NATIONAL ACTION PLAN TO REDUCE AND WHERE FEASIBLE ELIMINATE MERCURY USE IN ARTISANAL AND SMALL-SCALE GOLD MINING IN GHANA

(in accordance with the Minamata Convention on Mercury)



ACCRA, DECEMBER 2020

gef

UNIDO
UNITED NATIONS
NDUSTRIAL DEVELOPMENT ORGANIZATION

epa

World Health Organization

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Foreword

The objective of the Minamata Convention (the Convention), is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The need for Ghana to satisfy the requirements of Article 7 and Annex C of the Convention led to the initiation of a project that has culminated in the preparation of this National Action Plan (NAP) that aims at reducing and where possible, eliminating the use of mercury in Artisanal and Small-scale Gold Mining (ASGM).

The preparation of the NAP was the result of collaboration among international partners, government agencies, the private sector, Civil Society Organisations (CSOs) and Non-Governmental Organisations (NGOs). Funding was provided by the Global Environment Facility (GEF) with the United Nations Industrial Development Organisation (UNIDO) as the Implementing Agency.

A multi-sectoral and multi-stakeholder coordinating mechanism known as the Minamata Convention Implementation Committee (MCIC) which is hosted by Environmental Protection Agency (EPA) and chaired by the Ministry of Environment, Science, Technology and Innovation (MESTI), served as the steering committee for the project. The EPA under MESTI, coordinated the preparation of the NAP with the support of the Technical Working Group (TWG) constituted by the MCIC.

A comprehensive baseline analysis of the ASGM sector was undertaken by the Natural Resource Defense Council (NRDC), a non-profit organisation based in the United States of America and ably supported by the Friends of the Nation (FoN), a local NGO. The report of the baseline analysis, supported the development and implementation of a road map to reduce mercury emissions and releases in the ASGM sector. The World Health Organization (WHO) served as the executing agency for the health component of the NAP as recommended by Article 16 of the Convention. In close collaboration with the Ministry of Health and the Ghana Health Service, an institutional capacity needs assessment as well as a rapid health situation assessment were undertaken, to develop a public health strategy on ASGM. The various reports of the WHO and the NRDC have been published separately and can be found as annexes to the NAP.

It must be recognised that the preparation of the NAP took cognisance of the Minamata Initial Assessment (MIA) which was conducted in 2018. The MIA report identified the major sources of releases of mercury into the natural environment, as via human activities, mainly through (1) primary metal production; (2) gold extraction with mercury amalgamation from concentrates; and (3) informal dumping of general waste. Furthermore, five (5) priority areas were recommended by the MIA for the effective implementation of the Convention, namely: (1) Development of a legal framework that incorporates the obligations under the Convention as well as an administrative structure for its full and effective implementation; (2) Phase-out of the use of mercury-added products from the health sector (Article 4, Annex A Part I) and phase down the use of dental amalgam (Article 4, Annex A Part II); (3) Reduce and if feasible, eliminate the use of mercury and mercury compounds in ASGM; (4) Reduce emissions and releases of mercury from point source categories; and (5) Manage mercury waste in an environmentally sound manner to reduce/eliminate exposure to humans and the environment.

The multi-stakeholder approach enabled a synergistic merger of varying ideas and perspectives into the NAP. It is anticipated that the implementation of the NAP, which constitutes an important component of the overall National Implementation Plan (NIP), envisaged under Article 20, would enable Ghana meet her obligations under the Convention in particular and the 2030 Agenda for Sustainable Development in general. The Government of Ghana is committed to make this happen and 'make mercury history'.

PROF. KWABENA FRIMPONG-BOATENG
MINISTER OF ENVIRONMENT, SCIENCE, TECHNOLOGY AND INNOVATION
ACCRA, DECEMBER 2020

Acknowledgements

The successful preparation of Ghana's first National Action Plan on Artisanal Small-Scale Gold Mining (NAP-ASGM) for the implementation of the Minamata Convention on Mercury (the Convention) is a story of continuous commitment by government and all relevant stakeholders in Ghana to establish an ASGM sector that is safe, resilient, and sustainable. Most importantly, it demonstrates Ghana's commitment to ensuring that our environment and human health are protected from mercury releases especially from anthropogenic sources.

We are sincerely grateful to the Global Environment Facility (GEF) for providing financial support for the development of this NAP and to the United Nations Industrial Development Organisation (UNIDO) which served as the Implementing Agency for this important activity.

We are appreciative of members of the Minamata Convention Implementation Committee (MCIC) and the Technical Working Group (TWG), for their invaluable inputs and work throughout the various stages of development of the NAP. We are particularly indebted to the following individuals and their respective institutions that constituted the MCIC and the TWG: Mr. Henry Kwabena Kokofu and Mr. Ebenezer Appah-Sampong (EPA), (National Project Directors); Dr. Sam Adu-Kumi (EPA), (National Project Coordinator); Mr. Fredua Agyeman (Formerly of Ministry of Environment, Science, Technology and Innovation and Chairman, MCIC); Mr. Nelson Ahedor (Minerals Commission, co-chair of the TWG); Mr. Michael Sandow Ali (EPA, co-chair of TWG); Dr. Martha Gyansa-Lutterodt (Ministry of Health); Dr. Carl Osei and Dr. Emmanuel Kyeremateng-Amoah (Ghana Health Service); Mr. Adam Seidu (Ministry of Trade and Industry); Mr. Solomon Kusi Ampofo (FoN); Mr. Emmanuel Yirenkyi-Antwi (Ghana National Association of Small-Scale Miners); Mrs. Theresa N.A Konney (Ministry of Finance); Mrs. Patricia Dovi-Sampson (Ministry of Information); Mrs. Cecilia Ansah-Obiri (Ministry of Employment and Labour Relations); Dr. Naa Dedei Tagoe (Inter-Ministerial Committee on Illegal Mining); Mrs. Justine S. Seyire Dzadzra (EPA); Mr. Joseph C. Edmund (EPA); Mr. Lovelace Sarpong (EPA); Mrs. Felisa Owusu-Darko (EPA); Mrs Kafui K. Boni (EPA); Ms. Abena Ayensu (EPA); Mr. Larsey Mensah (Planetary Harmony Solutions); and Mr. Joel Ayim Darkwah (United Nations Development Programme).

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We wish to specially recognize the late Mr. Koku Treveh (formerly of International Labour Organisation), a key member of the Technical Working Group whose untimely death occurred at the latter stages of the NAP-ASGM drafting process.

Finally, Ms. Anifat Abubakar-Mahama; Mrs. Irene Parker-Allotey; Mr. Faisal Seidu; and Mr. Nathan Quao who served at the Project Coordinating Unit, deserve equal mention and gratitude.



HON DR. HENRY KWABENA KOKOFU (Esq)
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ACCRA, DECEMBER 2020

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List of Abbreviations

AGC	Artisanal Gold Council
AG's	Attorney General's Office
AMAP	Arctic Monitoring and Assessment Programme
AMD	Acid Mine Drainage
ASM	Artisanal and Small-scale Mining
ASGM	Artisanal and Small-scale Gold Mining
ARAP	Anti-corruption, Rule of Law and Accountability Programme
ARM	Alliance for Responsible Mining
BAT/BEP	Best Available Techniques/Best Environmental Practices
CCMC	Chemicals Control and Management Centre
CMP	Community Mining Programme
CSR	Corporate Social Responsibility
CHPS	Community-based Health Planning and Services
CRAFT	Code for Risk Mitigation Against Formal Trade
CSOs	Civil Society Organisations
CHAMP	Comprehensive Health in Artisanal Mining Programme
CWSA	Community Water and Sanitation Agency
DFR	Department of Feeder Roads
DMC	District Mining Committee
ECOWAS	Economic Community of West African States
EHPMP	Africa Environmental Health and Pollution Management Programme
EPA	Environmental Protection Agency
EPM	Enhanced Pollution Monitoring
ESM	Environmentally Sound Manner or Environmentally Sound Management
ESMF	Environmental Social Management Framework
FC	Forestry Commission
FIP	Forest Investment Programme
FoN	Friends of the Nation
FM	Frequency Modulation
GEF	Global Environment Facility
GES	Ghana Education Service
GGSA	Ghana Geological Survey Authority
GHS	Ghana Health Service
GIFF	Ghana Institute of Freight Forwarders
GIS	Ghana Immigration Service
GNASSM	Ghana National Association of Small-Scale Miners
GoG	Government of Ghana
GOLD+	Global Support for Long-term Development in Artisanal Small-scale Gold Mining Programme
GPS	Ghana Police Service
GRA-CD	Ghana Revenue Authority -Customs Division
GSA	Ghana Standards Authority
GWCL	Ghana Water Company Limited
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IA	Implementing Agency
IDA	International Development Association
IDMC	Inspectorate Division of the Minerals Commission
IE&C	Information, Education and Communication
IGO	Inter-Governmental Organisation
ILO	International Labour Organization
ISD	Information Services Department
IMCIM	Inter-Ministerial Committee on Illegal Mining
KNUST	Kwame Nkrumah University of Science and Technology

LEAP	Livelihood Empowerment Against Poverty
LUSPA	Land Use and Spatial Planning Authority
MC	Minerals Commission
MCIC	Minamata Convention Implementation Committee
MESTI	Ministry of Environment, Science, Technology and Innovation
MLGDRD	Ministry of Local Government, Decentralization and Rural Development
MLNR	Ministry of Lands and Natural Resources
MMDAs	Metropolitan, Municipal and District Assemblies
MMIP	Multi-sectoral Mining Integrated Project
MoE	Ministry of Education
MoF	Ministry of Finance
MFA&RI	Ministry of Foreign Affairs and Regional Integration
MOH	Ministry of Health
MOTI	Ministry of Trade and Industry
NAB	National Accreditation Board
NAP	National Action Plan
NAS	National Ambulance Service
NGOs	Non -Governmental Organisations
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NIC	National Insurance Commission
NRDC	Natural Resource Defense Council
OECD	Organisation for Economic Cooperation and Development
PANAf GEO	Pan-African Support to the Euro-GeoSurveys-Organisation of African Geological Surveys (EGS-OAGS) Partnership
PHS	Planetary Harmony Solutions
PNDCL	Provisional National Defence Council Law
PPE	Personal Protective Equipment
PIC	Prior Informed Consent
PMMC	Precious Minerals and Marketing Company
RECLAIMS	Responsive Engagement and Collective Learning Approaches to Inform Mercury Substitution in ASGM
SSM	Small-Scale Mining
STI	Sexually Transmitted Infections
TV	Television
TWG	Technical Working Group
UMaT	University of Mines and Technology
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WB	World Bank
WHO	World Health Organization
WIM Ghana	Women in Mining Ghana
WOA	Whole Ore Amalgamation
WRC	Water Resources Commission

SECTION I: Executive Summary

Artisanal and Small-Scale Gold Mining (ASGM) is estimated to be responsible for mercury emissions of over 700 tonnes per year into the atmosphere and an additional 800 tonnes per year of mercury releases to land and water, making it the largest anthropogenic source of mercury (AMAP/UNEP 2013). The Minamata Convention on Mercury defines ASGM as:

"...gold mining conducted by individual miners or small enterprises with limited capital investment and production..." Article 2(a).

Mercury is used by artisanal and small-scale gold miners to extract gold in many parts of the world, including Ghana. Factors favouring the use of mercury in ASGM include: affordability relative to the price of gold; ready accessibility; ease of use; and ability to be used in many locations. ASGM is practised by an estimated one million people and indirectly impacts about 4.5 million people in Ghana.

This National Action Plan (NAP) was prepared in partial fulfilment of Ghana's obligations under the Minamata Convention on Mercury (the Convention). Article 7 and Annex C of the Convention, are particularly relevant. The NAP reflects, as much as possible, the guidance provided in Annex C of the Convention. The objective of the Convention is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.

The first chapter deals with a number of formalization initiatives including, in the areas of mercury reduction, child labour, occupational health, safety and environment. The second chapter covers the geographical distribution of ASGM and looks at the geology of Ghana as well as the geographical distribution of ASGM activities. Chapter three focuses on mining and mineral processing information and examines gold occurrences, mining and mineral extraction methods. Baseline estimates of the amount of mercury used in ASGM, is the focus of chapter four. Chapter five covers the legal framework relevant to the subject and covers both principal and subsidiary legislation; key government regulatory institutions and environmental standards relevant to the regulation of mining in Ghana. Chapter six is on leadership and organisation of ASGM at national and local levels. This is followed in chapter seven, by mercury trade and demand under which mercury imports and supply distribution are considered. Economic aspects, including benefits and methods of financing and profit sharing, are dealt with under chapter eight, while chapter nine deals with demographic and social information. In this section, geographic distribution of ASGM as well as typical methods of work organisations of miners, are examined. The overall environmental impacts and mercury contamination are the focus of chapter ten whilst the main themes of chapter eleven are health effects of exposure to mercury and common health risks in ASGM communities.

The use of mercury for processing of gold concentrates is widely practised among Ghana's artisanal and small-scale gold miners. Concentrate amalgamation is the most widely-used method in Ghana although the field study revealed isolated cases of whole ore amalgamation and double amalgamation.

The use of retorts to capture vapours and reduce emissions is low in Ghana as is the case globally. High cost, user-unfriendliness and fragility of glass, were among the reasons given. In national percentage terms, use of mercury is dominated by Tarkwa, Dunkwa and Bibiani.

Mercury is not produced in Ghana but enters through legal and illegal means. Smuggling seems to account for the disparity between official import statistics and quantities used. The mercury supply chain consists of bulk traders, gold buyers, small-scale brokers, middlemen and Chinese traders.

ASGM is a significant contributor to Ghana's economy, employing about a million people directly, with the figure rising substantially when contribution to the secondary economy is added. Unemployment and poverty have been identified as the main drivers for engagement in illegal mining or 'galamsey'.

Data on the involvement of women in the ASGM sector is inadequate. Lack of employment opportunities and the need to bring income directly to the home, are the main drivers for women's involvement.

Notwithstanding the critical roles women and children play both directly and indirectly in ASGM, their voices are silent in conversations about the subject. They are significantly exposed to, and negatively impacted by a multiplicity of occupational hazards. Women earn much less than men for the same job and access to finance is also a challenge.

The report captures significant initiatives over the last five years, aimed at addressing challenges in the ASGM sector.

Among the significant environmental impacts uncovered in the NAP are: pollution of water resources, pollution by heavy metals and other chemicals, land degradation, deforestation, atmospheric emissions and noise pollution.

Direct health impacts of mining identified from the World Health Organization (WHO) rapid health assessment were inhalation of mercury vapour during burning of the amalgam, accidents such as 'falls into unprotected pits', 'entrapment in collapsing pits', 'cuts from machines', 'bruises', 'fractures', 'lacerations and traumatic amputations', 'high noise levels' and 'vibrations from the use of tools and machinery'.

The indirect impacts of mining were poor nutrition, lack of sanitation facilities at mining sites, open defecation, polluted drinking water, chemical pollution of rivers, consumption of fish contaminated with chemicals, environmental contamination with lead and contaminated drinking water sources. Others include brain and central nervous system disorders from mercury exposures, respiratory health disorders, parasitic infestations and Sexually Transmitted Infections (STIs) such as Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome (HIV/AIDS).

Access to healthcare services in mining communities is a challenge due to the non-availability of healthcare facilities in some areas, cost of transport and treatment for conditions that are not covered by the National Health Insurance Scheme (NHIS). Ghana has a public health strategy to reduce the exposure of ASGM communities to mercury. It includes considerations to prevent the exposure of vulnerable populations to mercury, particularly children and women of child-bearing age. The key areas of the strategy are mitigation of direct health impacts of mining, mitigation of indirect health impacts of mining, strengthening health system capacity and strengthening capacity of other institutions.

The following are among the main recommendations made based on the findings from the field surveys:

- Exempt ASGM licences from parliamentary ratification requirements;
- Establish new categories of ASGM to cover medium scale licenses;
- Enhance enforcement of regulations, including with the support of technology such as drones;
- Initiate social interventions to improve livelihoods;
- Assist miners with financial assistance to enable them invest in technology;
- Build capacity of regulatory agencies;
- Intensify public education;
- Create the necessary platforms to enable women participate in the debate on ASGM.
- Repeal and replace the Mercury Law, 1989 (PNDCL 217);
- Investigate and map illegal trade flows/routes;
- Create systems for tracking import/export and distribution by 2025
- Build capacities across different levels including institutional, stakeholder, community, enforcement, miners, border cooperation and communications.
- Streamline licensing and make it accessible;
- Accelerate the formalisation process of the ASGM sector;
- Improve environmental management (Reclamation, rehabilitation and mine closure;)
- Prohibit whole ore amalgamation (WOA)
- Prohibit open burning/burning in residential areas;
- Prohibit use of cyanide on mercury contaminated tailings;
- Minimize exposure to mercury;
- Assist miners to create tailored mercury free processing workflows;
- Speed up transition to mercury free processing.

The NAP outlines a series of activities and strategies through which the objective of the

Convention, in the area of ASGM will be achieved by Ghana. These include, implementation strategies on formalisation of the sector, promoting reduction of emissions, releases and risks of exposure to mercury; managing trade and preventing diversion of mercury and mercury compounds; involvement of stakeholders; strengthening public health initiatives aimed at prevention and mitigation of exposures; provision of information to miners and affected communities; and additional strategies including market-based mechanisms.

The NAP also has a detailed and comprehensive work plan describing concrete actions necessary to implement the various strategies. The details covered include a schedule for implementation, activity lead(s), budget, and expected outputs.

SECTION II: Introduction and Background

The Minamata Convention on Mercury

The Minamata Convention on Mercury (the Convention) is a global agreement to protect human health and the environment from the adverse effects of mercury. The text of the Convention was agreed in January 2013, opened for signature in October 2013 and came into force on 16 August 2017. The Convention addresses mercury, a globally ubiquitous and naturally occurring metal, that has broad uses in everyday objects and industrial processes. Mercury is released to the atmosphere, soil and water from a variety of sources. Reducing and eliminating anthropogenic sources of mercury throughout its lifecycle, has been a key factor in shaping the obligations under the Convention. As a result, the Convention includes, in part, measures to control the supply and trade of mercury, phase-out of certain products and processes that use mercury, control measures for air, land and water emissions and releases, waste management requirements, actions to address contaminated sites, and steps to reduce, and where feasible, eliminate mercury use in artisanal and small-scale gold mining. Health aspects are addressed in a stand-alone article (Article 16) to emphasise the importance of the impact of mercury from various sectors on human health, as well as in other articles where specific engagement with the health sector is needed. The Convention also includes measures for technical exchange and international support.

