 2020, estimates of miners directly involved in ASM in eastern provinces of DRC alone measured more than 400,000. The World Bank estimated that for each miner directly involved in ASM in the DRC, four to five persons rely directly on ASM. Potentially two million Congolese throughout the entire country work directly in ASM and an additional eight million Congolese rely on ASM. Most mining in the DRC is for gold, cobalt, copper, and diamonds, and also tin, tungsten, and tantalum.

Challenges: DRC mines face threats from state and non-state armed groups and public security forces; militarization is a key challenge in both gold mining and trade between provinces and entry into national and international supply chains. Violence in mining communities, fueled by this geopolitical conflict, has led to drastic impacts on social systems. The presence of militarized groups, particularly in eastern DRC, has also resulted in illegal taxation by non-state military agents and criminal networks interfering in local markets. Large migrations of miners following changes in security, production, local and world market prices, and the discovery of new deposits also have significant socio-economic impacts on local communities.

Development Interventions: Recent development interventions have encouraged the deployment of responsible supply chain initiatives for more sustainable sourcing practices, increased participation of local civil society, and improved governance by central and provincial governments.

For an additional resource, see the footnote.[30]

[29] Delve. n.d. Find Data by Country - Mozambique. https://www.delvedatabase.org/data/countries/mozambique.; Hilson, Gavin, Salvador Mondlane, Abigail Hilson, Alex Arnall, and Tim Laing. 2021. "Formalising Artisanal and Small-Scale Mining in Mozambique." IGC. https://www.theigc.org/sites/default/files/2021/06/Hilson-et-al-June-2021-Final-report.pdf.; and Feller, Gordon. 2022. Mining in Mozambique. https://www.canadianminingjournal.com/featured-article/mining-in-mozambique/.

[30] Delve. n.d. "Delve Country Profile: Democratic Republic of Congo - Artisanal and Small-Scale Mining Sector." https://www.delvedatabase.org/uploads/resources/Delve-Country-Profile-DRC.pdf.

2.3 ASM COMMODITIES

ASM can include the extraction and processing of various types of minerals, gemstones (precious and semi-precious), and metals. A broad range of minerals, metals, or gems are mined within the sector, which continues to contribute significantly to global extraction. It is estimated that 15–20 percent of global minerals and metals are extracted through ASM. Of mined commodities worldwide, ASM accounts for an estimated 20 percent of gold, diamonds, tin, and tantalum, and 80 percent of colored gemstones.[31] In many countries in Africa, activities center on the production of gold and diamonds. Beyond Africa, in Ecuador, the Philippines, and Peru, gold constitutes a majority of mineral production.

As global market trends shift, (e.g., significant changes occur in global prices for specific commodities, or demand for rare earth minerals for electronics increases), the scope and spatial and temporal distribution of ASM for specific commodities may follow. Arsenic, gallium, indium, and the rare earth elements cerium, europium, gadolinium, lanthanum, terbium, and yttrium are important mineral materials used in light-emitting diodes, smart phone, and semiconductor technologies. Additionally, cobalt for use in lithium-ion batteries is in high demand for the production of electric vehicles, computers, and smart phones. The global transition to electric vehicles is the most significant source of demand for cobalt and is expected to result in increased cobalt production. The DRC is the largest producer of cobalt, and an estimated 15 percent of cobalt produced in the DRC is from ASM.[32,33,34] The DRC has designated geographic ZEAs (Zone d'Exploitation Artisanale) specifically for artisanal mining. Every ZEA is assigned to a cooperative responsible for the management of the sites, and the level of mechanization is restricted within ZEAs. The DRC also issues PEs (Permis d'Exploitation), which are general mining licenses commonly used by LSM operators. PE concession holders may sign agreements with ASM cooperatives to authorize artisanal operations within their concessions.[35]

The United States and international organizations have established initiatives and are conducting projects to improve working conditions in the cobalt supply chain in the DRC. One such project, The Combating Child Labor in the Democratic Republic of the Congo's Cobalt Industry (COTECCO) Project, under the U.S. Department of Labor and the International Labor Organization, worked to improve working conditions and reduce the participation of child labor in the production of cobalt in the DRC.[36] The COTECCO Project supports efforts to achieve the following:

- Raise awareness of the challenges and opportunities to combat child labor;
- Build the enforcement capacity of government and other relevant stakeholders; and
- Improve private sector monitoring and remediation of child labor violations in the cobalt supply chain.

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[31] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches*. https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.

[32] Gerig, Laure, Patricia Ndagano, Nathan Schneck, and Lotte Hoex. 2020. "Delve Country Profile - Democratic Republic of Congo: Artisanal and Small-Scale Mining Sector." Delve. https://delvedatabase.org/uploads/resources/Delve-Country-Profile-DRC.pdf.

[33] The Economist. 2022. *How the world depends on small cobalt miners*. https://www.economist.com/middle-east-and-africa/2022/07/05/how-the-world-depends-on-small-cobalt-miners.

[34] Skidmore, Zachary. 2021. *The future of artisanal mining in the DRC*. https://www.mining-technology.com/features/artisanal-mining-drc/.

[35] Carter, Assheton Stewart, and David Sturmes. 2020. "Digging for Change: Towards a Responsible Cobalt Supply Chain." The Impact Facility. https://delvedatabase.org/uploads/resources/20200618-Digging-For-Change.pdf.

[36] U.S. Department of Labor, Bureau of International Labor Affairs. n.d. *Combatting Child Labor in the Democratic Republic of the Congo's Cobalt Industry (COTECCO)*. https://www.dol.gov/agencies/ilab/combatting-child-labor-democratic-republic-congos-cobalt-industry-cotecco.

The Fair Cobalt Alliance (FCA) has been established with the objective to broaden industry acceptance of and support for responsible artisanal cobalt mining.[37] The FCA has four principal objectives for artisanal cobalt mining:

- Enabling safe and dignified working conditions;
- Remediation of child labor;
- Raising workers' incomes; and
- Achieving market acceptance of Fair ASM Cobalt[38].

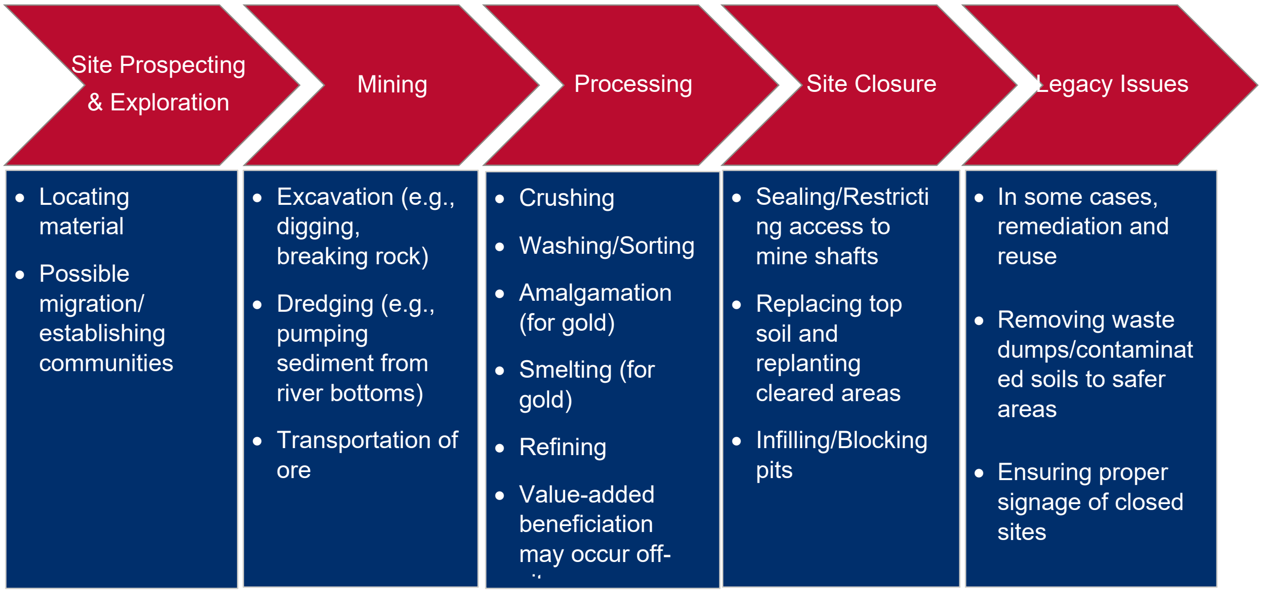
Globally, the ASM sector also exploits large amounts of tantalite, iron ore, and industrial minerals, such as bauxite, marble, and limestone, for aggregate and agricultural purposes. The ASM sector additionally includes the mining and sale of coal, construction-grade rock, depleted tailings, and sands in villages and along roads.

2.4 ASM LIFE CYCLE AND EXTRACTION PROCESS

The life cycle and extraction processes associated with artisanal or small-scale mines vary depending on the commodity or location but generally follow similar patterns. The life cycle of a specific mine begins with site prospecting and exploration, which includes site development. Earth may be moved using rudimentary hand tools and manual labor or, in some cases, may involve larger equipment. Although mining and processing can often occur at the same time, they are separated, as shown in Figure 3, because the activities associated with each step may differ. Ideally, remediation—or actions associated with reversing any environmental damage that occurred as a result of ASM activity—would take place upon mine closure; however, this often does not occur at ASM sites. This may result in ongoing environmental contamination and human health effects from continued releases from abandoned mine sites. It also does not obviate the need to remediate the site but rather pushes remediation into the future when government or other actors will be responsible for cleanup.

[37] Carter, Assheton Stewart, and David Sturmes. 2020. "Digging for Change: Towards a Responsible Cobalt Supply Chain." The Impact Facility. https://delvedatabase.org/uploads/resources/20200618-Digging-For-Change.pdf.
[38] For additional information see: https://www.faircobaltalliance.org/.

FIGURE 3. THE LIFE CYCLE OF AN ARTISANAL MINE AND TYPICAL ACTIVITIES

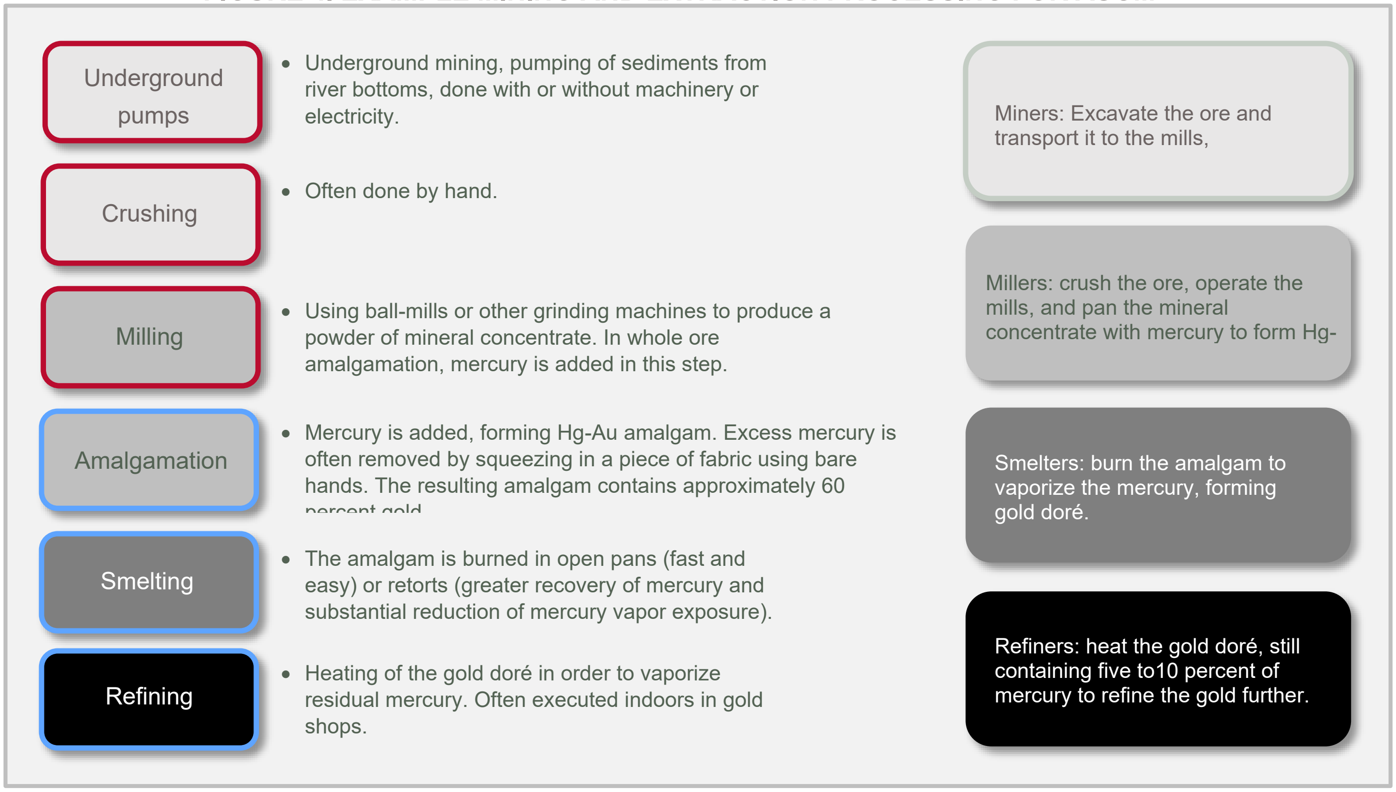


Within the mining life cycle, each phase may involve a separate series of steps. For example, processing may take place locally, or the commodity may be shipped elsewhere. Beneficiation, or value-adding, marketing, sales, final processing into jewelry or other goods, and transfer to buyers also occur outside of the mine and mining community. The value chain, which incorporates the economic or market stages of commodity production and sale, is discussed in the following section.

The mining and processing steps in are highly complex and variable, and depend on the specific commodity being produced, regional characteristics, and other factors. Typical activities for gold extraction and processing, described in Figure 4, are just one example of how the ASM mining and processing steps shown in are practiced. In ASM for gold, additional possible extraction steps, such as crushing and milling, are outlined in red. Amalgamation, smelting, and other refining processes (outlined in blue) occur as part of processing.

For further details on the production processes for ASM, see Annex 2: ASM Production, Processing, and Technologies.

FIGURE 4. EXAMPLE MINING AND EXTRACTION PROCESSING FOR ASGM[39]



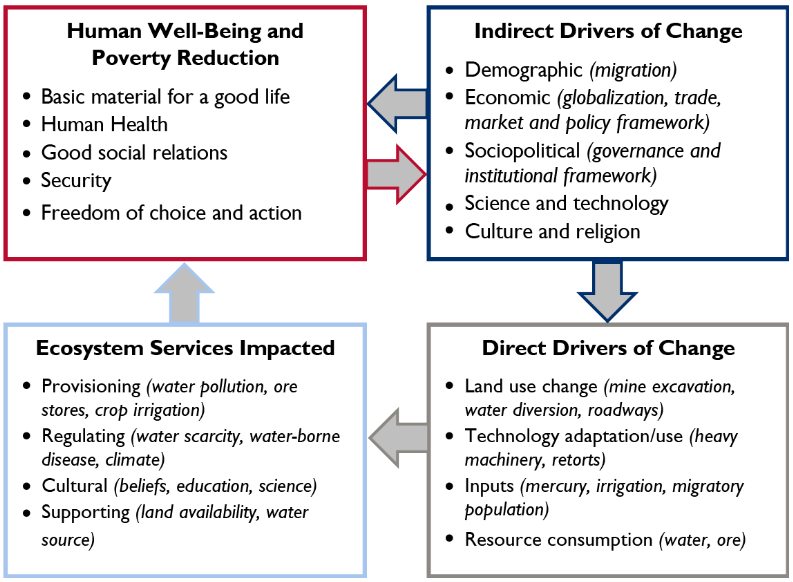
Project interventions or development activity can take place at many stages along this life cycle. Each stage in both the life cycle and the extraction process can generate various impacts. For example, site exploration and mine development can result in deforestation. The extraction process itself can result in erosion due to activity along riverbeds, or health impacts due to the use of contaminants in processing. Site closure, especially if conducted incorrectly or not conducted at all, can also result in persistent long-term land and water contamination, flooding, or other safety hazards.

[39] Kristensen, Anders Kasper Bruun, Jane Frølund Thomsen, and Sigurd Mikkelsen. 2013. "A review of mercury exposure among artisanal small-scale gold miners in developing countries." *International Archives of Occupational and Environmental Health* 87 (6): 579-590. https://pubmed.ncbi.nlm.nih.gov/23979147/.

3. CONTEXTUAL CONSIDERATIONS IN ASM COMMUNITIES

ASM activity often occurs in complicated social, political, economic, and environmental landscapes. Not only do ASM activities have impacts on these areas, ASM activity is subject to direct and indirect drivers, as seen in Figure 5. ASM can impact, and is impacted by, human well-being and poverty, ecosystem services, and other direct and indirect drivers of change. ASM varies across contexts and is impacted by local or global forces differently in different places. ASM occurring in West Africa will impact the surrounding environment or social systems differently than it might in Asia. Therefore, it is important for project managers to recognize that there may be underlying community factors that will impact projects directly, as well as the surrounding mining communities.

FIGURE 5. CYCLE OF ASM DRIVERS WITH EXAMPLES[40]



In the case of human health, underlying community health factors, such as the existing prevalence of communicable disease or access to health care, can have broad impacts on community members at mining sites. Even if the mining processes themselves are similar, a community with little healthcare infrastructure may not be able to address the injuries associated with unsafe ASM practices, nor the outbreaks of waterborne disease or sexually transmitted infections. Another community facing a weak local economy may respond differently to the job prospects that ASM may provide. Regarding economic considerations, mining activity responds to the rise and fall of commodity prices, market trends, or other adverse events affecting the workforce. The perception of a greater income entices hopeful miners to leave their traditional livelihoods for risky and physically demanding jobs in ASM. Marginal financial savings may be offset by having the entire family engage in work throughout the mining process, which adds new risks. Family involvement and other labor issues are discussed in the Social Impacts of ASM section.

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[40] Basu, Niladri et al. 2015. "Integrated Assessment of Artisanal and Small-Scale Gold Mining in Ghana—Part 1: Human Health Review." *International Journal of Environmental Research and Public Health* 12 (5): 5143-5176. https://www.mdpi.com/1660-4601/12/5/5143.

Project managers should recognize that the contextual considerations introduced above occur on various scales. ASM communities are impacted by micro-level (or local) and macro-level (or global) forces. Micro-scale considerations may include local economic or market forces, pressure from regional or state regulations, community or cultural pressures, local health trends, geopolitical or security-related issues, and environmental or ecosystem-specific trends, depending on factors that include the soil conditions, weather, geology, topography, and hydrology. On the other hand, macro-level or global forces might include global economic forces (such as commodity prices) or wider environmental forces such as climate change.

3.1 MICRO-LEVEL CONSIDERATIONS

At the micro level, local and regional markets, social and political trends, and the environment influence communities and their decisions to engage in ASM.

ASM can be a critical element of the local economy, where it often provides a significant source of employment for community members**.** Conversely, ASM may be one of the few sources of employment, legal or illegal, in the region; such limited opportunities may result in adverse working conditions for direct ASM participants and those who rely on them.

ASM can serve as a source of rural development as miners acquire wealth and are able to transition into more sustainable livelihoods or formalize their ASM operations. Such economic transitions may not take place organically but would depend on many factors, including the availability of capital investment, interventions, technology transfer, and capacity-building programs.[41]

There may also be pre-existing environmental, health, or other trends occurring in ASM communities; however, but they may also be impacted (even exacerbated or worsened) by ASM activities. It is critical to recognize and address these trends in program or intervention planning. They are discussed in more detail in later sections of this document, but may include some of the following:

- **Environmental trends.** ASM may cause or further contribute to erosion, deforestation, and alteration of natural waterways (e.g., natural flows, morphology, riverine ecosystems) in local areas. Climatic trends, such as rainfall or drought, vary from region to region, and therefore impacts will depend on geographic siting.

- **Health trends.** Some communities may already be facing pre-existing health threats or disease burdens, such as ongoing battles with cholera, HIV/AIDS, tuberculosis (TB), malaria, or other communicable diseases that could increase with an influx of people to mining sites.

- **Gender roles.** Women and men may have very different roles in the household and community, driven by cultural or religious values. These roles may dictate whether and how women and men work together in mines or in other components of the mining cycle and value chain. Although women may comprise up to 50 percent of the workforce in

[41] Hoadley, M., and D. Limpitlaw. 2004. "The Artisanal and Small Scale Mining Sector & Sustainable Livelihoods." https://www.researchgate.net/profile/Daniel-Limpitlaw/publication/228884900_THE_ARTISANAL_AND_SMALL_SCALE_MINING_SECTOR_SUSTAINABLE_LIVELIHOODS1/links/00b4953142c89933fc000000/THE-ARTISANAL-AND-SMALL-SCALE-MINING-SECTOR-SUSTAINABLE-LIVELIHOODS1.pdf.

ASM, they do not always have access to the decision-making process through equitable participation, and therefore may have little awareness of their rights.[42]

- **Education.** Surveys show that, in some places, the percentage of women who have access to education compared with men has been lower[43]. Also, in regions where children have been engaged in ASM activities rather than attending school, educational efforts have been hindered in the region. Coupling these two factors have perpetuated the conditions that propagate informal ASM.

- **Water security.** A challenging aspect of mining is the strong history and continuing tradition of herding and farming adjacent to ASMs and the reliance on traditional water sources that are also used by the ASM sector. In many locations, the quantity and quality of arable land and water sources are diminishing, underscoring the need for integrated management and investment in water infrastructure for miners, farmers, and herders. The sustainable interwoven management of ASMs and traditional herding and farming, has many broad barriers, including the lack of baseline data, feasible engineering, and reclamation solutions[44].

- **The temporality of ASM.** Individuals, groups, or families may partake in ASM activities on a seasonal basis, shifting among agricultural, fishing, or other livelihoods. One peer-reviewed study[45] described four different informal ASM activities that could affect the social structure, local economy, and/or political dynamics of mining communities:
    - *Seasonal ASM* provides a source of employment during the agricultural off-seasons.
    - *Permanent ASM* relies on established mineral resources that are often located where previous large-scale industrial or formal mining occurred. Seasonal miners become permanent if the compensation is a reliable source of income. Permanent mining activity may be a traditional practice in some ASM communities, where mining may have been ongoing for hundreds of years.
    - *Shock-push ASM* refers to rapidly established mining sites to which workers relocate due to severe drought, social disruptions, conflicts, or the hope of more productive and lucrative livelihoods.
    - *Rush ASM* typifies many diamond and gold mines where the news of a major strike can create a stream of skilled and unskilled miners to an area over a short period of time. With poor infrastructure and potentially crowded conditions, environmental and social problems may be easily exacerbated.

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[42] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches*. https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.
[43] Long, Rachel N., Elisha P. Renne, and Niladri Baru. 2015. "Understanding the Social Context of the ASGM Sector in Ghana: A Qualitative Description of the Demographic, Health, and Nutritional Characteristics of a Small-Scale Gold Mining Community in Ghana." International Journal of Environmental Research and Public Health 12 (10): 1279-12696. https://www.mdpi.com/1660-4601/12/10/12679.
[44] McIntyre, Neil, Nevenka Bulovic, Isabel Cane, and Phill McKenna. 2016. "A multi-disciplinary approach to understanding the impacts of mines on traditional uses of water in Northern Mongolia." Science of The Total Environment 557-558: 404-414. https://www.sciencedirect.com/science/article/pii/S0048969716305174?via%3Dihub.
[45] United Nations Environment Programme. 2020. "Chapter 3: Artisanal and Small-Scale Mining." In *Mineral Resource Governance in the 21st Century*, pp 79-104. https://www.un-ilibrary.org/content/books/9789280737790s007-c002. and Gyan-Baffour, G. 2003. Artisanal mining and poverty. Presented at Communities and Small-Scale Mining Annual General Meeting, Elmina. http://www.artisanalmining.org/Repository/01/The_CASM_Files/CASM_Meetings_International/2003_Elmina_AGM/Presentations/Elmina%202003%20-%20Workshop%20-%20Poverty%20Reduction%20-%204.pdf.

- **Inadequate physical infrastructure.** The absence of infrastructure for operations, transportation, and worker housing is common for seasonal, shock-push, and rush ASM mines, and infrastructure is often marginal at permanent ASM mines. Surveys indicate limited cement flooring, potable water, and a higher use of charcoal and wood in cooking, posing a risk of smoke inhalation for children. Rates of electricity and television and refrigerator ownership are much lower, and access to electricity is often prioritized for mining operations[46].

- **International governance frameworks.** Variations from one country to the next, in addition to a lack of monitoring and enforcement, impose numerous challenges with regard to the enforcement of ASM regulations directly, as well as the indirect consequences of ASM activities (e.g., child labor, gender rights, health and safety, environmental management, property crime).

- **National enforcement.** Each country has its own mechanisms and regulatory frameworks for governing mining activity, including enforcement and compliance. Despite the existence of such frameworks, the ability of each country to enforce these frameworks and implement related activities will vary depending on the capacity of the government to employ enforcement staff or implement efficient processes.

- **Security.** Due to the remoteness of some ASM activities and the inability of enforcement agencies to reach these areas, mining may also fund illicit activities or contribute to corruption, money laundering, guerilla activities, the drug trade, arms trade, and other types of illicit activity, while undercutting the viability of legal mining. Some areas have a geopolitical history of violence, although the factors involved—and how they impact ASM projects or local communities—will vary based on the area.

- **Political systems.** Certain countries may have a strong regulatory framework and political support. However, in some countries or sections of countries, ASM operations may take place in a governance and/or political vacuum if government agencies have weak regulatory or enforcement capacity or the country is involved in conflict. The informal nature of some mining operations may prevent monitoring and enforcement of environmental regulations and tariffs because enforcement agencies are unaware of these operations and are unable to conduct enforcement due to the remoteness of some ASM locations and a lack of resources. The inability of the government to collect taxes or royalties for services or regulation may result in fewer social services.

- **Land tenure.** ASM may take place on land subject to a variety of rights; lands may range from informal undocumented holdings to customary land, privately owned land, or public lands. Conflicting claims on and perceptions of land and resource rights may exist. For example, statutory law may recognize the land as public; however, the land may also be subject to long-standing customary or informal rights. Questions of land tenure and property rights raise issues of legality and access, with implications for employment, livelihoods, and sustainable management. The informality associated with land tenure and mining site locations, as mentioned above, can indirectly result in a lack

[46] Long, Rachel N., Elisha P. Renne, and Niladri Baru. 2015. "Understanding the Social Context of the ASGM Sector in Ghana: A Qualitative Description of the Demographic, Health, and Nutritional Characteristics of a Small-Scale Gold Mining Community in Ghana." International Journal of Environmental Research and Public Health 12 (10): 1279-12696. https://www.mdpi.com/1660-4601/12/10/12679. and Basu, Niladri et al. 2015. "Integrated Assessment of Artisanal and Small-Scale Gold Mining in Ghana—Part 1: Human Health Review." *International Journal of Environmental Research and Public Health* 12 (5): 5143-5176. https://www.mdpi.com/1660-4601/12/5/5143.

of associated services. Some ASM activity may also take place within, on the edges of, or on the outskirts of larger mining concessions, with or without formal agreements, which can lead to conflict[47].

3.2 MACRO-LEVEL CONSIDERATIONS

A number of cross-cutting or global issues of concern are relevant at the macro level. These issues may include underlying poverty, poor infrastructure, labor and gender rights, land tenure, governance, and global change (discussed further below). Regarding global economic forces, the ASM economic value chain, as depicted in Figure 6 for the gold industry, connects communities and local mining activities to other stakeholders, including banks, buyers, and others in the private sector, before the minerals ultimately end up in the hands of consumers. As outlined previously, extraction may occur locally if smelters are located nearby, although processing can also take place elsewhere. Therefore, global market forces can have cumulative impacts on stakeholders throughout the chain. Global costs can also have a dramatic impact on local activities as demand changes or shifts. It is also important to note that individual miners may sell their product for a very low price, ultimately receiving only a fraction of the final selling price. Each additional step or player within the value chain adds additional profit, whether adding value or not. Some miners do not have knowledge of the market values of their minerals and therefore do not receive fair value for their goods.