ASGM and the Minamata Convention

ASGM is estimated to be responsible for mercury emissions of over 700 tonnes per year to the atmosphere, and an additional 800 tonnes per year of mercury releases to land and water, making it the largest anthropogenic source of mercury (AMAP/UNEP 2013). The Convention on Mercury defines ASGM as:

"...gold mining conducted by individual miners or small enterprises with limited capital investment and production..." Article 2(a).

Mercury is used by artisanal and small-scale gold miners to extract gold in many parts of the world, including Ghana. Conditions favouring the use of mercury in ASGM include affordability relative to the price of gold, ready accessibility, ease of use, and ability to be used in many locations. Mercury use allows miners to produce gold quickly, often in one day. ASGM is practised by an estimated 1 million people and indirectly affects about 4.5 million people in Ghana.

Obligations of Parties contained in Article 7 and Annex C of the Convention

Article 7 of the Convention addresses ASGM in which mercury amalgamation is used (Annex 1). It requires that any country with such ASGM activities within its territory, "take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in ASGM, and the emissions and releases to the environment of mercury from such mining and processing" (Article 7.2). If the country determines that its ASGM activities are "more than insignificant" (Article 7.3), it must notify the Secretariat, and must develop and implement "a national action plan in accordance with Annex C" (Article 7.3(a)).

Annex C outlines the elements of the NAP. Paragraph 1 of Annex C describes the mandatory elements of the NAP, while Paragraph 2 describes additional elements that countries may include.

Each party that is subject to the provisions of Article 7 paragraph 3 and Annex C of the Convention, shall include in its NAP the following information:

- The scope of mercury in the ASGM sector;
- An inventory of quantities of mercury used and practices employed in the sector;
- An assessment of the health impacts of mercury use in ASGM;
- Baseline consumption of mercury and other harmful chemicals, including cyanide; and
- An assessment and cost-benefit analysis of technically available and economically feasible techniques and technologies to replace the use of mercury.

Submission of the NAP and Reporting Requirements

Under Article 7, a Party after developing its NAP, "shall submit it to the Secretariat no later than three years after entry into force of the Convention for it or three years after the notification to the Secretariat, whichever is later". Thereafter, a party must submit a review of progress in meeting its obligations under Article 7 every 3 years. These reviews are to be in reports submitted under Article 21 of the Convention.

Ghana's request to conduct a NAP

Ghana became a signatory to the Convention on 24 September 2014 and ratified it on 23 March 2017 as the 40th Party.

In 2020, the mining industry in Ghana accounted for about 5% of the country's GDP and minerals make up 48.4% of gross merchandise exports, of which gold contributes over 90% of the total mineral exports (Source: Ghana Chamber of Mines 2020 Annual Report). Gold remains the main focus of Ghana's mining and minerals development industry. Ghana currently has 16 large-scale mining companies producing gold, diamonds, bauxite and manganese. There are over 3,000 registered small-scale mining groups and ninety mine-support service companies.

As a result of significant contribution of the ASGM to Ghana's economy and in accordance with Article 7.3, Ghana notified the Convention Secretariat in 2016, that its ASGM activities are "more than insignificant". Subsequently, Ghana through the United Nations Industrial Development Organization (UNIDO), applied for funding from the Global Environment Facility (GEF) to develop and implement "a national action plan in accordance with Annex C" (Article 7.3(a)). Ghana's application was approved by GEF in 2016 with UNIDO as the Implementation Agency.

<u>Overview of the NAP Development Process in Ghana</u>

In developing a NAP and its subsequent review/update, countries may wish to follow a process involving six major steps, namely:

(I) Establishing a coordinating mechanism and organisation process;
(ii) Developing a national overview of the ASGM sector, including baseline estimates of mercury use and practices developed as part of the mercury inventory activity;
(iii) Setting goals, national objectives and mercury reduction targets, including elimination of mercury uses in ASGM where feasible;
(iv) Formulating an implementation strategy;
(v) Developing an evaluation process for the NAP; and
(vi) Endorsing and submitting the NAP.

Ghana organised an inception workshop for the development of the NAP on ASGM on January 25th – 27th 2017, at the Alisa Hotel, Accra. At the end of the workshop a multi-stakeholder and multi-sectoral national coordinating mechanism was established known as the Minamata Convention Implementation Committee (MCIC), with the sole task of providing strategic oversight and guidance to all mercury related initiatives in the country, to ensure that they are well harmonised/synergised and being implemented within national priorities.

Membership of the MCIC comprised government ministries, departments and agencies, civil society organisations and relevant international organisations. A Technical Working Group on ASGM as well as a Working Group on Education and Awareness Raising were assigned the responsibility of developing and disseminating the NAP document respectively. An Inter-Ministerial Committee on Illegal Mining (IMCIM) served as the advisory committee to the MCIC.

Basically, the process for the development of the NAP were in four key stages:

1. Inception meeting for stakeholder consultation, formation of steering committee and assigning of roles and responsibilities;
2. Conducting of baseline assessment in five ASGM districts to document the amount of mercury use and the prevailing ASGM practices;
3. Engagement with two ASGM districts for development of the health component focusing on the health impacts of mercury use in ASGM for the development of a public health strategy; and
4. MCIC sub-working group/technical review meetings, drafting, stakeholder endorsement and finalisation of the NAP document.

The NAP provided Ghana the opportunity to outline a clear and transparent basis for the development and implementation of activities to reduce, and where feasible, eliminate mercury use, emissions and releases from ASGM at the national level. In addition to the obligations outlined in the Convention, the NAP also allowed Ghana to incorporate other economic, social, environmental, and legal aspects that affect the ASGM sector within the context of sustainable development at the local, national and regional levels.

The development, finalisation and validation of the NAP was participatory, involving all national stakeholders in the management of mercury in the ASGM sector.

The activities of the project helped fill the gaps required to develop the NAP in the following ways:

- Assisting the Government of Ghana and ASGM partners, to formulate strategies to reduce mercury emissions; and
- Increasing awareness of the risks to human and ecosystem health.

The development of the NAP also helped Ghana to identify and prioritise hotspots for future investment and intervention to promote sound chemicals management as a key component of green industrial growth. Lessons learnt and experiences gained from national capacity building and development of the NAP in Ghana, would be used as a model approach to be replicated in other countries to effectively address similar issues.

The following were the five main outputs of the NAP development process:

- Output 1.1: Information disseminated and project coordination mechanism established;
- Output 1.2: National comprehensive analysis of ASGM sector completed to support the development and implementation of a road map to reduce mercury emissions and releases;
- Output 1.3: Institutional and capacity needs assessment completed to develop a public health strategy on ASGM;
- Output 1.4: Rapid health situation assessment conducted; drafting of the public health strategy initiated and awareness raising workshops organised;
- Output 1.5: NAP drafted, finalised and presented to relevant stakeholders for endorsement.

NAP Project Coordination and Execution Arrangements

The Environmental Protection Agency (EPA), under the Ministry of Environment, Science, Technology and Innovation (MESTI) served as the main national executing agency for the development of the NAP. EPA is the designated national authority for the Convention in Ghana, responsible for project management and execution.

UNIDO acted as the GEF Implementing Agency (IA) for the development of the NAP, provided technical advice, and also coordinated and monitored project activities. All work plans, responsibilities, timelines, and budget, were reviewed and approved by the UNIDO to ensure fast, safe, and accurate execution of the project.

The World Health Organization (WHO) served as the executing agency for the health component of the NAP, as recommended by Article 16 of the Convention. This was done in close collaboration with the Ministry of Health (MoH) and Ghana Health Service (GHS).

The Natural Resource Defense Council (NRDC), a non-profit organisation based in the United States of America and the co-lead of the ASGM area under the Global Mercury Partnership, was responsible for the activities under Output 1.2 (National comprehensive analysis of ASGM sector which supported the development and implementation of strategies to reduce mercury emissions and releases) and also provided support towards the development of the NAP.

SECTION III: National Overview

ASGM is widely practised in thirteen out of the sixteen regions of Ghana and provides an important source of livelihood for both proximate and distant communities. The regions where ASGM is not widely practised, are Greater Accra, Volta and Oti Regions.

The Minerals Commission has established nine mining district centres located close to mining areas, to provide technical extension services including information sharing, the provision of advice, assistance and training in best practices for mining, processing, marketing, environmental sustainability, health and safety.

In 2017, the Minerals Commission estimated that there were about one million small-scale gold miners in Ghana. This includes a wide range of people whose livelihoods are directly connected to the sector (miners, supervisors, processors, and managers). ASGM also indirectly supports the livelihood of other people in rural areas, through a secondary economy of those who provide goods and services to the sector. The level of mechanisation determines the size of the workforce.

Small-scale gold miners use a range of mining methods, depending on the type of deposit and where it occurs. Aryee (2003), categorised mining methods in Ghana, into three groups, based on ore type being extracted; namely, shallow alluvial; deep alluvial; and hard rock mining.

Mineral Processing Methods

Typically for alluvial ores, the material is traditionally processed using a sluice box to obtain gold concentrate. When processing hard rock ores, the raw ore must be crushed and milled before it can be further processed. Traditionally, this involves the use of hand-held tools. However, jaw crushers, hammer mills, ball mills and modified corn mills, are also used. The milled material is mixed with water and sluiced or otherwise separated to obtain a gold concentrate. In recent times, some Ghanaian small-scale gold miners have begun adopting semi-mechanised and mechanised mining methods in most mining districts, which includes the use of more sophisticated milling and concentration techniques.

Mineral Extraction Methods

The amount of mercury used in ASGM, is directly related to characteristics of gold production, specifically the types of gold deposits exploited, and the methods used to extract gold from the ores. The Baseline Inventory of Mercury Use in Artisanal and Small-Scale Mining in Ghana contains detailed descriptions of both gold extraction and processing in Ghana. These methods are summarised below.

(a) Concentrate Amalgamation

The use of mercury for gold extraction from concentrate (amalgamation) is widely practised among Ghana's small-scale miners because it is legal, simple, inexpensive, readily available, and has a long history of use in the country.

Mercury is usually added to gold concentrates and mixed to form an amalgam. This amalgam is then heated to separate the gold from the mercury.

Concentrate amalgamation is what is predominantly practised in Ghana, although the field study found isolated instances where mercury was added directly to the sluice, which in effect, constitutes whole ore amalgamation. This was observed at a mine site at Wassa Japa in the Asankragwa Mining District Centre. Field observations also uncovered an unusual practice of "double-amalgamation at a mine site in Prestea." In this case, mercury is applied to gold concentrate to form an amalgam. However, because the gold deposits in this area are also high in lead, the amalgam ball is dissolved in nitric acid to eliminate lead associated with the material. The acid solution is poured off, leaving behind gold, which is then amalgamated a second time. This practice uses nearly twice as much mercury as normal concentrate amalgamation.

To prevent mercury vapours from escaping freely into the surrounding environment, some efforts have been made to introduce devices, called retorts, that capture the mercury vapour during the amalgam burning process, thereby reducing emissions.

(b) Mercury-free Methods

The University of Mines and Technology (UMaT) has developed a direct smelting kit called Sika Bukyia (see Figure 4). In this method, gold concentrate is placed in a furnace together with

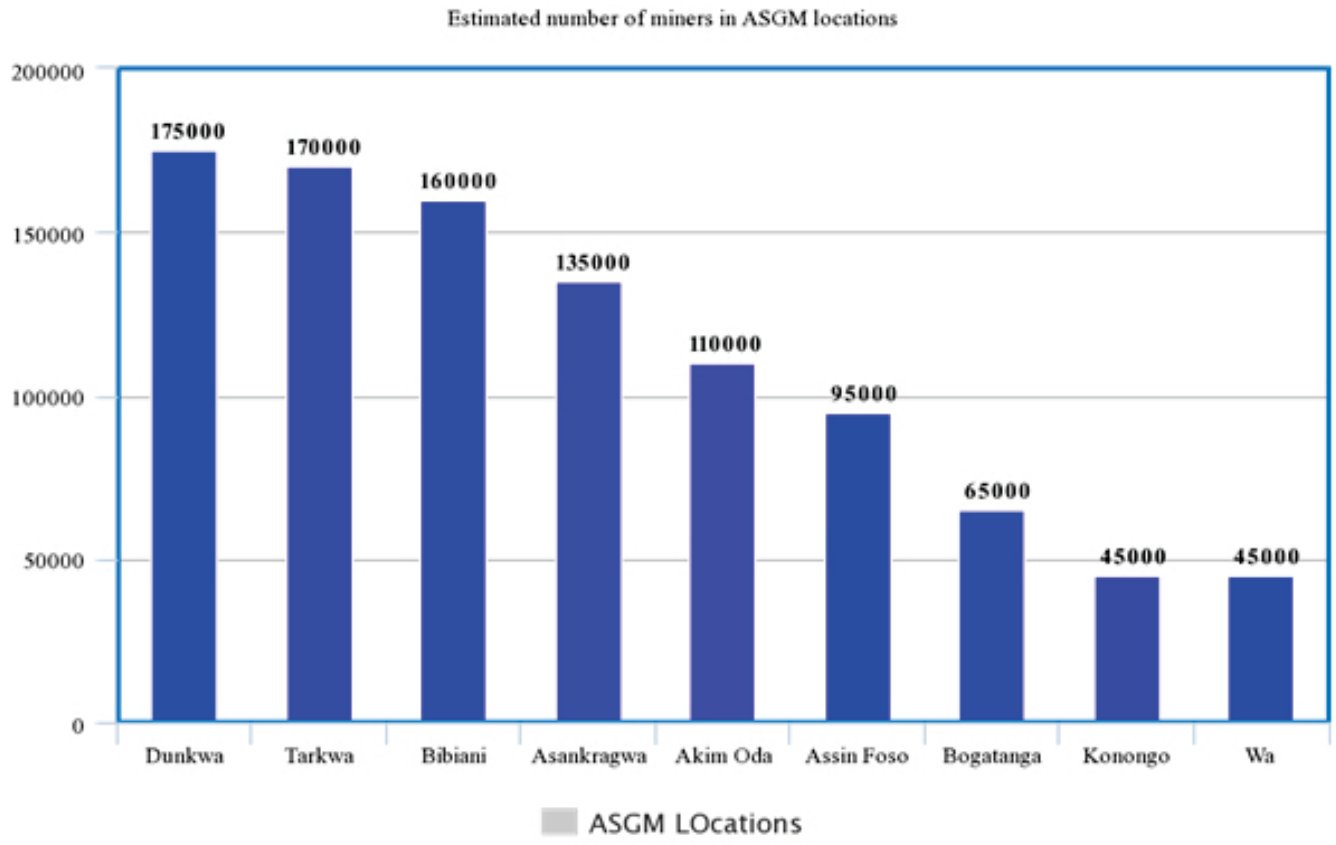
chemical fluxes to directly smelt gold at high temperatures (Amankwah et. al., 2010). In controlled conditions, the amalgamation process yielded a minimum recovery of 95 percent, while direct smelting conducted on alluvial, free milling and sulphidic ores, recovered an estimated 99%. These practices were then tested in the field and resulted in gold recovery of 98% for direct smelting versus 88% for amalgamation.

Other mercury-free processes have been developed in a range of settings but their applicability depends on the type of ore and the skills of the processors. A summary of considerations for reducing or eliminating mercury use in small scale gold mining, is available within UNEP and AGC's, "A Practical Guide: Reducing Mercury use in Artisanal and Small-Scale Gold Mining (2012)."

Chemical Leaching

Gold may be recovered from ore or tailings by leaching with chemicals. The most common method of chemical leaching is cyanidation. In this process, cyanide is added to milled ore and water. The gold in the ore is dissolved to form a water-soluble gold-cyanide complex. The common method used by artisanal and small-scale gold miners to recover this gold is to adsorb the gold-cyanide complex onto hard carbon and then burn the carbon to yield the gold. Another common method is to precipitate the gold onto zinc and then dissolve the zinc with acid leaving behind a gold paste which is then melted and poured into a bar.

Cyanidation in ASGM is widely practised in the neighbouring countries of Burkina Faso and Mali. Although, there have been reported cases of the use of cyanide in the ASGM sector in Ghana, according to the EPA, currently, no ASGM operator has met the requirement for the use of cyanide in mineral processing.



Best and Worst Practices

Winnowing, direct smelting, and enhanced concentration, are among the best practices used in some ASGM sites in Ghana. Notably, some of these processes are practised in Gbani, Tarkwa, Bogoso, Bibiani, Dunkwa, and Oda. Worst practices in the ASGM sector are: whole ore amalgamation; open burning of amalgam; burning amalgam in a residential area; and use of cyanide after mercury.

ASGM Governance

ASGM was legalised in Ghana through the passage of the Small-Scale Gold Mining Law of 1989. That Act defined small-scale mining as "…mining by any method not involving substantial expenditure by an individual or group of persons not exceeding nine in number or by a co-operative society made up of ten or more persons". (There is no upper limit on the number of persons stated in the law). In 2006, the Minerals and Mining Act, 2006 (Act 703) was enacted to consolidate and update all mining laws, including requirements for small-scale mining. A National Mining Policy was also approved by Cabinet in 2014. A summary of relevant laws and regulations is discussed below:

- National Mining Policy, 2014: Establishes the overall policy framework for mining in Ghana. Regarding small-scale mining, the Policy aims to "enhance the development of an efficient, modern and sustainable sector, involving both precious and industrial[1] minerals."

- Minerals and Mining Act, 2006 (Act 703) as amended: empowers the Minister responsible for Mines to issue licences for small-scale mining operations and designate areas for ASGM operations. The Act was amended in 2015 (Act 900), to (a) add substantial fines and penalties (including criminal penalties) for foreigners who unlawfully engage in small-scale mining, and for Ghanaians who engage foreigners to undertake small-scale mining; and (b) authorises the police to seize their equipment. A series of regulations to enable the effective implementation of the law, were passed in 2012 and include detailed regulations on licensing; health, safety and technical; resettlement and compensation; support services; and explosives.

- Environmental Protection Agency Act, 1994 (Act 490): Empowers the EPA to issue environmental permits for mining operations, and to prescribe and ensure compliance with environmental regulations.

- Water Resources Commission Act, 1996 (Act 522) and Water Use Regulations (2001), govern water use. The Commission in consultation with the EPA, can require water users, including miners, to provide an environmental management plan.

- National Land Policy, 1999: Provides a framework and direction to address issues such as land ownership, security of tenure, land use and development, and environmental conservation.

Key National Institutions on ASGM

- Minerals Commission (MC) was established by the Minerals Commission Act of 1993 (Act 450) to regulate and manage mineral resources, and to coordinate and implement policies relating to mining. The Inspectorate Division of the Minerals Commission (IDMC) grants operating and digging permits for ASGM after a mining licence has been granted by the Minister responsible for Mines.

- The Environmental Protection Agency (EPA) is responsible for ensuring environmentally sound operations of mines. EPA evaluates applications and issues environmental permits to small-scale miners. EPA is also responsible for overseeing the use of mercury as part of its chemicals' management responsibilities.

- The Water Resources Commission (WRC) was established in 1996 with the mandate to regulate and manage Ghana's water resources and coordinate government policies in relation to them. Ownership and control of all water resources are vested in the President on behalf of the people, and the WRC is defined as the overall body responsible for water resources management in Ghana. The WRC, which provides a forum for integration and collaboration of different interests, is composed of the major stakeholders involved in the water sector. The responsibilities of the WRC are, inter alia, processing of water rights and permits, planning water resources development and management, collating, storing and disseminating data and information on water resources in Ghana, monitoring and assessing activities and programmes for the utilisation and conservation of water resources.

- Ghana Geological Survey Authority (GGSA)

[1]Current usage replaces industrial minerals with development minerals

generates and manages geological and geoscientific information, including information on mineral and ground water resources, environment geo-hazards and land use planning. It is mandated to carry out geological mapping, collect geoscientific data and disseminate these data to the public.

- Precious Minerals Marketing Company (PMMC) is responsible for grading, assaying, valuing and processing of precious minerals. The company also promotes the development of precious minerals and the jewellery industry and exports gold on behalf of third parties.

- Ghana Revenue Authority (GRA) oversees the collection of taxes and royalties from ASGM. GRA is also responsible for overseeing imports of mercury to ensure compliance with import licences and the collection of required duties.

Organisation of miners at ASGM sites

In all designated districts where the MC operates district offices, there are associations or co-operatives of ASGM operators. The most proactive and recognised one is the Ghana National Association of Small-Scale Miners (GNASSM). The Association was formed through the facilitation of the MC as a business association of small-scale miners across Ghana. GNASSM represents the voice and views of small-scale miners at both the national and local level, though women are under-represented. It plays an active role in the promotion of effective, efficient and responsible artisanal and small-scale mining for sustainable development. It also acts as liaison with the government and is a source of information for miners about new laws and policies, including the Minamata Convention. GNASSM has close links with the MC and holds quarterly meetings. It is decentralised and has executives and offices at the national level and in all mining areas where the MC operates district offices. Within its district structures, there are zonal offices to provide services close to doorsteps of the miners. Apart from GNASSM, there are other small-scale miners' associations and co-operatives at different levels of designated small-scale mining centres.

At both legal and illegal sites, miners are very well organised. There are clear designation of roles and responsibilities at the mines ranging from concession owners, financiers or sponsors, managers, supervisors, ghetto owners, diggers, processors, security guards etc. At some mines, community elders and mine owners form local committees to manage the mines.

Mineralogy

The typical ore grades for gold mined in Ghana are as follows: alluvial and colluvial (0.5g/T -3g/T), hard rock (1g/T – 10g/T), with an average typical gold purity of 22k. As a result of the presence of silver and quartz in Ghana's gold mining process, it is difficult to determine the exact amount of gold produced at a typical ASGM site.

Mercury Trade

Mercury is obtained from shops, dealers and gold buyers. For mining centres where processing is done at the site, most of the mercury is supplied by mine owners or sponsors. At processing sites, mercury is usually supplied by gold buyers as an incentive to miners to sell their gold to them. From the Baseline Mercury Use Survey Report, some mercury is imported from Burkina Faso. The Report also indicated that the market chain for the acquisition of mercury and sale of gold is a complex one. It involves informal cross-border routes; clandestine deals between mercury suppliers and ASGM miners; informal agreements between gold brokers and ASGM miners, and owners of gold processing centres and miners.

The market price of mercury in 2019 in the mining districts where the survey was conducted ranged from GHS 875 (US$175) to GHS1,250 (US$ 250) per kg. A 330 ml soda bottle (equivalent to 4.5 kg) of mercury was sold for GHS 3,000 (US$ 600). The variation in price is attributed to demand and supply of mercury as well as distance from the source. Along the local supply chain, most of the mercury imported are in bottles of 1 or 2 kg and refilled into smaller bottles depending on the market. Below this level of supply, bottled portions are measured into 'eye drop' (liquid eye medication) bottles commonly known as poho which is estimated to weigh 40 g of mercury and priced between GHS 35.00 (US$7.00) and GHS 50.00 (US$10.00).

Socio-economics, Health, and Environment

As of 2017, the MC estimated that there were about 1 million small-scale miners in Ghana. This estimate is consistent with Hilson (2010), who estimated that there were about 500,000 to 1,000,000 small-scale gold miners nationwide, mostly in rural areas. The numbers above include a wide range of people whose livelihoods are directly connected to the sector (the miners, supervisors, processors, and managers).

The number of women and children working and involved in the ASGM sector, continues to be an ongoing and important discussion. Often, the data reported on women, tends to rely on old publications with very little investigation into the reliability of the data (Hilson, et. al., 2018). A recent report published by Hilson et. al. (2018) showed that out of the estimated number of 200,000 ASGM operators in Ghana, 50-75% are women.

Child labour in Ghana has also been acknowledged as a problem, gaining increasing attention of some key stakeholders. Human Rights Watch (2015) cited a Ghanaian government survey (2014) which reported that about 22% of children are involved in child labour and 14% of these are involved in hazardous work.

Priority Areas for NAP Strategies

Priority strategies identified within the NAP include the following:

- Eliminate worst practices in ASGM
- Accelerate the formalisation process of the ASGM sector
- Reduce mercury use in ASGM by twenty five percent (25%) by 2030
- Accelerate the adoption of occupationally and environmentally safe practices by artisanal and small-scale gold miners
- Establish effective systems to manage trade including prevention of diversion of mercury and mercury compounds from foreign and domestic sources by 2030
- Establish effective communication systems to provide and disseminate information on best practices and benefits in ASGM, as well as the impact of mercury use on miners and mining communities.
- Ensure the continuous involvement of all relevant stakeholders in the effective implementation of the NAP.

1 Planned And Previous Experiences In Addressing ASGM

Ghana has undertaken several initiatives aimed at improving the ASGM sector since its legalisation in 1989. Those initiatives, whether planned, ongoing or past can be categorised under the following areas:

- Formalisation;
- Mercury reduction;
- Reducing child labour; and
- Occupational Health, Safety and Environment

Details of the initiatives are described below highlighting the partners and the project objectives under the listed areas. A comprehensive list of past projects can be found in Annex A.

1.1 Formalisation initiatives

Initiatives instituted towards formalisation in the sector include the Inter-Ministerial Committee on Illegal Mining, Community Mining Programme and Ghana Artisanal and Small-Scale Mining Formalisation Project.

1.1.1 The Inter-Ministerial Committee on Illegal Mining

As part of government's efforts to address illegal mining and improve formalisation of the sector, the President set-up the Inter-Ministerial Committee on Illegal Mining (IMCIM) in March 2017, to coordinate the regulation of small-scale mining activities. The Committee has been involved in vetting and verification of small-scale mining licences/companies, training of over 4,500 miners in sustainable mining and mineral processing operations, registration of excavators and installation of tracking devices.

A software known as GalamSTOP has been developed to track the life-cycle of mining licences and associated permits, for real-time monitoring of GPS tracked excavators and as a platform for reporting illegal mining activities. Officers from the MC have also been trained as drone pilots and data analysts. Drone pilots and data analysts were trained in districts where illegal mining is prevalent. To facilitate their work, drones, tablets, high-end laptops (work stations) and other accessories, have been provided.

In collaboration with the Enhanced Pollution Monitoring (EPM) and sponsored by the European Space Agency, a customised satellite-based remote sensing service known as GalamWATCH has been implemented to map and monitor artisanal and small- scale mining (ASM) activities as well as abnormal land cover change(s) such as that associated with deforestation.

A livelihood diversification programme has been implemented targeting about 1,107 youth in 35 selected districts that have been adversely affected by illegal mining. A Community Mining Programme is also being implemented.

1.1.2 Community Mining Programme (CMP)

The Community Mining Programme (CMP) commenced in 2019 as a government flagship intervention designed to ensure sustainable livelihood opportunities for miners who do not have the financial resources to own their concessions, in order to be part of a communally-owned mine. It is an all-inclusive approach to mining which involves the community including the traditional authority, land owners and miners, as direct shareholders in the mining business and its funds management, to ensure equitable distribution of returns. It aims at assisting miners through enhanced technical capacity-building, to adopt reduced mercury approaches (e.g., retorts) or at best mercury-free technologies in gold processing. It also aims at improving gold supply and value chain and encouraging local community participation. The programme is currently being piloted at Wassa Amenfi East, Akrofruom and Adansi North Districts. To facilitate the pilot, government provided support by undertaking demarcation of concessions for the CMP at no cost to the miners.

1.1.3 Ghana ASM Formalisation Project

This is a five-year project supported by the World Bank (WB) and implemented by Ghana's Ministry of Lands and Natural Resources (MLNR). The aim is to create enabling conditions for the orderly, safe, sustainable, and environmentally sound development of artisanal and small-scale mining in Ghana. The project seeks to address legal and regulatory weaknesses or gaps; institutional capacity; technical constraints (licensing, geology, mining and processing); environmental issues;

economic and social sustainability and provision of alternatives to illegal mining. The proposed funding is about U$80 million, consisting of a US$60 million International Development Association (IDA) loan and about US$20 million of Global Environment Facility (GEF) and Forest Investment Programme (FIP) grants as well as other donor contributions.

1.2 Mercury reduction in ASGM initiatives

1.2.1 Global Opportunities for Long-term Development in Artisanal and Small-Scale Mining Programme (GOLD+ programme).

In July 2020, Ghana was selected by the Global Environment Facility (GEF) to be part of the second phase of its Global Opportunities for Long-term Development in Artisanal and Small-Scale Mining Programme (GOLD+ programme). This programme is a USD 6.3 million special facility designed by the GEF to fast-track mercury reduction in the ASGM sector and to make small-scale mining cleaner, safer and profitable. UNDP is the lead agency and will be implementing the project with EPA and support from UNIDO. The programme components include support the formalisation of the ASGM sector; granting of access to finance enhanced by financial inclusion and responsible supply chains; introduction of best available technologies for small scale mining and knowledge sharing, communication and local capacity building support.

1.2.2 Africa Environmental Health and Pollution Management Program (AEHPMP)

The EHPMP is funded by the World Bank and aims to promote sustainable inclusive growth by improving access to environmental services through knowledge sharing and capacity building; strengthening human capital by improving health of vulnerable populations, especially women and children; complementing other regional initiatives and individual projects, focusing on competitiveness, sustainability and governance in Ghana, Kenya, Senegal, Tanzania and Zambia.[2] Components include: (1) institutional strengthening, capacity building and knowledge sharing; (2) support to policy dialogue and regulatory enhancements; and (3) demonstrating application of technological tools and economic approaches. In Ghana, it will improve artisanal practices of small-scale miners, enhance the sector's competitiveness (by adopting new mining technologies, improving land and water management), and protecting the poor and vulnerable (by improving maternal and child health and labour practices).

1.2.3 Reduction of Mercury Use in the Artisanal & Small-Scale Gold Mining (ASGM) Sector through the Development of Tailored Mercury-Free Processing Workflows for ASGM Operations in Ghana

This project is funded by the US Department of State and implemented by Friends of the Nation. It aims to develop mercury-free process flows for small scale miners, based on the typical characteristics of ores found in Ghana. The project will provide small-scale gold miners assistance in equipment selection, reagents, and increased recovery without the need for mercury based on the ore type. This information will allow miners to choose cost-effective approaches for their own mercury-free processes.

1.2.4 The Responsive Engagement and Collective Learning Approaches to Inform Mercury Substitution in ASGM, Ghana (RECLAIMS ASGM Ghana)

Funded by the U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs (OES), and implemented by the Fund for Peace, this project aims to reduce mercury use in ASGM through both technological and policy means. RECLAIMS is focusing on two key ASGM pilot areas, Western region in the south and Upper East region in the north, to demonstrate best practices and to engage in community sensitisation, with the goal to replicate and scale up throughout the country. RECLAIMS will complement existing efforts of various government agencies on ASGM. RECLAIMS will coordinate multi-stakeholder platforms for key agencies, civil society, miners and donors to increase information exchange on their efforts related to ASGM reform and conduct awareness activities to promote safe and sustainable ASGM in Ghana.

1.3 Reducing Child Labour Initiatives

1.3.1 CARING Gold Mining Project

Funded by the US Department of Labour, and implemented by the International Labour Organization (ILO) together with local partners in both Ghana and the Philippines, this project focused on strategies to reduce child labour and improve working conditions in ASGM[3]. In Ghana, the CARING project took place across the Ashanti and Western Regions and within the Adansi North and Aowin Districts respectively. This included working on strengthening laws and policies to address child labour, increase monitoring; increase access to social protection services, as well as developing and disseminating innovative solutions to reduce child labour and improve

[2]http://documents.worldbank.org/curated/en/758581542745960738/pdf/Concept-Project-Information-Document-Integrated-Safeguards-Data-Sheet-Africa-Environmental-Health-and-Pollution-Management-Program-P167788.pdf

[3]https://www.dol.gov/agencies/ilab/caring-gold-mining-project

working conditions. Activities carried out included reviewing draft legislation, training government stakeholders, strengthening Civil Society Organisations (CSOs), and raising awareness about child labour in ASGM. The project has suggested five key recommendations for addressing child labour: (1) changing the social norms and behaviour around child labour at mining sites with targeted community-level campaign and advocacy (specifically traditional authorities, community leaders, miners' association leaders and regulators); (2) identifying vulnerable households and educating parents, especially females, to enrol in livelihood programmes such as LEAP, National Health Insurance Scheme and a social welfare support system; (3) asking district officials to engage financial services to promote and offer education to miners on financial management and thereby reduce financial illiteracy; (4) engaging with Metropolitan, Municipal and District Assemblies to monitor and handle child-labour related issues in the districts, and encouraging the EPA and the MC to strengthen monitoring and enforcement of their regulations to ensure compliance with proper mining practices; and (5) disseminating information on the safety requirements and use of Personal Protective Equipment (PPE) at work sites (ILO, 2017).

1.4 Occupational Health, Safety and Environment Initiatives

1.4.1 World Bank Forest Investment Program and Enhancing Natural Forest and Agroforest Landscapes Project: Additional Financing

On May 3, 2019, the World Bank announced an additional package of $9.89million to supplement its existing Forest Investment Project (World Bank, 2019). This additional financing is aimed at rehabilitating small-scale mining sites in forested areas. The project is expected to not only reduce erosion into water bodies, but also enhance forest resources through tree-planting and provision of economic opportunities, related to rehabilitation activities.

1.4.2 The Accelerator for Responsible Gold

Solidaridad, a Netherlands-based NGO, developed the Accelerator for Responsible Gold, a project to support more rapid adoption of better practices in ASGM by improving access to knowledge, equipment and financing in the sector, through building capacity of local service providers. They also aim to build the case for why responsible mining makes sense from a business perspective. More information can be found here: https://www.solidaridadnetwork.org/sites/solidaridadnetwork.org/files/publications/Solidaridad-Gold-Accelerator-2018x.pdf

1.4.3 Pan-African Support to the EuroGeoSurveys-Organisation of African Geological Surveys (EGS-OAGS) Partnership (PanAf GEO)

PanAf GEO uses an extensive training programme to increase African-owned geological knowledge and skills for sustainable mineral exploitation, related infrastructures, natural disaster prevention and mitigation. For the ASM sector, the project trains geological authorities, regulatory agencies and others, to better assist ASM operators. Training themes include the socio-economics of ASM, regulations and policies, mineral processing methods, occupational health and safety issues related to ASM, business development and related issues[4]. In Ghana, the project conducted training in 2017, led by the Ghana Geological Survey Authority (GGSA) in cooperation with the Geological Survey of Denmark and Greenland (GEUS). The project also produced a guidance document on ASM that covers a wide range of relevant topics including the regulatory structure for ASM in Ghana, basic geology, mine planning, minerals processing, health, safety and environmental issues as well as social, economic and financial dimensions (Tychsen et. al., 2017).

1.4.4 Accountability, Rule of Law and Anti - Corruption Programme (ARAP)

The Accountability, Rule of Law and Anti-corruption Programme (ARAP) began in 2016, through an agreement between the European Union Delegation (EUD) and the Government of Ghana (GoG). The programme is designed to promote good governance and support national reform, in order to enhance accountability and strengthen anti-corruption efforts across the country. The objective of the programme is to work alongside relevant government institutions and other strategic national stakeholders to reduce corruption, while improving accountability and respect for the legal structures already in place to fight it. It acts as a support programme for central government, but crucially has a wide coverage across the nation, also ensuring that both men and women's voices are heard. Environmental governance is a cross-cutting issue in the programme, tackled from both the 'demand' side (public education for awareness and the use of reporting and complaints mechanisms) and 'supply' side (strengthening the criminal justice system to enforce environmental laws) of accountability and anti-corruption.

[4] http://panafgeo.eurogeosurveys.org/trainings/artisanal-and-small-scale-mining/

1.4.5 Comprehensive Health in Artisanal Mining Programme in Ghana (CHAMP)

This programme is championed through a collaboration between the Government of Ghana and the Vatican's Dicastery for Promoting Integral Human Development (DPIHD), who together wish to align their efforts to realise the creation of a more responsible and equitable artisanal and small-scale mining sector. This project will support sustainable and systemic responses to improving the quality of life of the large and vulnerable artisanal mining population in Ghana. This Programme will engage with artisanal and small-scale mining communities to better understand their occupational health risk and disease burden, and implement an innovative and sustainable package of health, safety, environmental and socio-economic interventions, to reduce occupational exposure and disease.

2 Geographical Distribution Of ASGM

2.1 Geology of Ghana

2.1.1 Regional Geology

Ghana lies within the extensive West African Craton in which gold producing Paleoproterozoic Birimian rocks exist. About two-thirds of Ghana is dominated by the gold bearing Paleoproterozoic Birimian rocks consisting of five evenly spaced volcanic belts trending northeast-southwest. The intervening basins between the volcanic belts are filled by sediments. The remaining one-third is made up of post-Birimian rocks made up of the Dahomeyan Metamorphic Terrane, the Togo Series, the Buem Formation and Voltaian Sedimentary Basin.

The supracrustal rocks are highly deformed. However, the sedimentary rocks are particularly characterized by extensive folding. The lavas are mainly of basaltic composition, though andesitic, dacitic and rhyolitic rocks are also present. Some pattern of facies distribution is shown by the Birimian sedimentary basins from the margins towards the basin centres.

The transition zone between the volcanic belts and the sedimentary basins, is marked by chemical facies, which has of late, been found to be the site of lots of gold mineralization.