Besides economic forces, macro-level environmental and sociopolitical issues may impact not only ASM activities in general, but the miners themselves, the environments where they mine, and the communities where they live. Global change may include demographic shifts and migration of populations due to regional or international/global environmental or sociopolitical stressors, such as climate change, conflict, and security concerns. These forces may result in additional growth in the ASM sector as a viable employment option due to low barriers to entry. Alternatively, ASM may contribute to additional global change as natural resources may be depleted or ecosystem services altered due to poorly managed and enforced mining practices (e.g., deforestation or land clearing, unsustainable use of natural resources, contamination of ecosystems). Potential impacts may be addressed by introducing environmental monitoring and risk mapping. These impacts and possible mitigation measures are discussed later in the Environmental Impacts of ASM section and the Social Impacts of ASM section.

[47] United Nations Environment Programme. 2020. "Chapter 3: Artisanal and Small-Scale Mining." In *Mineral Resource Governance in the 21st Century*, pp 79-104. https://www.un-ilibrary.org/content/books/9789280737790s007-c002.; Tschakert, P., & Singha, K. 2007. Contaminated identities: Mercury and marginalization in Ghana's artisanal mining sector. *Geoforum*, *38*(6), 1304-1321. https://www.sciencedirect.com/science/article/abs/pii/S001671850700084X?via%3Dihub.; and Calvão, Felipe, Catherine Erica Alexina Mcdonald, and Matthieu Bolay. 2021. "Cobalt mining and the corporate outsourcing of responsibility in the Democratic Republic of Congo." The Extractive Industries and Society 8 (4): 100884. https://www.sciencedirect.com/science/article/pii/S2214790X21000290?via%3Dihub.

FIGURE 6. ASM VALUE CHAIN

3.3 ROOT DRIVERS OF ASM-RELATED IMPACTS

Negative impacts (e.g., dangerous working conditions in ASM) can occur as a result of a variety of root causes or drivers (e.g., lack of education or lack of opportunities to other forms of formal employment) that may be present in the community. Each of these are cross-cutting and can relate to micro- and macro-level phenomena, as well as local, national, and international drivers:

- **Government-level policies that fail to consider the local conditions** or contradicting national strategies;
- **Government-level policies that emphasize production** volumes over environmental sustainability;
- **Underfunded and understaffed government ministries** that are unable to manage mining activities, especially those taking place informally or in remote areas, in terms of enforcement and compliance (if related regulations exist);
- **Corruption** in government leading to or contributing to inadequate management of the ASM sector;
- **Poverty or limited job prospects** leading individuals to take on dangerous jobs with little oversight;

- **Inadequate knowledge of best practices for protecting the environment at the local level;**
- **Lack of training or equipment** to successfully implement cleaner or safer production techniques;
- **Geopolitical unrest or conflict that prevents** formalization and, therefore, safer, more sustainable practices;
- **Conflict between ASM and LSM concessions** leading to dispossession of land, relocation of communities, and other forms of instability for miners engaged in ASM;
- **Lack of understanding and valuation of ecosystem services** and natural resources impacted by ASM; and
- **The presence of organized crime networks** with quick-profit objectives.

3.4 INTERNATIONAL ASM FRAMEWORKS

The exploration for and the extraction of gold and diamonds have increasingly become an international concern due to the potential consequences of child labor, environmental destruction, and connections to rebel movements. Particularly, gold mining may involve the introduction of mercury into the environment during processing, which is detrimental to human health and the environment. A series of international frameworks have been established in recent years to govern aspects of the mining process and avoid unintended consequences, including frameworks for a reduction of mercury use and the promotion of alternative technologies. There is variation in the legality of ASM activities around the world and the enforcement of country-specific laws and regulations, and these frameworks seek to place political, social, and market pressure on those responsible for the governance of ASM. The Minamata Convention on Mercury seeks to address the adverse effects of mercury and to ultimately ban new mercury mines and phase out mercury use. In the case of diamonds, *conflict diamonds* have historically been mined and used to support war activities against legitimate governments. The Kimberly Process, a joint government, industry, and civil society initiative, seeks to stem the flow of conflict diamonds and raise the awareness of consumers. The Minamata Convention, the Kimberly Process, and other international frameworks governing the legality of ASM are discussed below.

Project managers should consider how their ASM activity aligns (or does not align) with all of these frameworks, keeping in mind that international frameworks do not supersede local regulations and laws buy may be complementary to local regulations and laws.

3.4.1 THE MINAMATA CONVENTION

Mercury used in ASGM causes significant adverse neurological and other health impacts, particularly in unborn children and infants. The Minamata Convention on Mercury is a global treaty implemented by the United Nations Environment Program to protect human health and the environment from the adverse effects of mercury. It was adopted in 2013 at the United Nations Diplomatic Conference in Kumamoto, Japan. The Minamata Convention includes a ban on new mercury mines, the phasing out of existing ones, the reduction and phasing out of mercury use in products and processes, control measures on emissions to air and on release to land and water, and the reduction of mercury use in the informal sector of ASGM. It also addresses the storage of mercury and its disposal as waste (including long-term storage), as well as site contamination by mercury. Countries that join the Minamata Convention are under a legally binding obligation to implement the responsibilities outlined in the Convention.

To reduce mercury use in ASGM, participating countries who declare that they have "more than insignificant ASGM" must develop and implement a National Action Plan (NAP). The NAP must outline the following:

- National objectives and reduction targets;
- Actions for eliminating the worst practices with regard to mining and processing using mercury;
- Actions for mitigating mercury emissions;
- Steps for facilitating the formalization or regulation of ASM;
- Baseline information on mercury use;
- Strategies for promoting the reduction of mercury and managing trade;
- Methods for involving stakeholders, building capacity in training healthcare workers, and preventing the exposure of vulnerable populations; and
- Strategies for sharing information.

Article 7 of the Minamata Convention focuses on ASGM in particular.

Many destructive impacts of ASGM are also due to worst practices, or specific techniques that result in negative consequences. Country-specific obligations under Annex C of Article 7 of the Minamata Convention include the elimination of these worst practices as part of their ASGM NAPs. For definitions of these practices, see Annexes I and 2. These practices may include *whole ore amalgamation, open burning of amalgam or processed amalgam, the burning of amalgam in residential areas,* and c*yanide leaching in sediment, ore, or tailings to which mercury has been added without first removing the mercury.* Focusing on worst practices allows countries to set priorities to deal with the most dangerous and widespread uses of mercury first.

ADDITIONAL RESOURCES

Minamata Convention: http://www.mercuryconvention.org/.

- The Minamata Convention: A Beginner's Guide https://artisanalgold.org/the-minamata-convention-on-mercury-a-beginners-guide/.
- Minimata Convention on Mercury – Fact Sheet https://www.mercuryconvention.org/sites/default/files/documents/2021-07/Minamata%20Convention%20on%20Mercury%20at%20a%20glance_COP1%202017_EN.pdf.
- Considerations for ASGM: https://www.nrdc.org/experts/susan-egan-keane/minamata-convention-what-it-means-artisanal-and-small-scale-gold-mining. Accessed January 3, 2023.
- Key operational articles of the Minamata Convention: https://cwm.unitar.org/cwmplatformscms/site/assets/files/1337/overview_key_control_measures_under_the_minamata_convention_05_16-1.pdf. Accessed January 3, 2023.

MINAMATA CONVENTION NATIONAL ACTION PLANS

The UNEP report, *Developing a National Action Plan to Reduce, and Where Feasible, Eliminate Mercury Use in Artisanal and Small Scale Gold Mining,* provides guidance to countries that are formulating their NAPs, including technical, legal, and policy information in line with the requirements of the Minamata Convention.[48] Each NAP must include the following elements:

- National overview
  - Review of legal and regulatory status of ASGM
  - National baseline analysis, including demographic, environmental, health, and economic information about mining communities and the mining sector in that country, including mercury usage, environmental contamination, and human health impacts.
  - Relevant stakeholders such as local leaders and organizations working in ASGM at the national and local level
  - Innovations in addressing AGSM
- National objectives and reduction targets
- Implementation strategy
  - Actions for eliminating worst practices
  - Steps planned to facilitate formalization activities
  - Strategies for reducing emissions and exposure risk
  - Strategies for managing trade of mercury
  - Strategies for involving stakeholders and sharing information with miners
- Evaluation mechanisms

The breadth of information in a country's NAP can provide a helpful resource to program or project managers as they work on related activities in areas where ASGM occurs. USAID-sponsored or funded activities can be more effective if they support and leverage the national objectives and targets of the countries in which they operate.

For examples of NAPs, see the footnote below.[49]

[48] UNEP. 2017. "Developing a national action plan to reduce and, where feasible, eliminate mercury use in artisanal and small-scale gold mining." https://www.unep.org/resources/policy-and-strategy/developing-national-action-plan-reduce-and-where-feasible-eliminate.

[49] Ghana - *National Action Plan on Mercury in the Artisanal and Small-scale Gold Mining Sector in Ghana:* https://www.thegef.org/projects-operations/projects/9478; Kyrgyzstan - *National Action Plan on Primary Mercury Mining in Kyrgyzstan:* https://wedocs.unep.org/bitstream/handle/20.500.11822/12928/S1_08_Kyrgyzstan.pdf?sequence=1&amp%3BisAllowed=; Philippines - *National Action Plan on Mercury and Mercury-containing Wastes Management:* https://wedocs.unep.org/bitstream/handle/20.500.11822/12897/Annex5_PHL_NationalActionPlanonMercury&Mercury-Contai.pdf?sequence=1&isAllowed=y

3.4.2 THE KIMBERLY PROCESS

The Kimberly Process was established in 2000 in response to the trade of *conflict diamonds* or *blood diamonds* throughout Sub-Saharan Africa, with the goal of preventing or reducing violence by rebel groups seeking to undermine legitimate governments. In the case of conflict diamonds, diamonds would be seized or mined by rebel groups and sold to finance their activities. The Kimberly Process was adopted by the United Nations General Assembly and created an international certification scheme for rough diamonds, which requires controlling rough diamond production and trade in participating countries. Requirements include certifying rough diamonds as “conflict-free” and preventing conflict diamonds from entering the legitimate trade. Participating states must enact national legislation and institutions must monitor export, import, and internal controls, as well as commit to transparency and the exchange of statistical data. Participating states may trade with each other if they meet the minimum requirements, thus providing market benefits to participation. As of 2024, Kimberly Process members account for 99.8 percent of the global production of rough diamonds. Participating countries include South Africa, Canada, Russia, Botswana, the European Union, India, Namibia, Israel, the DRC, the United States, Angola, and the Republic of China.

ADDITIONAL RESOURCES

1. Information on the Kimberly Process: https://www.kimberleyprocess.com/.
2. Washington Declaration on Integrating Development of Artisanal and Small Scale Diamond Mining with Kimberley Process Implementation: https://www.land-links.org/wp-content/uploads/2016/09/Washington_Declaration_Kimberley_Process_Implementation.pdf.

3.4.3 ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT DUE DILIGENCE GUIDANCE FOR RESPONSIBLE SUPPLY CHAINS OF MINERALS FROM CONFLICT-AFFECTED AND HIGH-RISK AREAS

The Organization for Economic Cooperation and Development (OECD) Due Diligence Guidance provides recommendations to help companies avoid contributing to conflict through their mineral purchasing decisions and practices. The guidance emphasizes responsible mineral supply chains, especially for purchases from areas associated with armed conflict, terrorism financing, human rights violations, and poor economic or social development. With the guidance, companies are better equipped to manage risks along the entire supply chain—from miners, local exporters, and mineral processors to manufacturing. Adopted in 2011, the guidance is a leading industry standard for mineral supply chain transparency and integrity. It is cited and used in binding regulations in the United States (Section 1502 of the Securities and Exchange Act of 1934: Disclosing the Use of Conflict Minerals) and is part of legal frameworks in the DRC,

ADDITIONAL RESOURCES

1. OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas: http://www.oecd.org/corporate/mne/mining.htm.
2. A Global Standard Towards Responsible Mineral Supply Chains: http://mneguidelines.oecd.org/Brochure_OECD-Responsible-Mineral-Supply-Chains.pdf.
3. U.S. Securities and Exchange Commission Fact Sheet Disclosing the Use of Conflict Minerals Section 1502: https://www.sec.gov/opa/Article/2012-2012-163htm---related-materials.html.

Burundi, and Rwanda. Implementation of the guidance provides market pressure to support legal or formalized ASM endeavors versus those that support conflict.

3.4.4 FAIR COBALT ALLIANCE

The Fair Cobalt Alliance (FCA) is a multi-stakeholder action platform that brings together actors from across the entire Cobalt mineral supply chain to find solutions to the increasing scrutiny on ASM cobalt mining. By bringing together companies across the cobalt supply chain, international development agencies, local governments, civil society, and local implementing partners, the FCA seeks to establish themselves as a touchstone for all who want to participate in the improvement of the ASM sector and their communities[50].

[50] Fair Cobalt Alliance. n.d. Fair Cobalt Alliance. https://www.faircobaltalliance.org/.

4. ENVIRONMENTAL IMPACTS

In this section, the environmental impacts of ASM are discussed. As emphasized previously, project managers should recognize that many issues are cross-cutting. Case studies throughout this section outline examples of cross-cutting impacts.

ASM generally involves moving dirt and rock to access valuable ores or gems, usually employing manual labor and no or limited mechanization. ASM operations frequently use large volumes of water to separate the mined resource and help wash away dirt and tailings; site development, typically unregulated, can cause deforestation. ASM operations typically have few, if any, environmental controls and may pollute the air with dust and cause the runoff of sediment, chemicals, and other contaminants onto land or into surface waters. This section will describe in more detail how ASM affects land, water, and air resources and why these effects are significant. Mitigation measures and best practices are presented later. Table 3 lists some of the potential environmental impacts associated with ASM practices, their causes, and their significance for land, water, and air resources.

TABLE 3. ENVIRONMENTAL IMPACTS OF ASM AND THEIR CAUSES AND SIGNIFICANCE

PROBLEM/ISSUE		CAUSE	SIGNIFICANCE
Land Resources	Deforestation	• Land clearing for mine construction, expansion, road construction, and waste disposal	Clearing land for the construction of mines can cause small-scale clearing or larger scale deforestation. Regardless of the scale, deforestation or forest clearing has impacts on biodiversity, ecosystem services, and greenhouse gas (GHG) emissions mitigation (e.g., carbon sinks).
	Landslides	• Improper mine pit construction. • Deforestation (which destabilizes the soil surface)	Landslides in an active mine pit can cause loss of human lives. Landslides into streams will reduce water quality and alter the stream flow, causing additional erosion and possibly flooding.
	Chemical contamination of soil	• Dumping of chemicals or excavated materials onto the ground	Chemicals in soil can make it difficult to grow crops, and the crops can accumulate heavy metals and other compounds that are transferred to humans when eaten.
	Topsoil loss and erosion	• Deforestation • Improper erosion controls • Mixing of topsoil with other excavated materials • Release of contaminants in the soil or natural pollutants, rendering the soil unusable	Loss of topsoil can make land infertile such that agriculture cannot be practiced and/or create a persistent erosion problem due to lack of revegetation.

PROBLEM/ISSUE		CAUSE	SIGNIFICANCE
	Contamination of the food supply	• Bioaccumulation of chemical contaminants • Chemical contamination of soil and water	Mercury and other contaminants can collect in edible plants and animals, transferring to humans upon ingestion in both the local and global food supply chains.
	Biodiversity loss	• Deforestation • Chemical and/or physical contamination • Ecosystem services alteration	Plants and animals that the community typically utilizes may not be available. Natural processes that sustain food sources and fertile soils downstream are negatively affected.
Water Resources	Chemical contamination of water	• Dumping of mining chemicals, such as mercury or cyanide • Weathering of excavated ores (acid rock drainage) • Washing of ores in surface water • Methylation of mercury from ASGM	Heavy metals in drinking water can cause developmental and other health problems in humans. Heavy metals and other contaminants will also affect aquatic species that the local community uses for food. Contamination of water supplies can also affect the global food supply chain for fish or other resources.
	Physical contamination of water	• Erosion, especially when stream channels are disrupted • Dumping of debris, overburden, and trash • Dredging of river sediments for mineral processing	Muddy water from erosion can kill aquatic species used for food and make the water unfit for drinking.
	Stagnant water	• Unfilled mine pits • Localized flooding due to stream channel disruption	Stagnant water breeds mosquitoes and is more likely to harbor pathogens that will affect the people or animals who drink it. Larger pits filled with water can be a drowning hazard for people and animals.
Air Resources	Air pollution or contamination	• Emissions or toxic fumes (e.g., diesel exhaust) from fuels used in vehicles or machinery around ASM sites	Toxic fumes can have health impacts on workers and local communities and can adversely impact local ecosystems, habitats, and waterways.

4.1 IMPACTS ON LAND RESOURCES

When vegetation is removed from large areas of land, the roots, stems, and trunks of the plants are no longer present to retain soil as water flows or wind blows over the ground. This can result in erosion of the topsoil into streams, which makes the cleared land less fertile for crops and more difficult to revegetate with native flora and fauna. The topsoil can also be lost if it is not removed separately when the mine is excavated because mixing topsoil with rocky and less fertile dirt from the excavation will lead to poor soil quality. It is good practice when clearing land for a mine to minimize the cleared area, use the removed vegetation as an erosion barrier, and try to leave native trees and plants to hold soil in place where feasible. Additionally, it is good practice to separate and store the topsoil separate from underlying layers while digging a mine so that the topsoil can be reapplied when the mine is remediated. Materials that were excavated from the mine should be stored away from water bodies because they can erode or leach and potentially degrade the water quality.

CROSS CUTTING ISSUES: SOIL AND WATER CONTAMINATION FROM ASGM IN LUKU, NIGERIA

In 2013, soil sampling near ASGM sites in Luku, Nigeria, found elevated concentrations of lead, arsenic, cadmium, and mercury (Ako et al., 2014). These contaminants can bioaccumulate in ecosystems; plants can take up chemicals, and animals can absorb these chemicals in their fat tissues when they ingest contaminated plants or drink contaminated water. Some animals can experience malformations due to chemical exposure, with impacts to the ecosystem food web. Plants can also experience slowed growth rates.

When people ingest edible, contaminated plants or animals, the contaminants can be transferred to those people, with impacts on human health. International food supplies, such as global fish supplies, can also be impacted. In Luku, chemicals in the soil were found to be accumulating in plants, animals, and surface and ground water, making the water unsuitable for human consumption. Some residents were found to have respiratory problems as well as liver and kidney damage as a result of ingesting contaminated food and water.

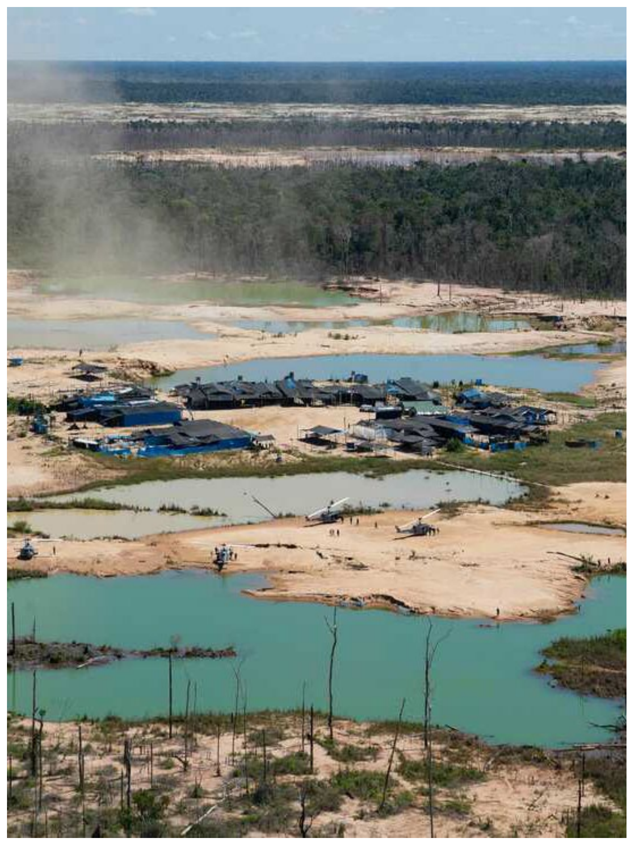
Landslides are another concern when it comes to clearing land and digging mines. When the land is cleared of vegetation, there are no roots to retain the soil in heavy rains. This can lead to a higher risk of landslide, especially in areas currently prone to intense rainfall or where increased high-precipitation events are projected due to climate change. Landslides can fill the mine site with mud and water, flow into and block rivers and streams, or harm people and livestock. It is also important to angle the sides of the mine to reduce the likelihood of collapse in wet weather for the safety of mine workers.

Artisanal and small-scale gold mining (ASGM) accounts for more than a third of all anthropogenic mercury emissions, with most ASGM sector-related mercury emissions coming from the burning of mercury-gold amalgam.[5] Chemical contamination of soil can occur in ASGM both from chemicals brought in to help with resource recovery, such as mercury or cyanide, or from the materials that are removed from the mine. Mercury and cyanide are used in gold mining to help separate gold from rocks and gravel, and both have significant health effects that are described in more detail in the Climate Change and Risks for Human Health and Safety section of this document. Mercury is combined with gold to extract it from its matrix, after which excess mercury is removed by heating over a flame, causing the mercury to evaporate into the air. It can be deposited onto the soil or in waterways, where it affects crop growth, accumulates in fish or other animals that can then be eaten by humans, or ends up in drinking water for communities downstream of the mine. Methylation of mercury also presents particular human health and aquatic risks, as discussed below in the Climate Change and Risks for Human

Health and Safety section. Cyanide can be used to dissolve gold, and while it also has negative health impacts, it will naturally break down in the environment.

Chemical contamination of soil can also come directly from the rocks that are excavated from the mine. Some rocks, when exposed to air and water, will weather away, causing the soil they contact to become acidic. In some cases, as water travels through the mined materials, it becomes acidic and causes heavy metals to leach out of the rocks into the soil, contaminating it and the crops that may be grown there in the future. This weathering is called *acid rock drainage*. Even if a mine is closed and forest cover or plant life returns, that land may still be contaminated, and crops grown or livestock kept there could become contaminated as well. Mine closure and decommissioning therefore become an integral part of the planning process during the life of the mine and legacy issues must be addressed while requiring coordination with USAID BEOs.

FIGURE 7. FOREST DEGRADATION FROM ILLEGAL MINING IN PERU



ASM can also contribute to biodiversity loss. Clearing forest and other natural land cover destroys habitats for native species, and if the soil is not fertile enough or the land did not retain other structural properties needed to support timely reforestation, then these ecosystems and species may be locally lost. An example of forest degradation from ASM is shown in Figure 7[51]. Deforestation and land cover change can impact entire ecosystems of high biodiversity value. Chemical contamination of the soil and water may harm native species of plants, animals, and insects, reducing biodiversity. Finally, an influx of mine workers to the area may cause unsustainable biological resources extraction (e.g., excessive hunting, fishing, and harvesting of timber and non-timber forest products) around the mining community.

When a mine pit is abandoned, it becomes a hazard to wildlife and humans as falling into a mine pit can lead to injuries or death. If the pit fills partially with water, then it becomes a drowning hazard and a stagnant water source that can breed mosquitoes and contribute to the spread of diseases. Abandoned mine tunnels can also fill with water, become more susceptible to collapse over time, and can harbor dangerous gases that can asphyxiate or poison people or animals who enter the shaft. The water in abandoned mining structures can also become acidic or contaminated with mercury, depending on the location, presenting a hazard for cattle or wildlife if they use it as a source of drinking water.

[51] Tegel, Simeon. 2024. Gold mining reduced this Amazon rainforest to a moonscape. Now miners are restoring it. https://www.npr.org/sections/goatsandsoda/2024/04/02/1231873144/gold-mining-reduced-this-amazon-rainforest-to-a-moonscape-now-miners-are-restori.

4.2 IMPACTS ON WATER RESOURCES

Water is a major consideration in ASM because it is frequently used for the separation of grains of valuable material from gravel and soil in pans or sluices. This practice can have several impacts on water resources near mine sites, including the degradation of water quality due to the erosion of mine sites and chemical contamination. Figure 8 provides an example of erosion related to ASGM activities.

Several water-based mining practices can result in the contamination of water sources or other environmental impacts (see Annex 2 for more details on these practices). Pans and sluices function by allowing water to carry away less dense soil and gravel, leaving heavier valuable gold or minerals, and require a water source to function. Often, the soil and gravel washed away from the target material is left in the streambed, and with many miners in a small area, this accumulated material can destroy natural riverbed ecosystems, causing damming of the stream and a change in the course of the water flow. When the course of the stream changes, it can cause the erosion of stream banks, further impairing the water with mud and silt. This mud and silt can settle on aquatic plants, killing them and the animals that depend on them. It will also impair drinking water quality downstream. Furthermore, the eroded bank can make the stream shallower, decreasing its capacity and making the area susceptible to flooding in heavy rain. Riverine mining can destroy rare, delicate, and valuable habitats that depend on the water body's specific physical, chemical, and biological properties and processes. The impacts of riverine mining can also be felt by downstream ecosystems and communities when natural sediment, nutrient, and species migration cycles are altered. These floods, aside from the primary damage from the rising water, can lead to standing water, which may breed mosquitoes carrying diseases.

FIGURE 8. EROSION OF A STREAM BANK NEAR ARTISANAL GOLD MINING ACTIVITIES IN LUKU, NIGERIA[52]

Washing of ores in waterways can also lead to chemical contamination of the water. It is common for metal ore deposits, such as gold and cobalt, to also contain other heavy metals and contaminants, such as lead, arsenic, copper, and radioactive elements. These contaminants are dangerous to humans and aquatic life and can be washed out of the ores and into the

[52] Ako, T. A., U. S. Onoduku, S. A. Oke, I. A. Adamu, S. E. Ali, A. Mamodu, and A. T. Ibrahim. 2014. "Environmental Impact of Artisanal Gold Mining in Luku, Minna, Niger State, North Central Nigeria." *Journal of Geosciences and Geomatics* 2 (1): 28-37. http://pubs.sciepub.com/jgg/2/1/5/jgg-2-1-5.pdf.

waterway. They are especially dangerous in small streams or during periods of low water flow because there is no extra water to dilute the concentration of hazardous compounds.

Direct dredging of river sediment is also an important source of water contamination. This is a very common practice where sediment is directly pumped from the riverbed. The materials dredged (known as slurry) are put through a sluice to capture the gold. The turbid, muddy water is then discharged directly back into the river. The discharged water can harm the aquatic ecosystem by blocking oxygen for fish and plant life living in the river, among other impacts.

4.3 IMPACTS ON AIR RESOURCES

ASM can impact air resources in several ways. If mechanized equipment or vehicles are used at ASM sites, fossil fuel (e.g., carbon dioxide) emissions can contribute to the damaging effects of climate change (see the Climate Change Considerations section below). Both vehicular emissions and particulate matter or disturbed dust can cause significant degradation to local air quality and threaten health and safety. These impacts on ambient air quality are discussed in the section pertaining to Health, Well-Being, and Safety.

5. SOCIAL IMPACTS

The potential exists for adverse and unintended negative social impacts as a result of ASM projects. USAID is committed to integrating stakeholders' voices, concerns, perspectives, and values as a form of acquiring feedback and input on a proposed project to identify potential social impacts early on and make sound decisions during the design and planning phase. As indicated in the adjacent textbox, per ADS 201, USAID requires an initial screen of potential social impacts.