Both the volcanic belts and sedimentary basins, are intruded by three types of granitoids differing in age, mineralogy and chemistry, namely: (i) Granitoids in the sedimentary basins - the Cape Coast type - are dominated by two-mica granites; (ii) Granitoids associated with the volcanic belts - the Dixcove-type - are dominated by hornblende-bearing granites; (iii)The late K-rich granitoids (post-Tarkwaian) comprising the Bongo, Tongo and Banso granitoids. Each of the Birimian volcanic belts contains meta-sedimentary rocks - the Tarkwaian Group lie unconformably over the Birimian. The Tarkwaian consists entirely of conglomerates, sandstones, phyllites and slates derived from the Birimian country rocks.

Alluvial gold deposits have been derived from weathering, erosions and transportation of lode quartz veins and stock works from the Birimian rocks. The alluvial deposits occur in stream- belts, alluvial flats, old valleys and terraces of most streams that drain the Birimian rocks. Bonte Mine has operated and exploited one of the richest alluvial deposits, which lies some few kilometers away from the present concession area.

2.1.2 Regional Mineralisation

Mineralisation in Ghana can be divided into two environments based on spatial association. The first environment lies close to the boundary faults that separate greenstone belts from basinal sediments; the second is found within the intra-basinal assemblages.

The age of mineralisation is not known. However, lithologic and structural associations strongly suggest that mineralisation is late-stage and is associated with wrench faults along the basin margins. Remobilisation of existing gold or poly-phase introduction, is not precluded. Mineralisation in the basins shows temporal relationship to granitic plutons controlled along the major intra-basinal shears. The gold mineralisation belts from the southeast towards the north include:

i. Kibi-Winneba Belt
ii. Ashanti Belt
iii. Sefwi Belt
iv. Bui Belt
v. Bole-Nangodi Belt
vi. Lawra Belt

These belts are separated by gold mineralisation basins including:

i. Birim River Basin
ii. Kumasi Basin (Asankragwa Belt)
iii. Sunyani Basin
iv. Maluwe Basin

2.1.3 Alluvial Gold Deposits

The vast majority of historical gold production from Ghana, prior to the 20th century, came from a myriad of small streams and rivers draining areas with underlying oxide and primary deposits. Several of the major rivers, such as the Tano, Ankobra, Pra, Ofin and Birim Rivers have been mined and continue to be mined in several parts of Ghana.

Ghana Geological Survey
Geology and Mineral Resources Map of Ghana

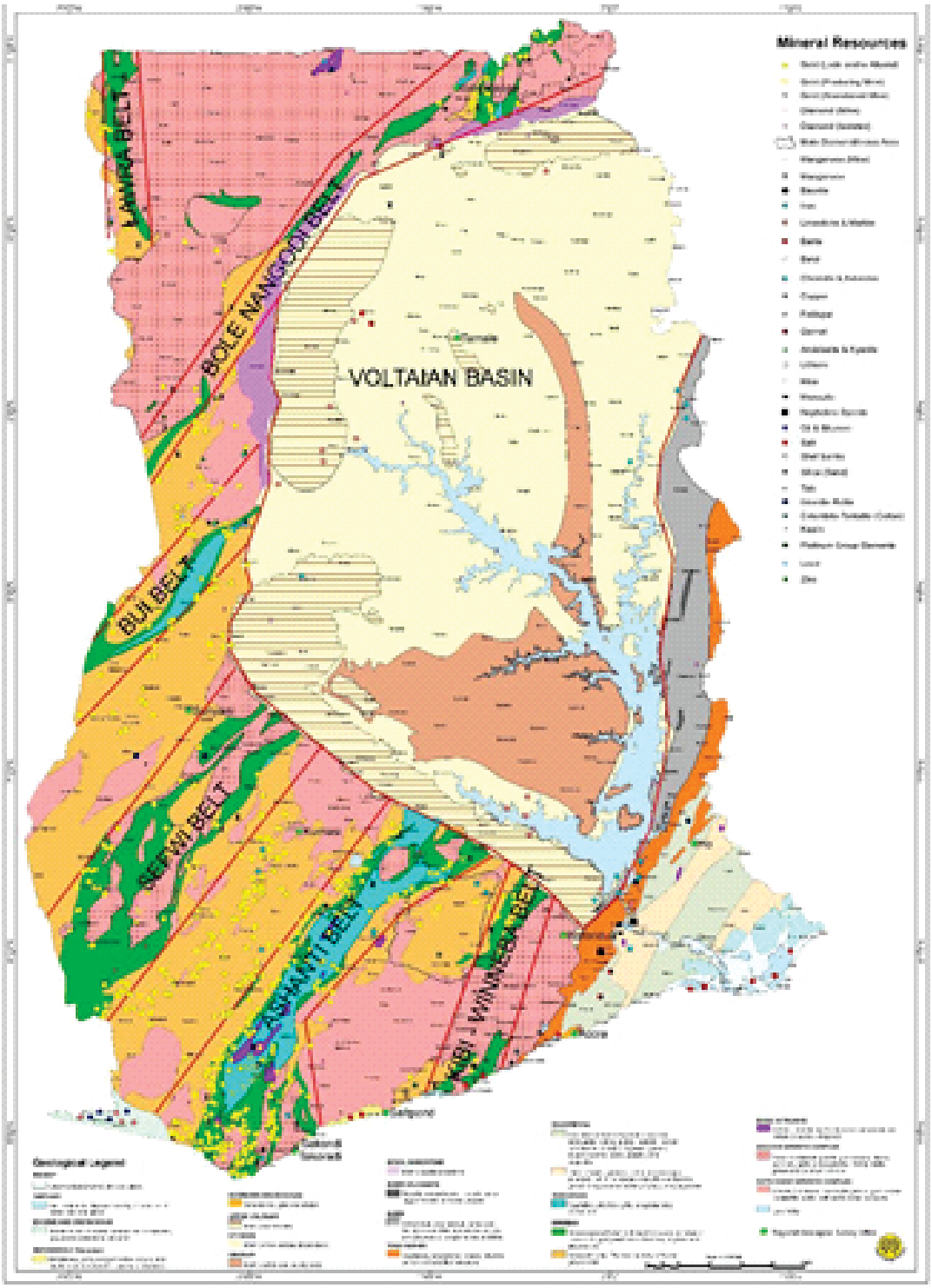


Figure 2: Geological and Mineral Resources Map of Ghana

2.2 Geographic Distribution of ASGM Activities

ASGM is widely practised in thirteen out of the sixteen regions of Ghana and provides an important source of livelihood for both proximate and distant communities. The regions where ASGM is are not widely practised, are Greater Accra, Volta and Oti Regions. The MC has established nine mining district centres located close to mining areas, to provide technical extension services including information sharing, provision of advice and assistance; training in best practices for mining, processing, marketing, environmental sustainability, health and safety. These centres are manned by District Officers who are experienced mining engineers, to provide assistance within small-scale mining areas in close proximity to their respective locations in Tarkwa, Asankragwa, Bibiani, Assin Foso, Akim Oda, Dunkwa on-Offin, Konongo, Wa and Bolgatanga.

The biggest ASGM operations occur in Tarkwa, Bibiani, Dunkwa, Asankragwa and Akim-Oda District Centres.

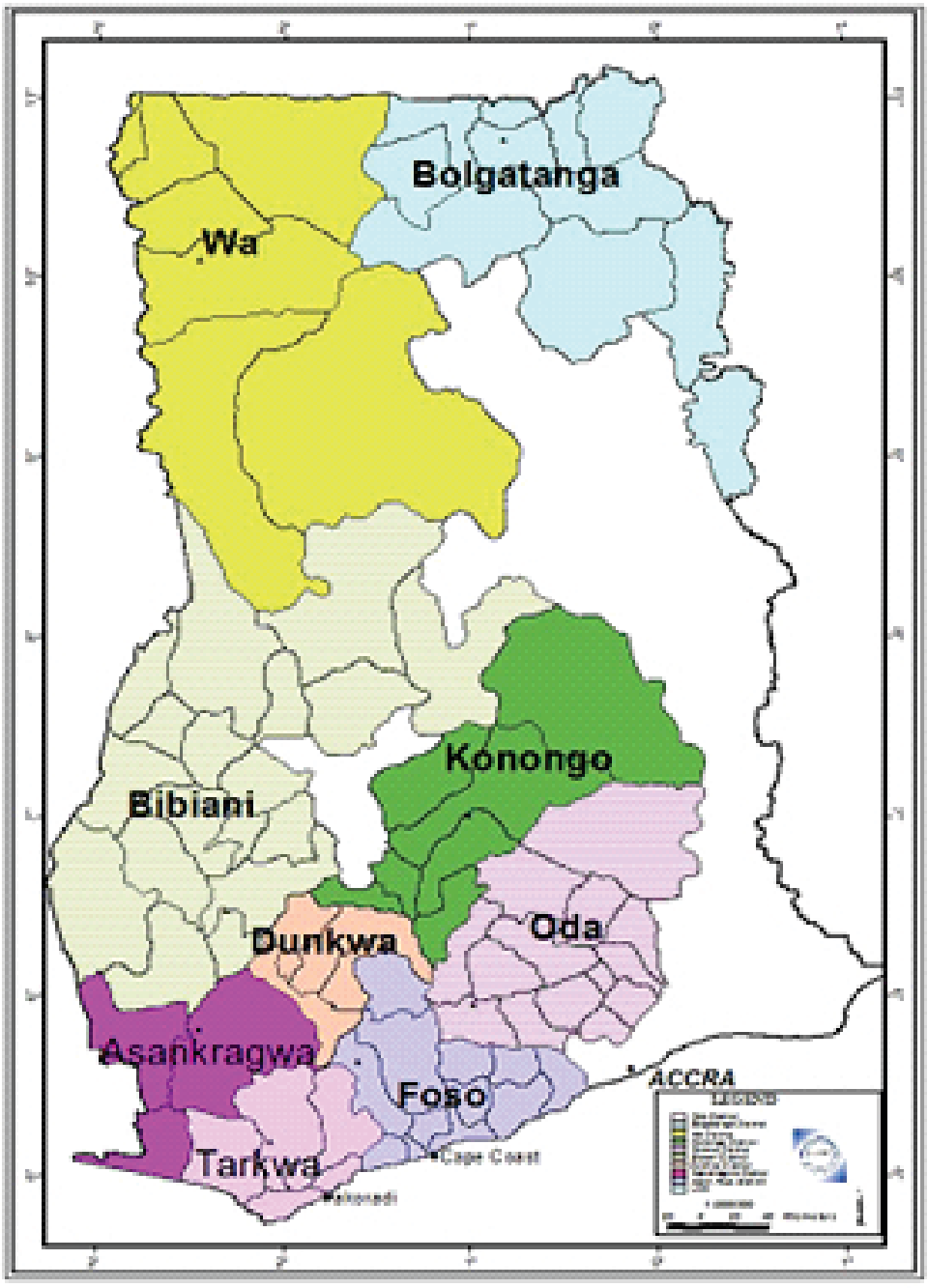


Figure 3a: Map of Mining Districts in Ghana

The Minerals Commission has recently created 4 new District Centres in Cape Coast, Ho, Hohoe and Kenyase. The Ho and Hohoe Centres are mostly for development/industrial minerals The Dunkwa District Centre is now located in Obuasi.



Figure 3b: New AGSM Centres

3 Mining And Mineral Processing Information

3.1 Gold Occurrences

Gold mined by ASGM operators occurs as:

(a) Hard rock deposits (including quartz vein and paleoplacer type gold deposits)
(b) Eluvial deposits (including oxide and laterite deposits); or
(c) Alluvial deposits

3.2 Mining Methods

Small-scale gold miners use a range of mining methods, depending on the type of deposit and where it occurs. Aryee (2003) categorised mining methods in Ghana into three groups, based on ore type being extracted: shallow alluvial; deep alluvial; and hard rock mining.

Shallow alluvial mining techniques (often called "dig and wash") are used to access shallow alluvial deposits. These techniques involve excavation of vegetation and top layers of soil (usually not more than three meters) by hand or machine to reach the gold. These deposits are relatively accessible and do not necessarily require heavy equipment; thus, many artisanal (and illegal) operations use these techniques. Note that river dredging also falls into this category, where sediments are suctioned directly from river bottoms for processing.

Deep alluvial mining techniques are used to mine deep alluvial deposits found along rivers. Pits are usually dug to depths of 7 to 12 meters, where the gold is reached. Terraces are sometimes built at the sides of the pits to prevent collapse. This kind of mining is common along Pra, Bonsa, Ankora, Birim, and Tano rivers.

Hard rock mining techniques are used to mine veins (also called reefs) of gold-bearing rock (usually quartz). These rock deposits can be located close to the surface or deep. Miners dig until they hit one of these veins. On finding a vein, they then mine by following the vein. Small-scale miners use chisels and hammers for mining hard rock, but explosives may also be used.

Table 1 describes the distribution of these extraction techniques within Ghana, and estimates the number of miners associated with each technique.

Table 1: Estimated Distribution of Small-Scale Gold Mining Extraction Practices in Ghana, by District

District	Estimated Number of miners	Alluvial: Land based		Alluvial: Dredging		Hard rock: Tunnel/shaft		Hard Rock: Pit	
		%	#	%	#	%	#	%	#
Akim Oda	110,000	70%	77000	20%	22000	10%	11000	0%	0
Asankragwa	135,000	50%	67500	25%	33750	20%	27000	5%	6750
Assin Foso	95,000	60%	57000	30%	28500	0%	0	10%	9500
Bibiani	160,000	75%	120000	10%	16000	15%	24000	0%	0
Bolgatanga	65,000	5%	3250	0%	0	90%	58500	5%	3250
Dunkwa	175,000	70%	122500	25%	43750	3%	4375	3%	4375
Konongo	45,000	55%	24750	15%	6750	20%	9000	5%	2250
Tarkwa	170,000	45%	76500	25%	42500	25%	42500	5%	8500
Wa	45,000	2.5%	1125	17.5%	7875	50%	22500	30%	13500
TOTAL			549625		201125		198875		48125

3.2.1 Mineral Processing Methods

In the case of alluvial ores, alluvial material is traditionally processed using a sluice box to obtain gold concentrate. When processing hard rock ores, the raw ore must be crushed and milled before it can be further processed. Traditionally, this involves hand-held tools, for example "pounding" (crushing and grinding) using locally designed mortars and pestles. However, jaw crushers,

hammer mills, ball mills and modified corn mills are also used. The milled material is mixed with water and sluiced or otherwise separated to obtain a gold concentrate.

In recent times, some Ghanaian small-scale miners have begun adopting semi-mechanised and mechanised mining methods in some mining districts, particularly Tarkwa. This includes the use of more sophisticated milling and concentration techniques.

3.2.2 Mineral Extraction Methods

The amount of mercury used in ASGM, is directly related to gold production, specifically the types of gold deposits exploited and the methods used to extract gold from the ores. The Baseline Inventory of Mercury Use in Artisanal and Small-Scale Mining in Ghana, contains detailed descriptions of both gold extraction and processing in Ghana. These methods are summarised below.

Concentrate Amalgamation

Mercury is usually added to gold concentrates and mixed to form an amalgam. This amalgam is then heated to separate the gold from the mercury. From the field observation, the residue concentrate from the amalgamation stage, is kept in a bowl for re-sluicing and amalgamation. The field study observed that mercury is burnt in residential areas where community members including (women and children) are exposed to the vapours, and in almost all cases, was burnt without the use of a mercury vapour capture device. When there are no measures in place to capture the mercury released from this burning process, it can pose immediate risks to the workers, who directly inhale this dangerous vapour. Further, if the burning is done in residential areas, other community members (including children) can be exposed to the vapours.

Mercury may also settle in the surrounding environment, contaminating structures, vegetation, lands, and water-bodies, and remain available for re-emission through volatilisation. Some mercury may not settle immediately, but may travel far distances through the atmosphere and get deposited in areas far from the sites. Mercury in the air, that is deposited in water bodies, can be transformed by bacteria into methyl mercury, which is then absorbed and bio-accumulated by a variety of living organisms including fish. Methyl mercury is a dangerous neurotoxin, especially to young children.

The use of mercury for gold extraction from concentrate (amalgamation) is widely practised among Ghana's small-scale miners because it is simple, inexpensive, has a long history of use in the country, it is legal and the mercury is readily available. Concentrate amalgamation is what is (exclusively) practised in Ghana. The baseline mercury use survey, however, found isolated instances where mercury was added directly to the sluice, which in effect, constitutes whole ore amalgamation. This was observed at a mine site at Wassa Japa in the Asankragwa Mining District Centre. Further, the field survey uncovered an unusual practice of “double-amalgamation at a mine site in Prestea.” In this case, mercury is applied to gold concentrate to form an amalgam. However, because the gold deposits in this area are also high in lead, the amalgam ball is dissolved in nitric acid to eliminate lead associated with the material. The acid solution is poured off, leaving behind gold, which is then amalgamated a second time. This practise uses nearly twice as much mercury as normal concentrate amalgamation.

Use of Retorts to Control Mercury Vapor Exposure

To prevent mercury vapours from escaping freely into the surrounding environment, some efforts have been made to introduce devices, called retorts, that capture the mercury vapour during the amalgam burning process, thereby reducing emissions. In theory, mercury captured in a retort can be reactivated and reused, or it can be safely stored or disposed of properly. However, in practise, retorts are rarely used by miners in the field. For example, a glass retort was introduced in Ghana in the past, but the miners considered it costly and fragile so uptake was low (Veiga et. al., 2014). This is consistent with experiences elsewhere in the world. Jønsson et. al., (2009) reported that nearly none of the 300,000 small-scale gold miners in Tanzania used retorts, despite the legal requirement to do so. Kiefer et. al., (2015) also reported very low retort use in Guyana, Ecuador and Mozambique, despite intense efforts to introduce the devices, their ease of use and relatively low cost. These reports are consistent with our field observations, which found a retort in use at only one out of 30 visited field sites, as well as consultation with miners, who confirmed that retorts were rarely used. Miners gave a number of reasons for not using retorts, including the fragility of the glass retort, cost of the equipment, length of time it takes to use the retort, the length of time needed to cool the retort before opening and retrieving gold, and discoloration of the gold.

The University of Mines and Technology (UMaT), Tarkwa, has recently been involved in efforts to produce a locally-made retort that may be more widely accepted. The "lantern" retort is meant to address some of the concerns of miners, including the fragility of the glass and issues of conductivity (Amankwah, et. al., 2017).

It should be noted that even when retorts are used, they are not completely effective at preventing mercury exposure. Under field conditions, retorts generally capture only 75% or 80% of mercury. The retorts can also become contaminated and act as a source of exposure if not handled properly. Contaminated retorts stored in a car or other indoor space, can become a source of exposure to mercury vapour, which can concentrate in enclosed spaces (AGC, 2014). These devices therefore require careful handling.