USAID's visions, policies, and strategies call for a participatory process that safeguards against doing harm to its beneficiaries. This process includes ensuring meaningful stakeholder engagement from government, communities, and individuals to assure that USAID's international development efforts benefit all members of society, particularly marginalized and underrepresented groups and/or people in vulnerable situations.

SOCIAL IMPACT RISK INITIAL SCREENING (SIRS) TOOL

Per the June 2024 update to ADS Chapter 201 Program Cycle Operational Policy, USAID design teams must conduct an initial screening of the social impact of their Activities and Programs using the Social Impact Risk Initial Screening and Diagnostic Tools (ADS 201mbf).[53] The Social Impact Risk Initial Screening (SIRS)[54] Tool is intended to help USAID design teams plan for, mitigate, and monitor potential adverse social impacts from USAID Activities and Programs. The Tool consists of 10 questions designed to kickstart mandatory analytical thinking about a variety of different potential adverse social impacts and help identify when additional social safeguarding is needed. Additional social safeguarding may include redesigning Activity/Program components or concepts, identifying social impact mitigation measures, or conducting additional analyses, such as a Social Impact Assessment. When filling out the Tool, design teams should only check "no" when they are highly certain that there is no potential for an adverse impact. The complexity of the process for completing the Tool will vary based on the severity of social impacts posed by the Activity/Program.

Stakeholder engagement is critical for ensuring that USAID maintains accountability to program participants by ensuring the active participation of local communities, developing mitigation measures that include participants' voices, as well as ensuring that affected individuals and communities can communicate their concerns through USAID's Accountability Mechanism.[55] Given the importance of stakeholder engagement for fostering a successful project, the project may benefit from sustaining this engagement throughout the entire project life.

Just as environmental compliance measures under 22 Code of Federal Regulations (CFR) 216[56] seeks to avoid, minimize, and mitigate impacts, including with ASM projects, social impacts should be assessed to determine whether there has been a change from baseline conditions for individuals and communities resulting from a USAID project. Furthermore, there may be pre-existing adverse conditions in a local community prior to a USAID-funded activity, which should be taken into consideration to maximize benefit sharing so that proposed USAID-

[53] USAID. 2024. A Mandatory Reference for ADS Chapter 201. https://www.usaid.gov/about-us/agency-policy/series-200/references-chapter/201mbf.
[54] USAID. 2024. "Social Impact Risk Initial Screening and Diagnostic Tools. A Mandatory Reference for ADS Chapter 201." https://www.usaid.gov/sites/default/files/2024-05/201mbf_051424.pdf.
[55] The USAID Social, Economic, and Environmental Accountability Mechanism (SEE-AM) is expected to be formally launched in summer 2024. The SEE-AM offers communities and project participants to report adverse social, economic, or environmental impacts caused by USAID-funded activities. Complaints and questions can be submitted to disclosures@usaid.gov.
[56] USAID. Reg. 216 (22 CFR 216). https://www.usaid.gov/environmental-procedures/laws-regulations-policies/22-cfr-216.

funded activities minimize unintended social consequences, such as impacts on a person's livelihood, economic activities, traditional vocations, land or property rights, access to natural resources, culture and customs, and health and well-being.

5.1 KEY SOCIAL IMPACTS

This section is organized according to the principles presented in USAID's Voluntary Social Impacts Principles Framework.[57] The Voluntary Social Impact Principles Framework encompasses nine principles for considering and assessing potential social risks and social impacts across USAID programs, projects, and activities. Table 4 summarizes the nine principles. For additional information on the nine Principles see the [USAID Voluntary Social Impact Principles Framework](). For the key relevant principles, the subsequent sections present an illustrative list of potential social impacts pertaining to ASM projects for consideration by Missions and/or Implementing Partners (IPs).

TABLE 4. USAID SOCIAL IMPACT PRINCIPLES

PRINCIPLE		DESCRIPTION
1	Indigenous Peoples	Indigenous Peoples are a distinct cultural, linguistic, and social group with historical continuity, collective attachment to surrounding natural resources, and/or commitment to maintaining ancestral systems. Specific actions are required of USAID programs involving Indigenous Peoples.
2	Cultural Heritage	Cultural heritage is part of every culture and is found all over the world. It includes archaeological sites, historic buildings, artifacts, and natural environments inherited from past generations as well as intangible knowledge and practices. Working in areas with cultural heritage or on cultural heritage projects can have consequences beyond just destruction of an important resource and can also offer potential means of positively engaging with communities.
3	Land Tenure, Displacement, and Resettlement	Land tenure is associated with acquiring and managing rights to land. Land use change may lead to compulsory displacement, resettlement, and/or the loss of access and/or use of land and natural resources, which should be avoided and minimized to reduce social impacts on affected landholders, tenants, community members, and pastoralists, among other groups. Failure to account for, and respect, the land and resource rights of local community members can cause costly delays, work stoppages, protests, and, in some cases, violence. USAID may face legal actions and suffer financial, brand, or reputational harm.
4	Health, Well-being, and Safety	Health, Well-being, and Safety is safeguarding against potential physical, psycho-social, and health impacts among project staff, program participants, and communities where AID actions are implemented. Individual USAID actions must account for potential occupational health and safety risks, as well as potential uneven socio-economic gains

[57] USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

		across affected communities/program participants, to avoid unintended consequences.
5	Working with Security Personnel	Cognizance of the unique challenges involved in engaging security personnel, working with security personnel prioritizes a rights-based approach to ensure respect for, and safety of, individuals and local communities. Without transparent and accountable oversight of rule of law, the risks of potential human rights violations increase.
6	Conflict Dynamics	Attentiveness to the operational context in relation to past and present conflicts as well as sensitivity around the role that a USAID action has in shaping the conflict landscape. Poor understanding of conflict dynamics increases the possibility of contributing to or exacerbating conflict.
7	Inclusive Development	Inclusive development is an equitable development approach built on the understanding that every individual and community, of all diverse identities and experiences, is instrumental in the transformation of their own societies, which means providing them with the opportunity to be included, express their voices, and exercise their rights in activities and public decisions that impact their lives. Inclusion is key to aid effectiveness. Nondiscrimination is the basic foundation of USAID's inclusive development approach.
8	Environmental Justice	Environmental Justice (EJ) is the fair treatment and meaningful engagement throughout the project life cycle of marginalized and underrepresented groups and/or people in vulnerable situations, with respect to environmental and/or health impacts and implementation and enforcement of environmental laws. It includes the protection of marginalized and underrepresented groups that may face enhanced vulnerability due to environmental harms caused by any action or activity. Marginalized and underrepresented groups and/or people in vulnerable situations may include (but are not limited to): Indigenous Peoples, LGBTQI+ persons, persons with disabilities, children and other youth, older persons, women, low-income populations, and all disadvantaged and marginalized communities across race, color, gender, or national origin.
9	Labor	The Labor principle focuses on advancing worker empowerment, rights, and labor standards through programming, policies, and partnerships to advance sustainable development outcomes. USAID recognizes the high risk of labor abuses that may result from programming, and, thus, USAID works to establish and strengthen labor protections (including social protections) that align with internationally recognized worker rights. This principle includes the promotion of safe and healthy work environments; respecting the principles of freedom of association and collective bargaining; the elimination of forced labor and the worst forms of child labor; and the protection from discrimination at work.

5.1.1 INDIGENOUS PEOPLES

When a Mission /or IPs are identifying stakeholders, it is important to ascertain whether Indigenous Peoples are present in or nearby the project footprint. Indigenous Peoples may be unintentionally impacted and are particularly vulnerable to negative impacts of proposed projects. Several Agency guidelines, such the Voluntary Social Impact Principles Framework[58] can aid an Operating Unit in identifying whether a project may affect Indigenous Peoples. Furthermore, Missions or IPs should apply USAID's Policy on Promoting the Rights of Indigenous Peoples (PRO-IP)[59] when Indigenous Peoples are identified. The PRO-IP should be followed to uphold protections for Indigenous Peoples, wherein opportunities should aim to address goals and issues identified by Indigenous Peoples and include actions to improve standard of living and increase long-term sustainability of the natural resources they use. The policy sets out criteria that should be used when identifying Indigenous Peoples, as well as ensuring that Free, Prior and Informed Consent (FPIC) is obtained related to project impacts and decisions that may affect their land, livelihoods, lives, resources, or territories. Additional resources are also provided in the footnote below.[60]

Impacts on Indigenous Peoples should be avoided as much as possible. In cases where social impacts from project activities are deemed to adversely impact the lands, rights and livelihoods of individuals and communities, consider ending plans to implement the project. If/when the project is under implementation, consider stopping the project until adequate management measures have been designed and implemented to mitigate the identified impacts. Management measures must always be commensurate with the degree of the identified adverse social impacts.

5.1.2 CULTURAL HERITAGE

Cultural heritage is part of every culture and is found around the world. Working in areas with cultural heritage resources can have consequences beyond just the destruction of an important cultural site. It is important to assess cultural heritage when planning for ASM projects as there may be unintended impacts. Cultural heritage refers to monuments (e.g., architecture, sculptures, elements, or structures of an archaeological nature), groups of buildings, and sites (e.g., archaeological sites, burial sites, areas of human-made and natural features) that are of outstanding universal value from a historical, artistic, scientific, aesthetic, ethnological, or anthropological point of view. Examples of this tangible type of cultural heritage also include moveable objects (including artifacts, paintings, coins, manuscripts, and sculpture), underwater resources or sites (including shipwrecks, ruins, and submerged landscapes), and paleontological remains. In addition to tangible resources, cultural heritage includes intangible resources, which may be aspects of culture, knowledge, history, customs, beliefs, and traditions that may be invisible or not apparent and are often unseen by people who are not of that culture. The United Nations Educational, Scientific and Cultural Organization (UNESCO) states that intangible heritage can include oral traditions and expressions, folklore, beliefs, language,

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[58] USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

[59] USAID. 2020. "Policy on Promoting the Rights of Indigenous Peoples (PRO-IP)." USAID. https://www.usaid.gov/sites/default/files/2022-05/USAID-IndigenousPeoples-Policy-mar-2020.pdf.

[60] USAID. 2021. "Optional Toolkit for Identifying Indigenous Peoples." USAID. https://www.usaid.gov/sites/default/files/2022-05/Optional-Toolkit-for-Identifying-Indigenous-Peoples.pdf.; USAID. 2021. "Concise Guide to USAID's Toolkit for Monitoring Engagement and Verifying Free Prior, and Informed Consent (FPIC)." USAID. https://www.usaid.gov/sites/default/files/2022-05/Guide-to-Monitoring-FPIC-Toolkit.pdf.; USAID. 2021. "USAID Guidance on Monitoring Free, Prior, and Informed Consent (FPIC)." USAID. https://www.usaid.gov/sites/default/files/2022-05/Guidance-on-Monitoring-FPIC.pdf.; and USAID. n.d. FPIC 360 Monitoring Tool. https://www.usaid.gov/document/fpic-360-monitoring-tool.

knowledge, performing arts, social practices, rituals, festive events, and traditional craftsmanship.[61,62]

In order to ascertain whether an ASM project may have unintended impacts on cultural heritage, USAID has released a resource on the potential positive and negative impacts for cultural heritage resources as the result of USAID programming.[63] In addition, several resources are available from the U.S. National Park Service, the International Council on Monuments and Sites, UNESCO, and the International Finance Corporation (IFC) (see footnote).[64] Furthermore, prior to project implementation, it is important to carry out a Social Impact Assessment while including broad and in-depth stakeholder consultations to become aware of the existence of the cultural resources in or nearby the proposed project site.

5.1.3 LAND TENURE

Land tenure is the relationship that individuals and groups of people hold with respect to land and related resources. Land tenure rules define the ways in which property rights to land are allocated, transferred, used, or managed in a particular society. Land tenure issues can be complicated in areas that may not have a formal system of land ownership or of documentation of land ownership.

While the majority of ASM is "informal," operating in the absence of appropriate legal frameworks, some ASM miners are operating within a "legal" or "formalized" framework, with established land titles and government permits, payment of taxes or fees, and compliance with social and environmental regulations imposed by the government.

Local property rights may determine the extent to which extractives may cause conflict. For example, if mining communities possess statutory or customary rights to land, the presence and extraction of mineral resources may not lead to social conflict and may allow Indigenous communities to lease or receive other compensation for use of the land. Alternatively, where land rights are unclear, artisanal mining may create conflict over boundaries and access, as well as land use, which may result in the deterioration of relationships and social networks, possibly leading to violence.

The extractive industry has a contentious history regarding access to and control of mineral resources worldwide. In several developing countries, customary tenure often extends to only the surface land and resources; communities and other surface landholders acknowledge that subsurface sources are owned by the state. *Statutory tenure* is a system based on laws and regulations, which authorize state-established institutions to oversee access, use, or the transfer of rights to both surface and subsurface resources. *Customary tenure*, also referred to as

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61 UNESCO. n.d. "What is Intangible Cultural Heritage?" https://ich.unesco.org/en/what-is-intangible-heritage-00003.

62 UNESCO. 1972. *Convention Concerning the Protection of the World Cultural and Natural Heritage.* https://whc.unesco.org/en/conventiontext/.

63 USAID. 2023. *Guide to Encountering and Working with Cultural Heritage.* https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/cultural-heritage-guide-2023-09.

64 National Park Service. 2019. "National Heritage Area Feasibility Study Guidelines." https://www.nps.gov/subjects/heritageareas/upload/NHA-Feasibility-Study-Guidelines_FINAL-Revisions-2019_508-compliant.pdf.; ICOMOS. 2011. *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.* Paris: International Council on Monuments and Sites. https://www.iccrom.org/sites/default/files/2018-07/icomos_guidance_on_heritage_impact_assessments_for_cultural_world_heritage_properties.pdf.; UNESCO. 2023. "List of World Heritage in Danger." https://whc.unesco.org/en/danger/.; and IFC. 2012. "Performance Standard 5: Land Acquisition and Involuntary Resettlement." https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-5..

“informal,” “Indigenous,” or “traditional” law, is based on Indigenous populations’ customs and coexists with statutory tenure. It may allocate seasonal access to resources and provide nuanced agreements to address competing users of natural resources, such as hunters, gatherers, cultivators, and herders. However, while customary tenure arrangements may be clear regarding surface resources, they may not be clear for subsurface mineral resources, resulting in potential conflict between land holders and miners. In the case of fragile states, customary tenure typically rules, unless neither governmental nor traditional authority enforces access, in which case, armed groups may move in.

While the allocation of rights to subsurface minerals in many countries is the responsibility of the government, the resulting tension over the distribution of mining rights between large-scale and artisanal and small-scale miners can be rampant and sometimes result in violence. Typically, the government will allocate rights to individuals or corporations that are equipped with the capability to extract the resource, while taxing the miners to financially support infrastructure and social services, which often do not make it equitably back to the local community. Resources on land tenure can be found in footnote[65].

LAND TENURE ISSUES IN COTE D’IVOIRE

The West African nation of Cote d’Ivoire has experienced forest cover loss and unsustainable resource depletion, including via ASM, in part due to land tenure customary law. Historic land tenure practices based on customary law have traditionally dictated that land is held and transferred according to the lineage of the original inhabitants of the area; however, these laws are not well defined and not consistently applied. Further, population growth, immigration, and commercialization of agriculture have led to increases in competition for land, resulting in conflict, confusion, and ultimately unsustainable farming techniques and land uses. While in the past, agricultural livelihoods were most common (and had more predictable incomes), diamond mining has become more widespread due to the perceived potential for greater income.[66,67]

In 1998, the World Bank assisted Cote d’Ivoire in transforming to a land tenure system defined by the Rural Land Law, utilizing private property rights regulated by the state. While private property regimes can potentially remove the confusion and competition for land, potentially resulting in the enforcement of more sustainable practices, little has been done to implement the Rural Land Law. The USAID PRADD project seeks to define and strengthen the appropriate laws, assess the formalization of existing tenure agreements, build capacity among stakeholders within ASM communities to manage and resolve conflict, and establish a collaborative framework of stakeholders to improve land tenure laws based on the appropriate local political and social context.[68] Overall, the project aims to clarify

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[65] USAID. 2017. "Why Land Rights Matter." https://www.usaid.gov/sites/default/files/2022-05/USAID_Land_Tenure_Infographic_October-2016b.pdf.; Food and Agriculture Organization of the United Nations (FAO). 2022. "Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security." Rome. https://www.fao.org/3/i2801e/i2801e.pdf.; USAID. 2016. *Securing Land Tenure and Property Rights for Stability and Prosperity.* https://www.usaid.gov/land-tenure.; USAID. 2015. "Operational Guidelines for Responsible Land-Based Investment." *LandLinks.* https://www.land-links.org/wp-content/uploads/2016/09/USAID_Operational_Guidelines_updated-1.pdf.; USAID. 2016. "Guidelines on Compulsory Displacement and Resettlement in USAID Programming." *LandLinks.* https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Guidelines_CDR.pdf.; and USAID. 2012. "Land Tenure and Property Rights (LTPR) Impact Assessment Tool." USAID. https://pdf.usaid.gov/pdf_docs/PNADZ008.pdf.

[66] USAID 2017*: USAID Country Profile Côte d’Ivoire, July 2017:* https://www.land-links.org/country-profile/cote-divoire/

[67] African Minerals Development Centre. 2017. "ASM Sector Report: Report on Artisanal & Small-Scale Mining in Africa - Selected Countries Policies Profile Review on ASM ." https://knowledge.uneca.org/ASM/sites/default/files/docs/ASMStudyReport2017.pdf.

[68] USAID 2017: *PRADD II Diagnostic of Land and Conflict in Artisanal Diamond Mining Communities – French*. https://www.land-links.org/document/pradd-ii-diagnostic-land-conflict-artisanal-diamond-mining-communities-french/.

and formalize land tenure regimes in order to reduce conflicts and contribute to increased investments in sustainable livelihoods by local communities.

CROSS-CUTTING ISSUES: VIOLENCE IN ASM COMMUNITIES IN COLOMBIA

Violence taking place around mines often fuels illegal activity of armed rebel groups, with cross-cutting implications for both social systems and community and individual health. In Colombia, mining-related violence takes place via a complicated web of players. Illegal mining is worth approximately $7 billion per year, funding the activity of leftist guerillas, paramilitary groups, and drug traffickers. Each of these elements have established a presence in various regions throughout Colombia in an effort to control mining operations, and informal miners – often of Afro-Colombian descent – face murders and kidnappings. For example, in 1988, 43 civilians were killed when armed men opened fire and threw grenades into crowds. Community members say that paramilitary and armed groups both threaten miners and extort money from them, which has become another source of funding for mining activity in the Segovia region. Informal miners are threatened and required to pay in order to continue mining, even if on their own land.

The government, in an attempt to cut off funding for armed groups and lower mercury levels in rivers, is cracking down on informal mining activity. Though they are prioritizing legalization and formalization programs, a number of informal miners have lost their livelihoods and see the government's efforts as a means of regaining control of resource-rich land for the sake of business ties to multi-national corporations. Former president Juan Manual Santos' administration prioritized the drug trafficking and the licensing of mining as inter-related and core safety-related problems in Colombia. Colombia's current government has been tackling illegal ASM by combatting the export and sale of illegal gold. They have a military brigade called the Illegal Mining Brigade. In 2021, the USAID representatives for Colombia signed a memorandum to ensure environmental protection where illegal mining occurs. Nonetheless, as gold prices have risen in global markets, more miners are employing semi-mechanized mining techniques versus the lower-impact gold panning processes that had a smaller environmental footprint, and more are entering the (formal and informal) ASM/ASGM sector.[69]

5.1.4 HEALTH, WELL-BEING, AND SAFETY

Specific choices around project design and implementation invariably have the potential to influence health, well-being, and safety. Assessing and managing the potential social impacts related to health, well-being, and safety requires a careful and sustained effort.

This section summarizes ASM-related health, well-being, and safety hazards mainly from an occupational health and safety standpoint. ASM miners extract commodities in mostly low-resource field settings in remote areas in which supportive infrastructure is usually weak and lacking basic services such as housing, sanitation, municipal electricity, potable water, medical services, and maintained roads.

The precarious and often dangerous conditions under which ASM is performed may exacerbate occupational health and safety hazards. These health hazards are associated with a range of mining processes, including extraction, grinding, sifting, washing, amalgamating, and burning. Table 5 categorizes occupational health and safety hazards with a brief review of significant health effects in each category. The most dangerous risks are biomechanical risks and physical

[69] Sanchez, Diego Ibarra. 2017. *Illegal gold mining fuels violence in Colombia*. https://www.aljazeera.com/gallery/2017/5/7/illegal-gold-mining-fuels-violence-in-colombia/.; and USAID. n.d. "Final Report: Artisanal Gold Mining - Environmental Impact Reduction Activity (Oro Legal)." https://pdf.usaid.gov/pdf_docs/PA00XHVF.pdf.

injury, working in confined spaces, and chemical and biological risks that may extend to the local community.

Additional guidance is available in the USAID Voluntary Principles Framework[70] and in IFC Performance Standard 4: Community Health, Safety, and Security[71]. Table 5 below summarizes examples of potential health, well-being and safety impacts of ASM organized by issue. The following sections provide additional details on Physical and Biochemical Exposure; Mine Structure, and Chemical and Biological Hazards.

TABLE 5. HEALTH, WELL-BEING, AND SAFETY IMPACTS OF ASM

PROBLEM/ISSUE		CAUSE	SIGNIFICANCE
Biomechanical	Lifting and physical exertion	• Accidents from handling materials manually Physiological strain • Work-related musculoskeletal disorders • Tendonitis and nerve impingement • Chronic injury	Injuries can result in severe impacts on the ability to work, affecting local economies and poverty. Females often experience excessive physiological strain from physical labor, resulting in impacts on family structures. The severity of these cases is often unknown due to lack of surveillance.
	Physical trauma, falls	• Contusion, fractures, and spinal injuries from working under unsafe conditions and rock falls or explosions • Chemical or electric burns and eye injuries due to inappropriate use of equipment	Physical trauma can also impact individuals' ability to work or lead to death. Fatality rates are estimated to be 90 times higher than in large-scale mines in industrial countries.
Physical Exposure	Heat (see the Climate Change Considerations section for additional information)	• Heat stress, stroke, faintness, and dizziness due to extended work underground or under intense sun exposure • Breathing difficulties • Palpitations due to a lack of scheduled breaks • Excessive thirst or dehydration due to lack of access to potable water	Health impacts should be avoided for their own sake; however, poor health can also alter one's ability to work.
	Noise	• Hearing impairment or loss due to noisy tools, blasting, drilling, crushing, or ore processing	Undetected hearing loss can impact one's role in society and the ability to continue working.
	Vibration	• Ulnar nerve damage, numbness in hands and arms from explosions,	Ergonomic stress or burdens can result in lower mobility, higher healthcare costs, and a lower probability of finding work.

[70] USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.
[71] IFC. 2012. "Performance Standard 4: Community Health, Safety, and Security." https://www.ifc.org/content/dam/ifc/doc/2010/2012-ifc-performance-standard-4-en.pdf.

PROBLEM/ISSUE		CAUSE	SIGNIFICANCE
		noise, vibrating drills, or hand tools	
	Dust	• Dust from roads, excavation, or mine blasting	Dust can cause breathing problems for people and carry heavy metals into the body.
Mine Structural Hazards	Structural failures, mine tunnel or pit flooding, mudslides, confined spaces, and other health or safety impacts as a result of structural hazards	• Falls or even death/drowning from collapsed tunnels due to inadequate trenching and shoring or if rain fills shafts and trenches • Collapsed pit walls, tailings piles, or tunnels	These structural failures cause not only miner death or injury but can impact local communities depending on their extent. Local infrastructure, such as roads, bridges, or buildings, can also be impacted.
Chemical Exposure	Mercury (elemental and methylmercury)	• Neurological symptoms such as poor short-term memory or concentration, affected vigor, tension, confusion, or anger; kidney disease or developmental problems in children and fetuses	Mercury can be inhaled as airborne vapor when used in gold processing, or absorbed and bioaccumulated from the consumption of fish, shellfish, and other animals that live in contaminated water. There are long-lasting impacts on children with far-reaching effects on health, education, and development.
	Lead	• Deficits in neurocognitive development • Prenatal fetal neurotoxin	Exposure via ingestion and inhalation of lead-contaminated soils and dust also has far-reaching impacts on children's health.
	Arsenic	• Dermal impacts, cancers	Exposure via ingestion and inhalation of arsenic-contaminated soils and dust also has far-reaching impacts on children's health.
	Silica dust	• Silicosis, chronic obstructive pulmonary disease, tuberculosis (TB), lung cancer	Inhalation during drilling, mineral extraction, ore crushing, blasting, and explosions can occur due to a lack of worker protection programs.
	Sodium cyanide/hydrogen cyanide	• Asphyxiation affecting the body's ability to use oxygen • Cancers, visual impairment	Inhalation and skin exposure can result in long-term health impacts.
	Toxic gases (e.g., methane, sulfur dioxide, oxides of nitrogen,	• Respiratory tract irritation • Asphyxiation from lowered oxygen levels during mining	Due to a lack of ventilation training, deaths or long-term health impacts can occur.

PROBLEM/ISSUE		CAUSE	SIGNIFICANCE
	hazardous air pollutants)		
	Carbon monoxide	• Headache, nausea, vomiting, and confusion, leading to coma and death	Incomplete combustion in poorly ventilated spaces where petrol or diesel fuels are used can lead to death.
Biological Hazards	TB, HIV/AIDS, cholera and other waterborne, hazards, vector-borne hazards, sexually transmitted infections	• Disease transmission within ASM communities	Contaminated and stagnant water in mines and homes can lead to vector-borne diseases. Higher risk sex practices and unsafe health behaviors can also lead to the spread of disease.

Physical and biochemical exposure. Heat, noise, and vibration are common exposures attributable to working in small-scale mining in hotter climates and underground, with machinery and vibrating hand tools, and with explosives that can result in excessive dust, unstable soils, and an elevated risk of injury. Even simple mechanized industrial processes produce a mix of continuous sound and complex peak noises from extraction, crushing, and milling processes.

ASM activities generate dust through the use of mining tools in the pit or shaft, blasting, truck traffic on unpaved roads, dumping or moving rocks and dirt, grinding ores, or wind erosion in areas where vegetation has been cleared. Any dust can irritate the lungs and throat, and silica dust that is released when breaking down rocks can cause silicosis, which decreases lung capacity and can be fatal. Additionally, dust from ores commonly contains heavy metals that are transferred to the body as the dust is inhaled. This is especially problematic when dust gathers in homes from indoor ore grinding because children receive heavier doses simply by being smaller and closer to the ground when the contaminated dust is stirred up.

HEAVY METAL EXPOSURE FROM COBALT MINING IN THE KATANGA REGION, DRC

Urine samples from 311 subjects living near the cobalt mining activity had four-, 43-, five-, and four-fold higher concentrations of the heavy metals cadmium, cobalt, lead, and uranium, respectively, than the general U.S. population. These levels were due to contaminated land, water, and air resources in the region[72].

Mine structural hazards. Mines can take the form of tunnels, pits, or other confined spaces. Failures due to poor trenching and shoring practices, uncontrolled flooding, and mudslides are an inherent risk in ASM operations, particularly those operations that are unregistered or illegal. Figure 9 provides an illustration of a structural hazard at an ASM mine. A study conducted between 2015 and 2016 revealed that the annual incidence rate of mining-related injury was 289 per 1,000 workers, with the majority of injuries caused by machinery.[73] These hazards can

[72] Banza, Célestin Lubaba Nkulu, Tim S. Nawrot, Vincent Haufroid, Sophie Decrée, Thierry De Putter, Erik Smolders, Benjamin Ilunga Kabyla, et al. 2009. "High human exposure to cobalt and other metals in Katanga, a mining area of the Democratic Republic of Congo." Environmental Research 109 (6): 745-752. https://www.sciencedirect.com/science/article/abs/pii/S0013935109000814?via%3Dihub.
[73] Nakua, Emmanuel Kweku, Ellis Owusu-Dabo, Samuel Newton, Adofo Koranteng, Easmon Otupiri, Peter Donkor, and Charles Mock. 2019. "Injury rate and risk factors among small-scale gold miners in Ghana." *BMC Public Health* 19. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7560-0.

result in severe injuries and fatalities. In the absence of formal surveillance in this sector, an exploratory study collated newspaper articles reporting small-scale accidents between 2007 and 2012 in Ghana and found that 31 percent of events were attributable to entrapment, 17 percent to drowning, 13 percent each to crushes and falls, 9 percent each to burning and shootings, and 4 percent to suffocation.[74] The high percentages for entrapment and drowning underscore the importance of introducing safer tunneling and confined space practices with occupational safety and health training.