Mercury-free methods

UMaT has developed a direct smelting kit called Sika Bukyia. In this method, gold concentrate is placed in a furnace together with chemical fluxes to directly smelt gold at high temperatures (Amankwah et. al., 2010). The practice of direct smelting and amalgamation for gold recovery, were tested under controlled and field conditions. In controlled conditions, the amalgamation process yielded a minimum recovery of 95%, while direct smelting conducted on alluvial, free milling and sulphidic ores, recovered an estimated 99%. These practices were then tested in the field and resulted in gold recovery of 98% for direct smelting versus 88% for amalgamation.

Time, along with operating cost, are two important factors miners consider when choosing gold processing techniques. Amalgamation, retorting and smelting involves more steps and can take longer than direct smelting. A cost comparison of operational inputs for direct smelting and amalgamation of 62g of gold processed and contained in a concentrate amalgamation, reported a cost of US$5.50 for amalgamation, which included expenses such as: the use of mercury, fuel (charcoal) for heating the amalgam. Comparatively, direct smelting, has a total processing cost of US$3.20. Direct smelting also recovers gold particles that cannot be extracted by mercury amalgamation. This makes this process potentially even more attractive. The authors noted that miners who were present for the demonstrations, volunteered their gold-containing black sands for smelting using the Sika Bukyia.

Other mercury-free processes have been developed in a range of settings but their applicability depends on the type of ore and the skills of the processors. A summary of considerations for reducing or eliminating mercury use in small scale gold mining, is available within UNEP and AGC's guide (2012).

Chemical Leaching

Gold may be recovered from ore or tailings by leaching with chemicals. The most common method of chemical leaching is cyanidation. In this process, cyanide is added to milled ore and water. The gold in the ore is dissolved to form a water-soluble gold-cyanide complex. The common method used by artisanal small-scale gold miners to recover this gold, is to absorb the gold-cyanide complex into hard carbon and then burn the carbon to yield the gold. Another common method is to precipitate the gold onto zinc and then dissolve the zinc with acid leaving behind a gold paste which is then melted and poured into a bar.

The use of cyanide for leaching gold is increasing among small-scale miners in Ghana. The practice is commonly referred to as "Burkina" as it is believed to have been introduced to Ghanaian miners by Burkinabes. The extent to which cyanide is used directly by small-scale miners for primary extraction of gold from ore is unknown. However, cyanide is widely used in the neighbouring countries of Burkina Faso and Mali. From the field survey, cyanide leaching ponds were found in Obuasi in the Dunkwa Mining District. According to the miners, this became very common during the ban on small-scale mining operations in 2017.

As a way to sustain their livelihoods during this period, miners who had stockpiled tailings dug cyanide leaching ponds to treat their tailings. This process allows them to recover more gold and obtain more income. As reported earlier, miners sold their tailings to specific large-scale mining companies who in turn use cyanidation to recover the gold. According to the EPA, the use of cyanide for gold processing by artisanal small-scale gold miners is not illegal. However, any ASGM operator seeking to use this method, must meet stringent requirements prior to obtaining an environmental permit as is the case in the large-scale mining sector where leaching with cyanide is allowed. Presently, this is an illegal activity for ASGM since no ASGM operator has obtained the requisite approvals to do so.

4 Baseline Estimates Of The Amount Of Mercury Used In ASGM

From the baseline inventory, the total national estimate ranges from a low of 42.5 tonnes per year to a high of 62 tonnes per year. The national estimate is presented as a range, because there is significant uncertainty regarding the number of alluvial miners in each district that are using mercury. In the field survey, all alluvial miners were observed to use mercury. However, some experts assert that many alluvial miners recover coarse gold using only gravity methods. There is no data available to accurately estimate the number of alluvial miners engaged in this kind of mercury-free mining. Due to this uncertainty, a low and high national estimate of mercury use were derived; the low estimate assumes that 60% of alluvial miners use mercury (based on personal communication from GNASSM); the high estimate assumes that nearly all alluvial miners use mercury. All hard rock miners are assumed to use mercury in both scenarios.

In the baseline study, a total of 30 representative sites in 5 key mining districts were visited. The estimated population of miners in these 5 districts, represents over 65% of the total number of small-scale miners in Ghana in 2017, according to the Minerals Commission. In the survey, information on gold production and rate of mercury use were collected, together with the number of miners working at each site. Combining these data with the total number of miners working in each district, (see Table 2) yielded an estimate of gold production and associated mercury use in each district, based on 2019 data:

Table 2: Estimated Gold Production and Mercury Use in Visited Districts

Type of ore	District	Average gold production per miner (gminer/yr)	Number of miners*	Total estimated gold production (kg/yr)	Average Hg:Au ratio	Total Hg Use (kg/yr)
Hard rock	Tarkwa	86.4	51000	4,406	1.2:1	5,288
	Dunkwa	45.6	8750	399	1.3:1	519
	Asankragwa	60.9	33,750	2,055	1.2:1	2,466
	Bolgatanga	31.5	61750	1,945	1.1:1	2,140
	Akim Oda	22.5	11,000	248	1.2:1	297
Alluvial (Land Base)	Tarkwa	37.5	77,000	2,888	1.5:1	4,331
	Dunkwa	82.5	122,500	10,106	1.3:1	13,138
	Asankragwa	61.5	67,500	4,151	1.2:1	4,982
	Bolgatanga	1.5	3,250	5	1.1:1	5
	Akim Oda	61.5	77,000.0	4,736	1.1:1	5,209

During the baseline survey, all miners at the sites visited, were observed to use mercury. Therefore, the district level estimate assumes that all miners use mercury.

The figures below present the high and low-end estimates of mercury use in ASGM Ghana. The total estimate ranges from a low of 42.5 tonnes per year to a high of 62 tonnes per year. The figures show that, national use is dominated by three districts: Tarkwa, Dunkwa and Bibiani.

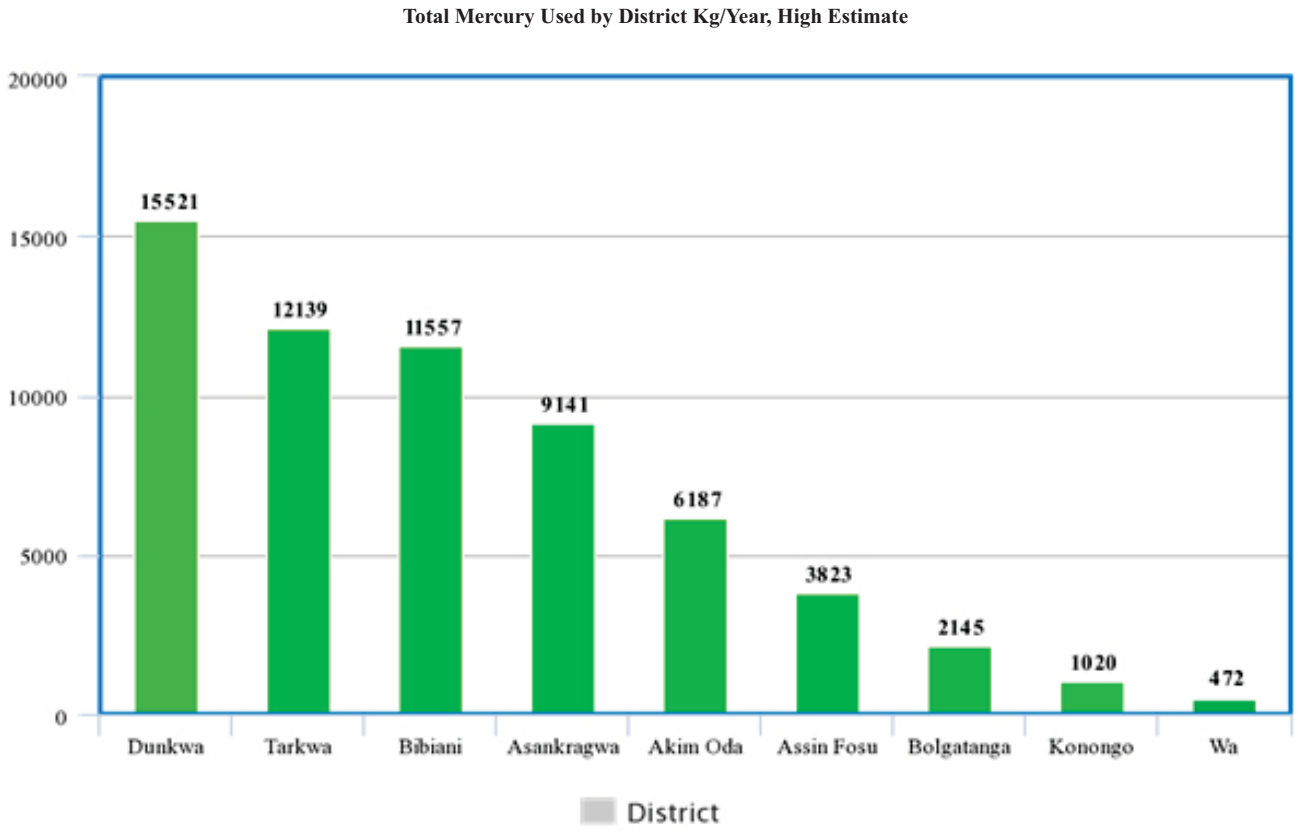


Figure 4: Total Mercury Used by District Kg/Year, High Estimate

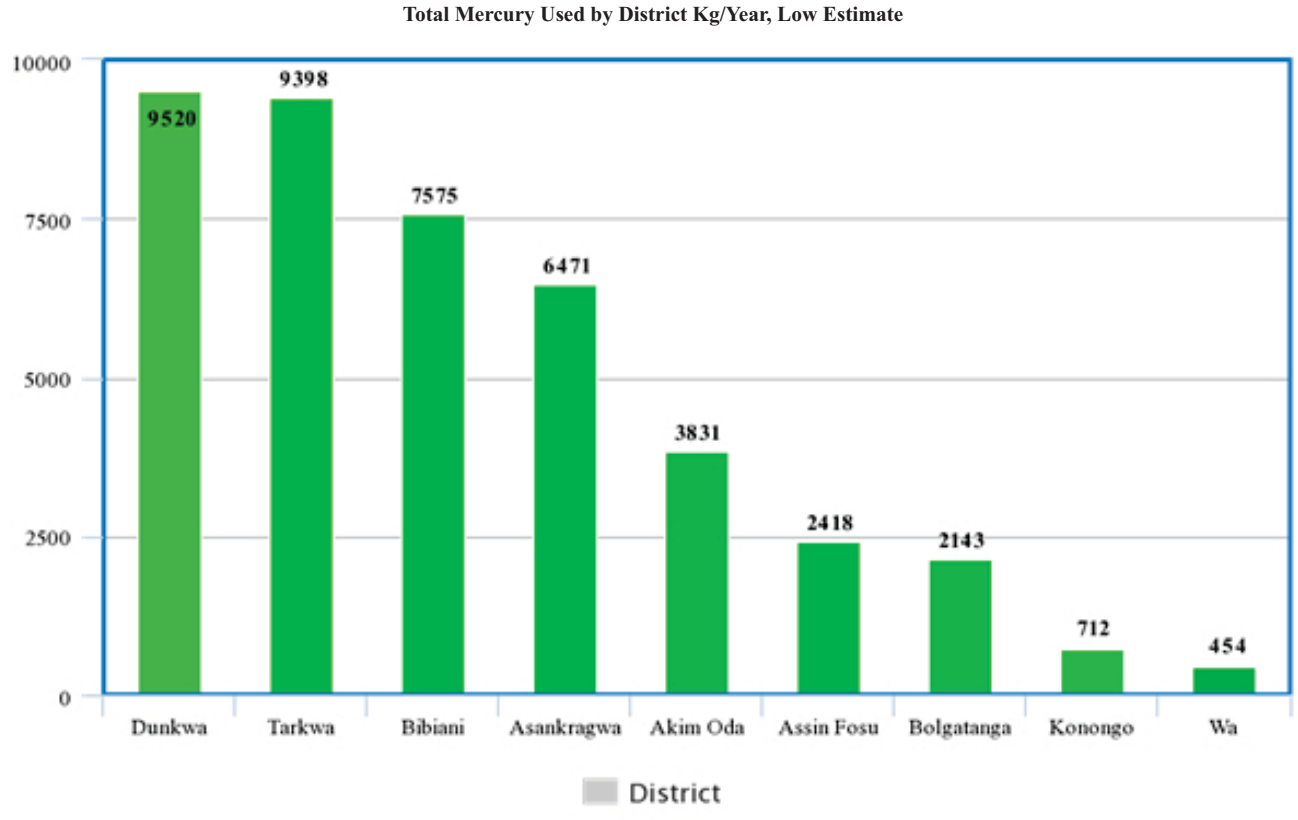


Figure 5: Total Mercury Used by District Kg/Year, Low Estimate

Figures 6a and 6b present use of mercury in ASGM in Ghana by the type of ore mined, for the high and low estimate scenarios. These figures show that most of the mercury used occurred among alluvial miners, even in the low estimate scenario.

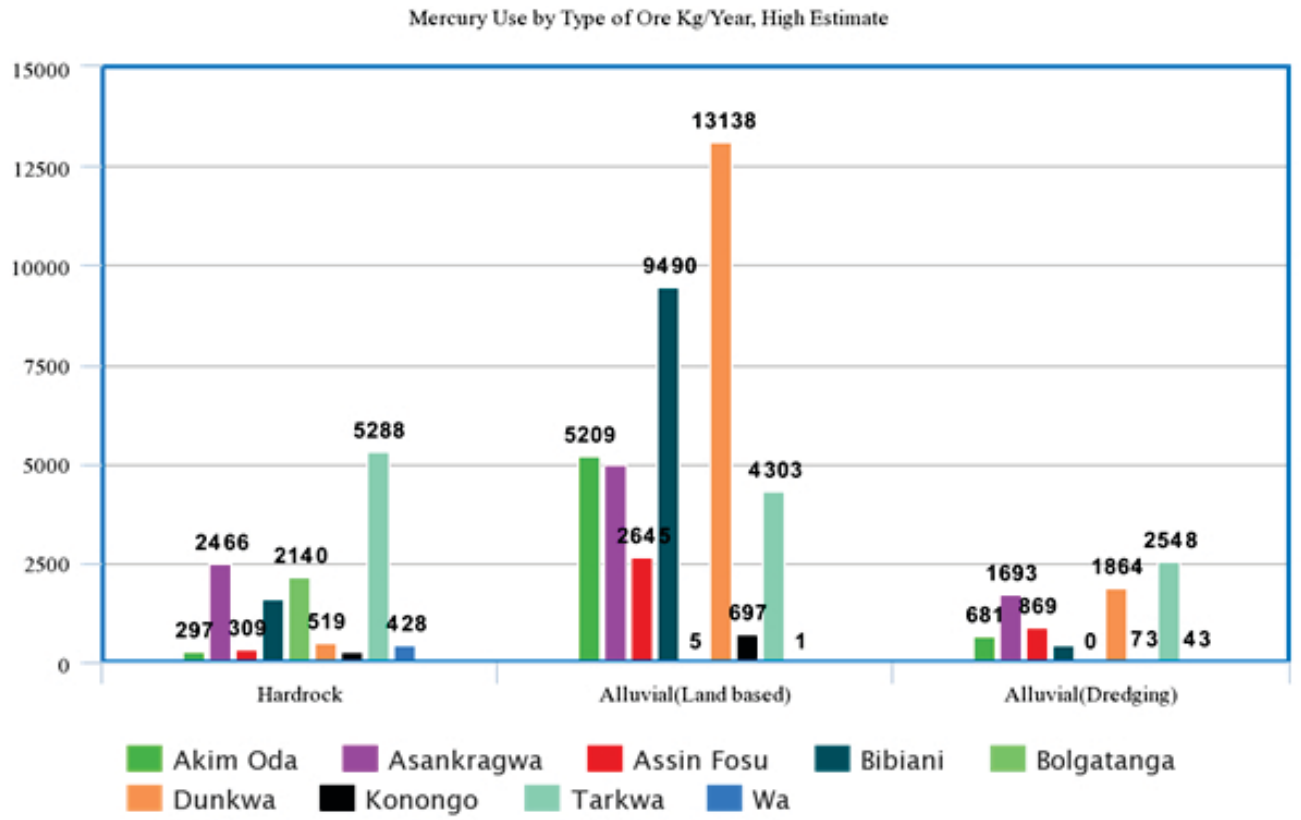


Figure 6a: Mercury Use by Type of Ore Kg/Year, High Estimate

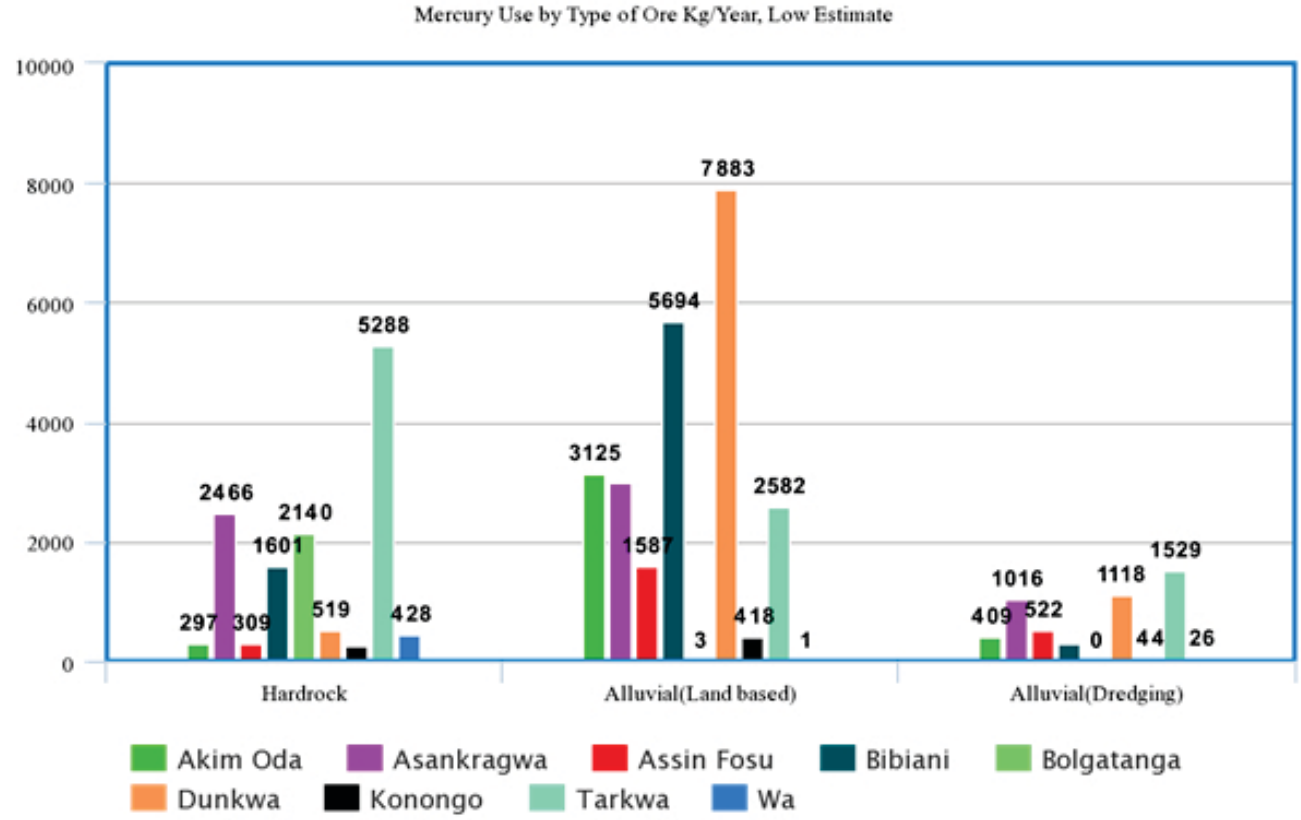


Figure 6b: Mercury Use by Type of Ore Kg/Year, Low Estimate

5 Legal and Regulatory Status

5.1 Legal Framework

5.1.1 The Constitution

The 1992 Constitution of Ghana provides the broad policy basis for the protection of human health and the environment. The relevant sections are as follows:

(a) Economic Development - Article 36 (9): The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for the purposes of protecting the wider international environment for mankind.