FIGURE 9. A GHANAIAN MINER AT THE OPENING OF A 15-M MINE SHAFT REINFORCED WITH WOOD.[75]

Chemical hazards. Chemical hazards pose an occupational health and safety risk for miners engaged in ASM; however, they may also cause negative impacts on the nearby local communities. For example, *chemical hazards* from several different contaminants are common due to the unregulated use of chemicals for mineral processing in ASM activities. These chemicals make their way into the environment and individuals' bodies. In the case of mercury, 38 percent of global air emissions are produced by ASGM processes.[76] Mercury amalgamation is one of the most common and inexpensive ways to extract gold from raw ore; ore is crushed and then mixed with metallic mercury, which binds to the gold, creating an amalgam. The amalgam is then heated to distill the mercury and isolate the gold.[77] Another technique—sluicing—involves using water to wash ore or alluvium down a type of mill (sluice). As the sediment is going down the sluice, gold particles settle to the bottom and are captured by a

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[74] Kyeremateng-Amoah, E., and Edith E. Clarke. 2015. Injuries among artisanal and small-scale gold miners in Ghana." International Journal of Environmental Research and Public Health 12.9 (2015): 10886-10896. https://www.mdpi.com/1660-4601/12/9/10886.
[75] International Institute for Environment and Development (IIED). n.d. *Ghana: on our way to participatory reform in the artisanal and small-scale mining sector.* https://www.iied.org/ghana-our-way-participatory-reform-artisanal-small-scale-mining-sector.
[76] United Nations Environment Programme. 2019. "Global Mercury Assessment 2018." UN Environment Programme, Chemicals and health Branch, Geneva. https://www.unep.org/resources/publication/global-mercury-assessment-2018.
[77] Esdaile, Louisa J., and Justin M. Chalker. 2018. "The Mercury Problem in Artisanal and Small-Scale Gold Mining." *Chemistry A European Journal.* https://chemistry-europe.onlinelibrary.wiley.com/doi/10.1002/chem.201704840.

material on the bottom of the sluice.[78] As the sediment is going down the sluice, gold particles settle to the bottom and are captured by a material on the bottom of the sluice.[79]

HEALTH EFFECTS FROM MERCURY EXPOSURE

ASM communities face substantial mercury exposure, with profound health effects. Lower occupational exposures in adults adversely affect mood (tension, anger, confusion, fatigue, depression), increase self-reported symptoms (poor short term memory and concentration), and can result in performance deficits linked to neurobehavioral domains for visual memory, hand-eye coordination, and manual dexterity. Adverse health effects may intensify and/or become irreversible as exposure duration and concentration increase. Very high exposures are more common in small-scale mining operations and this can increase the severity of neurotoxicity. Mercury has no physiological benefits and even small exposures can cause negative health effects in children in particular; mercury's impacts are particularly severe for the developing fetus in women who are exposed while pregnant.

Elemental mercury exposure can also occur throughout the extraction process. In particular, direct exposure occurs to workers without personal protective equipment (PPE), such as gloves and respirators, and their families. During the sluicing process in whole ore amalgamation, mercury can be spilled on the ground, wiped on clothing, or lost to the environment as mercury flour, which readily contaminates soil and waterways near processing centers. Figure 10 depicts the wide geographical scope of mercury contamination, although it is likely not reflective of undocumented or unofficial mercury use and subsequent contamination.

Exposure to *methylmercury,* an organic compound of mercury that is generated by the microorganisms present in water, primarily occurs when contaminated fish or other animals are consumed. Methylmercury can bioaccumulate in fish, shellfish, or other wildlife in contaminated waterways near mining sites. Impacts are more severe depending on the dose; they range from hair loss to delayed brain development in children. Prenatal mercury exposure can impact infant neurodevelopment and is "associated with rapid growth during the first three years of life".[80] A 2021 study observing Peruvian Amazon populations found that community members surrounding mining sites, not just miners, have had considerable exposure to mercury. Furthermore, the communities at the highest risk were Indigenous or native communities. Even communities upwards of hundreds of kilometers away from mining sites still had exposure to mercury due to the mercury found in water.[81] In general, lead exposure with mercury, arsenic, and other contaminants is also a significant risk factor.

Silica in drilling and extraction dust is a mineral that is also found in gold and diamond-bearing ores. Depending on the size of the silica particles, silica can be retained in the lung, causing lung cancer, and can increase susceptibility to TB. The absence of personal protection and

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[78] United States Environmental Protection Agency. 2023. *Artisanal and Small-Scale Gold Mining Without Mercury.* https://www.epa.gov/international-cooperation/artisanal-and-small-scale-gold-mining-without-mercury.

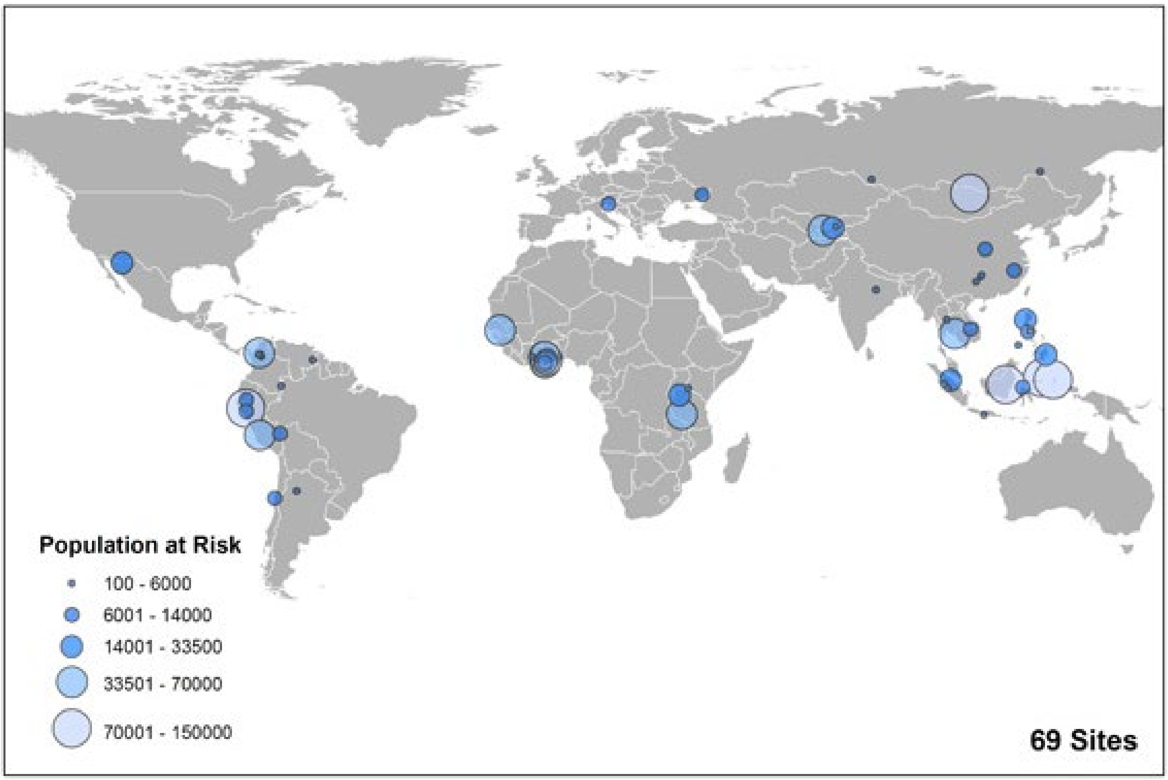
[79] United States Environmental Protection Agency. 2023. *Artisanal and Small-Scale Gold Mining Without Mercury.* https://www.epa.gov/international-cooperation/artisanal-and-small-scale-gold-mining-without-mercury.

[80] Kim, Byungmi, Surabhi Shah, Hye-Sook Park, Yun-Chul Hong, Mina Ha, Yangho Kim, Boong-Nnyun Kim, Yeni Kim, and Eun-Hee Ha. 2020. "Adverse effects of prenatal mercury exposure on neurodevelopment during the first 3 years of life modified by early growth velocity and prenatal maternal folate level." *Environmental Research* 191. https://www.sciencedirect.com/science/article/pii/S0013935120308045.

[81] Weinhouse, Caren, John A. Gallis, Ernesto Ortiz, Axel J. Berky, Ana Maria Morales, Sarah E. Diringer, James Harrington, et al. 2021. "A population-based mercury exposure assessment near an artisanal and small-scale gold mining site in the Peruvian Amazon." *Journal of Exposure Science & Environmental Epidemiology* 31 (1): 126-136. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8281380.

respirators contributes to the health risks. Exposure to silica dust is also associated with the development of silicosis, which is a lung disease that leads to fluid buildup and scar tissue in the lungs, thus impacting respiration.

FIGURE 10. MERCURY CONTAMINATION FROM ASGM MINING AND PROCESSING AROUND THE GLOBE[82]



LEAD POISONING FROM ASGM ACTIVITY IN ZAMFARA STATE, NIGERIA

In March 2010, global alarm was raised by a series of unexplained deaths among young children in more than 50 villages in Zamfara State, Nigeria. More than 400 children died, and at least 3,000 were poisoned. Investigators identified lead poisoning as the likely cause; the lead originated from the nearby gold deposits, and gold mining activities spread the lead as dust, in particular from dry crushing and milling of ore. Unfortunately, the processing was conducted in the villages, in close proximity to family compounds. High levels of lead were measured in housing dusts and community water sources. This dust was inhaled or ingested from the hands of people living in the community, causing lead poisoning. Lead poisoning can cause irreversible damage to brain development and lead to seizures and death[83].

The Government of Nigeria, with the assistance of Médecins Sans Frontières, provided health education, and environmental remediation. These efforts reduced mortality, but many exposed families remain unremedied. Wet milling of the ore and other dust control practices can also help mitigate the impacts of dust-borne contamination. Other ASM communities have never been tested for potential exposure to lead and likely remain at risk.

[82] Pure Earth. n.d. *Artisanal Gold Mining.* http://www.worstpolluted.org/projects_reports/display/87.
[83] Médecins Sans Frontières. 2012. "Lead poisoning crisis in Zamfara state northern Nigeria paper." https://www.msf.org/lead-poisoning-crisis-zamfara-state-northern-nigeria.

Sodium cyanide is often dissolved in water to make a solution for leaching gold out of ore. However, it can emit *hydrogen cyanide*, which is a gas that can interfere with the body's ability to use oxygen. Inhalation of the dust or fumes that it generates can cause severe and acute effects, including rapid breathing, tremors, asphyxiation, and death. Chronic effects include neuropathological lesions, difficulty breathing, chest pain, nausea, headaches, and an enlarged thyroid gland. Despite these health impacts, the use of cyanide is increasing because the gold recovery rate is high and the cost is low. In Zimbabwe, most small-scale regional mills first amalgamate with mercury and then use open pools of cyanide on the tailings to increase yield. The gold is further refined in a sealed cascade impactor where cyanide is poured into a closed system to increase purity. The process actually increases the bioavailability of mercury in the environment. For this reason, the use of cyanide after the use of mercury is an "action to eliminate" in Annex C of the Minamata Convention on Mercury and is included as a "worst practice" in the Minamata Convention.

Toxic gases, such as methane, sulfur dioxide, oxides of nitrogen, and carbon monoxide, are also common in ASM activities. Many mines in the informal sector do not add additional ventilation ducts or forced air in confined spaces or deep trenches. This elevates the risk of carbon monoxide exposure when using petrol- or diesel-operated machinery in these areas, which can be lethal. It also increases the risk of asphyxiation by methane and nitrous oxide. Blasting fumes and vapors also contain sulfur dioxide and oxides of nitrogen, which are strong respiratory tract irritants. The absence of safety equipment contributes to the health risks.

Biological hazards. Biological hazards may be considered both an occupational health and a safety risk for the miners, as well as a community health risk because these types of hazards go beyond the mining site. For example, HIV/AIDS, other sexually transmitted infections, TB, cholera and other waterborne diseases, and vector-borne diseases can be found in mining communities or are exacerbated by mining activities. Mining locations are often far from a home village, so miners may seek out concurrent sex partners and engage in unprotected practices. These factors increase the spread of sexually transmitted infections, HIV, and AIDS. Miners and families are also more prone to living in crowded substandard housing, which increases contact with airborne TB. Studies have shown increased susceptibility to TB in miners due to co-exposure to silica dust. The inhalation of silica dust decreases immunity and increases the scarring of lung tissue, permitting TB infection to advance.

The lack of quality infrastructure for sanitation and potable water is another pressing problem across informal ASM communities, increasing the risk of cholera. The presence of stagnant pools of water (such as that shown in Figure 11) at most mine sites permits the reproduction of mosquitoes that can become carriers of and transmit malaria, dengue, and emerging infections. Finally, small-scale mining communities often live near the tailings of larger mines located along waterways used for drinking, cooking, and bathing. The probability of mine waste and discharges into communal water, with and without flooding, is high.

FIGURE 11. A GOLD MINE WITH STANDING WATER IN THE AMAZON[84]

5.1.5 LABOR

ASM serves as a significant but generally poorly compensated and potentially dangerous source of livelihood in many developing countries. Additionally, the demographics of the ASM sector vary considerably across nations and include all age groups. ASM is sometimes conducted as a family business and, as such, women and children play significant roles in the sector. Men primarily work in the mines, while women and children may work in the mines, in processing and support roles, and in the household, requiring a balancing of mining and household responsibilities. However, when spouses or family members are ill or their capacity to work is otherwise diminished, a “healthy” family member must work harder to pay for normal living expenses in addition to health costs. Available low-cost labor and poor health are thus components of the ASM poverty cycle. These factors expand the number of women and children engaged in the ASM sector. It is estimated that more than one million children are working in mining worldwide, with the most common sector being ASM.[85] Additionally, an estimated 30 percent of the 40.5 million ASM miners worldwide are women.[86]

Male miners. Men are more prevalent in the mining workforce, although this varies by region, and have more control over land, units of gold and diamonds, the mine site, and its revenues

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[84] Fraser, Barbara. 2010. "Taking on Malaria in the Amazon. The Lancet 2376 ." *Lancet* 376 (9747): 1133-1134. https://www.thelancet.com/journals/lancet/article/PIIS014067361061522X/fulltext.

[85] International Labour Organization (ILO). 2019. "Child Labor in Mining and Global Supply Chains." https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-manila/documents/publication/wcms_720743.pdf.

[86] Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF). 2018. *Women in Artisanal and Small-Scale Mining: Challenges and opportunities for greater participation.* Winnipeg: IISD. https://www.iisd.org/system/files/publications/igf-women-asm-challenges-opportunities-participation.pdf.

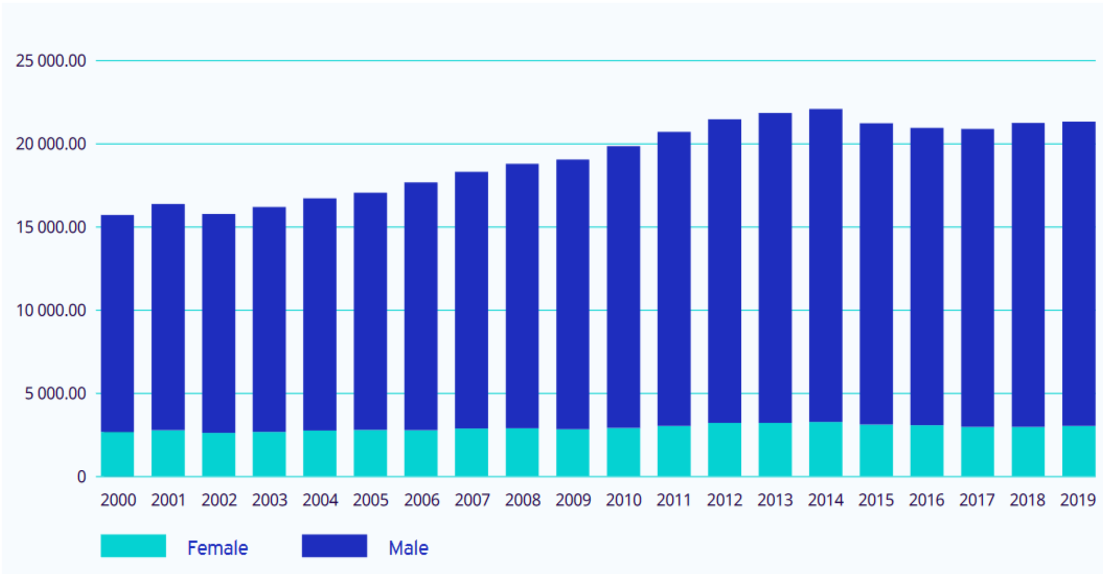
and resources.[87] Relative to female miners, men are also more directly involved in the physical excavating and breaking down of ores. There are usually two groups—those who have been long-term members of a mining community and those who are younger, lack experience, and are more prone to risk-taking work and personal behaviors.

Female miners. The degree to which women participate in mining activities varies by region: in general, less than 10 percent of miners in Asia, 10–20 percent in Latin America, and 40–100 percent in Africa.[88] The ILO reported ASM employment data by gender, collected from their member countries, as shown in Figure 12 below; the ILO noted that because of the informal nature of ASM, total ASM employment may be underestimated in the reported data. However, because of ASM gender roles and other factors, the actual number of women involved in ASM may be particularly underestimated. Women are more active in ASM versus LSM. Typically, women's responsibilities in the mines are more likely to be in processing, transporting, or selling materials, while more mechanized work is reserved for men. Women may also be involved in the trading of gold, gemstones, or extractives. Women not only incur the same excessive occupational risks as that of men but also incur pregnancy and reproductive risks from working with toxicants. There are perceived trends suggesting that women are likely to do the following:[89]

- Transport ore and water, conduct manual crushing and grinding, washing or panning, amalgamation, and amalgam decomposition (the process of removing mercury by heating or adding acid). Some may participate in extraction. At many ASM sites, women work with young babies tied to their backs and toddlers at their side, increasing children's exposure to contaminants.
- Participate in decisions for low unit value commodities, such as industrial minerals, but not gold or diamonds.
- Be less prevalent in larger and more mechanized ASM operations. Women are most prevalent in small family operations where mining takes place to supplement subsistence agriculture.
- Remain the primary caregivers, prepare food, care for children, and conduct cleaning and other household activities. In some locations, women also supply food and drink, tools and equipment, and sexual services.

[87] USAID. 2020. "Gender Issues in the Artisanal and Small-Scale Mining Sector." *LandLinks.* https://www.land-links.org/wp-content/uploads/2020/05/USAID-ASM-and-Gender-Brief-1-June-20-Final.pdf.
[88] International Labour Organization (ILO). 2021. "Women in mining: Towards gender equality." https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_821061.pdf.
[89] International Labour Organization (ILO). 2021. "Women in mining: Towards gender equality." https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_821061.pdf.; United Nations Environment Programme. 2020. "Chapter 3: Artisanal and Small-Scale Mining." In *Mineral Resource Governance in the 21st Century*, pp 79-104. https://www.un-ilibrary.org/content/books/9789280737790s007-c002.; and Javia, Immaculate, and Paulina Siop. 2010. "Paper on Challenges and Achievements on Small scale mining and Gender. Papua New Guinea." WAU Small Scale Mining Training Centre, Papua New Guinea. https://sustainabledevelopment.un.org/content/documents/presentation_javia.pdf.

FIGURE 12. MINING EMPLOYMENT, BY GENDER (2000–2019), IN THOUSANDS[90]



Note: These estimates are based on data collected by ILO Member States. Given the informal nature of ASM, the data collected are likely to exclude large numbers of women and men in ASM.
Source: ILO, n.d.-b.

When women are compensated for their work, they typically earn less than men, and the ASM sector is no exception. Women in ASM usually earn less than their male counterparts, despite sometimes working longer hours than men.[91] For example, a study done in South Africa reported that women in ASM were paid significantly less than men but tended to work more irregular hours.[92] In addition, women have less access to financial services than men, which sometimes results from women having low levels of formal education or no collateral.[93] Lack of credit results in women being unable to afford to buy or lease land and mining tools to achieve independence and increase their earnings.[94]

Traditional gender roles also impact the sector. Women are typically responsible for maintaining households and agricultural responsibilities, sometimes resulting in workdays that can be between 4 and 8 hours longer than those of men. This added contribution is largely unrecognized and undervalued. Despite this, men may ultimately retain control over the household, reserving decision-making authority for the family. In addition, although women's contributions to ASM are significant, oftentimes ownership and control of the land, incomes, tools, households, and personal property belong to men, as do the rights and any benefits that come from them. Due to this difference in influence, women may be differentially affected by project plans or the sector and reform more broadly. However, properly designed projects may provide an opportunity to improve economic outcomes for women in developing countries.

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[90] International Labour Organization (ILO). 2021. "Women in mining: Towards gender equality." https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_821061.pdf.
[91] USAID. 2020. "Gender Issues in the Artisanal and Small-Scale Mining Sector." *LandLinks.* https://www.land-links.org/wp-content/uploads/2020/05/USAID-ASM-and-Gender-Brief-1-June-20-Final.pdf.
[92] Ibid.
[93] Ibid.
[94] Ibid.

ASSESSING GENDER DIMENSIONS OF ASM

The World Bank released a Rapid Assessment Toolkit in 2012 that outlines how practitioners should assess gender dynamics and promote gender equality in ASM communities.[95] The toolkit provides a framework for understanding the factors that determine an individual or group's capacity to assess, control, accumulate, and benefit from ASM-related assets. With this understanding, a practitioner can ensure that the project's interventions are cognizant and supportive of human rights and the equal rights of women in particular, providing means of engagement and participation in policy and interventions.

While this toolkit provides a thorough and in-depth methodology for collecting data and analyzing related local dynamics, project managers and implementers can consider the overarching goals of increasing both women and men's voices in influencing policies and programs, increasing commitment of local government or key organizations to general equality, and recommending means of increasing opportunities for women and men to drive their own social and economic development.

Child Labor. The ILO describes the worst forms of child labor as work that deprives children of their childhood, their potential, and their dignity; that is harmful to physical and mental development; is mentally, physically, socially, or morally dangerous and harmful to children; and interferes with schooling. ILO Convention No. 182 prohibits the worst forms of child labor for anyone under age 18, which is work that is likely to harm the health, safety, or morals of children, either by its nature or the circumstances under which it is carried out. The worst forms of child labor include hazardous work, such as mining activities, including underground work; work with dangerous tools or machinery; transportation of heavy loads; and work that exposes children to hazardous substances.

The worst forms of child labor is a serious problem[96] in local, small-scale gemstone and mineral mining operations worldwide. Children under age 15 comprise a large portion of the workforce in ASM. In Niger and Burkina Faso, 30–50 percent of the gold mine workforce are children, mostly under age 15.[97]

Children (anyone under age 18) may be involved in virtually all stages of ASM. Depending on the country, child labor in ASM may be equally divided between boys and girls or dominated by boys. There are few tasks performed by children in ASM that are not hazardous; often, children conduct work similar to that performed by adults. Most work characteristics fit the definition of a "worst form of child labor" under ILO Convention No. 182[98]. Many of the children who work in mining are subject to violence and forced labor. There are research gaps in the statistics of children forced into labor in ASM; however, a study done in the DRC found that of the 931 people documented in the mining workforce at three mining sites in 2013, 93 percent were

[95] World Bank Group. 2012. "Gender dimensions of artisanal and small-scale mining : a rapid assessment toolkit (English)." Washington, D.C. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/644761468157780524/gender-dimensions-of-artisanal-and-small-scale-mining-a-rapid-assessment-toolkit.

[96] Department of Labor. 2022. "Findings on the Worst Forms of Child Labor." https://www.dol.gov/agencies/ilab/resources/reports/child-labor/findings; Department of Labor. 2022. "List of Good Produced By Child Labor or Forced Labor." https://www.dol.gov/sites/dolgov/files/ilab/child_labor_reports/tda2021/2022-tvpra-list-of-goods-v3.pdf.

[97] International Labour Organization (ILO). 2019. "Child Labor in Mining and Global Supply Chains." https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-manila/documents/publication/wcms_720743.pdf.

[98] International Labour Organization (ILO). 2005. The burden of gold Child labour in small-scale mines and quarries. https://www.ilo.org/publications/burden-gold-child-labour-small-scale-mines-and-quarries.

forced into some form of labor exploitation.[99] In some countries, including Zambia, Zimbabwe, Ghana, Nigeria, and Sierra Leone, children in the ASM workforce were trafficked or were in situations of debt bondage[100].[101] In underground mines, for example, children may be involved with ore extraction, assist with drilling, push carts, clean galleries, and remove water from the mines. In river mines, they may dig and dive for sediment. Children may also crush stones, haul minerals, pick gemstones, and wash gold in mineral concentration processing. Boys perform a range of functions, from helping to dig and haul to washing sediment, burning amalgam, and performing support tasks such as brick making and hauling water. Within industrial materials mines (e.g., clay, coal, sand), young girls may be required to carry huge loads on their heads and backs, sometimes in extreme temperatures. Some children are also required to run errands or deliver food and water to miners working deep within the mines. Girls may also be expected to perform other jobs on mining sites, such as preparing or selling food or other items, and may face the additional risk of sexual harassment, sexual exploitation, and sexual assault.[102] These children incur developmental risks, as well as excessive occupational and environmental risks, from working with heavy loads and toxicants. For more guidance, please see footnote.[103]

Given the level of family engagement in ASM, it is very difficult to eliminate the participation of children. There are several underlying challenges that make the elimination or limiting of child labor in ASM difficult. Often, the mines are in poverty-stricken areas and are family-oriented, with children working alongside family members. Additionally, the often informal and transient nature of ASM means that it is difficult to ensure that mines or traders purchasing from unlicensed sources do not benefit from child labor.

Forced Labor. The exploitation—as forced laborers, indentured servants, or slaves—of men, women, and children occurs at mining sites around the world. In forced labor, fraud or deception are often used to obtain consent initially, or individuals may offer their services and then become exploited regardless of consent. In areas of extreme poverty, resources such as food or housing may be offered in exchange for employment; however, coercive means are used to prevent those individuals from leaving. Forms of coercion include threats and violence, restriction of workers' freedom of movement, debt bondage or debt manipulation, withholding of wages, retention of identification documents, or abuse of vulnerability.[104] Debt bondage refers to forced labor specifically for the repayment of debt or other obligations when the service's duration is undefined. Refer to more guidance in the footnote.[105]

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[99] International Labour Organization (ILO). 2019. "Child Labor in Mining and Global Supply Chains." https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-manila/documents/publication/wcms_720743.pdf.

[100] *Debt bondage* refers to forced labor specifically for the repayment of debt or other obligations when the service's duration is undefined.

[101] Organisation for Economic Co-operation and Development (OECD). 2017. "Practical Actions for Companies to Identify and Address the Worst Forms on Child Labour in Mineral Supply Chains." https://mneguidelines.oecd.org/Practical-actions-for-worst-forms-of-child-labour-mining-sector.pdf.

[102] The Global Initiative Against Transnational Organized Crime. 2016. "Organized Crime and Illegally Mined Gold in Latin America." Geneva. https://globalinitiative.net/wp-content/uploads/2016/03/Organized-Crime-and-Illegally-Mined-Gold-in-Latin-America.pdf.

[103] Department of Labor. 2022. "Findings on the Worst Forms of Child Labor." https://www.dol.gov/agencies/ilab/resources/reports/child-labor/findings; Department of Labor. 2022. "List of Good Produced By Child Labor or Forced Labor." https://www.dol.gov/sites/dolgov/files/ilab/child_labor_reports/tda2021/2022-tvpra-list-of-goods-v3.pdf.

[104] Hidron, Clara, and Ronald Koepke. 2014. Addressing Forced Labor in Artisanal and Small Scale Mining (ASM): A Practitioner's Toolkit. Alliance for Responsible Mining, Envigado. https://www.responsiblejewellery.com/wp-content/uploads/ForcedLaborToolkit-Solidaridad-ARM.pdf.

[105] Responsible Sourcing Tool. n.d. "Is Forced Labor Hidden in Your Global Supply Chain." https://www.responsiblesourcingtool.org/.

HUMAN TRAFFICKING IN ARTISANAL MINING TOWNS IN EASTERN DRC[106]

Artisanal mining towns in eastern Congo have gained international attention due to the role that they have played in fueling conflict with rebel groups. Aided by poor governance, poor regulatory oversight, and corruption, labor and sexual trafficking have become commonplace due to the lack of job prospects. The 2014 State Department *Trafficking in Persons Report*[107] specifically mentions trafficking associated with ASM, but human trafficking in general includes sex trafficking as well as forced labor.

Based on a USAID-funded survey published in 2014, 6.7 percent of surveyed respondents were at the time or had been victims of trafficking, 3.7 percent of those surveyed experienced labor trafficking, and 2.6 percent experienced debt bondage. Though sex trafficking was lower than expected (0.9 percent), 31.1 percent of female respondents reported exchange of sex for money. Child labor was found to affect 22.4 percent of surveyed minors. However, underlying social systems were such that non-armed group actors – such as family members, mining bosses, or government officials – were actually found to be behind many of the coercive labor practices.

The USAID effort emphasizes the need to address socio-cultural norms, peace-time power structures and attitudes, and the need to promote civic engagement rather than solely armed group abuses.

For more on human trafficking, see: State Department. 2024. "Trafficking in Persons Report." https://www.state.gov/trafficking-in-persons-report/ and Alliance 8.7. n.d. Ending Forced Labour, Modern Slavery, Human Trafficking and Child Labour. https://www.alliance87.org/.

Off-Site Milling and Shop Workers. Impure gold at around 85–90 percent purity is generally taken from a mill to a centralized gold shop where the sponge-like gold doré[108] is further refined through smelting to remove residual mercury and other impurities. The work is largely performed by better educated men who are also able to work with the miner to buy and sell products. Efforts to improve fume hoods through the installation of mercury capture technologies are reducing ambient and indoor exposure of these workers to the mercury remaining in the gold.

5.2 OTHER SOCIAL CONSIDERATIONS

5.2.1 THE ROLE OF STAKEHOLDER ENGAGEMENT

Stakeholder engagement provides a systematic approach to Missions and Implementing Partners to acquire stakeholders' input, information, feedback, local and traditional knowledge, local perspectives, and concerns early on, during the design and planning phase (i.e., well before the assessment of the social impacts phase) , and throughout the entire project life cycle.[109] Stakeholders may be groups or individuals from the private or public sector, as well as individuals who may be considered an affected party along with those who may have interests in a project or the ability to influence its outcome, either positively or negatively. Members of civil

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[106] USAID. 2022. "DRC Countering Trafficking in Persons (C-TIP) Assessment." https://pdf.usaid.gov/pdf_docs/PA00ZK7W.pdf.

[107] USAID. 2014. "Assessment of Human Trafficking in Artisanal Mining Towns in Eastern Democratic Republic of Congo." https://pdf.usaid.gov/pdf_docs/PA00K5R1.pdf.

[108] A semi-pure alloy of gold and silver.

[109] USAID. 2022. "Community Engagement Guide." https://www.climatelinks.org/sites/default/files/asset/document/2022-04/5a.%201_Community%20Engagement%20Reference%20Guide_30Mar22_508.pdf.

society organizations may also be considered such as youth groups, church groups, or women's clubs. Special attention should be paid to marginalized and underrepresented groups and/or people in vulnerable situations because they may be inequitably affected by a project.

Stakeholder mapping, engagement, and consultation are key steps in the planning process of ASM projects and will also be crucial in identifying opportunities for the inclusion of marginalized and underrepresented groups and/or people in vulnerable situations [110]. Stakeholder engagement should be a broad, inclusive, and continuous process. The benefit of beginning the stakeholder engagement process early on and sustaining it throughout the entire project life cycle is that it may allow for the co-creation[111] of positive benefits, for example identifying mitigation measures regarding the social impacts based on traditional knowledge from local community members, through adaptive management. Information on best practices for stakeholder engagement is available in the USAID document entitled *Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process*.[112]

5.2.2 LOCAL COMMUNITY

When planning and designing ASM projects, the local community in which the project will be embedded should be assessed. This assessment may be addressed prior to assessing potential social impacts by means of undertaking a desktop review of the characteristics of the community, such as demographics; socioeconomic composition; and political, institutional, and legal frameworks, as well as through field visits and stakeholder engagement. Although the particulars of identifying social impacts for ASM projects depends on the site location, and local context, undertaking stakeholder engagement early on is necessary to improve the understanding of how the proposed project may affect the local community. If stakeholders in a local community voice concerns regarding potential negative social impacts due to a proposed project, the social impacts may be assessed, and mitigation and monitoring measures designed. Management measures should be commensurate with the degree of the identified adverse social impacts. In cases where social impacts from project activities are deemed to adversely affect the lands, rights, and livelihoods of individuals and communities, implementation of the project should be reconsidered (i.e., potentially ended). If/when the project is under implementation, the local community is adversely impacted, implementation of the project may need to be curtailed until adequate management measures have been designed and implemented to mitigate the identified impacts.

5.2.3 PARKS AND PROTECTED AREAS

Protected areas, in their many forms, are critical land and seascapes to conserve ecosystems and the variety of species that inhabit them. They can also be powerful forces for change. A community conservancy may secure land rights, improve local governance, and generate new livelihood opportunities. National parks that engage local communities can have a stabilizing

[110] USAID. 2016. "Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process." https://www.usaid.gov/sites/default/files/2022-05/Stakeholder_Engagement_052016.pdf.

[111] USAID defines co-creation as a process that "brings people together to collectively design solutions to specific development challenges. Time limited and participatory, partners, potential implementers, and end-users define a problem collaboratively, identify new and existing solutions, build consensus around action, and refine plans to move forward with program and projects." For additional information see https://www.usaid.gov/co-creation-usaid.

[112] USAID. 2016. "Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process." https://www.usaid.gov/sites/default/files/2022-05/Stakeholder_Engagement_052016.pdf.

influence on an area and can help attract private investment and create jobs. However, without safeguards for conservation activities and effective engagement with local communities, there is an increased risk that some surrounding communities can be marginalized or worse off following such development interventions. To ensure the best outcomes are achieved, USAID acknowledges the central role that strong safeguards combined with local engagement, ownership and meaningful participation play in ensuring conservation activities contribute to long term local and regional development.

To fulfill USAID's commitment to the communities with which it works, USAID applies four safeguards within its support for national parks and other protected areas:

1. Local communities are consulted regarding the activity and potential impacts, rising to free, prior and informed consent for impacted Indigenous Peoples consistent with the USAID Policy on Promoting the Rights of Indigenous Peoples.

2. Consider the impact of an activities park and protected area's support on affected communities, with a particular focus on land and resource claims.

3. In the context of the specific USAID activity and objectives, rangers and similar personnel are trained and monitored regarding safe and fair application of the law, including respect for human rights and avoiding intimidation or unnecessary use of force.

4. An implementer-led grievance and redress mechanism exists for reporting human rights abuse, misconduct and other grievances.

These safeguards are directed by Congress for Fiscal Year (FY) 2020 and later funds. Safeguard requirements are incorporated into new awards and are reflected in the environmental compliance process for both new and existing awards. USAID takes a project- and fact-specific approach that considers the potential impacts inherent to each activity, including the type of support provided and the experience of the communities involved.

The technical support documents for implementing these safeguards are available on the USAID Environmental Procedures Hub to help USAID staff and implementing partners apply these requirements and avoid or mitigate social risks associated with conservation activities for parks and protected areas.[113]

5.2.4 GENDER EQUALITY

Many social impacts are gender differentiated and can affect men and women in different ways. USAID seeks to support gender equality with the following goals: (1) improve the lives of people by advancing gender equality; (2) empower women and girls to participate fully in, and equally benefit from, the development of their societies on the same basis as men; and (3) secure equal economic, social, cultural, civil, and political rights regardless of gender. USAID policy requires that a Gender Analysis "be integrated in strategic planning, project design and approval, procurement processes, and measurement and evaluation" as part of ADS 205: Integrating

[113] USAID. n.d. "Safeguards for Activities Supporting Parks and Protected Areas." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/safeguards-for-activities-supporting-parks-and-protected-areas.

Gender Equality and Women's Empowerment in USAID's Program Cycle, which seeks to integrate gender and equality into the program cycle.[114]

Special attention must be paid to how ASM projects may affect women and girls. Gender Analysis[115] "is a systematic analytical process used to identify, understand, and describe gender differences and the relevance of gender roles and power dynamics in a specific context." Such analysis[116] typically involves examining the differential impact of development policies and programs on women and men and may include the collection of sex-disaggregated or gender-sensitive data. Gender Analysis examines the "different roles, rights, and opportunities of men and women and relations between them. It also identifies disparities, examines why such disparities exist, determines whether they are a potential impediment to achieving results, and looks at how they can be addressed."[117] Furthermore, there may be gender divisions in the decision-making process that may influence how the placement of the project may be proposed.

Disparate gender impacts on ASM projects may involve imbalances in stakeholder input, decision making, employment opportunities, and monetary compensation for project impacts. A Gender Analysis helps to identify gender disparities in the community early on. Because USAID projects require stakeholder engagement and consultation as part of the process of identifying, avoiding, and mitigating adverse social impacts, it is increasingly important to be aware of gender-based barriers to public participation. In these cases, stakeholder engagement and consultations may need to occur in a gender sensitive manner, for instance by having separate venues for men and women. To acquire input and feedback from women, a combination of methods may be undertaken (such as interviews and focus groups). For, instance semi-structured interviews or women-only focus groups may be conducted with women in a safe space such as an individuals' home or place of worship. Providing a space in which to obtain women's perspectives may shed light on a potential gender division in decision making and consultation, and in turn could impact siting and benefit sharing.

5.2.5 MIGRATION AND DEMOGRAPHIC SHIFTS

ASM typically occurs in remote, rural areas and may be a poverty-driven activity.[118] The most typical forms of ASM occur in stable communities and are year-round or seasonal in nature, varying with the agricultural cycles as an alternative livelihood. Other forms of ASM in stable communities may include traditional activities that are practiced in countries such as Bolivia, Colombia, Chile, Philippines, Indonesia, and Zimbabwe. Alternatively, rush mining, or ASM activities that result from gold or diamond rushes, or temporary ASM activities that begin during economic recessions, occur in unstable communities that may have significant fluctuations in

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[114] USAID. 2023. "ADS Chapter 205: Integrating Gender Equality and Women's Empowerment in USAID's Program Cycle." https://www.usaid.gov/about-us/agency-policy/series-200/205#:~:text=USAID%20has%20adopted%20several%20comprehensive,fully%20exercise%20their%20rights%2C%20determine.

[115] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.

[116] USAID. 2011. "Tips for Conducting a Gender Analysis at the Activity or Project Level." https://pdf.usaid.gov/pdf_docs/PDACX964.pdf.

[117] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.

[118] World Bank. 2020. *2020 State of the Artisanal and Small Scale Mining Sector.* Washington, D.C.: World Bank. https://delvedatabase.org/uploads/resources/Delve-2020-State-of-the-Sector-Report-0504.pdf. Please see the overview on page 68 of the linked document.

population and potential conflict or security concerns. Such fluctuations may be a result of domestic migration or migration from neighboring countries.

Various types of ASM operations may occur depending on market values and local conditions. Informal ASM activities often involve seasonal, permanent, shock-push, or rush workers as mentioned above. Due to the transient nature of some mines (e.g., ASM activities often have shorter life cycles than larger scale mining operations), this may cause ASM workers to be more mobile. Therefore, the lack of population data on mining settlements is a challenge for tracking populations in and out of ASM sites. However, the World Bank estimates that the total number of people entering the ASM sector will continue to grow as social and economic stressors increase, especially in regions that are already vulnerable to conflict[119]. As the number of miners increases, the risk of conflict among miners—whether between individuals, individuals and formalized ASM operations, or between ASM and LSM operations—increases. Alternatively, with many migrants having to separate from their homes or existing social networks for extended periods of time, there is a need to re-establish social networks in the destination locale, which may eventually result in new migrant-based social networks. Such networks may result from commonalities, such as homeland or region of origin, religious beliefs, tribal or ethnic linkages, language, and culture, and alleviate the loneliness and social isolation that may present from migrating to a new location.

Additionally, ASM will continue to provide a viable alternative livelihood as other sectors face challenges due to environmental or social stressors (e.g., climate change, lack of education, labor skills). For example, women are increasingly entering the ASM sector as an alternative to subsistence agriculture. However, governments face numerous challenges in designing policies that are effective in controlling informal labor sectors, such as ASM.

5.2.6 DEVELOPMENT CHALLENGES AND OPPORTUNITIES

As discussed in the prior sections, negative social impacts from the ASM sector may indeed hinder development. However, with adequate mitigation measures to address the potential negative social impacts, as well as engaging in a participatory planning process, which includes stakeholder engagement, ASM may become a vehicle to strengthen development opportunities. If well managed, the ASM sector can provide an accessible livelihood for populations who lack other viable livelihood strategies. However, differences exist in the organizational structure of mining entities, such as LSM, formalized ASM, and informal ASM; based on these differences, the level of economic contributions will vary, which may lead to development opportunities. For more information on the differences among LSM, formalized ASM, and informal ASM, please see footnote [120]. For example, should an informal ASM entity become formalized, it may start to generate some revenue in the local community through taxes and invest in economic and social

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[119] Hund, Kirsten, Carole Megevand, Edilene Pereira Gomes, Marta Miranda, and Erik Reed. 2013. "Deforestation Trends in the Congo Basin: Reconciling Economic Growth and Forest Protection - Working Paper 4: Mining." The World Bank. https://openknowledge.worldbank.org/server/api/core/bitstreams/25c8a82f-a91f-5ec3-a4b1-3d4065ba7f77/content.

[120] World Bank. 2009. "Mining Together - Large-Scale Mining Meets Artisanal Mining: A Guide for Action." https://documents1.worldbank.org/curated/en/148081468163163514/pdf/686190ESW0P1120ng0Together0HD0final.pdf.; International Institute for Sustainable Development (IISD). 2018. *Six Key Factors in Formalizing Artisanal and Small-Scale Mining.* https://www.iisd.org/articles/insight/six-key-factors-formalizing-artisanal-and-small-scale-mining.; USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches.* https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.; and Prescott, Graham W., Matthew Baird, Sara Geenen, Bossissi Nkuba, Jacob Phelps, and Edward L. Webb. 2022. "Formalizing artisanal and small-scale gold mining: A grand challenge of the Minamata Convention." *One Earth* 5 (3): 242-251. https://www.sciencedirect.com/science/article/pii/S2590332222000902.

development. LSM companies can provide benefits to the local host communities through contributions made by royalties and taxes that may improve the infrastructure, communications, networks, and basic services of a local community.[121] Miners use income from mining activities to pay for school fees for their children, food, medicines, and remittances for family members. These benefits are referred to as positive indirect economic impacts through the multiplier effect.[122]

5.3 CAUSE AND SIGNFICANCE OF SEVERAL SOCIAL IMPACTS

Table 6 provides a summary of the cause and significance of several social impacts to facilitate the identification of impacts of activities. This list is for illustrative purposes only and is not an exhaustive list. Table 8 presents other examples of Impacts, Best Practices, Mitigation Measures, and Indicators.

TABLE 6. CAUSE AND SIGNFICANCE OF SAMPLE OF SOCIAL IMPACTS

SOCIAL IMPACT	CAUSE	SIGNIFICANCE
Worst forms of Child Labor	• Poverty-stricken communities where children are forced to work, either in family-run operations or otherwise, versus attending school • A source of cheap (and exploitable) labor • Cultural traditions • Lack of legislation and enforcement • Lack of education on the risks or impacts	Worst forms of child labor puts minors in dangerous positions and causes a loss of educational opportunities, as well as depriving children of the opportunity to enjoy their childhood without the pressures associated with work, which may have lasting negative effects on the child. Children are also at greater risk for health impacts as well as potential sexual harassment or exploitation.
Gender Equality	• Disruption of traditional gender roles and cultural traditions • Inequitable compensation for labor based on gender • Impacts on pregnant or nursing women • Lack of education on the risks or impacts • Large concentrations of miners may increase Gender Based Violence (GBV) for women.	Gender roles may be negatively impacted in some geographical regions that depend upon ASM. For example, there may be an exploitation of women in mining operations because women may not receive equal compensation; however, they are more likely to spend their wages on family and household needs, whereas men may be more likely to spend wages on activities that

121 Columbia Center on Sustainable Investment, Sustainable Development Solutions Network, UNDP, and World Economic Forum. 2016. "Mapping Mining to the Sustainable Development Goals: An Atlas." https://www.undp.org/sites/g/files/zskgke326/files/publications/Mapping_Mining_SDGs_An_Atlas_Executive_Summary_FINAL.pdf.

122 The "multiplier effect" is the amount of increase in final income that results from an injection of spending. See: de Haan, Jordan, Kirsten Dales, and James McQuilken. 2020. "Mapping Artisanal and Small-Scale Mining to the Sustainable Development Goals." Pact. https://www.pactworld.org/library/mapping-artisanal-and-small-scale-mining-sustainable-development-goals. and Barreto, Maria Laura, Patrick Schein, Jennifer Hinton, and Felix Hruschka. 2018. "The Impact of Small-Scale Mining Operations on Economies and Livelihoods in Low- to Middle-Income Countries." East Africa Research Fund (EARF). http://www.responsiblemines.org/wp-content/uploads/2018/03/Pact__DFID_EARF_Overarching_Synthesis_Jan2018VF.pdf.

SOCIAL IMPACT	CAUSE	SIGNIFICANCE
		are associated with social issues, such as substance abuse, gambling, and prostitution. Women may also experience impacts when pregnant or nursing and may also be at greater risk for sexual harassment, exploitation, and GBV.
In-Migration and Demographic Shifts	• Underlying poverty trends • Stresses on alternative livelihoods or lands (e.g., agriculture, conflict, climate change) • Rush mining as a result of strikes and rushes on potential commodities (e.g., gold, diamonds)	An increase in in-migration of miners that are external to the local community may lead to conflict, security concerns, and social deterioration (e.g., prostitution, gambling, substance abuse), although demographic shifts can also provide an opportunity for economic gain for those families or individuals.
Land Tenure Conflicts	• Informal miners not having formal titles to land or rights to the subsurface resources on the mining site creating conflict around land stewardship, land tenure conflicts, financial arrangements between workers and titleholders, and workers' rights	Informal land tenure rights may cause tension and conflict between miners, both within ASM as well as between ASM and LSM concessions. A lack of clarity on access and rights to land complicates financial arrangements between titleholders and those leasing the land (or those on the land without legal rights to the land, or formal agreement). Clarification of land tenure can improve the legitimacy of artisanal efforts, increasing the likelihood of investment in and ultimate profits for the community. Clarification of land tenure can also be linked to continued use of the land, encouraging the rehabilitation of mined lands or conversion to alternative uses. Finally, clarification of land tenure rights moves miners away from the realm of "illegal" status, shielding them from criminal prosecution.
Social Issues (e.g., prostitution, gambling, substance abuse)	• Unstable mining communities due to strikes or rushes and large influxes of miners • Unequal compensation and distribution of income to favor men, who are more likely to use	A wide range of social issues (e.g., prostitution, gambling) can bring an increased risk of community health issues (e.g., sexually transmitted diseases), with far-reaching impacts on

SOCIAL IMPACT	CAUSE	SIGNIFICANCE
	the income for activities such as prostitution, gambling, and substance abuse, thus contributing to community health impacts	community development and the local economy. Informal work settings and transient lifestyles (e.g., seasonal or migratory) can lead to the spread of disease, as described for biological hazards in Table 5. A lack of community health workers can make mitigating disease spread more challenging.
Development Challenges and Opportunities	• ASM may be considered to be a permanent, seasonal, or temporary source of livelihood for marginalized and underrepresented groups and/or people in vulnerable situations in remote settings • ASM may affect development challenges and opportunities because it may impact economic opportunities. For instance, ASM activities may take place on a permanent or seasonal/temporary basis and the latter may affect a person's livelihood which may expose the person to economic hardship. Marginalized and underrepresented groups and/or people in vulnerable situations in remote settings may be particularly affected by this challenge.	ASM is a potential strategy for livelihood diversification, including economic production and stimulation (the creation of jobs); however, it can also impact other economic opportunities. Development opportunities also provide the potential for alignment with sustainable development goals and additional co-benefits with improved health, more sustainable environmental practices, and improved infrastructure.

6. CLIMATE CHANGE CONSIDERATIONS

As the climate continues to change due to rising GHG emissions, USAID has opportunities to reduce or avoid these emissions in ASM practices, as well as to consider measures to build resilience in ASM projects.

6.1 PROJECT DESIGN

When planning ASM projects, the project design process should include consideration of the potential near- and long-term changes to climate conditions and local weather patterns in the area of the ASM project and an evaluation of how those changes will likely impact the construction and operation of the project. Evolving and shifting climate change risks (e.g., the increased frequency of extreme weather events, changing rainfall and wind patterns, and other hazards) can result in unexpected and significant risks to mine site conditions, mining and construction equipment and mine-related infrastructure, mine workers, and the resources and supply chains connected to ASM operations. USAID's required process for Climate Risk Management (CRM) ensures that all relevant climate risks are considered and addressed for each ASM activity.[123]

When seeking to address climate change challenges, it is useful to take a broad perspective in considering options for reducing emissions and building resilience. These actions can be supplemented with measures to mobilize financing for climate-related investments; efforts to strengthen governance and enabling conditions, including policies, regulations, and relevant market signals; and engagement with Indigenous Peoples, local communities, and women, youth, and marginalized groups to foster buy-in and direct engagement in ASM operations.

Consistent with proven approaches for sustainable, effective development assistance, climate-focused activities should, where applicable, also seek to reflect the principles of locally led development, equity and inclusion, private sector engagement, nature-based solutions, innovation, and the use of evidence.[124]

6.2 REDUCING GREENHOUSE GAS EMISSIONS

The construction and operation of ASMs results in emissions of GHGs from operation of vehicles and construction and mining equipment (e.g., diesel /gasoline fuel combustion). The transportation of mined commodities for processing and ultimately the market by vehicles can further contribute to GHG emissions from ASM. Infrastructure built to support ASM activities can also result in GHG emissions, such as the building of roads. Additionally, as ASM communities often face underlying poverty, the lack of access to reliable and efficient energy sources (e.g., electricity, natural gas) for everyday needs (e.g., cooking, heating) often result in reliance on carbon-intensive sources of energy (e.g., wood, charcoal, gasoline, kerosene, diesel fuel), which also contribute to GHG emissions. As described previously, ASM is conducted via manual or semi-mechanized labor (e.g., mechanized mining equipment may be limited to use of water pumps and small-scale earthmoving equipment) and uses less fossil fuel in comparison with large-scale or industrialized extractive processes on a "per mine" basis. However, there are hundreds of thousands of workers involved in ASM in 80 countries, and the collective worldwide use of fossil fuels in ASM may not be negligible.

[123] See further information and resources on the USAID Climate Risk Management process at https://www.climatelinks.org/climate-risk-management.
[124] USAID policies on these topics can be found at https://www.usaid.gov/policy.

However, the more urgent and consequential contributions to climate change by the ASM sector are deforestation, land use change, and soil loss, associated loss of GHG sequestration in vegetation and soils from land degradation, and potential direct GHG emissions from open burning of forestland. These degraded ASM sites also lead indirectly to ongoing climate change impacts because even after mining is completed, land cover characteristics will continue to change. Laws and regulations of the country may require restoration of ASM lands, but restoration (reforestation/revegetation) is not guaranteed. This may result in the permanent removal of critical carbon sinks. For example, artisanal mines can degrade ecosystems with mercury, killing vegetation and leading to increases in emissions and loss of sinks resulting from reduced forest cover. In addition to removal of carbon sinks resulting from deforestation and land clearing, ASM activities can also negatively impact overall ecosystem resilience and thus the adaptive capacity of adjacent communities.

Artisanal coal mining, in addition to GHG emissions from fuel combustion and loss of carbon sinks, described above, also results in direct emissions of methane (CH_4) from the mine itself. Coal mine methane is emitted from (1) degasification systems, (2) ventilated air, (3) abandoned or closed mines, (4) surface mines, and (5) fugitive emissions.[125] Therefore, artisanal coal mining could result in ongoing GHG (methane) emissions from abandoned/closed mines long after mining activities cease. Other types of ASM activities may also result in ongoing GHG emissions after mining activities cease. For example, the decomposition of carbonate minerals from copper mining releases carbon dioxide.[126] GHG impacts of ASM including GHG emissions and loss of GHG sinks, are described in more detail in Table 9 in section 7: Best Practices Guidance and Mitigation Strategies.

[125] United States Environmental Protection Agency. 2024. *Sources of Coal Mine Methane.* https://www.epa.gov/cmop/sources-coal-mine-methane.

[126] Azadi, Mehdi, Stephen A. Northey, Saleem H. Ali, and Mansour Edraki. 2020. "Transparency on greenhouse gas emissions from mining to enable climate change mitigation." *Nature Geoscience* 13: 100-104. https://www.nature.com/articles/s41561-020-0531-3.

6.3 BUILDING RESILIENCE AND ADAPTING TO CLIMATE CHANGE

The Intergovernmental Panel on Climate Change (IPCC) has found that populations who are socially, economically, culturally, politically, institutionally, or otherwise marginalized have increased vulnerability to the impacts of climate change. Some impacts of climate change may materialize as sudden events (e.g., extreme storms or flooding), while others are longer term (e.g., drought's impact on food security). Climate impacts on activities and communities can be direct, such as mortality due to extreme heat, or indirect, such as changes in food production systems or water availability due to changing precipitation patterns.

In addition, it is important to understand the GHG emissions associated with ASM and how the populations who participate in ASM may best increase their adaptive capacity and resilience to the impacts of climate change in both the short and long terms. For example, ASM may present an opportunity for more sustainable development of rural and peri-urban communities, increasing socioeconomic status in a way that improves adaptive capacity and overall resilience to the impacts of climate change and other global environmental changes.

Many of the communities in which ASM occurs are already at increased risk for climate change impacts (United Nations Economic Commission for Africa [UNECA], 2017).[127] Specific physical changes from climate change will vary from region to region; therefore, development specialists and project managers supporting ASM projects should have a basic understanding of the specific climate impacts anticipated at their project locations, pulling from historical records and current trends to understand existing risks, and future models and projections to understand how

CRM OPPORTUNITIES TO BOOST RESILIENCE

Part of the CRM process includes considering "opportunities" to further adaptation goals through stakeholder engagement, leveraging recent policy changes, pursuing co-benefits, or furthering broader development outcomes. This is an important way to build lasting climate resilience/adaptation beyond the CRM process. Opportunities to consider in the ASM sector include the following:

- **Engage with communities** to share climate information, plan for emergencies, and champion climate-resilient economic growth. This could include support for early warning systems or the politicization of civil society to demand climate-resilient policies and regulations.
- **Explore options outside of ASM for climate-resilient development** with sustainable natural resource use to bolster local economies and livelihoods, such as beekeeping, soapmaking, or ecotourism.
- **Consider investments in ecosystem services** to improve local resilience through participatory and integrated resource management. Nature-based solutions (NBS) benefit both nature and human well-being by harnessing the protection of natural resources and ecosystems to build resilience to climate change and safeguard ecosystem services that are vital for sustainable economic development.
- **Collaborate proactively within and across industries** to share emerging concerns, solutions to climate risks, and regional adaptation strategies and synergies for climate resilience. Consider working groups, trainings, conferences, or digital knowledge sharing platforms.