(b) Economic Development - Article 36 (10): The State shall safeguard the health, safety and welfare of all persons in employment, and shall establish the basis for the full deployment of the creative potential of all Ghanaians.

(c) Duties of a Citizen - Article 41 (k): The exercise and enjoyment of rights and freedoms is inseparable from the performance of duties and obligations, and accordingly, it shall be the duty of every citizen to protect and safeguard the environment.

(d) Article 268 of the 1992 Constitution states that "Any transaction, contract or undertaking involving the grant of a right or concession by or on behalf of any person including the Government of Ghana, to any other person or body of persons howsoever described, for the exploitation of any mineral, water or other natural resource of Ghana made or entered into after the coming into force of this Constitution, shall be subject to ratification by Parliament.

ASGM was legalised in Ghana with the passage of the Small-Scale Gold Mining Law of 1989. That Act defined small-scale mining[5] as "…mining by any method not involving substantial expenditure by an individual or group of persons not exceeding nine in number or by a co-operative society made up of ten or more persons". There is no upper limit on the number of persons stated in the law. In 2006, the Minerals and Mining Act, 2006 (Act 703) was enacted to consolidate and update all mining laws, including requirements for ASM. A National Mining Policy was also approved by Cabinet in 2014. A summary of relevant policies, laws and regulations are discussed below:

5.1.2 Minerals and Mining Policy, 2014

The Minerals and Mining Policy, 2014 establishes the overall policy framework for mining in Ghana. Regarding artisanal small-scale mining, the Policy aims to "enhance the development of an efficient, modern and sustainable sector, involving both precious and industrial minerals."

5.1.3 National Land Policy, 1999

The National Land Policy, 1999 provides a framework and direction to address issues such as: land ownership, security of tenure, land use and development, and environmental conservation.

5.1.4 Riparian Buffer Zone Policy for Managing Freshwater Bodies in Ghana, 2013

The Buffer Zone Policy is a harmonised document of all the fragmented regulations in the country on buffers bordering water bodies or river systems in Ghana. It is also designed to provide comprehensive measures and actions that would guide the coordinated creation of vegetative buffers for the preservation and functioning of Ghana's water bodies and vital ecosystems. The Policy aims at ensuring that all designated buffer zones along rivers, streams, lakes, reservoirs and other water bodies, are sustainably managed.

Five major areas are emphasised in the policy with specific objectives and measures in the context of national development namely:

(a) Maintaining the ecological and life support functions of buffer zones;
(b) Sustaining the multi-functionality of buffer zones;
(c) Riparian buffer zones specific to urban and peri-urban areas;
(d) Building capacity through research and education, training and empowerment of communities on conservation of buffer zones; and
(e) Coordinating and harmonising

[5]Within the law, artisanal mining is subsumed within the term 'small-scale mining'; it is not regulated separately.

policies, bye laws and traditional practices on buffer zones among government institutions and stakeholders.

The policy confines buffer zones to lands adjacent to rivers, streams, lakes and wetland. Lands at margins of municipal reservoirs are required to be identified and demarcated on a riparian buffer map. ASGM activities are therefore not encouraged in rivers, streams, lakes and wetlands.

5.1.5 Mercury Law, 1989 (PNDCL 217)

The Mercury Law of 1989, prohibits the importation of any quantity of mercury into Ghana except under a license. The prohibition also covers possession, purchase, sale or transfer. The penalty for breach is a fine, imprisonment or both. The Law does not however prohibit the use of mercury in the ASGM sector. ASGM operators may purchase, from licensed dealers, "such reasonable quantities of mercury as may be shown to be necessary for the purpose of their mining operations." The small-scale gold miners are required to: "observe good mining practices in the use of mercury for carrying out mining operations."

5.1.6 Minerals and Mining Act, 2006 (ACT 703), AS AMENDED

This is an Act revising and consolidating mining and minerals laws in Ghana. It empowers the Minister, after consulting the Minerals Commission, to designate areas for ASGM operations. The Minister currently responsible for this Act, is the Minister for Lands and Natural Resources. The Act was amended in 2010, 2015 and 2019 to enable the Minister to prescribe the rates of royalty payments (formerly fixed at five per cent), to enable the confiscation of equipment used in illegal artisanal and small-scale mining operations and include stiffer penalties for offences respectively. An ASGM operator may win and produce minerals by an effective and efficient method and observe good mining practices, health, safety and the protection of the environment. Section 96 prohibits the use of explosives in the operational area, except with the written permission of the Minister responsible for mining. It allows an ASGM operator to purchase mercury from an authorised dealer for use in ASGM operations.

The 2015 amendment also a) added substantial fines and imposed penalties on foreigners who unlawfully engage in ASGM, and for Ghanaians who engage foreigners to undertake small-scale mining; and (b) authorises the police to seize their equipment.

This Act repeals the Minerals and Mining Law, 1986 (PNDCL 153) and Small-Scale Gold Mining Law, 1989 (PNDCL 218) among others and incorporates existing laws and regulations on the sale of mercury and minerals, use of explosives, requirement for environmental permits, etc.

Section 96 indicates that a small-scale miner may purchase from an authorised mercury dealer, the quantities of mercury that may be reasonably necessary for the mining operations of the small-scale miner. The provision is similar to section 4 of the Mercury Law from where it appears to have been borrowed.

Section 93 which deals with the operations of small-scale miners, states that a licensed operator may win, mine and produce minerals by an effective and efficient method and shall observe good mining practices, health and safety rules and pay due regard to the protection of the environment during mining operations.

At the institutional level, section 92 provides for the establishment of a small-scale mining committee made up of political, traditional and governmental appointees including an officer of the EPA. The mandate of the committee who are appointed by the Minister, is to "assist the district office to effectively monitor, promote and develop mining operations in the designated area."

5.1.7 Environmental Protection Agency Act, 1994 (Act 490)

The Environmental Protection Agency Act, 1994 (Act 490) empowers the Environmental Protection Agency (EPA) to issue environmental permits for mining operations, and to prescribe and ensure compliance with environmental regulations in the mining sector. Section 10 (1) establishes the Hazardous Chemicals Committee whose function, among others, is to monitor the use of hazardous chemicals by collecting information on the importation, exportation, manufacture, distribution, sale, use and disposal of those chemicals, including mercury, as stipulated in section 10 (2) (b) of the Act 490.

5.1.8 Water Resources Commission Act, 1996 (Act 522)

The Water Resources Commission (WRC) was

established in 1996 with the mandate to regulate and manage Ghana's water resources and coordinate government policies in relation to them. Ownership and control of all water resources are vested in the President on behalf of the people, and the WRC is defined as the overall body responsible for water resources management in Ghana. The WRC, which provides a forum for integration and collaboration between different interests, is composed of the major stakeholders involved in the water sector. The responsibilities of the WRC are, inter alia, processing of water rights and permits, planning water resources development and management, collating, storing and disseminating data and information on water resources in Ghana, monitoring and assessing activities and programmes for the utilisation and conservation of water resources.

5.1.9 Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)

The Act was enacted to give effect to Ghana's obligations under: the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, 1989; the Stockholm Convention on Persistent Organic Pollutants; and the Rotterdam Convention on Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. It is “an Act to provide for the control, management and disposal of hazardous wastes, electrical and electronic waste and for related purposes.”

The First Schedule of the Act, prescribes the categories of waste controlled under the law and covers mercury and mercury compounds-Y29, Clinical Wastes from medical care in hospitals, medical centres and clinics-Y1.

Section 12 imposes monitoring obligations on the EPA in the management of hazardous wastes in order to prevent any harmful effects of the wastes on human health and the environment, to encourage the adoption of new environmentally sound technologies aimed at minimising the generation of hazardous wastes and other wastes, and to take, encourage and facilitate preventive measures. Section 13(1) imposes an obligation to prevent pollution from hazardous and other wastes and to minimise any effects where these occur and where pollution occurs, to minimise the consequences of the pollution on human health and the environment.

The Act and its Regulations have direct relevance to Article 11of the Convention on mercury wastes.

5.2 Subsidiary Legislation

5.2.1 Environmental Assessment Regulations, 1999 (L.I. 1652)

The Environmental Assessment Regulations, 1999 (L.I. 1652), requires all undertakings including mining, to undertake an environmental impact assessment. The relevance of these regulations is that it affords the proponent an opportunity to minimise or mitigate possible environmental impacts including the impact of mercury on human health and environment.

5.2.2 Hazardous, Electronic and Other Wastes (Classification) Control and Management Regulations, 2016 (L.I. 2250)

The Hazardous, Electronic and other Waste (Classification), Control and Management Regulations, 2016 (L.I. 2250), enacted under the Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917), provides for the classification, control and management of hazardous waste and provides a mechanism and procedure for listing waste management activities that do not require a waste management permit. The Regulations also prescribe the requirement for the disposal of hazardous waste. Regulation 19(c) of L.I. 2250 prohibits the mixing of hazardous wastes where it may cause a risk of pollution or create a problem in the further management of the wastes. This is particularly essential with regards to the use of cyanidation to treat mercury contaminated waste thereby making the mercury more mobile.

The Third Schedule of the Regulations deals with criteria for assessment of waste for landfill disposal including measurements for total concentrations and leachable concentrations of chemical substances, including mercury.

5.2.3 Regulations under the Minerals and Mining Act, 2006 (Act 703)

These Regulations, made under section 110 of the Mining Act, 2006 (Act 703), provide for selected matters to implement provisions of the Act, including, among other things, exportation, sale and disposal of minerals, conditions of mineral rights, obligations under a reconnaissance licence, and obligations of a holder of prospecting licence.

5.2.4 Minerals and Mining (General) Regulations, 2012 (L.I. 2173)

Minerals and Mining (General) Regulations, 2012 (L.I. 2173); regulates the general operation of ASGM licence holders. It requires ASGM licence holders, to commence operations within 6 months after the grant of license or any other period stated in the licence; to conduct their operations in accordance with the approved plan; demarcate and keep demarcated their boundaries; and comply with the terms and conditions of the licence and any directives from the Minerals Commission.

5.2.5 Minerals and Mining (Licensing) Regulations, 2012 (L.I. 2176)

The Minerals and Mining (Licensing) Regulations, 2012 (L.I. 2176) cover the licensing process and procedure for ASM. The L.I. regulates the creation of designated areas for ASM. The regulation provides for the grant of ASGM licences and extension, renewal, amendment, division, merger and suspension or termination of licences. Where the ASM area is designated, the district office receives and processes applications for ASM licences in respect of the designated area.

5.2.6 Minerals and Mining (Support Services) Regulations, 2012 (L.I. 2174)

ASGM licence holders may engage the services of a company registered to provide support services to them and such companies are to be holders of licence Class B. A class B support services provider, means a person who is a Ghanaian and must be specifically or exclusively licensed to provide the following services; mining, processing of ore, reclamation, re-vegetation and management of mining operations, haulage service and transportation of personnel, among others. A person who is not a Ghanaian, and is registered to provide contract services to ASGM licence holders before the commencement of these Regulations, shall be permitted to do so until otherwise determined by the Minister.

5.2.7 Minerals and Mining (Compensation and Resettlement) Regulations, 2012 (L.I. 2175)

Issues of compensation and settlement for those who lost lands to mining, was a major area of concern for several years. These regulations therefore fill an important and critical gap in providing a basis for addressing this problem timeously and preventing protracted conflict.

Among other things, the regulations cover claims for compensation and their assessment, resettlement, resettlement plans and related requirements as well as surface rights and exercise of those rights in a mining area. It also deals with surface rights and compensation outside the mining area.

5.2.8 Minerals and Mining (Explosives) Regulations, 2012 (L.I. 2177)

These Regulations, made under section 110 of the Mining Act, apply to the conveyance, storage, possession, manufacture and use of explosives for mining, quarrying and civil works and to substances used for the manufacture of explosives. It also provides with respect to effects on the environment of the manufacture, storage and use of explosives for mining purposes, fire prevention and emergency response. In Ghana, it is not just the large scale -mining companies that employ the use of explosives in their operations. The ASGM sector also uses explosives. However, they must first obtain written permission from the Chief Inspector of Mines of the Minerals Commission and must be ready to engage a licensed blast man for those operations.

5.2.9 Minerals and Mining (Health, Safety and Technical) Regulations, 2012 (L.I. 2182)

L.I. 2182 establishes environmental, safety, machinery and related guidelines for mining operations. Regulation 473 requires a written permission from the Chief Inspector of Mines to use mercury and also requires the use of a retort for small-scale mining activities. Regulation 474 prescribes for the safe handling of mercury.

5.2.10 Water Use Regulations, 2001(L.I. 1692)

These Regulations, made under Section 35 of the Water Resources Commission Act, 1996, covers the appeal for and grant of authorisation by the WRC to use water. Subject to the Act, a person may obtain a permit from the WRC for: (a) domestic water use (b) commercial water use, (c) municipal water use, (d) industrial water use, (e) agricultural water use, (f) power generation water use, (g) water transportation water use, (h) fisheries (aquaculture).

5.2.11 Drilling Licence and Groundwater Development Regulations, 2006 (L.I. 1827)

These Regulations require a person to obtain a drilling licence, granted in accordance with these Regulations, for the construction of a well for the abstraction or monitoring of groundwater or for research. An application for a licence, shall be made to the WRC which shall keep a register containing the particulars of licences granted and the register may be accessed by the public. An applicant who qualifies for a licence, shall pay a licence fee in accordance with the Fees and Charges (Amendment) Instrument 2019 (L.I. 2386).

5.3 Key Government Institutions Responsible for the Regulation of Mining Operations in Ghana

5.3.1 Minerals Commission

The Minerals Commission is a government agency established under Article 269 of the 1992 Constitution and the Minerals Commission Act, 1993 (Act 450). The MC, as the main promotional and regulatory body for the minerals sector in Ghana, is responsible for "the regulation and management of the utilisation of the mineral resources of Ghana and the coordination and implementation of policies relating to mining".

It also ensures compliance with Ghana's mining and mineral laws and regulations through effective monitoring. The MC's primary responsibility is to foster the efficient and effective regulation and management of the utilisation of Ghana's mineral resources. The Inspectorate Division of the Commission grants operating permits for ASGM, after a mining licence has been granted by the Minister responsible for Mines.

5.3.2 Environmental Protection Agency

The Environmental Protection Agency Act, 1994 (Act 490) established the EPA to be responsible, among other things, for ensuring the environmentally sound operations of mines. The Agency evaluates applications and issues environmental permits to small-scale miners. The Agency also grants clearance permits for importation of mercury and is also responsible for overseeing the use of mercury as part of its chemicals management responsibilities.

5.3.3 Water Resources Commission

The Water Resources Commission (WRC) was established in 1996 with the mandate to regulate and manage Ghana's water resources and coordinate government policies in relation to them. Ownership and control of all water resources are vested in the President on behalf of the people, and the WRC is defined as the overall body responsible for water resources management in Ghana. The WRC, which provides a forum for integration and collaboration of different interests, is composed of the major stakeholders involved in the water sector. The responsibilities of the WRC are, inter alia, processing of water rights and permits, planning water resources development and management, collating, storing and disseminating data and information on water resources in Ghana, monitoring and assessing activities and programmes for the utilisation and conservation of water resources.

5.3.4 Ghana Geological Survey Authority

The Ghana Geological Survey Authority Act, 2016 (Act 928) established the Ghana Geological Survey Authority (GGSA), to generate and manage geological and geoscientific information, including information on mineral and ground water resources, environment geo-hazards and land use planning. It is also mandated to carry out geological mapping, collect geoscientific data and disseminate these data to the public.

5.3.5 Precious Minerals Marketing Company

Precious Minerals Marketing Company (PMMC) is responsible for grading, assaying, valuing and processing of precious minerals. They also promote the development of precious minerals and the jewellery industry and export gold on behalf of third parties. The PMMC was established in 1963, as a Diamond Marketing Board, responsible for the purchasing and marketing of Ghana's diamonds. In 1965, L.I. 405 made the PMMC a State-Owned Enterprise. The name was later changed by L.I. 916, to Diamond Marketing Corporation. Under PNDC Law 219, 1989 the name was changed to Precious Marketing Corporation with functions including appointing licensed buying agents for the purchase of precious minerals produced by ASM. In the year 2000, it was finally converted by Act 461 (Statutory Corporations Conversion to Companies Act) to a Limited Liability Company to operate under the Ghana Companies Act, 2019 (Act 992).

5.3.6 Ghana Revenue Authority

The Ghana Revenue Authority Act, 2009 (Act 791) established the GRA to replace the revenue agencies in the administration of taxes and customs duties in the country. The Customs Division is responsible for collection of Import Duty, Import VAT, Export Duty, Petroleum Tax, Import Excise and other taxes.

5.4 Environmental Standards that are relevant to the Regulation of Mining Operations in Ghana

The following standards have been adopted through the collaborative effort of the EPA and the Ghana Standards Authority (GSA), and are relevant to the regulation of the ASGM sector:

5.4.1 The Ghana Standards for Environmental Protection Requirement for Effluent Discharge GS 1212: 2019

The Environmental Protection Requirement for Effluent Discharge GS 1212: 2019 specifies the requirement for sector specific effluent quality standards for various sectors including mining and prescribes standards for various parameters including mercury and also gives guidelines for discharge into the environment.

5.4.2 The Ghana Standards for Environment Health Protection Requirement for Ambient Air quality and point source/stack emission GS 1236: 2019

The Ghana Standards for Environment Health Protection Requirement for Ambient Air quality and point source/stack emission GS 1236: 2019, specifies the Ghana specific requirement and test methods for ambient air quality. It specifies the requirements and test methods for point source or stack emission based on the sources of energy.