Adapted from Nelson, Julia, and Ryan Schuchard. n.d. "Adapting to Climate Change: A Guide for the Mining Industry." Business for Social Responsibility. https://www.bsr.org/reports/BSR_Climate_Adaptation_Issue_Brief_Mining.pdf.

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[127] United Nations. Economic Commission for Africa. Special Initiatives Division. African Minerals Development Center. 2017. "ASM and Climate Change." Addis Ababa. https://repository.uneca.org/handle/10855/24426.

those risks may change. Broadly, from a risk management perspective, it is less costly to account for the potential direct and indirect impacts of climate change on mines and community members in project design than to continue "business as usual" and risk paying the full cost of damages or lost livelihoods in the future. Planning ahead reduces vulnerability, increases resilience, and facilitates adaptation to climate change by ecosystems and communities alike. While the transient and sometimes short-lived nature of some ASM activities may limit the incentive for proprietors to conduct longer term risk assessments, effective consideration and management of potential climate impacts, as required by USAID, should limit both current and future risks to mining operations and the community. In addition to planning ahead to ensure that mining sites are resilient to climate impacts, development specialists or project managers working with ASM communities should provide guidance on increasing the adaptive capacity of ecosystems surrounding ASM projects, ensuring the protection and sustainability of critical natural resources and the resilience of the people who are dependent upon such resources.

USAID requires the consideration and management of climate risks for all projects and activities as part of the CRM process. The sections and Table 10 below describe the climate risks associated with ASM activities, along with some potential risk management options. These options are explored in more detail in the Best Practices Guidance and Mitigation Strategies section. Refer to ADS Reference 201mal, Climate Risk Management for USAID Projects and Activities, for additional guidance.

Climate risk management measures could also inadvertently result in increased vulnerability to climate impacts for certain individuals or communities, particularly those who are already marginalized. This is sometimes called *maladaptation*. For example, a community that is displaced to accommodate water resource management infrastructure aimed at improving climate resilience could potentially suffer economically and lose cultural or knowledge-based connections with the land, ultimately leaving that community less resilient to climate stressors.

Equity should be a critical element of climate-resilient ASM activities because activities that lack resilience or address resilience without considering equity concerns can create or reinforce vulnerabilities for people. In addition to the example noted above, mining structures that are improperly strengthened against flooding may weaken or collapse during a flood event, exposing workers to safety risks. This could exacerbate existing inequality. Project planners should seek to both improve climate resilience and work with local communities and Indigenous Peoples to ensure that local knowledge and voices, including around potential climate risks and adaptation measures, are incorporated into design and implementation.

6.3.1 EXACERBATION OF ENVIRONMENTAL IMPACTS

Climate change is expected to exacerbate the environmental impacts described previously, both indirectly and directly, over the short, medium, and long terms. These impacts will also vary by region, each of which experiences climate change stressors, such as sea level rise, storm surge, or temperature or rainfall changes, differently:

- Landslides may occur because of improper mine construction; however, heavy rainfall can worsen landslides or make them more likely to occur.
- Topsoil loss due to improper erosion controls during ASM may be worsened by flooding, which may become more intense or frequent as a result of climate change.
- Heavy rainfall may fill mine pits and shafts with water, requiring draining to continue mining activities.

- Wastewater discharges from mine drainage could expedite erosion and its impacts and possibly cause the overflowing of waste pits into drinking and irrigation water supplies, thus increasing the weathering of mined rocks and releasing their heavy metals into soil and water at higher rates, in addition to discharging mine contaminants in the wastewater to surface water bodies.
- Heavy rain events can result in damage to or the destruction of tailings ponds and mine waste impoundments, which can threaten downstream communities. For more information, see footnote 128.
- As noted above, ASM is typically conducted via manual or semi-mechanized labor, requiring energy for underground pumps, crushing, milling, smelting, and refining. The energy sources used for these operations may be impacted by flooding, wildfires, or other climate-related risks, which could potentially lead to the use of less sustainable energy options.[129]
- In some regions, climate change may increase the severity and/or frequency of drought, which may constrain water availability in locations already adversely affected by ASM-related water contamination. If the area experiences extended drought conditions, there may not be enough water to wash and separate ores by traditional means. Additionally, the reduced flow of water will result in higher concentrations of contaminants that are washed from the ores, making it a greater environmental and health hazard.
- Longer term changes in temperature and rainfall can also impact environmental conditions and the provision of ecosystem services. For example, fires, storms, or periods of drought can exacerbate deforestation and the habitat loss that occurs as a result of ASM.
- Some ASM activities are in valleys that are subject to inversions, which may increase the frequency or severity of climate impacts. During an inversion, colder air is trapped underneath warmer air, and emissions within the valley become trapped with the colder air. This could cause emissions, such as diesel exhaust or emissions containing mercury from mining, to be trapped also, exacerbating their adverse impacts on human health and local biodiversity.
- Mine sites that were established under previous climate conditions may require additional rehabilitation measures to ensure that waste rock and tailings covers are sustainably managed. The costs and time required for rehabilitation and monitoring of effective mine closure may increase.

6.3.2 CLIMATE CHANGE AND RISKS FOR HUMAN HEALTH AND SAFETY

Climate change can amplify a number of the human health and safety-related impacts described in the section above, although the actual effects will vary by time scale and region:

- Increasing temperatures can worsen the physical heat exposure that miners may already feel while working in poorly ventilated mines.
- Excessive rainfall can exacerbate potential structural hazards in mines by weakening tunnel walls or filling pits with floodwaters.

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[128] For more information see UNEP's Guidance document on the management of artisanal and small-scale gold mining, available at https://minamataconvention.org/sites/default/files/documents/information_document/4_INF6_ASGM_Guidance.English.pdf

[129] For more information on climate change impacts on energy, please see the USAID Sector Environmental Guideline for Energy.

- Climate change may impact the distribution and frequency of disease vectors (e.g., mosquitos and other insects) and therefore vector-borne diseases, negatively impacting the health of ASM workers.
- Extreme weather events, such as storms, flooding, landslides, and wildfires, can threaten those working in ASM construction or operations, create structural hazards, and exacerbate hazards along transportation routes both for input materials and equipment brought to and from ASM locations, and for the delivery of minerals to processing facilities and to markets.
- Depending on the mine's location, emissions may become trapped near the surface (i.e., in the case of inversions), allowing pollutants to build up to an unhealthy level.
- A lack of water availability due to drought or extended heat waves may lead to insufficient dust suppression, with implications for respiratory health. Drought conditions can also worsen the impact of dust from road construction, mine excavation, or mine blasting.
- Over the long term, changing climate conditions may lead to water or food insecurity or famine, resulting in demographic shifts as individuals and families seek out alternative livelihoods or move to new regions entirely. This could affect both the demand for work in the ASM industry, as well as the availability of labor for ASM activities.

6.3.3 CLIMATE CHANGE AND SOCIOPOLITICAL IMPACTS

As in environmental and health-related impacts, climate change can have particular impacts on the sociopolitical systems of ASM communities. Many of these impacts on sociopolitical systems can be considered longer term and indirect. For example, changing climate conditions over time may cause migration shifts as climate refugees move from areas where their livelihoods or homes are threatened by extreme weather, sea level rise, flooding, and changing agricultural conditions. Land tenure conflicts, which can occur as a result of transient population movement (among other things), could arise from climate-related demographic shifts as well. In general, instability brought on by climate change can worsen underlying sociopolitical issues and vice versa.

A summary of the above risks and potential climate risk management options can be found below in Table 10 in the Best Practices Guidance and Mitigation Strategies section, and additional mitigation of these risks are discussed in more detail in the Best Practices Guidance and Mitigation Strategies section.

7. BEST PRACTICES GUIDANCE AND MITIGATION STRATEGIES

USAID-funded projects and related interventions or activities should always strive to maintain or improve environmental, health, or sociopolitical systems, minimizing negative or detrimental impacts. Projects should be designed to meet best practices and sustainability goals. As discussed previously, mitigation measures can be used to prevent the need for remediation and rehabilitation later by encouraging the implementation of best practices early in a project life cycle; however, best practices can be incorporated throughout a project, including during project design, IEEs, and during the development of EMMPs. Whatever the point in the project, such practices should be considered in view of economic viability and practicality or utility for the project manager and implementers. For example, to minimize GHG emissions, renewable fuels could be mandated for use in project vehicles. However, if renewable energy sources are not available at the project site, this option is not realistic. At a minimum, project design and ongoing program and project efforts should emphasize the improvement of existing conditions. This section will provide a summary of best practices, mitigation strategies, and indicators for measurement and monitoring.

7.1 UNDERSTANDING CONTEXT AND CONDITIONS FOR PROJECT DESIGN AND IMPLEMENTATION

As discussed in this SEG, there are a variety of potential environmental, health, and socioeconomic impacts of ASM. Preventing, mitigating, or otherwise addressing the environmental, health, and socioeconomic impacts of ASM requires broad understanding of the complexity of ASM and the micro- and macro-level forces. In particular, understanding the context and conditions within which ASM takes place is critical to effectively implement any measures to prevent or mitigate the negative and optimize the positive effects of these activities in the context of responsible development—both globally and locally. In view of the micro-level and macro-level contextual layers discussed previously, project implementers should conduct a baseline or community diagnostic assessment of existing conditions in order to identify the range of activities that could be associated with or impacted by ASM. Understanding these questions will help focus project design and maximize impact and sustainability.

Projects should be designed to consider environmental baseline criteria, such as the following:

- Local soils and their susceptibility to degradation and erosion;
- Water quality and availability (e.g., groundwater access for drinking or irrigation, depletion or contamination of aquifer resources);
- Topography, hydrology, and geology;
- Weather patterns (e.g., rainy season versus dry season);
- Status of biologically significant areas (e.g., protected areas, wetlands, waterways, fish nurseries, high endemism areas); and
- Air quality.

Other social considerations might include the following:

- The status of health, safety, and well-being, such as HIV/AIDS levels in the area, access to healthcare or sanitation infrastructure;
- Land tenure, including conflicts over ownership and the status of the land where ASM takes place (e.g., privately owned or on an LSM concession);
- Indigenous Peoples;
- Parks and Protected Areas; and

- Gender and youth considerations when assessing labor issues.

In addition to planning for these local considerations, participatory involvement of local communities is critical to the sustainability and overall success of the project. Traditional knowledge and practices can offer invaluable insight into local customs, environmental patterns, political systems, and economic systems.

There are other activities specific to various phases within a mine life cycle where project design elements can be considered, as shown in Figure 13.

FIGURE 13. THE ASM MINE LIFECYCLE AND POSSIBLE PROJECT INTERVENTIONS

Site Prospecting & Exploration	Mining	Processing	Site Closure	Legacy Issues
• Providing technical support • Conducting environmental and health impact assessments • Securing rights and access (e.g., licenses, titles)	• Implementation of mitigation measures • Education and capacity building on best practices	• Implementation of mitigation measures • Education and capacity building on best practices	• Providing technical support • Conducting environmental and health impact assessments • Minimizing abandonment of mines	• Providing technical support • Remediation planning • Identification of alternative use of land • Good governance and community involvement

7.2 IMPACTS, MITIGATION STRATEGIES, AND INDICATORS

The tables below serve as a quick reference to the various impacts and associated best practices, mitigation measures, and indicators that can be incorporated throughout various phases of the program life cycle. They should not be interpreted as the only resource to inform program designers of possible best practices in ASM impact mitigation, particularly given the dynamic nature of these sectors and the constant emergence of new strategic approaches and practices. The Best Practices columns in the tables below show *goals* that project managers should strive for in project implementation or interventions. Mitigation Strategies are specific steps or *approaches* that can be taken to reach the stated goal. Finally, the Indicators column lists metrics for measuring and monitoring progress toward best practices. Many of these mitigation strategies may require capacity building and technical assistance. Expertise should always be shared directly with the relevant stakeholders so that they can continue with more sustainable practices after the project ends.

While the tables below are organized by impact category, many best practices, mitigation measures, and indicators are common across impacts and will have cross-cutting relevance and co-benefits for multiple categories or sectors. These types of activities should be prioritized when possible. For example, minimizing the use of mercury will have co-benefits for the environment and human health. Minimizing erosion is good for the environment but also supports the sustainability of communities that also rely on subsistence agriculture.

7.2.1 ENVIRONMENTAL IMPACTS

Possible environmental impacts and best practices range across land, water, and air resources. See Table 7 for additional information.

TABLE 7. BEST PRACTICES, MITIGATION MEASURES, AND INDICATORS FOR ADDRESSING THE ENVIRONMENTAL IMPACTS

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
Land Degradation	Minimize soil loss and erosion.	• Avoid or minimize logging and land clearing practices. • Implement soil cover and conservation methods. • Enhance soil fertility and revegetate land to protect topsoil. • Protect riverbeds.	• Water quality testing showing improvement • Fewer acres cleared
	Prevent or minimize soil contamination.	• Prevent improper production waste disposal. • Provide and maintain adequate sanitation infrastructure. • Ensure proper mine closure and signage of land in view of legacy issues.	• New practices implemented • Soil testing showing improvement in soil fertility
	Prevent or minimize landslides.	• Avoid or minimize logging and land clearing practices. • Promote proper pit construction. • Provide technical support on pit construction or closure. • Fill closed mines, cover with topsoil, and replant vegetation to reduce landslide risk.	• New practices implemented • Increased use of alternative construction methods • Number of pieces of equipment distributed
	Avoid deforestation and major landscape changes.	• Avoid or minimize logging and land clearing practices.	• Fewer acres cleared • New practices implemented
Water Quality and Access	Prevent or minimize water contamination.	• Prevent improper production waste disposal. • Provide and maintain adequate sanitation infrastructure. • Prevent mined rock, gravel, and soil from accumulating in streams or rivers. • Ensure that the panning, sluicing, and washing of	• Number of pieces of equipment or supplies distributed

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
		ores take place downstream from where water consumption for food, irrigation, and livestock takes place. • Prevent cyanide and mercury cross-contamination.	
	Maintain or improve sustainable access to water.	• Increase water use efficiency/improve rainwater management. • Promote integrated watershed management.	• Gallons of water obtained through rainwater management or other more sustainable techniques
	Prevent stagnant water sources.	• Prevent the disruption of stream/river flow. • Promote integrated floodplain management. • Promote proper pit construction. • Provide technical support on pit construction or closure.	• Water quality testing showing improvement
Air Quality	Prevent or mitigate occupational exposure and/or ambient air pollution from chemical processing. Prevent or mitigate occupational exposure and/or ambient air pollution from dust.	• Promote cleaner production methods (e.g., retorts, gold shop mercury capture technologies). • Provide personal protective equipment (PPE). • Promote handwashing to miners. • Educate miners on environmental and health impacts and sustainable practices. • Provide technical training on alternative, cleaner, or more sustainable practices. • Provide technical training on the use of PPE.	• Trainings conducted • Quantity of PPE distributed • Informational materials distributed in communities or in schools • Chemical capture technologies distributed and installed (mercury capture and retorts) • New mine construction using new methods
	Minimize emissions from mechanized equipment or vehicles.	• Promote cleaner fuel use when possible. • Limit the distances traveled by vehicles.	• Alternative fuel sources identified and procured • Miles traveled

7.2.2 SOCIAL IMPACTS OF ASM

While some social impacts may be assessed individually, the best practices and mitigation measures often benefit from a holistic approach, and therefore are jointly presented in the table below. Table 8 is for illustrative purposes only and is not an exhaustive list of social impacts of ASM.

TABLE 8. BEST PRACTICES, MITIGATION MEASURES, AND INDICATORS FOR ADDRESSING THE SOCIAL IMPACTS OF ASM

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
Health, Well-being, Safety	Reduce exposure to vector-borne and/or communicable diseases.	• Set up a stakeholder engagement plan (SEP) early on in the project life cycle and sustain stakeholder engagement throughout the project. • Promote integrated pest management. • Reduce sources of stagnant water pools (to reduce vector-borne and other disease spread). • Promote safer sex options. • Educate miners and community members on communicable diseases and prevention measures. • Increase access to health care. • Build capacity for community health services and health education.	• Surveys on decreased rates of communicable and/or vector-borne diseases • Trainings conducted • Informational materials distributed in communities or in schools • Use of healthcare services
	Reduce exposure to social hazards.	• Provide health education on sexually transmitted infections and substance abuse.	• Informational materials distributed in communities or in schools
	Reduced exposure to chemical hazards.	• Promote alternative processing or production methods that reduce the use of hazardous chemicals and/or control and reduce the releases of contaminants. • Educate miners on environmental and health impacts and sustainable practices regarding exposure to chemicals. • Promote demonstration projects to introduce new hoods, retorts, and other	• Use of new methods in existing or new mine sites

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
		mercury capture technologies that reduce exposure to mercury and sodium cyanide.	
Health, well-being, and safety impacts associated with land degradation	Minimize soil loss and erosion.	• Educate miners on environmental impacts and sustainable practices.	• Trainings conducted with relevant stakeholders.
	Prevent or minimize soil contamination.	• Educate miners on health impacts (i.e., impacts to their personal health) and how best to protect themselves from health hazards. • Provide technical training on workplace hazards and occupational safety. • Educate miners on environmental impacts and sustainable best practices. • Provide technical training on alternative (cleaner, more sustainable) technologies	• Trainings conducted • Number of miners trained on sustainable practices
	Prevent or minimize landslides.	• Educate miners on proper pit construction and mine closure.	• Trainings conducted
	Avoid deforestation and major landscape changes.	• Provide trainings on the importance of forest cover.	• Trainings conducted
Health, well-being, and safety impacts associated with water quality and access	Prevent or minimize water contamination.	• Educate miners on environmental and health impacts and sustainable practices. • Provide technical training on alternative, cleaner, or more sustainable practices.	• Trainings conducted
	Maintain or improve sustainable access to water.	• Educate miners on environmental and health impacts and sustainable practices. • Provide technical training on sustainable practices.	• Trainings conducted
	Prevent stagnant water sources.	• Educate miners on environmental and health impacts, and proper pit	• Trainings conducted

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
		construction and mine closure practices.	
Health, well-being, and safety impacts associated with air quality	Prevent or mitigate occupational exposure and/or ambient air pollution from chemical processing.	• Provide personal protective equipment (PPE). • Promote handwashing to miners. • Educate miners on environmental and health impacts and sustainable practices. • Provide technical training on alternative, cleaner, or more sustainable practices. • Provide technical training on the use of PPE.	• Trainings conducted • Quantity of PPE distributed • Informational materials distributed in communities or in schools
	Prevent or mitigate occupational exposure and/or ambient air pollution from dust.	• Provide and maintain adequate infrastructure (e.g., roads). • Promote proper pit construction. • Promote cleaner or safer excavation practices. • Provide PPE. • Ventilate mine shafts and tunnels when possible. • Educate miners and community members. • Provide technical training on the use of PPE.	• Trainings conducted
Impacts on marginalized and underrepresented groups and/or people in vulnerable situations such as children, older people, and religious minorities	Uphold protections for marginalized and underrepresented groups and/or people in vulnerable situations.	• Set up a stakeholder engagement plan (SEP) early in the project life cycle and sustain it throughout the project. • Prevent and monitor labor violations. • Enforce labor protection. • Strengthen labor protection legislation. • Promote equal compensation. • Acknowledge a balance of mining and household activities.	• Surveys on decreased rates of child labor violations • Coordination with mining associations[131] • Documentation of compensation • Coordination with community centers or schools • Systematic monitoring and evaluation efforts showing

[131] For more information please see:
AngloGoldAshanti. 2023. "Sustainability Report 2023: Addressing ASM." https://www.anglogoldashanti.com/sustainability/social/addressing-artisanal-and-small-scale-mining/ and
Alliance for Responsible Mining. 2023. "Alliance for Responsible Mining 2023 Annual Report." https://www.responsiblemines.org/wp-content/uploads/2024/07/ARM-Annual-Report-2023-ENG.pdf.

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
		• Add counter-trafficking measures.[130] • Improve the technical knowledge of public defenders. • Prevent and monitor labor violations against children. • Enforce labor protection for children. • Educate community members regarding the impacts on high-risk subgroups.	documented improvements
	Protect and improve the rights of women and girls.	• Undertake a gender analysis and follow the guidance per the Gender Equality and Women's Empowerment Policy.[132] • Promote equal compensation for women. • Educate community members on specific risks to pregnant women and nursing mothers. • Prevent, monitor, and enforce measures against sexual harassment, sexual exploitation, and Gender Based Violence (GBV).	• Trainings conducted for ASM miners and members of the mining community • Documentation of compensation • Systematic monitoring and evaluation efforts showing documented improvements. For instance: identifying and reporting on the number and distribution of incidents; keeping records on the number and distribution of incidents that are actually formally reported; keeping a log of the performance of initiatives to reduce the number of incidents; reporting on the percentage of total incidents
Land Tenure	Protect and improve legitimate rights to land and resources.	• Work through local mechanisms, such as community centers,	• Lowered counts of violence

[130] For examples please see: USAID. 2014. "Assessment of Human Trafficking in Artisanal Mining Towns in Eastern Democratic Republic of the Congo." https://pdf.usaid.gov/pdf_docs/PA00K5R1.pdf
and U.S. Department of State. 2024. "2024 Trafficking in Persons Report: Democratic Republic of the Congo." https://www.state.gov/reports/2024-trafficking-in-persons-report/democratic-republic-of-the-congo/.
[132] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." *USAID.* https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
	Engage with national governments to promote adoption of laws and regulations that formalize ASM and bring ASM under a formal legal and regulatory regime.	mining associations, or the local government. • Increase access to financing so that miners can invest in formalizing the ASM sector. • Record and digitize mining claims. • Facilitate village-level land use planning and demarcation between mining areas and other uses. • Record the acknowledgment of the rights of artisanal and small-scale miners and local landholders and promote the right to common pool resources.[133] • Undertake stakeholder engagement and set up a stakeholder engagement plan. • Avoid the displacement of agricultural production; however, if it cannot be avoided, mitigate it through compensation. • Set up a Grievance Redress Mechanism (GRM) for project affected people.	associated with land conflict • Secured public records, such as mineral concessions, contracts, titles, and production figures • Number of miners entering the formal ASM sector • Clarified boundaries to address minerals conflicts • Secured resource rights and a basis for compensation and restitution
Impacts on women in the ASM sector or in the local community where ASM is taking place	Protect and improve the rights of women in the ASM sector.	• Undertake ongoing stakeholder engagement by setting up a stakeholder engagement plan (SEP) in a manner that captures women's perspectives, concerns, and views of the project. • Undertake a gender analysis and follow USAID guidance on Gender Equality and Female Empowerment Policy.[134]	• Numbers of project-affected women consulted during stakeholder consultations • Lowered incidence of Gender Based Violence (GBV) • Numbers of women being inserted into the labor force in an equitable manner with equal payment and compensation

[133] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches.* https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.
[113] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." *USAID.* https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.

IMPACTS	BEST PRACTICES	MITIGATION STRATEGIES	INDICATORS
			per findings from the gender analysis

7.3 CROSS-CUTTING MITIGATION MEASURES

In addition to the impact-specific best practices and mitigation measures provided above, several mitigation strategies and best practices for sustainable interventions and ASM activities are cross-cutting and are not specific to any one impact area. Good project management involves reducing or avoiding GHG emissions and building resilience and adaptation to climate impacts, which should be considered in cross-cutting mitigation best practices as well.

The formalization of mining and proactive stakeholder engagement can set the foundation for improved conditions and more sustainable mining practices. Formalization of miners and mining associations is an activity in which USAID has been involved, and it can ultimately result in more sustainable practices with greater oversight. Informality and illegality often result in poorly regulated activities, with few technical or financial resources available to miners. Where organized mining associations exist, training can more easily be offered in a coordinated manner. Occupational health and safety training (e.g., in the use of PPE, safety measures, construction best practices for improving trenching) and more sustainable ASM extraction or mine development practices may help mitigate both short-term and long-term health hazards.

It is important to note that financial barriers may be a challenge if the adoption of new technologies, equipment, or other supplies is needed. For example, proper mercury (or other chemical) storage can minimize exposure; however, specific equipment is necessary. Additionally, supplying miners or mining organizations with equipment may not be sustainable over the long term due to the scarcity of parts and/or skilled maintenance labor. For example, if equipment breaks down, will miners be able to fix it or purchase replacements? Providing or supporting access to micro-finance loans or other financial resources may allow miners to purchase different or more sustainable equipment. The formalization of miners or mining associations will also allow miners access to these resources. If miners have land tenure and mineral rights, they can access credit to invest in improved technology. However, it is easier for mining associations and formalized groups to obtain land tenure and mineral rights than it is for individuals.

Proactive and coordinated engagement with stakeholders at multiple levels connects the relevant ministries at a national or regional level with activity at the local level through nonprofit organizations, community centers, or municipal government. A coordinated approach is important to ensure that hazard mitigation is consistently and widely implemented. Capacity building in conflict resolution, which requires proactive and broad sustainable engagement, can assist local communities in establishing positive and productive relationships.

Local processing sites, such as gold shops, can serve as a main entry point for the community. Because one gold shop communicates with many miners, gold shop owners have been used as community opinion leaders by the World Bank, the United Nations Industrial Development Organization (UNIDO), and the U.S. Environmental Protection Agency (USEPA). Gold shops serve as critical locations for establishing relationships and lines of communication with the supply chain and the mining communities. Gold shops are also natural sites for demonstration projects to introduce new hoods, retorts, and other mercury capture technologies that reduce exposure to mercury and sodium cyanide. They are also sites through which to deliver health screenings and health education on issues such as mother/child occupational risks, better environmental practices, and formalization/legalization approaches.

Cleaner production methods, practices, and equipment can help mitigate longer term environmental and health hazards and can be shared with mining cooperatives to mitigate potential impacts. Retorts are simple devices that, when used correctly, capture most of the mercury for recycling before it enters the air. Mercury control technologies and retorts can be used to recover mercury and limit its release; however, these still need to be used away from living areas and with good ventilation. There are other alternative methods to concentrate gold, such as centrifugation or cyanide leaching in the ore milling process without prior mercury treatment. See Annex 2 for more details on cleaner production methods.

Building the capacity to utilize cleaner production methods and providing training can help sustainably minimize and ultimately avoid the use of mercury, cyanide, and other chemicals. Plans can be developed with miners to process and resell waste rock for construction and create permanent sedimentation ponds to improve water quality. Practices such as backfilling pits and underground workings or stockpiling topsoil for future placement on cleared areas or waste dumps are simple measures that mitigate environmental impacts.

Providing training on and facilities for the proper use of chemicals can reduce water or soil contamination, reducing chemical exposure. Chemical contamination of water can result from improper chemical storage, dumping, or the weathering of mined materials. Chemicals and chemical wastes should be stored away from bodies of water, and care should be taken that a heavy rain event will not cause the chemicals to leak into a waterway. It is not good practice to dispose of chemicals in surface water. Mined materials, when exposed to air and water, can weather and produce acidic streams with high heavy metals content that may harm aquatic life and degrade water quality. Mined materials should be stored where they have minimal contact with water flows. Mercury used in gold mining can also settle in waterways near mining sites. Where possible, mercury should be replaced by other technologies because it is not a recommended process for ASGM. However, if it is used, the burning off of the mercury from the amalgam should be done in a well-ventilated area that is away from living spaces and water sources. Avoiding destructive practices or methods will not only improve environmental conditions in the surrounding areas but also lower exposure risks and improve the health of miners, their family members, and the local community.

MERCURY

Mercury-dependent artisanal gold mining is the largest source of mercury pollution globally and accounts for 38 percent of total anthropogenic emissions of mercury (UNEP, 2018; Esdaile & Chalker, 2018). According to the National Institutes of Health, between 10 and 19 million people, including children, use mercury to mine for gold in more than 70 countries, resulting in significant health impacts (Esdail & Chalker, 2018). Mercury contamination stemming from widespread mercury use in ASGM has raised serious concerns over human and environmental health in the Amazon Basin and the gold producing countries of West Africa. Methyl mercury, the more biohazardous form of mercury, bioaccumulates in the food chain and has been documented at high levels in people and wildlife near mines, in indigenous people far from active mining areas in the Amazon Basin, and in fish and wildlife as far away as the Artic, where breeding bird populations may be declining due to elevated mercury deposition. In addition to global transport of mercury, contamination can impact large areas downwind and downstream from mines and processing centers. Even small periods of exposure can cause negative health effects in children; mercury's impacts are particularly severe for the developing fetus in women who are exposed while pregnant.

USAID's Sector Environmental Guidelines on Mining emphasize prevention of mercury use rather than remediation. Environmental remediation is expensive – in some cases not financially feasible – and less effective overall, and environmental remediation does not entirely mitigate the inherent human health risks of ASM miners using mercury. For example, instead of focusing on removing mercury from the surrounding environment, activity managers should emphasize methods that avoid mercury in the first place, which is often reflected in the country's ASGM NAP. Although mercury capture devices are an effective interim solution for reducing mercury emissions, mercury-alternative technologies are available and should be adopted for ASGM [135] For example, the Government of Ghana, the largest gold producer in Africa. Initiated a program in 2024 to formalize ASGM into Ghana legal, regulatory, and financial frameworks and phase out the use of mercury in ASGM. [136, 137] The Alliance for Responsible Mining reported on a pilot project conducted In Guyana for mercury-free equipment testing. [138]

Since ASGM often occurs outside of the formal economy, regulating mercury use is challenging. USAID programs have supported efforts to improve research and monitoring of mercury contamination, reduce mercury use in mining, formalize the ASM sector, enforce national laws, introduce mercury-free technologies, address environmental degradation, and combat the criminality of ASM.[139]

ADDRESSING MERCURY USAGE AND CONTAMINATION

Practitioners should note that criminalizing or otherwise governing and regulating mercury use has important implications for miners; promoting alternative technologies or other efforts to mitigate mercury contamination is complex. With the expansion of amalgamation, a common gold recovery mechanism using mercury, due to its simplistic and inexpensive nature, anthropogenic mercury emissions have increased significantly. To scale the abundant use of mercury in artisanal gold mining (ASM), about 1.5-2 grams of mercury is used to extract one gram of gold (Mantey et al. 2020). It is estimated that 650-1000 tons of mercury are released annually with the majority released into water systems and the rest into the atmosphere (Mantey et. al. 2020). In Ghana, AGM contributes a significant portion to the GDP and employs many people directly and indirectly. There has been a surge in illegal AGM, exacerbating the amount of mercury released. Many miners are aware of the health risks associated with mercury contamination but do not tie it to gold mining or the health problems affecting their community.

Ultimately, sustainable promotion of safer and healthier mining practices, such as alternative methods, are not viable if the target population is uninformed about their usage and benefit. Practitioners and government officials should first seek to understand the knowledge base and needs of miners and community members, both male and female, before broadly applying new regulations or dictating the use of new technologies. Although, Ghana ratified the Minamata Convention on Mercury in 2017, the prominence of illegal AGM has made it difficult to make substantial progress in reducing mercury emissions. A 2018 United Nations Development Programme assessment suggested the government

[135] UN Environment Program. 2018. UNEP Global Mercury Partnership Guidance: Illustrated Guide to Mercury Free Artisanal and Small Scale Gold Mining. https://indd.adobe.com/view/a9b3c39e-e7b7-412a-9d12-5cf47f484e56.
[136] Yada, Cecilia Lagba. 2024. "Use of mercury in ASGM gold processing to be phased-out – EPA." *Ghanian Times.* https://ghanaiantimes.com.gh/use-of-mercury-in-asgm-gold-processing-to-be-phased-out-epa/#google_vignette
[137] UNDP 2023. Ghana kick-starts a project to advance formalization and mercury-free gold production. United Nations Development Program, February 15, 2023. https://www.undp.org/ghana/news/ghana-kick-starts-project-advance-formalization-and-mercury-free-gold-production
[138] Alliance for Responsible Mining, 2024. 2023 Annual Report. Alliance for Responsible Mining, https://www.responsiblemines.org/wp-content/uploads/2024/07/ARM-Annual-Report-2023-ENG.pdf
[139] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches*. https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.

should “develop a legal framework that incorporates the obligations under the Minamata Convention” to effectively reduce mercury emissions from AGM.[140]

Conceptualizing community adoption of mitigation measures involves working directly with community leaders, health workers, and specifically marginalized and underrepresented groups and/or people in vulnerable situations. In many ASM communities, this means working directly with women and children. Children are especially vulnerable and should be protected by changes in both policy and practices. Project managers should design and deliver education and outreach programs that aim to reduce child labor in ASM through broader development strategies. There should be a focus on educational opportunities for children, ensuring that children are afforded equal opportunity to participate. Project managers can help with education on and compliance with international standards on labor regulations. When ASM activities are formalized, enforcement agencies should monitor and penalize mines found to benefit from child labor practices that endanger or otherwise negatively impact children. Additional community capacity building on issues such as human rights and conflict resolution can benefit ASM communities as well.[141]

The role that women play in ASM should remain a key consideration for project planning and should be considered separately from other labor issues, such as child labor. Projects should be designed to empower women, increase participation at all levels of ASM, and facilitate equal benefits for women for their work and recognition of the roles and contributions they play in development. Education and outreach on specific risks to pregnant and nursing mothers could help increase awareness of specific risks that should be avoided (e.g., chemical exposure) and capacity building in the healthcare sector should include a focus on monitoring and prevention of maternal and child health risks specific to local ASM techniques.[142]

Linking to local policy or planning strategies at multiple levels is critical to ensure coordination with ongoing activity. At the national level, NAPs for mercury/waste management exist in many countries and already outline actions or best practices based on local context. Ministries of environment, health, agriculture, or mineral resources may have legislation, working groups, or other measures in place. Thinking more broadly, national policy measures focusing on poverty eradication will help communities in countries that practice ASM. At the international level, frameworks such as the Kimberly Process may also provide important linkages for addressing ASM impacts. Finally, USAID requirements should also be incorporated into project or program design. Within this multi-level context, development specialists and project managers should ultimately seek to understand and advocate for the potential of ASM to stimulate and serve as a basis for sustainable and/or economic development, with environmentally responsible processing techniques.

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[140] United Nations Development Programme (UNDP). 2018. "Minaminta Convention on Mercury Initial Assessment Report for Ghana." https://www.undp.org/sites/g/files/zskgke326/files/migration/gh/UNDP_GH_SDC_MIA_REPORT_2018-1_0.pdf.
[141] UNDP. 2021. *Ghana’s Initial Assessment Report on Mercury Launched.* https://www.undp.org/ghana/press-releases/ghana%E2%80%99s-initial-assessment-report-mercury-launched.
[142] USAID. 2020. *Issue Brief: Artisanal & Small-Scale Mining: USAID Activities & Approaches.* https://www.land-links.org/wp-content/uploads/2020/01/USAID-ASM-Issue-Brief-Jan-2020.pdf.

7.4 PLANNING TOOLS FOR IMPROVING ASM AND MITIGATING IMPACTS

There are several specific planning tools that can improve ASM operations and/or mitigate the impacts of ASM-related contamination or environmental damage. These tools include the following:

- Data and mapping (e.g., geographical information system, satellite data) obtained through participatory mapping can be used by project planners (and taught to local practitioners or individuals) to understand the spatiality of ASM activity. Publicly documented validation of georeferenced mining sites could also be obtained to add records of mining claims. Databases or other registries can play an essential role in establishing and strengthening the chain of custody for mining operations. The ubiquitous nature of cell phones—most miners are likely to have one—could allow for publicly sourced global positioning system data to be obtained. Participatory mapping involves working with local organizations in mining, environmental conservation, and related activities to understand the drivers of forest degradation, illegal mining activities, or other locally relevant issues.

- Mobile applications on cell phones can be used to share information and connect miners or community members with other networks. For example, information about rain forecasts could be shared to help miners prepare for and prevent flooding within mine structures. Information on commodity prices could help miners ensure that they receive fair prices from local buyers as well.

- Community-based programming for mitigation/management; organizing mining cooperatives; and working through local health workers, community leaders, or other culturally or religiously significant individuals or groups can give credence to development or intervention activities. Project managers can work alongside community groups to understand community characteristics, including transient and nomadic lifestyles (including of miners), as well as the marginalized and underrepresented groups and/or people in vulnerable situations, or exhibit other demographic trends. Mining cooperatives similarly provide an effective way to reach miners and their families.

- Social programming and community-based communication campaigns on risk and exposure can be leveraged to incorporate ASM-related environmental and health risks. There may be ongoing activities, such as health-related campaigns, that project managers can expand on to ensure that mining communities also receive relevant messages.

- Monitoring and surveillance for evidence-based health data are needed to provide a better picture of health impacts, both for baseline determination and for impacts resulting from ASM or project activity. Health impact assessments are required for USAID-funded projects and are critical for understanding baseline environmental or health conditions in project communities.

- A thorough environmental and social impact assessment and/or strategic environmental assessment (SEA) that considers the mining site, operation size, nature of the activities, and related activities and how they may impact nearby land, water, and biodiversity resources, as well as local communities, will help USAID and implementers understand environmental and social conditions and meet USAID requirements. An SEA may go beyond an EIA to address multiple EIA deficiencies and integrate multiple development interests. Any assessment should consider how close the site is to the local community, communal land, and water resources; how the land will be used after mining; and whether an alternative site or no mining would be a better course of action. Additionally, if possible/applicable, plans should be made before mine construction regarding the mine area, where topsoil and mined rocks will be stored, how much land area needs to be cleared, and how erosion controls will be implemented. This assessment should also consider water resources, water quality, and air quality effects. Pre-intervention identification of particularly sensitive areas (e.g., protected areas, endemic species habitats, fish nurseries), use of buffer zones, and other efforts to maintain or restore natural waterway flows can also help mitigate impacts on biodiversity and ecosystems services.

7.5 REDUCING GHG EMISSIONS FROM ASM ACTIVITIES

As discussed in the Climate Change Considerations section above on Reducing Greenhouse Gas Emissions, mining activities have the potential to generate GHG emissions that contribute to climate change. Table 9 summarizes potential GHG emissions, emissions mitigation measures, and estimation options for ASM activities:

- Minimize deforestation and land clearing practices in ASM siting that contribute to the loss of carbon sinks.
- Ensure that any machinery or vehicles utilized in ASM processes are maintained and optimized for fuel efficiency to reduce GHG emissions.
- Increase access to alternative energy sources to provide electricity, heating, and lighting power both within mines and across the community (e.g., maximizing the opportunity for solar or hydro power) to reduce reliance on carbon-heavy energy sources.
- Minimize transport requirements through the placement of processing facilities in close proximity to mine sites to reduce GHG emissions from vehicular or other fossil fuel-based transportation methods (consider the full market value chain from the Overview of the ASM Sector section).
- Minimize the use of mining practices that alter ecosystems (e.g., river morphology that could increase flood risk).
- Educate miners and community members on climate change, impacts, and potential mitigation and adaptation actions they can take to reduce contributions to and impacts from climate change.

TABLE 9: POTENTIAL SOURCES OF GHG EMISSIONS, EMISSIONS MITIGATION MEASURES, AND ESTIMATION OPTIONS FOR ASM ACTIVITIES

POTENTIAL GHG EMISSIONS	EMISSIONS MITIGATION OPTIONS	ESTIMATION TOOLS
MINING PROCESSES		
• Emissions from equipment used for underground pumps, crushing, milling, smelting, and refining • Emissions from the combustion of fossil fuels to transport equipment and	• Opportunities to reduce emissions by reducing transport distance and by using hybrid-electric and electric vehicles for the transportation of equipment and mined ore, although not	• Use the GHG Protocol's GHG Emissions Calculation Tool to estimate emissions from fuel combustion or electricity use, and the use of vehicles and other equipment (see

mined ore to and from the mining site, including to processing facilities and consumers of derivative products • Emissions from the decomposition of carbonate minerals from copper mining • Indirect emissions from fossil fuel-based electricity used in the extraction process and in mine facilities (buildings and other infrastructure)	always possible or appropriate, depending on the grid composition.	https://ghgprotocol.org/calculation-tools-and-guidance). • Use the USAID's Clean Energy Emission Reduction (CLEER) Tool to estimate emissions that would be avoided as a result of renewable energy use (see https://www.cleertool.org/).
LAND USE CHANGE, DEFORESTATION, AND SOIL LOSS		
• Emissions from the removal of forest, soil, or other high-carbon content natural systems as a result of ASM activities	• Opportunities to reduce emissions by minimizing the disruption of natural systems during site preparation and installation. • Opportunities to identify and reduce emissions by developing transparent, integrated approaches for assessing and reporting the impact of ASM on land use change and deforestation. • Opportunities to reduce emissions and increase carbon sinks through reforestation and afforestation efforts.	• Use the USAID's Agriculture, Forestry and Other Land Use (AFOLU) Carbon Calculator can to estimate CO_2 emissions (or sequestration) that would result from land use changes (see https://afolucarbon.org/).

7.6 MINIMIZING CLIMATE RISKS TO ASM ACTIVITIES

As discussed in the above section on Building Resilience and Adapting to Climate Change, climate change can impact ASM in many ways, such as by damaging infrastructure, disturbing the construction and production process, and creating indirect impacts related to migration and increased likelihood of social conflict. Table 10 identifies risk mitigation measures and monitoring indicators that can be integrated into project and activity design and monitoring and evaluation to ensure that ASM activities are resilient to the impacts of climate change.

TABLE 10. MITIGATING CLIMATE RISKS TO ASM

CLIMATE RISKS	RISK MITIGATION OPTIONS	INDICATORS
CLIMATE STRESSOR: IN GENERAL		
• Overall risks to ASM workers as well as to communities at large resulting from increased risk and cumulative climate impacts including severe storms, extreme events, extreme heat, droughts, and sea level rise.	• Adopt climate adaptation measures to protect miners and community members (e.g., water or cooling stations, personal protective equipment for dust or emissions exposure, mosquito netting).	• Document creation of and support for sustainable alternative livelihoods. • Document annual labor statistics on workers in the agriculture and ASM sectors and assess whether a shift in livelihoods is occurring.

CLIMATE RISKS	RISK MITIGATION OPTIONS	INDICATORS
	• Promote sustainable alternative livelihoods and climate smart agriculture to diversify economic opportunities, improve food security, and reduce reliance on the ASM sector.	
CLIMATE STRESSOR: INCREASING INCIDENCE AND/OR SEVERITY OF STORMS (INTENSE RAINFALL AND HIGH WIND EVENTS)		
• Damage to mine, transportation, and energy equipment and infrastructure, disrupting mine construction and operation. • Damage to transportation routes, disrupting the delivery of input materials, labor access, and transport to processing facilities and markets, as well as interfering with production and distribution. • Flash flooding of mine sites, resulting in the disruption of mining activities, risks to the health and safety of mine workers, and/or destabilization of mine walls and shafts. • High dust events as a result of highly arid and/or windy conditions, resulting in the disruption of mining operations and the need for increased water to control dust on site.	• In site selection, consider the likelihood of climate risk impacts on the specific location in question, with the consideration of both current and future climate change projections. • Take steps to ensure that engineering design and construction standards are significantly robust to withstand increasingly variable weather and extreme events (e.g., ensuring stable mine walls and water pump availability). • Provide education and capacity building for emergency preparedness and response. • Identify alternative routes for the delivery of inputs and transport to market. • Use early warning systems for storm events to allow proactive preparation.	• Indicate the consideration of severe storms in siting selection, materials selection, and design/construction. • Document the availability of planned alternative routes to minimize disruptions from storms. • Document increased capacity in emergency preparedness and response. • Identify and document available early warning systems and their use. • Document that emergency plans are available and posted.
CLIMATE STRESSOR: INCREASING INCIDENCE AND/OR SEVERITY OF EXTREME EVENTS (E.G., FLOODING, LANDSLIDES, WILDFIRES)		
• Damage to mine, transportation, and energy infrastructure, disrupting mine construction and operation. • Damage to transportation routes, disrupting the delivery of input materials, labor access, and transport to processing facilities and markets, as well as interfering with production and distribution. • Flash flooding of mine sites, resulting in the disruption of mining activities, risks to the health and safety of mine	• In site selection, consider the likelihood of climate risk impacts on the specific location in question, with the consideration of both current and future climate change projections. • Take steps to ensure that engineering design and construction standards are sufficiently robust to withstand increasingly variable weather and extreme events (e.g., ensuring stable mine walls and water pump availability).	• Indicate the consideration of extreme events in siting selection, materials selection, and design/construction. • Document increased capacity in emergency preparedness and response. • Document the availability of planned alternative routes to minimize disruptions from extreme events. • Document the use of alternative energy sources. • Identify and document available early warning systems and their use.

CLIMATE RISKS	RISK MITIGATION OPTIONS	INDICATORS
workers, and/or destabilization of mine walls and shafts. • Flooding may require additional controls to enhance water treatment capacity. • Flooding may compromise sound management of tailings and/or result in the contamination of soil/water in surrounding areas, which, in turn, may result in negative impacts on community health and safety. • Increased rockfall in glaciated regions due to glacial melt could damage mine sites and block or damage access routes.	• Provide education and capacity building for emergency preparedness and response. • Invest in renewable energy and alternative fuels to ensure a reliable and consistent energy supply in the face of variable weather and extreme events. • Identify alternative routes for the delivery of inputs and transport to market. • Use early warning systems for extreme weather events to allow proactive preparation.	• Document that emergency plans are available and posted.
CLIMATE STRESSOR: INCREASING AIR TEMPERATURES AND INCIDENCE AND/OR SEVERITY OF EXTREME HEAT		
• Hotter working conditions could result in impacts on worker/community health (e.g., heat stress, vector-borne disease). • May cause shifts in the seasonality of mining. • Temperature fluctuations may increase energy demands and strain energy systems, potentially adding costs. • Added difficulties decommissioning and rehabilitating mining sites (e.g., establishing vegetative cover). • Reduced agricultural yields resulting in increased migration toward ASM areas and livelihoods.	• In site selection, consider the likelihood of climate risk impacts on the specific location in question, with the consideration of both current and future climate change projections. • Adoption of adaptation options to protect miners and community members (e.g., water, cooling stations). • Provide education and capacity building for high heat events and emergency preparedness and response. • Promote integrated watershed management and rainfall capture/water efficiency practices to build resilience to decreased water availability and/or drought. Ensure that there are redundant water storage facilities • Use early warning systems to predict and plan for extreme heat.	• Indicate the consideration of increasing air temperatures/ heat waves in siting selection, materials selection, and design/construction. • Document the availability of hydration and guidelines for allowing workers to take breaks and/or time off in case of extreme heat. • Document increased capacity in emergency preparedness and response. • Document the use of integrated watershed management and rainfall capture/water efficiency. • Identify and document available early warning systems and their use.
CLIMATE STRESSOR: INCREASING INCIDENCE AND/OR SEVERITY OF DROUGHTS		
• Reduced access to water for ASM activities and operations. • Increased likelihood for conflict within and between communities over water resources.	• In site selection, consider the likelihood of climate risk impacts on the specific location in question, with attention to both current and	• Consider the increasing incidence and/or severity of droughts in siting selection, materials selection, and design/construction.

CLIMATE RISKS	RISK MITIGATION OPTIONS	INDICATORS
• Added difficulties decommissioning and rehabilitating mining sites (e.g., establishing vegetative cover). • Reduced agricultural yields resulting in increased migration toward ASM areas and livelihoods.	future climate change projections. • Promote integrated watershed management and rainfall capture/water efficiency practices to build resilience to decreased water availability and/or drought. • Use early warning systems to predict and plan for periods of drought.	• Document the use of integrated watershed management and rainfall capture/water efficiency. • Identify and document available early warning systems and their use.
CLIMATE STRESSOR: SEA LEVEL RISE		
• Damage to mine, transportation, and energy infrastructure in coastal areas, disrupting mine construction and operation. • Damage to transportation routes in coastal areas, disrupting the delivery of input materials, labor access, and transport to processing facilities and markets, as well as interfering with production and distribution.	• In site selection, consider the likelihood of climate risk impacts on the specific location in question, with the consideration of both current and future climate change projections. • Take steps to ensure robust engineering design and construction standards that can withstand sea level rise (e.g., ensuring stable mine walls and water pump availability). • Identify alternative routes for the delivery of inputs and transport to market. • Use early warning systems for storm events to allow proactive preparation for storm surge.	• Indicate the consideration of sea level rise risk in siting selection, materials selection, and design/construction in coastal areas. • Document capacity building in emergency preparedness and response. • Document the availability of planned alternative routes to minimize disruptions from extreme events. • Identify and document available early warning systems and their use. • Document that emergency plans are available and posted.

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9.5 CLIMATE CHANGE: REDUCING EMISSIONS AND BUILDING RESILIENCE

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United Nations Framework Convention on Climate Change (UNFCCC), Long-Term Strategies Portal, https://unfccc.int/process/the-paris-agreement/long-term-strategies. The Paris

Agreement encourages all Parties to strive to formulate and communicate long-term low greenhouse gas emission development strategies.

UNFCCC, National Communication submissions from Non-Annex I Parties, https://unfccc.int/non-annex-I-NCs. National Communications are submitted by countries to the UNFCCC and include information on country context, broad priority development and climate objectives, overviews of key sectors, historic climate conditions, projected changes in the climate and impacts on key sectors, potential priority adaptation measures, limitations, challenges and needs.

UNFCCC, Nationally Determined Contributions (NDC) Registry, https://unfccc.int/NDCREG. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of its long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change and include specific priorities and targets for reducing GHG emissions and adopting low-emission, climate resilient policies and technologies.

UNFCCC, Submitted National Adaptation Plans (NAPs), https://napcentral.org/submitted-naps. Countries develop NAPs and submit them to the UNFCCC to identify medium- and long-term adaptation needs, informed by the latest climate science.

USAID, Agriculture, Forestry and Other Land Use (AFOLU) Carbon Calculator, http://afolucarbon.org/. The AFOLU Carbon Calculator employs IPCC-based accounting methods that allow users to estimate the CO_2 benefits and potential climate impacts of eight different types of land-based project activities: forest protection, forest management, afforestation/reforestation, agroforestry, cropland management, grazing land management, forest degradation by fuelwood, and support/development of policies. Each of these tools within the AFOLU Carbon Calculator transparently documents the methods, discusses the assumptions, and presents the underlying data along with its associated sources of uncertainties.

USAID, Clean Energy Emission Reduction (CLEER) Tool, https://www.cleertool.org/. The CLEER Tool is a user-friendly calculator based on internationally accepted methodologies, enabling users to calculate emissions reduced or avoided from clean energy activities. CLEER uses up-to-date methodologies and emissions factors from the IPCC, the GHG protocol, and other internationally accepted guidance for estimating GHG emissions and reductions. The tool helps users to estimate, track, and report GHGs reduced or avoided from clean energy; estimate and project the amount of energy generated or saved from clean energy activities; identify high-impact activities with cost-effective GHG reductions; evaluate the emissions reduction potential of planned activities and possible alternatives; and estimate projected GHG emissions reduced or avoided to 2050.

USAID ClimateLinks portal, https://www.climatelinks.org/. ClimateLinks is a global knowledge portal for climate and development practitioners and includes specific guidance on USAID climate change programming and planning requirements and a resource library.

The World Bank, Climate Change Knowledge Portal, https://climateknowledgeportal.worldbank.org/. This portal is intended to provide quick and readily accessible climate and climate-related data to policy makers and development practitioners. The site also includes a mapping visualization tool (webGIS) that displays key climate variables and climate-related data.

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ANNEX 1: ASM GLOSSARY

Acid rock drainage: The acidic water created from large-scale earth disturbances (such as mining) of rocks containing sulfide materials, creating environmental and health-related risks of contamination and exposure, such as leaching of heavy metals.

Amalgamation: A concentrating process in which mercury is mixed with an ore containing metallic gold or silver, or an alloy of the two. The precious metal bonds with the mercury to form the metal-laden mercury amalgam and the waste (barren) ore pulp to effect separation.

Artisanal and small-scale mining (ASM): Mining conducted by individual miners or small enterprises with limited capital investment and production.

Commodity: A raw material or primary agricultural product that can be bought and sold.

Conflict mineral: Minerals or ores that are mined in an area of armed conflict and traded illicitly to finance that conflict.

Crushing or grinding: Crushing and grinding are the two primary processes to reduce the size of excavated materials. Crushing is normally carried out on dry ore, while grinding (normally carried out after crushing) may be conducted on dry or slurried material.

Exploration: The process of searching for and finding ores (viable concentrations of minerals) to mine.

Extraction: The removal of valuable minerals or other geological materials from the earth.

Kimberly Process: A joint government, industry, and civil society initiative to stem the flow of *conflict diamonds*, which are rough diamonds used by rebel movements to finance wars against legitimate governments.

Large-scale or industrial mining (LSM): Mining typically undertaken by big companies using many employees and a large labor force. The company mines at large sites and continues the operations until the mineral or metal can no longer be recovered economically.

Mercury capture technology: A series of technologies used to capture mercury during artisanal and small-scale gold mining to reduce the release of mercury into the environment.

Milling: The process of breaking solid materials into smaller pieces by grinding, crushing, or cutting.

Minamata Convention on Mercury: A global treaty implemented by the United Nations Environment Program (UNEP) to protect human health and the environment from the adverse effects of mercury. The Minamata Convention includes a ban on new mercury mines, the phasing out of existing ones, the phasing out and down of mercury use in products and processes, control measures on emissions to air and on release to land and water, and regulation of the informal sector of artisanal and small-scale mining (ASM).

Mine/Site closure: The process of shutting down mining operations on a temporary or permanent basis. Mines have a limited lifetime, which is typically determined by the size and quality of the mineral deposit being extracted. Mines may be permanently or temporarily closed when the supply of recoverable ore runs out or the commodity prices drop, making the mine uneconomical to operate.

National Action Plan (NAP): NAP is requirement for countries participating in the Minamata Convention on Mercury that outlines national objectives and reduction targets, actions for the elimination of mercury and related mercury processing, steps for facilitating the formalization or regulation of ASM, baseline information on mercury use, strategies for promoting the reduction of mercury use and managing trade, methods for involving stakeholders, public health capacity building in training healthcare workers, preventing the exposure of vulnerable populations, and strategies for sharing information.

Permanent ASM: Mining that relies on established mineral resources that are often located where previous large-scale industrial or formal mining is present. Seasonal miners become permanent if the compensation is a reliable source of income.

Processing: The step within the ASM commodity life cycle of separating valuable minerals from their ores. Sometimes referred to as ore dressing.

Prospecting: The search for mineral deposits in a place, especially by means of experimental drilling and excavation.

Rare-earth elements: A set of 17 chemical elements with unique magnetic, phosphorescent, and catalytic properties that are critical for technology and electronics. While named rare earths, they are, in fact, not that rare and are relatively abundant in the Earth's crust. What is unusual is to find them in quantities significant enough to support economic mineral development.

Refining: The process of purification of a substance, usually a natural resource that is almost in a usable form, but which is more useful in its pure form. In artisanal and small-scale gold mining, it is typically completed by gold shops through heating the gold ore and vaporizing the residual mercury.

Remediation/Reclamation: The process of restoring land or waterways that have been mined to an acceptable standard of productive natural or economically usable state.