5.4.3 The Ghana Standards for Acoustics: Guide for Measurement of outdoor A-Weighted Sound levels: GS 1253: 2018

The Ghana Standards for Acoustics: Guide for Measurement of outdoor A-Weighted Sound levels: GS 1253: 2018 provides guidance for the measurement of A-weighted sound level out door at specific locations or along particular sites and boundaries using a general-purpose sound level meter.

5.4.4 The Ghana Standards for Health Protection Requirement for Ambient Noise Control – GS 1222: 2018

The Ghana Standards for Health Protection Requirement for Ambient Noise Control – GS 1222: 2018, specifies the requirement for acceptable ambient noise levels with categorised locations.

5.4.5 The Ghana Standards for Health Protection Requirement for Motor Vehicle Emissions GS 1219: 2018

The Ghana Standards for Health Protection Requirement for Motor Vehicle Emissions GS 1219: 2018 specifies requirements for exhaust emissions of motor vehicles as well as tractors and mobile industrial construction machines like excavators. The requirement does not however apply to engines used on water bodies such as boats, airboats and aviation engines like helicopters and airplanes. Stationary motors, generators and mills which are covered under point sources/stack emissions (the Ghana Standards for Environment Health Protection Requirement for Ambient Air quality and point source/stack emission GS 1236: 2019) are excluded.

6 Leadership And Organisation Of ASGM At National And Local Levels

In all designated districts where the MC operates district offices, there are associations of ASGM operators. The most recognised and proactive among them is the Ghana National Association of Small-Scale Miners (GNASSM). The Association was formed through the facilitation of the MC as a business association of small-scale miners across Ghana. GNASSM represents the voice and views of small-scale miners at both the national and local level, though women are under-represented. It plays an active role in the promotion of effective, efficient and responsible artisanal and small-scale mining for sustainable development.

They also act as liaison with the government and as a source of information for miners about new laws and policies, including the Convention. GNASSM has close links with the Minerals Commission and holds its quarterly meetings at the Minerals Commission.

It is decentralised and has executives and offices at both the national level and in all mining areas where the Minerals Commission operates district offices. Within its district structures, there are zonal offices which enable their services to be brought to the doorsteps of miners. Apart from GNASSM, there are other small-scale miners' associations and co-operatives at various levels in designated small-scale mining centres.

7 Mercury Trade And Demand

Mercury is obtained from shops/dealers and gold buyers. In mining centres where processing is done at the site, most of the mercury is supplied by mine owners or sponsors. However, it is also supplied by gold buyers as a means to incentivise the miners to sell their gold to the former. From the interactions with mercury traders during the field survey, it was gathered that some of the mercury entered the country through Burkina Faso. The survey also revealed that the market chain is very complex involving multiple informal cross-border routes, clandestine deals between mercury suppliers and ASGM miners, informal agreements between gold brokers, ASGM miners and owners of gold processing centres regarding acquisition of mercury and selling of gold.

7.1 Mercury Imports to Ghana

Mercury is not produced in Ghana, but enters the country through both legal and illegal routes. It is an obvious fact that the quantity of mercury used by ASGM is far more than what is officially available. This, therefore, implies that most of the mercury is obtained through unapproved trade transactions. Table 3 provides mercury import data as reported by the Ministry of Trade and Industry (MOTI):

Table 3: Mercury Imports to Ghana 2010-2018

Year	Weight (rounded to nearest kilogram)
2010	19,947
2011	24,503
2012	12,335
2013	1175
2014	166
2015	9890
2016	855
2017	8
2018	274

7.1.2 Gold Export from Ghana 2015-2019

Table 4 below shows the value and weight of gold exports between 2015 and 2019. In the survey conducted from 2017 to 2019, information on gold production and the rate of mercury use (See Table 2, Chapter 4), shows that there is a good correlation between mercury use, gold production and exports.

Table 4: Gold Exports from Ghana 2015-2019

Year	Net Weight (Kg)	Custom Value (GHS)	Custom Value (USD)
2015	134,608.77	16,380,686, 305.84	2,978,306,601.06
2016	154,295.32	17,425,520,070.82	3,168,276.376.51
2017	197,670.10	25,488,765,118.52	4,634,320,930.64
2018	755,546.29	27,798,312,682.85	5,054,238,669.61
2019	1,298,283.16	32,302,504,542.28	5,873,182,644.05

Source: Ministry of Trade and Industry (1USD = GHS 5.5)

In addition to national data, the UN COMTRADE database provides official information about imports of mercury into Ghana, as well as data on corresponding exports reported by trading partners to Ghana. A comparison of these data reveal some inconsistencies. For example, Table 3, shows that in 2014, 166 kg of mercury was imported; however, COMTRADE shows an export report from Singapore of 518 kg (COMTRADE data accessed 23 March 2018 https://comtrade.un.org/data using commodity code 280540; SITC commodity codes 51325, 52216, and 52227).

The Ministry of Trade and Industry issues a licence for the importation of mercury. When mercury is legally imported, the Customs Division of the GRA, in collaboration with the MC as well as the EPA's Chemicals Control and Management Centre (CCMC) ensure that the importer has a licence and quantities are within the approved amounts. The actual amounts imported are recorded by EPA and the Customs Division of the GRA and Ministry of Trade and Industry. For imports of mercury to Ghana, the figures reported by the MOTI, are as shown in Table 4 (See section 7.1.2).

Regardless of the source of official data, the total amounts officially recorded, are well below the amounts estimated to be used by the ASGM sector (see Section 7.2). It could therefore be assumed that mercury is routinely smuggled into the country.

COWI (2016) and UNIDO (2018) also studied likely routes of the illegal trade in mercury. Both reports describe how mercury first enters Togo through the Port of Lome, and then crosses into Ghana across its land borders with Togo. The report also noted a possible supply stream from China, with Chinese traders selling mercury in mining areas. Hilson et. Al., (2018) also posited that mercury could be coming from China, along with mining equipment, through the Port of Lome. COWI (2016) which suggests that mercury also directly enters Ghana through the Ports of Tema and Takoradi, where it is then obtained by large-scale gold buyers and distributed through middle-men to the small-scale miners.

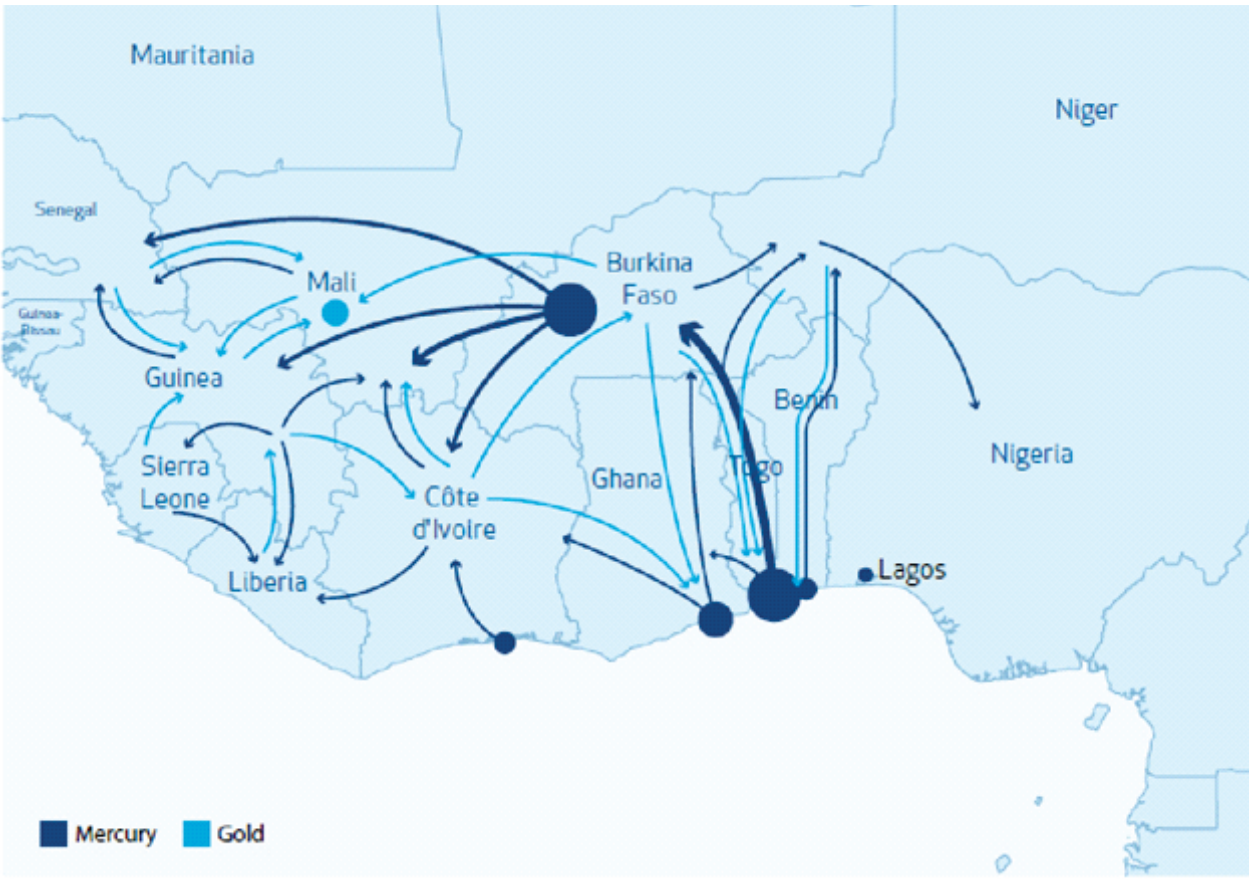


Figure 7: Map of Gold and Mercury Flows in West Africa
Source: UNIDO 2018.

The report suggested that port workers associated with the gold buyers, repackage mercury into 5 kg, 25 kg and 50 kg containers. Another reported method for smuggling, is the concealment of mercury in the waste stream of the ship, which is then sent to a landfill where the mercury is recovered. The recovered mercury is then delivered to wholesalers in 5l containers. The report also suggests a well-developed regionally integrated flow of illegal mercury. For example, one reported flow of mercury was from wholesalers in Ghana to suppliers in Burkina Faso, and to gold-buyers distributing mercury to miners in La Côte d'Ivoire. Additionally, it was noted that many Ghanaian traders networking with mercury suppliers in Burkina Faso, are in fact emigrants originally from Burkina Faso, who settled in Ghana several decades ago, to specialise in ASGM.

7.2 Mercury Supply Distribution within Ghana

The Mercury Law, 1989 (PNDCL 217), allows licensed small-scale gold miners to purchase mercury from "licensed mercury dealers such reasonable quantities as will be necessary for the purpose of their mining operations." The end users of the chemical only need to be licensed as small-scale miners to enable them to purchase and possess the chemical. The quantity possessed is determined by one's need. Regulation 473 of the Minerals and Mining Regulations (Health, Safety and Technical), 2012 (L.I. 2182) requires written permission from the Chief Inspector of Mines to use mercury and also requires the use of a retort; Regulation 474 requires the safe handling of mercury.

Registered ASGM operators and licensed traders, can legally purchase and trade mercury legally through authorised dealers.

The fieldwork also revealed that mercury can be purchased at local stores or sourced from middlemen and gold buyers, who acquire mercury in small quantities like one beer bottle, from importers or their agents. In some mining areas, gold buyers provide mercury to miners, under the condition that miners will sell their gold to those buyers at favourable prices. Mercury is also sold in smaller quantities (about 5 ml) in various containers including glass bottles, polyethylene sachets, matchboxes etc. In many instances, no special precautions are taken for handling the mercury.

The market price of mercury in mining districts ranges from GHS 875 (US$175) to GHS1,250 (US$ 250) per kg. A 330 ml soda bottle (equivalent to 4.5 kg) of mercury, is sold for GHS 3,000 (US$ 600). The variation in price is attributed to demand and supply, as well as distance from the source. Within the local supply chain, most of the mercury imported, are in bottles of 1 or 2 kg and are refilled into smaller bottles, depending on the market. Below this level of supply, bottled portions are measured into 'eye drop' (topical liquid eye medication)' bottles commonly known as *poho* which is estimated to weigh 40 g and costs between GHS 35.00 (US$7.00) and GHS 50.00 (US$10.00).

The following are examples of prices of mercury at different points of the supply chain:

Table 5: Mercury Prices in Ghana, throughout the Supply Chain

Location in chain	Volume	Price	Price per Kg
Upstream	34.5 kg canisters	GHS 10,000 (USD 2516)	GHS 289 (USD 73)
Middlemen	625 ml beer bottle (approximately 10 kg)	GHS 3,000 (USD 755)	GHS 300 (USD 75)
Downstream	5ml eye- drop, ear-drop and penicillin bottles (referred to by locals as poho)	GHS 20 to 30 (USD 5 to USD 8).	
	small plastic bags, around 30 grams of mercury (0.03 kg)	GHS 25 to 30 (USD 6 to USD 8).	GHS 833 to 1000 (USD 200 to 267)

Source: COWI, 2016

The downstream price is consistent with data from the field research which found the price of mercury at the mining sites averaging from GHS 875 to GHS 1250 (USD 175 to USD 250) per kg.

In summary, the mercury supply chain consists of:

- Bulk traders - who sell mercury informally (or sometimes formally) to large-scale gold buyers (in bulk quantities) for subsequent sale further downstream in the gold-buying chain;
- Gold buyers - who supply mercury to the middle-men buyers who in turn distribute it to significant ASGM operations;
- Small-scale brokers - who provide mercury to ASGM miners under different arrangements;
- Middle-men - who sell mercury to miners in ASGM areas;
- Chinese traders - who allegedly sell mercury in ASGM sites

8 Economic Aspects

The distribution of income among miners observed from our field research is commonly based on the number of bags of ore (gold bearing rocks) produced. Depending on the site, there are different mechanisms for sharing the ore according to an agreed ratio. However, there are some sites where miners are paid fixed monthly salaries. The amount of gold extracted depends on the geological nature of the ore and the technology employed in mining and processing. Although miners may get lower incomes due to low production of gold, they prefer to opt for division of shares rather than fixed salaries. Typical earnings are intermittent, variable and uncertain, but on average, the earning of miners is relatively high in comparison to the national minimum wage. On the average, miners earn between GHS 1,500 (US$ 300) and GHS 3,500 (US$ 700) a month.

Revenue and expenditure patterns vary between men and women, in line with the existing division of labour at the mining sites. Mostly, the incomes of men are higher compared to that of women. Men earn as much as twice or even more than women. The expenditure pattern of men was observed to be more focused on constructing a house, buying cars and investing in other businesses. On the other hand, the expenditure patterns of women are focused on maintaining the daily needs of households such as buying of food, school needs and catering for health emergencies. However, this was not entirely the case, as income use patterns were also observed to vary between levels of miners and marital status; for instance, the income gained and used by women who were pit holders, was different from those who were casual labourers. Also, single women who work in the lower levels of ASGM, work extra hard to sustain their families in comparison with men and women who have an advantage of sharing income with their spouses.

Notably, some of the positive impacts of ASGM are creation of employment opportunities along the value chain for many unemployed youth, boost in the local economy and improved social infrastructure services. Most of the miners reported improvement in their living standards. Some have acquired properties, invested in other businesses (such as transport and groceries) and are able to take good care of themselves and their families. For non-miners, ASGM contributes to improving the local economy: some of the income earned from mining is spent locally and most businesses benefit from it. This extends from food vending to selling of clothes and trading in household consumables. These businesses thus enjoy the fruits of mining.

Other industries/sectors benefit from mining viz, ASGM supports the jewellery industry, providing them with raw material. Others are crop (including cocoa) farming, driving, trading and artisanship. Local government authorities in ASGM communities, also benefit from mining as they collect levies and fees from mining operations. Mining and processing centres obtain business operating licences and pay fees for the machines used for their operations.

8.1 Economic Benefits for Miners and Communities

As noted earlier, the ASGM sector contributes substantially to the Ghanaian economy. The MC estimated that in 2018, the sector contributed over one third of total gold production, accounting for almost 2,100,000 oz (Minerals Commission, 2018). The African Mining Vision, ECOWAS Directive on Harmonisation of Guiding Principles and Policies in the Mining Sector, as well as Ghana's own National Mining Policy, recognise the economic potential of ASGM and encourage its development into a lawful and productive sector.

The positive economic benefits of ASGM for mining communities can also be significant. McQuilkin and Hilson (2016) note the positive impact of both informal and unlicensed as well as formal and licensed ASGM to community and national development. In addition to providing a source of livelihood which is relatively well-paid compared to other options in many rural communities, wealth derived from ASGM can contribute to the development of associated businesses (equipment dealers, food services etc), as well as to the building of schools, clinics, houses and other local infrastructure. Wealth from ASGM can also provide finance to support improved farming, which is a complementary source of income for many miners. There are strong ties between subsistence agriculture and ASGM. For example, in areas with distinctly dry and rainy seasons such as Tarkwa, Obuasi, Dunkwa, Akim Oda and Assin Fosu, ASGM provides farmers with income during the dry season, while they practise subsistence agriculture during the rainy season.

Hilson et. al., (2017) noted that while some ASGM is driven by entrepreneurial opportunity, more evidence suggests that the main driver of engagement is unemployment and poverty. In the northern part of Ghana, for example, Hilson et. Al., (2013) found that the growth of ASM has resulted in greater wealth and helped to provide more stable livelihoods in a region that has historically been highly impoverished.

8.2 Typical Models of Financing and Profit Sharing

8.2.1 Modes of financing

Small scale mining requires access to adequate financing for upfront exploration, capital investment and ongoing operational costs, business management skills to adequately access and manage finances and access to profitable markets. The source of finance for ASGM in Ghana varies, depending on many factors including legal status, size and type of operation. These forms of financing include:

- Pooling of resources among individual miners, groups of miners or community groups;

- Financing from commercial banks, or other conventional sources. This option is typically limited to miners with clear mineral rights/concessions and with data on resource reserves; information that is often lacking for ASGM;

- Informal financing from financiers/sponsors, some of whom are gold buyers, who provide capital upfront in exchange for a favourable purchase price for the gold. This source of financing has drawn significant attention in the past decade, as miners have turned to foreign investors, especially Chinese investors, to provide the needed capital and equipment, despite the legal prohibition on the participation of foreigners in ASGM.