Reuse: Using former mine sites for alternative purposes after the close of a mine, whether closed formally or not.

Rush ASM: Mining that typifies many diamond and gold mines where the news of a major strike can create a stream of skilled and unskilled miners to an area over a short period of time.

Seasonal ASM: Mining that provides a source of employment in the agricultural off-seasons, where ASM may provide an alternative livelihood.

Shock-push ASM: Mining that refers to rapidly established mining sites where workers relocate due to severe drought, social disruptions, conflicts, or the hope of more productive and lucrative livelihoods.

Smelting: A form of extractive metallurgy; its main use is to produce a base metal from its ore. In a furnace, chemicals are added to the ore so that when heated, liquid metal is formed, allowing it to be separated from minerals with no value.

Washing: Rinsing to sort dirt or debris away from valuable ore.

ANNEX 2: ASM PRODUCTION, PROCESSING, AND TECHNOLOGIES

1. GENERAL ASM OVERVIEW: PRODUCTION AND PROCESSING

Valuable minerals are generally found in low concentrations, mixed with rocks, soil, and other materials that have comparatively low value. Mining is therefore a progression of steps to increase the concentration of valuable minerals, and ultimately purify them into a saleable product.

The specifics of the mining **production** steps and operations depend on the type of mineral deposit because hard rock deposits are mined very differently from alluvial deposits in sand or gravel in a riverbed, and the chemistry of each mined commodity is different. However, at each step, a stream of less-valuable material is generated and requires proper handling and disposal in order to not contaminate the surrounding environment or cause health impacts.

Typically, the first step in the production process is to extract the valuable minerals/ores and associated rocks and dirt out of the ground. If the mineral/ore deposit is in stone, then explosives are commonly used to break the rock and liberate the ore. Alternatively, extraction could involve digging, either by hand (with hand tools) or with small-scale machinery (such as jack hammers), but can be expedited with the use of diesel-powered backhoes, dump trucks, and other excavation equipment. Within an excavation site, a first-level separation is often completed to avoid moving rocks and dirt with no value, so that miners can focus on excavating valuable ores and minerals. This can lead to the excavation of tunnels, troughs, and pits that follow veins of higher concentration of ore.

Once the material has been excavated, it needs further separation and **processing** to select just the portions that contain valuable minerals. Frequently, the valuable material differs in density (usually it is denser) from the surrounding rock and soil. This allows for a physical separation to be realized by passing water over the mined material. Less dense rocks and soil are carried farther by the flowing water than the dense ores, which sink faster. There are many devices that use this density difference for separation, including gold pans, sluices, shaking tables, spiral concentrators, centrifuges, and many others.

In larger or more complex mining operations, physical *beneficiation* (the process of removing rocks and dirt from the ore, creating waste tailings in the process) of the ores is continued by crushing and grinding the ore to release valuable minerals from the rock, and floating the removed minerals in water by adding special chemicals similar to soaps. This extra concentration of ores decreases the use of chemicals later in the mining process.

After the ores have been separated by physical means such as sluicing or flotation, the next step is usually purification by pyro- or hydrometallurgical methods. *Pyrometallurgy* refers to refining the ores by heating them to very high temperatures, with chemical additions that lead to separation and/or purification of the valuable metals. *Hydrometallurgy* requires leaching of the ores with solutions of chemicals, extracting valuable compounds and enabling further purification and separation. Both methods benefit from a crushed feed material that allows for better access to the target material. Additionally, the feed to this process should be of relatively high concentration in the target material because other components consume energy and chemicals and, in the case of hydrometallurgical processing, the waste stream will contain the chemicals used for leaching.

Depending on where they are mined, ores can have a significant amount of heavy metals, including lead, copper, and silver. Apart from the chemical processes used to refine gold and other metals, which may cause an environmental impact, it is equally important to recognize that the ores are not pure and can also be a source of contaminants.

Many different minerals are mined by ASM, including gold, cobalt, nickel, diamonds and other gemstones, silver, coal, building materials, and base metals. Each of these commodities are mined in a different way, and variations between mines for the same material can be seen due to the nature of the deposit and local geologic, geographic, economic, and cultural differences. Gold, cobalt, and diamonds are chosen here as examples for how ASM is conducted. Cobalt is selected as an example of an ore-based mining operation more relevant to other base metals.

2. GOLD MINING PROCESS

Gold is an important part of the ASM sector worldwide, and it is notable for its extensive use of mercury by small-scale miners. A number of artisanal and small-scale gold mining (ASGM) production and processing techniques require mercury, however not all. In addition to USAID, national and international organizations have identified and promoted non-mercury alternative processes for ASGM, including the U.S. Environmental Protection Agency and the United Nations Environment Program Global Mercury Partnership.[143,144,145] Non-mercury alternatives for ASGM are discussed below.

Extraction of Alluvial Gold Flakes. Alluvial gold occurs as pure grains that weather away from the source rock, and these grains are transported with other sediments, primarily in rivers and streams. Extraction of alluvial gold is performed next to rapidly moving water well above ground and requires fewer resources. ASGM operations directly dredge rivers and streams to access gold particles, and miners use different types of gravity concentrators to extract gold from the river sediment. These methods use water but no chemicals in the process.

- *Sluicing* uses channeled water to wash ore or alluvium down a series of declining troughs and platforms. As water washes sediment down a sluice, heavier gold particles sink between riffles and are captured by carpeting laid at the bottom of the sluice. Loaded carpets are then washed in a holding pool or bucket to remove the material. Most ASGM sluices are wooden; however, modern ones are more elaborate metal designs to increase recovery. The resulting gold concentrate is usually low and most miners then pan the sediment.
- *Panning* uses water to separate heavy gold particles from other lighter particles within a medium-size hand-held pan. In this process, sediment that could contain gold is placed in a wide pan along with water. The miner repeatedly shakes the pan to eject lighter sediments. The density of the gold keeps it on the bottom. This works if the gold is coarse. Miners can then further recover the gold by direct smelting (described below). Panning is also done after sluicing to increase recovery.
- *Shaking tables (motorized)* use water to wash the sediment feed through a tilted table with raised ridges running horizontally down to a narrow channel. The sediment and water are released at one end of the table. The grooves trap the gold and direct it to

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[143] United States Environmental Protection Agency. 2023. *Artisanal and Small-Scale Gold Mining Without Mercury.* https://www.epa.gov/international-cooperation/artisanal-and-small-scale-gold-mining-without-mercury.
[144] United Nations Environment Programme. n.d. *UNEP Global Mercury Partnership.* https://www.unep.org/globalmercurypartnership/.
[145] United Nations Environment Programme. n.d. *Illustrated Guide to Mercury Free Artisanal and Small Scale Gold Mining.* https://indd.adobe.com/view/a9b3c39e-e7b7-412a-9d12-5cf47f484e56.

collection points on the side of the table. The table is continually shaken by a motor, which aids in the gravimetric separation of gold particles.

- *Spiral concentrators (motorized)* a rotating spiral pan with a collection hole is continually fed concentrate by an operator. A pipe placed across the pan sprays water along the surface of the pan as the concentrator spins. The water washes lighter particles down the spiral concentrator into a bucket while denser gold particles are carried by the spiral grooves toward the hole in the center of the concentrator. The concentrate is still crude but is purer than panning.
- *Vortex concentrators* use a rotating flow of water in a tub to separate lighter materials from a concentrate. The vortex pulls lighter materials up and the heavier gold remains in the bottom of the tub.
- *Centrifuges (motorized or manually powered)* are more effective than vortex concentrators but cost more to operate. They separate sediment mixtures by density. The concentrate is fed into the centrifuge through a pipe at the top of the machine in a slurry. The rotation forces lighter materials up the sides of the vessel's walls and the gold remains in the ridges. These are more often found at local processing centers due to cost. A small one cycles for 20 minutes to 2 hours, so different owners can use it over a day and the yield is higher than for other methods of gravity concentration.

Extraction of Gold from Rock. Gold in rock must be broken and graded down prior to separation. Large rocks are broken by using a jack hammer and then either crushed mechanically at the mine or at a processing center. Crushing is also done manually in a hand-stamping cylinder. An iron cylinder is welded to a long rod and placed inside a pipe that is one size larger. Smaller, more promising rocks are pulverized by the drop hammer inside the metal pipe, which captures the finer particles. The particles are then ready to be separated and refined without chemicals as discussed above, or with the use of mercury and cyanide as discussed below.

Processing Gold Using Mercury. Gold can be more rapidly refined to as high as 85 percent purity using amalgamation with mercury. Amalgamation is a concentrating process in which metallic gold is mixed with liquid elemental mercury, either in a drum or on a table. The precious metal naturally bonds with mercury to form an amalgam and the waste is removed. Water helps disperse the ore, thus increasing the yield.

A cast iron heated retort is best used to recover the mercury fumes so they cannot escape except by a condenser. The amalgam is placed in a vessel, which is then connected to the cooled condenser. The vessel is heated, vaporizing the mercury, and the mercury is re-condensed to a metallic state that is submerged in water during the distilling operation. It then can be reused. There are many different designs of retorts, and if used properly, they can significantly reduce mercury emissions. However, they still should not be used indoors, and the heating process takes longer than typical open-air heating.

Processing Gold Using Dilute Sodium Cyanide Solution. Cyanide leaching is now more common in the world and is safer than extraction with liquid mercury; however, it remains dangerous. Cyanide leaching is usually done after milling, crushing, or gravity separation. The pH of the resulting slurry is raised by adding lime to ensure that cyanide ions do not change into toxic cyanide gas. The gold is then further concentrated and reduced, before being smelted into gold bullion.

Cyanide leaching processes are commonly used to recover additional gold from the large amount of tailings from a mercury amalgamation process. Cyanide solutions in large open pools of water will dissolve the gold more efficiently than mercury, so the tailings are mixed with the solution. The pool is drained and the gold is recovered from the solution. Combining mercury amalgamation and cyanide leaching is practiced, but not recommended, because cyanide will make mercury more mobile, contaminating more land, water, and air resources than either process alone.

The Role of the Gold Shop. After the miner, the gold shop is the next link in the informal gold supply chain. Shops can both process raw gold or gold-mercury amalgam and buy the raw gold product from the miner or middle buyer at a London fixed price for the level of purity. Gold shops can use nitric acid cascaders to further digest impurities such as copper and refine gold to close to 24k purity (> 99 percent).

Gold shops also use chemical leaching in smaller enclosed systems. The gold in solution is recovered by using activated charcoal, or by electrowinning, where the gold is plated out onto electrodes. An emerging technology for chemical leaching is the use of thiosulfate instead of cyanide, which is less toxic. Gold shops also smelt the gold and pour it into gold ingots. The process works by heating the ore until it melts. Chemicals are added to the ore before smelting to lower the melting points. The dense gold settles to the bottom of the melted material and can be separated after it cools. The ore fed to the smelting process should be as pure as possible to reduce the energy required to melt it and end up with a pure gold material.

Alternative Technologies for Gold Mining. The use of mercury in ASGM is dangerous to local communities and wildlife and affects the safety of the local and global food supply. There are alternatives to traditional mercury amalgamation that can reduce or eliminate mercury use, with co-benefits for both the surrounding environment and human health and safety. These alternative technologies or methods allow the recovery of gold more economically, allowing miners to realize higher prices.

Gravity concentration methods (described above) include the following:

- Panning
- Sluicing
- Shaking tables
- Spiral concentrators
- Vortex concentrators
- Centrifuges

Other concentration and separation methods include the following:

- Magnets: If the ore surrounding the gold happens to be magnetic, then a magnetic separation can be used to concentrate the gold. Magnetic ore particles will attach to a magnet, leaving behind non-magnetic gold and other non-magnetic materials.
- Flotation: Chemicals are added to a slurry of gold ore and air bubbles are then mixed in. The chemicals will cause gold and some other minerals to stick to the air bubbles, causing them to rise and concentrate at the top of the vessel where they are skimmed off. Other minerals sink to the bottom of the tank.

Gold recovery methods include the following:

- Direct smelting: High-grade concentrate is heated until the gold melts. The liquid is then cooled to form a solid mass of gold semi-pure alloy. A crucible, or high-temperature bowl for smelting, must be used in combining the gold concentrate with a mixture of borax or other materials. A blow torch can be used to heat the mixture.

- Chemical leaching: Chemicals such as cyanide are used to leach gold from ore, concentrate, or tailings via gravity techniques. This technique is used mostly in larger scale mining but increasingly in ASGM due to the high gold recovery rates at lower costs. However, cyanide is highly toxic and should never be mixed with mercury, although cyanide does not persist in the environment as long as mercury does.

The U.S. Environmental Protection Agency (USEPA) has more detailed descriptions of these non-mercury ASGM process operations on its International Cooperation website[146]. The United Nations Environment Program (UNEP) also has resources for nom-mercury processes[147].

3. DIAMOND MINING

ASM of diamonds and other gemstones is typically done in alluvial deposits, which means that the gemstones weathered away from their source rock and were deposited with gravel in streambeds. Source rock for gemstones is generally mined by major companies due to the increased capital requirements and higher payoff.

ASM of diamonds can be done in an existing stream/riverbed; however, it may also take place in locations where a river used to flow but is now no longer flowing. Diamond ASM may also be conducted by underground mining, including in hand-dug open pits, tunnels, and vertical shafts.

The first step in ASM diamond mining is the removal of sand, dirt, and silt that covers the gravel more likely to contain gemstones. This can be done by hand, but is sometimes done mechanically, and often entails dredging an active river or stream. In some cases, divers will manually remove gravel from the bottom of a river, or a dam will be built to assist in gravel removal.

The equipment is basic and includes the use of sieves and pans to search for the diamonds. When the gravel has been excavated, it is washed, screened, and sized. It can then be sorted for diamonds by hand or by using other gravity separation devices as described in the section on gold mining (e.g., sluices, pans, spiral concentrators). Rough diamonds are sold to traders, who may also have financed the mining process or provided tools.

Exposure to inhalable dust is a health concern. Diamond mining can expose workers to contaminants such as silica from dust. Moved soil, or tailings, associated with diamond mining could contain lighter metals such as zinc and cadmium. Diamond miners can also be exposed to asbestos due to the location of diamond mines in relation to asbestos deposits.[148]

More details on the diamond mining process can be found in a Diamond Development Initiative report: Mechanisation of Alluvial Artisanal Diamond Mining: Barriers and Success Factors, available at https://www.projekt-

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[146] United States Environmental Protection Agency. 2023. *Artisanal and Small-Scale Gold Mining Without Mercury.* https://www.epa.gov/international-cooperation/artisanal-and-small-scale-gold-mining-without-mercury.

[147] United Nations Environment Programme. n.d. *Illustrated Guide to Mercury Free Artisanal and Small Scale Gold Mining.* https://indd.adobe.com/view/a9b3c39e-e7b7-412a-9d12-5cf47f484e56. and United Nations Environment Programme. n.d. *UNEP Global Mercury Partnership.* https://www.unep.org/globalmercurypartnership/.

[148] Nelson, G., J. Murray, J.I. Phillips. 2011. The Risk of Asbestos Exposure in South African Diamond Mine Workers. The Annals of Occupational Hygiene (2011) 55 (6): 569-577. https://academic.oup.com/annweh/article/55/6/569/175512?login=false.

consult.de/newsletter/downloads/638137/mechanisation_alluvial_artisanal_diamond_mining.pdf
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4. COBALT MINING

Cobalt mining takes place primarily in the Democratic Republic of the Congo (DRC), which contains the world's largest cobalt deposits. Cobalt production is mainly concentrated in the Katangese Copper Belt in the provinces of Haut-Katanga and Lualaba. The DRC cities of Kolwezi, Likasi, and Lubumbashi are important hubs for artisanal miners' production. LSM companies are estimated to extract approximately 70–85 percent of cobalt along the copper belt, ASMs extract the other 15–30 percent.[149] In DRC, 15–30 percent of cobalt production is via ASM. For more information, please see footnote 150. The Organization for Economic Cooperation and Development [151,152] reported that there is extensive commercial and physical interaction and interface between ASM and LSM in the DRC throughout all segments of the upstream supply chain, and that it is therefore difficult to distinguish LSM-sourced cobalt from ASM-sourced cobalt within the supply chain. Calvao and others [153] also reported on the integration of ASM and LSM in cobalt mining in the DRC. Most of the ASM cobalt mining takes place in private concessions where LSMs are actively operating.

The Impact Facility reported on working conditions, children's rights, and economic opportunity in two cobalt ASM communities in Lualaba Province, DRC.[154] The ore accessed by artisanal miners is commonly shallow deposits (e.g., tens of meters) of weathered cobalt ores that can be mined with picks and shovels. Teams of diggers will work in hand-dug pits to remove ore, which is taken to the surface where it is crushed, washed to remove soil and other unwanted impurities, hand-sorted, and packed into bags for sale. The Impact Facility reported that in the two ASM areas surveyed, the washing and hand-sorting process is conducted primarily by women.[155] These bags are sold to traders and the ore at this point contains several percent of cobalt.[156] The ore is then sold by the traders to depots that handle large amounts of ore, which are then sold to crude refiners. Traders in this scenario can be several entities with access to the market, including private traders, larger companies, and mine owners that charge for access to the deposit. The Impact Facility reported that in the two ASM areas surveyed, miners are able to sell ore directly to the depots provided that a larger amount of ore is accumulated for sale to

[149] Gerig, Laure, Patricia Ndagano, Nathan Schneck, and Lotte Hoex. 2020. "Delve Country Profile - Democratic Republic of Congo: Artisanal and Small-Scale Mining Sector." Delve. https://delvedatabase.org/uploads/resources/Delve-Country-Profile-DRC.pdf.
[150] USAID. 2021. *Mining and the Green Energy Transition.* https://www.land-links.org/wp-content/uploads/2021/11/Green-Energy-Minerals-Report_FINAL.pdf.
[151] Katz, Benjamin, and Luca Maiotti. 2020. "Analyzing Supply Chain Collaboration for ASM Cobalt Formalization in the DRC." Organisation for Economic Co-operation and Development (OECD). https://www.delvedatabase.org/uploads/resources/2020-SoS_REC-1_Cobalt.pdf.
[152] OECD. 2019. Interconnected supply chains: a comprehensive look at due diligence challenges and opportunities sourcing cobalt and copper from the Democratic Republic of the Congo. https://delvedatabase.org/uploads/resources/Interconnected-supply-chains-a-comprehensive-look-at-due-diligence-challenges-and-opp_ENGLISH.pdf.
[153] Calvão, Felipe, Catherine Erica Alexina Mcdonald, and Matthieu Bolay. 2021. "Cobalt mining and the corporate outsourcing of responsibility in the Democratic Republic of Congo." The Extractive Industries and Society 8 (4): 100884. https://www.sciencedirect.com/science/article/pii/S2214790X21000290?via%3Dihub.
[154] Carter, Assheton Stewart, and David Sturmes. 2020. "Digging for Change: Towards a Responsible Cobalt Supply Chain." The Impact Facility. https://delvedatabase.org/uploads/resources/20200618-Digging-For-Change.pdf.
[155] Ibid.
[156] Tsurukawa, Nicolas, Siddharth Prakash, and Andreas Manhart. 2011. "Social impacts of artisanal cobalt mining in Katanga, Democratic Republic of Congo." Institute for Applied Energy (Öko-Institut), Freiburg. https://www.oeko.de/uploads/oeko/oekodoc/1294/2011-419-en.pdf.

the depots.[157] The DRC has established an agency—Service for Assistance to Artisanal Small-Scale Mining (SAEMAPE)—to oversee artisanal mining operations.

[157] Carter, Assheton Stewart, and David Sturmes. 2020. "Digging for Change: Towards a Responsible Cobalt Supply Chain." The Impact Facility. https://delvedatabase.org/uploads/resources/20200618-Digging-For-Change.pdf.

ANNEX 3: ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN		
CATEGORY	**COMPONENT**	**PRIMARY COMPLIANCE ISSUES**
Environmental Impact Assessment	EIA	1. Has the IEE been prepared per Reg. 216? 2. Has the IEE or EIA been approved by the mission and BEOs? 3. Is host country approval needed? Has it been granted? 4. What, if any, are the conditions outlined in the IEE or EIA?
	Stakeholder Engagement	1. Have the appropriate stakeholders been identified? 2. Has the project, its goals, and potential impacts been adequately explained to local stakeholders? 3. Have comments from stakeholders been adequately addressed and/or integrated into the project design? 4. Has the project information been presented in a way that is relevant and understandable to local stakeholders?
	Alternatives Analysis	1. Have alternatives for the project been appropriately evaluated accounting for direct, indirect, and cumulative impacts? 2. Are the alternatives feasible and appropriate for the context? 3. Have the benefits and costs been accounted for?
Pollution Control	Air Quality	1. Will any air pollutants be emitted, such as soot, dust, sulfur oxides, nitrogen oxides, or hazardous air pollutants, as a result of the project? 2. Do these emissions comply with the host country's emissions and air quality standards? 3. Do air emissions and air quality conform to relevant complementary international standards related to air quality? 4. Are adequate mitigation measures being taken with regard to the impacts on air quality?
	Water Quality	1. Will any effluents be generated as a result of project activities, such as oils, chemicals, wastes, or other toxicants? 2. Do effluent discharges to surface water/groundwater comply with the host country’s effluent and water quality standards? 3. Do effluent discharges and surface water/groundwater quality conform to relevant complementary international standards related to water quality?

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN		
CATEGORY	**COMPONENT**	**PRIMARY COMPLIANCE ISSUES**
		4. Is there a possibility that the effluent will negatively impact water quality? 5. Are adequate mitigation measures included to mitigate the contamination of surface water, groundwater, and/or soils by effluents from project activities?
	Solid Waste	1. Will any solid wastes be generated as a result of project activities, such as oils, chemicals, wastes, or other toxicants? 2. Will any wastes generated from the project be treated and disposed of in accordance with national standards and complementary international standards? 3. Are adequate mitigation measures being taken to mitigate the contamination of soils, surface water, and groundwater by the wastes generated?
	Noise	1. Will any noise or vibrations be generated as part of the project activities? 2. Do the noise and vibrations comply with host country standards? 3. What mitigation measures are included to prevent unintended effects from noise?
	Odors	1. Will any odors be generated as part of the project activities? 2. If yes, will these odors cause negative health, social, or ecosystem impacts? 3. Are mitigation measures adequate to address the generation of odors?
Natural Environment	Protected Areas	1. Will the project occur within or adjacent to protected areas designated by host country laws or international treaties/conventions? 2. Will the project impact protected areas? If so, how? 3. Do mitigation measures adequately prevent unintended impacts on protected areas?
	Ecosystems	1. Will the project occur within or adjacent to critical habitat, primary forests, or ecologically valuable or rare habitats? 2. Will the project involve land clearing, deforestation, or other physical impacts on natural resources? 3. Does the project site overlap with the protected habitats of endangered species designated by either national law or international treaties/conventions? 4. If impacts on ecosystems are anticipated, are mitigation measures adequate for addressing those impacts? 5. Will the project reduce the quantity of available surface water or groundwater? Will this usage adversely impact aquatic

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN		
CATEGORY	**COMPONENT**	**PRIMARY COMPLIANCE ISSUES**
		environments, such as rivers, wetlands, or streams? 6. Are mitigation measures adequate to address aquatic impacts? 7. Will the project adversely affect biodiversity? If so, are mitigation measures adequate to address the impacts on biodiversity?
	Topography and Geology	1. Has the project design considered the topography and underlying geology for the project and possible impacts (e.g., leaching, surface hydrology, slope stability)? 2. Will the project alter topographic features via cut and fill, excavation, ground clearing, earthmoving, or other activities? 3. Will the project generate soil runoff from earthmoving activities, waste disposal sites, and/or borrow pits? 4. Are mitigation measures adequate to prevent soil runoff and/or the impacts of improperly placed waste sites or borrow pits? 5. Will the project negatively impact shorelines, coastal areas, wetlands, rivers, or other waterbodies?
Social	Resettlement	1. Will involuntary resettlement occur because of project activities? If yes, how are resettlement impacts minimized? Is there a Resettlement Action Plan (RAP)? 2. Have compensation and resettlement plans been developed and explained to affected people prior to the initiation of project activities? 3. Did a social impact assessment inform the resettlement action plan? 4. When will resettlement compensation be paid during the project cycle? 5. Are the compensation policies publicly available and presented in accessible formats to the affected populations? 6. Are there marginalized and underrepresented groups and/or people in vulnerable situations, such as women, children, older persons, or ethnic minorities, who may be affected by the project? 7. Have agreements been reached with the affected peoples? 8. How will the impacts of resettlement be monitored and evaluated? 9. Has a grievance mechanism been developed?
	Living and Livelihoods	1. Will the project adversely affect the living conditions of inhabitants? How will the project impact livelihoods, living conditions, and/or social networks?

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN		
CATEGORY	**COMPONENT**	**PRIMARY COMPLIANCE ISSUES**
		2. Are mitigation measures adequate to address these matters? 3. Will the project strain existing infrastructure? If existing infrastructure is insufficient, are there plans to either improve or develop new infrastructure? 4. Will the large-vehicle traffic associated with the activity impact traffic, impede the movement of inhabitants, or cause risks to pedestrians? 5. Is there a possibility that diseases or other unintended health or social impacts will be introduced via the in-migration of workers associated with the project?
	Cultural Heritage	1. Have local communities been consulted regarding the existence of important cultural heritage sites in the project area? 2. Could the project damage or destroy important cultural heritage sites, such as archeological, historical, or religious sites? 3. Are any cultural heritage sites in the project area protected by local or national law? 4. Are mitigation measures adequate to address these potential impacts?
	Landscape	1. Could the project adversely affect the local landscape via land clearing, deforestation, or other activities? Would these effects diminish or obliterate the use of the local landscape? 2. Are mitigation measures adequate to address these potential impacts? 3. Has land tenure been appropriated and adequately considered with regard to project activities?
	Ethnic Minorities and Indigenous Peoples	1. Are all the rights of ethnic minorities and Indigenous Peoples, including customary rights, to land and resources respected? 2. Are mitigation measures adequate to reduce the impacts on the culture and lifestyle of ethnic minorities and/or Indigenous Peoples?
	Labor and Occupational Health	1. Does the project comply with host country laws related to labor and working conditions? 2. Are appropriate and implementable safety considerations in place and operational? 3. Is a worker safety plan and safety training plan in place? Do workers have access to proper PPE? Have workers been instructed on proper use? 4. Have workers been trained on labor laws and rights relevant to the host country? 5. Does the project conform to relevant complementary international standards related to labor and working conditions?

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS FOR PROJECT DESIGN		
CATEGORY	**COMPONENT**	**PRIMARY COMPLIANCE ISSUES**
Climate Change	Climate Risk Management	1. How has the project element been impacted by climate stressors in the past? This may include the risks from gradual climate change (e.g., sea level rise) and climate variability or weather-related disasters (e.g., droughts, floods, extreme storms). How severe were those impacts? Were any populations disproportionately impacted? How might the project element be affected by climate stressors now and under changing climate conditions? 2. Has an adaptive capacity assessment been conducted? Consider the adaptive capacity of all relevant project stakeholders potentially affected by climate change, as well as others who can contribute to adaptive capacity (e.g., civil society organizations, government agencies). 3. Are the appropriate qualitative risk ratings assigned for each climate risk identified? 4. Have opportunities for broader development objectives been identified? 5. Based on the climate risk rating, has the project selected the appropriate climate risk management options?
Other	Monitoring	1. Has an appropriate monitoring and evaluation plan been developed to monitor the impacts anticipated for the activity, where impacts are anticipated in the impact assessment, pollution control, natural environments, and/or social sectors? 2. Are the components, methods, and frequencies of monitoring included in the EMMP? 3. Does the EMMP establish an adequate monitoring framework (e.g., organization, personnel, equipment, budget)? 4. Is there appropriate training and capacity (such as tools, access, and transport) to conduct monitoring in an effective way? 5. Are the regulatory requirements for the host country and USAID monitoring identified clearly?