- Financial support from various government-supported programs designed to increase access to financing in ASGM. In Ghana, several of such programs have been implemented, including microfinance, subsidised loan schemes and lease-to-own equipment purchasing schemes, with mixed results. The MMIP (2017) lists previous initiatives to provide access to equipment and finance that were generally unsuccessful and/or unsustainable. The reasons cited for lack of success included: mismatch of equipment provided for the miners' needs; low repayment due to low recovery of gold; financial facilities were located far from miners; and low acceptance of retorts, which were promoted in some programs as an option for mercury reduction. On the other hand, Hilson and Ackah-Baidoo (2011) describe a successful microcredit scheme for ASGM operators in the Yale mining camp in the then Talensi-Nabdam District, Upper East Region. The authors note that several factors contributed to that success, including lending money to groups who are more likely to repay a loan than individuals, devolution of responsibility to borrowers, and borrower discipline. Further, UNECA (2011) notes that in 2006, Ghana created a small-scale miner loan scheme, using money partly from the government's Mineral Development Fund. The loan scheme was managed by the MC and provided loans at subsidised rates to qualified cooperatives with the PMMC ensuring that part of the gold sold by the miners was used to repay the loans.

- In recent times, foreign miners, many working illegally, often filled gaps in the supply of finance, equipment, technical knowledge, and support on efficient mining and backfilling techniques (Hilson et. al., 2014). However, due to the recent crackdown on illegal mining and its supporters, the role of such foreign financing is likely to have changed dramatically.

8.2.2 Sharing profits

The mode of profit sharing differs by the type of mining practised.

- In the hard rock areas, about 30% of total ore production is given to the concessionaire, with the rest going to the miners. In some cases, the licence holder employs the miners as laborers and pays them an agreed salary.

- In alluvial areas, typically, the licence holder engages the miners, finances the operation and then buys the gold at an agreed subsidised price (bush price).

9 Demographic and Social Information

9.1 Geographic Distribution of ASGM Miners

As of 2017, the MC estimated that there were about one million small-scale miners in Ghana. This estimate is consistent with Hilson (2010), who estimated that there were about 500,000 to 1,000,000 small-scale gold miners nationwide, mostly in rural areas.

The MC estimated that, those engaged in small-scale mining were distributed across the nine mining districts as shown in Table 6:

Table 6: Number of Miners Engaged in Small-scale mining cross Nine Mining Districts, 2017

District	Estimated number of miners
Akim Oda	110,000
Asankragwa	135,000
Assin Foso	95,000
Bibiani	160,000
Bolgatanga	65,000
Dunkwa	175,000
Konongo	45,000
Tarkwa	170,000
Wa	45,000

Source: Minerals Commission

The numbers above include a wide range of people, whose livelihoods are directly connected to the sector (the miners, supervisors, processors, and managers). ASGM also indirectly supports the livelihood of other people in rural areas, through a secondary economy of those who provide goods and services to the sector.

The numbers of miners engaged in the sector has almost certainly changed since the 2017-2018 ban on small-scale mining. However, a more recent census of miners is not yet available from the MC.

9.2 Typical Model of Work Organisation of Miners

At both legal and illegal sites, miners are very well organised. There are clear designation of roles and responsibilities at the mines, ranging from concession owners, financiers or sponsors, managers, formers, ghetto owners, diggers, processors, security guards etc. At some mines, community elders and mine owners form local committees to manage the mine.

Below is a detailed description of the role and responsibility of each player:

i) Small-scale mining licence holders or concession owners have obtained mineral rights/ licences. The owners are legally responsible for the mining activities conducted on their concession including hiring and paying labour, organising the mining, and ensuring adherence to safety and environmental regulations.

ii) Financiers or sponsors provide financial resources towards the operations of the mines. It is a widespread practise among concession owners to informally have arrangements with sponsors, who organise and source necessary inputs, labourers and conduct the mining.

iii) Managers are employed by pit holders or a cooperative society with the responsibility of being in charge of overall day to day activities of the mine sites. The manager also liaises with the District Minerals Commission Officer on operational matters at the site/centre.

iv) Formers are responsible for planning, organising and controlling mining and processing activities at the site/centre. They oversee, supervise and guide pit workers and processors to ensure that operations are conducted with due regard to basic safety, health and environmental requirements and that production targets are met as forecasted by the concession owner or sponsor. They report to the Manager of the mine site/centre.

v) Diggers/pit workers are divided into traditional drillers (chisellers) who work their way into the rock

mainly with hammers, chisels and sometimes power drills and ore hoister (loco boys) who remove the waste material and gold bearing rocks out of the pit. There are also workers (ghetto owners) who are responsible for construction of pit timber support and local mines inspectors who perform pit inspection and advise accordingly.

vi) Processors include workers involved in initial size reduction of gold ore using hammers, sun drying and heating on plates, milling, using crushers (hammer mills), sluicing (concentrating), and panning/amalgamation process.

vii) Security guards protect the miners' assets and maintain peace and tranquillity at the mine site/centre.

viii) Mine committees usually comprise landowners, traditional leaders, assembly members, concession owners and opinion leaders. They set out their own local rules at the mine and ensure compliance. The committee usually agrees on the profit sharing and punishments for bad behaviour such as theft and fighting.

ix) *Buyers and Dealers* are gold traders near the mining site and in the district towns who buy sponge gold directly from the miners. The sponge gold is taken to refiners/jewellers where it is further purified by heating at high temperature.

9.2.1 Roles and participation of women in ASGM

Women's involvement in ASGM can be grouped into two categories: direct involvement in mining operation or production and involvement in mining related activities i.e., providing services at the mining site. The direct roles include carrying of ore from mining to processing sites, sluicing of milled ore, manual breaking of hard rocks into smaller pieces and sorting of ore, amalgamation and gold trading. At some sites, women engage in fetching water from mining sites to cooling milling machines at processing sites, trekking long distances. Some buy waste rock from the mines to process to extract gold. Those who are involved in breaking and sorting of ore, are given some portions to process and thereafter sell the gold. There are few women who are licence holders (about 5-10%). Indirect roles of women include food vending, washing miners' clothes for a fee, trading in items such as rubber foot wear used for mining, torch lights, sacks and pans for carrying ore. From the baseline survey, there were varied reasons for women's engagement in mining. Some are into mining to raise capital to start businesses that will allow them to quit since they see mining as endangering their health. Others opined that they are into it to provide subsistence living for themselves and their families as there are not many job opportunities especially in the dry season when little or no farming activity occurs

The driving force for the majority of women engagement in ASGM activities is poverty i.e., limitation on their financial and economic capacities and therefore participation in ASGM is considered as an alternative both for income generation and business opportunities with the aim of improving and sustaining their welfare and those of their families. Other reasons include low employment opportunities, high birth rate and extended families. In order to support their families, women are forced to look for new means of survival to increase money earning opportunities and reduce over dependence on agricultural production where in some instances they also experience limited access to land.

The working conditions of women at most ASGM sites are poor. As indicated earlier, the direct involvement of women in ASGM is more in casual work such as hauling of ore to processing sites, breaking of ore rocks using hand held hammers, mercury amalgamation, sluicing and fetching water to cool milling plants. It was also observed that, both pregnant and nursing mothers work at mine sites. Some nursing mothers are compelled to bring their children to work due to the fact that they have no one to care for them, as culturally, women are expected to be the main caretakers. Some of the mothers stated they are unable to cater for their wards and the home as they should because they spend most of their time at the mine site.

9.2.2 Roles and participation of children in ASGM

The involvement of children was mostly seen at processing sites. They usually help in sluicing and sometimes mixing of the concentrate before amalgamation. Out of the five districts that the field team visited, Bolgatanga recorded the highest number of the children seen at the mining/processing sites with most of them actively engaged in the operations. At a processing area in Sherigu in the Bolgatanga Mining District as many as 18 children were seen performing various roles - operating mills, mixing ore, washing and sluicing. At another processing site in Nagruma (in the Bolgatanga Mining District) which is within the 'make-shift' mining community, children were seen

helping their parents in milling and sluicing. At Adumanu in the Adansi North District (Dunkwa Mining District), four teenage girls aged between 15 -17 years were seen at the mining site. They indicated to the field team that they only come to the mining site to carry ore over the weekends and during school vacations. At Prestea, one 12-year-old child was seen at a processing site washing ore. The boy was said to have come to the site after school. About 85% of the sites that we visited informed the team that children are allowed to work on their sites over the weekends when they are not in school.

For children, according to the ILO survey (2017), the decision to work at the mining sites, is often made by the child labourers themselves and less so by parents. While 88 percent of children are aware of the life-threatening dangers and risks associated with mining, the key driver for child labour is economic gain. Children work to assist with their personal upkeep (73%), family income (43%) or for their schooling (26%).

Perceptions of child labour vary. Statistically, parents of non-working children are equally likely to agree that there is nothing wrong with child labour (21% vs 31%) as compared to parents of working children. Although both adult miners and employers perceive child labour to be illegal, they also see it as a means of survival and a way out of poverty for poor households, as well as a way of stopping children from engaging in deviant behaviour. Working and schooling is also highly acceptable, and both school teachers and heads confirmed this practice exists within the study communities (ILO, 2017).

Peers and relatives working at the mines do have significant influence on a child's decision to work at the mines as well. About 84% of child labourers shared with the surveyors that it is common practice for children of their age-group to be working at the mining and processing sites which makes the practice acceptable within the societies (ILO, 2017). While child labourers are aware of, and accept the negative issues associated with their work, only about a third are willing to stop mining and to advocate to their peers not to engage in mining. The ILO (2017) found that there is a high acceptance of children above 12 years old working at the mining sites if they have the physical strength to support the work.

9.2.3 Dangers of Mining

The ASGM sector is perceived to be a very dangerous environment. There are high risks of danger related to accidents, pit collapses, use of dangerous chemicals such as mercury and cyanide and the constant inhalation of dust. According to the ILO survey (2017), while miners claimed to have received some education on improved mining practices, these are not adhered to. Many miners, no matter the age, work without safety measures facing high risks of all forms of accidents and even death (ILO, 2017).

The physical level of difficulty that women endure at work, poses a high risk to their health. Women have inadequate access to protective equipment as well as r access to safe working practices. This makes them prone to injuries and bodily pains which in turn means absence from work, thus resulting in income reduction (UNDP, UNICEF, IOM, 2016). Women often perform roles where they are exposed to mercury and/or cyanide, resulting in increased chances of brain, kidney and lung damage. Common problems include headaches, waist, neck and back pains, associated with carrying loads and silicosis (Hinton, Veiga & Beinhoff, 2003), malaria, anaemia, hypertension and diarrhoea (Yakovleva, 2007). They are also more likely to have lung diseases, skin irritation, and eye damage because of the dust from crushing ore and musculoskeletal disorders from heavy lifting (IGF 2018). Not only do women have responsibilities on the mining site but they also are traditionally in charge of childcare, food and drink preparation, cleaning and other household tasks, which most likely occurs before, during and after a long day thereby resulting in extreme fatigue (IGF, 2018). These responsibilities limit any mobility or additional time and effort towards opportunities to gain financial knowledge, mining education or networking opportunities that could give way to their entrepreneurial progress (IGF, 2018).

Children face the same health risks and accidents as adult miners. The ILO (2017) reported that 58% of children do not wear protective gear at the mines and most female workers (87%) do not wear any safety gear at all. Children are mostly exposed to loud noise (86%), chemicals such as mercury (64%), drugs and alcohol (54%), standing in dirty water for long hours (54%) and carrying heavy loads (59%). Boys are usually exposed to ergonomic and biomechanical hazards associated with digging, grinding, crushing and moving materials (WHO, 2016). About 31% of female child workers, reported that they were exposed to sexual abuse and harassment. “The responsibility for their medical treatment lies mostly with their parents

and not the adult miner or employer who engaged the child" (ILO, 2017).

Any toxic health hazards associated with ASGM such as mercury, cyanide, arsenic, lead, dust, and sulphur, to name a few, that women and children are exposed to, can accumulate in their bodies and cause severe health issues which could lead to death (WHO, 2016). Women who are of reproductive age, are at high risk of transferring these toxins to their developing foetuses. This exposure can lead to spontaneous abortions and their offspring could show signs of birth defects, development disorders, impaired cognition and low birth weight. Children who may not have been affected in utero are still highly sensitive to any toxins and specifically children who are exposed to mercury during their development ages, are prone to neurologic and systemic damage (WHO, 2016).

Along with exposure to toxins, women and children also experience high levels of stress, and reported substance abuse. Exposure to these hazards could lead to: reduced fertility, infertility, menstrual disorders, early menopause, diminished libido and early onset of puberty (WHO, 2016).

9.2.4 Perceptions of Child Labour

Any child working under the age of 18, violates Ghana's Children's Act, 1998 (Act 560). The ILO defines child labour as, "work that deprives children of their childhood, their potential and their dignity that is harmful to their physical and mental development and that interferes with their schooling" (HRW, 2015). The worst forms of child labour include, but is not limited to, working underground, handling or working near dangerous machinery and tools, transporting heavy loads, and exposure to hazardous substances (HRW, 2015).

According to the ILO (2017), child labour is seen as an acceptable practice – particularly amongst the poorest children, who are most likely to work in the first place, and who are also most likely to deny that there is a problem with their engagement in paid work - and as such, tackling it is not a priority for employers, parents or local governments.

About 96% of miners interviewed, were aware of the *legal* age for mining and 36% of miners found it acceptable for children aged 9-17 years to work at the mining sites, despite their knowledge of campaigns against child labour. About 79% of adult miners equally believe that children easily comply and can be controlled to get the job done faster and cheaper which contributes to their engagement at the mining sites (ILO, 2017).
There is a gap between what district officials know and the expectations to enforce child-labour and mining-related laws in the communities in which they operate**.** The high-level knowledge on issues around sanctions of child labour among the key directors, has not translated into general community awareness. Equally, there are no sanctions enforced against the employers at mining sites who allow children to work at their sites (ILO, 2017).

9.2.5 Financial Progress Challenges for Women

While both women and men are generally challenged in their access to finance, banks tend to lend more to the agriculture sector due to its lower level of "risk." Women are less likely to be considered for loans because of cultural barriers, lack of traditional collateral, and their low-income levels (IGF, 2018).

A case study on female participation in ASM, particularly in the illegal segment, reported that women in the Birim North District of Ghana are paid daily, depending on the mining camp, between GHS 1.5 and GHS 3 (US$ 1.66-3.33) (Yakovleva, 2007). While women contribute 50% of the mining workforce, they generally do not receive equal financial compensation as men (UNDP et. al., 2016). Women who work in processing and hauling in Ghana earn 60% less than men who dig (IGF, 2018). According to a recent study, females who mine, make only $0.53 to every dollar their male counterparts earn (Healthy Entrepreneurs et. al., 2016). It is reported that, 36% of Ghanaian women who have access to credit. However, more information is needed on opportunities to access credit and costs involved in both formal and informal financial mechanisms (Healthy Entrepreneurs, 2017).

10 Environmental Information

10.1 Environmental Impacts

Artisanal and Small-scale Gold Mining like any type of mining, has its own environmental consequences on water, air and land. Some of the negative environmental impacts brought about by ASGM are described below:

10.1.1 Impact on Water Quality

One of the negative aspects of ASGM is its impact on human health and the environment, particularly on surface water resources. Water bodies such as rivers and streams as well as groundwater which serve as sources of drinking water for surrounding and downstream communities, are often contaminated or polluted through inappropriate mining practices. Fresh water sources are among the most heavily affected. ASGM operations have been reported to decrease water quality and subsequently increase the cost of water treatment, according to the Ghana Water Company. Large amounts of chemicals are needed to treat the polluted water for it to be potable. This can eventually lead to the shutdown of the water company's operations if not controlled. (Emmanuel et. al., 2018). Water pollution can interfere with the quality of drinking water at the intake point and the ability of municipal systems to supply domestic water needs. In fact, water has been referred to as “mining's most common victim” (Emmanuel, et. al., 2018).

Some of the factors causing water pollution may include geochemistry of the ore (e.g., acid generating materials, heavy metals, arsenic rich ores etc); processing storage, handling and haulage of ore and tailings; improper management of chemicals and hazardous materials; poor hydrocarbon management; poor waste management, runoff/siltation from de-vegetated areas; and spillages/leakages from containment structures and impoundments (e.g., tailings' storage facilities, slimes dams, etc).

According to Emmanuel et. al., (2018) there are four main ways mining adversely impacts on water quality: (1) acid mine drainage; (2) heavy metal contamination and leaching; (3) processing chemical pollution and; (4) erosion and sedimentation.

1. ***Acid Mine Drainage (AMD):*** This is sometimes referred to as acid rock drainage or is acidic drainage or runoff produced when water comes in contact with exposed rocks containing sulphur-bearing minerals that react with water and air to form sulphuric acid and dissolved iron. This acidic run-off dissolved heavy metals including copper, lead, and mercury which can pollute downstream aquatic ecosystems. Ghana typically has ores associated with sulphide mineralisation and this phenomenon has been known to occur in some large-scale mines in Ghana. Unfortunately, this has not been well documented in the ASGM subsector.

2. ***Heavy Metal Contamination:*** Heavy metals that naturally exist in the earth's crust, are disrupted during the mining process and may lead to the leaching and transportation of same by run-off and ground water. Tailings and mine waste may also contain high amounts of heavy metals. When these metals leach out in an uncontrolled manner into surrounding environments, they can cause pollution of water resources. A study was completed on the Prestea Huni Valley District (between January and March 2011), which hosts four major mining communities as well as a large number of galamsey operators. Random sampling of 70 water and 30 sediment samples collected from nine locations in the area, were all tested separately for Cd, As, Hg, and Pb. The results showed that ASGM workers in this study area were at risk of developing cancerous and non-cancerous diseases due to the exposure to the metals mentioned above (Obiri, et. al., 2016). Water samples in Nangodi were taken from drinking water sources which were sampled from boreholes, hand dug wells, and dug-outs. Researchers reported high mercury concentrations in water bodies adjacent to areas of mining activities. They also found dangerous levels, exceeding the WHO stipulated limits, not only for arsenic, lead, zinc and cadmium but also for mercury.

3. ***Processing Chemicals Pollution:*** Processing of ore can release toxic chemicals into the environment and water bodies; of particular concern are mercury and cyanide. Due to its affordability and ease of access, mercury is sought out and used during the gold amalgamation process.

Improper handling, storage and use of mercury results in mercury contamination and consequently mercury pollution. Within mine tailings is mercury waste, which when exposed to the natural elements, easily releases these mercury compounds into the ground, nearby water bodies and finally, groundwater (Cobbina et. al., 2015). Mercury cannot be destroyed, it is biomagnified along the food chain. Mensah also reported on another study by Owusu (2012) who reported back from the Dumasi Township where there was confirmation of high amounts of mercury contamination in the groundwater, river sediments and fish. In Tinga, water samples collected from the only stream in the community and used for drinking, domestic chores and the washing of gold-bearing ore, were found to contain high levels of mercury, lead and cadmium above WHO permissible levels. (Cobbina et. al., 2015).

Gold cyanidation is a hydro-metallurgical technique allowing for the extraction of gold from low-grade ores. Although cyanide reacts readily in the environment and may quickly degrade when exposed to sunlight or form complexes of varying stabilities, its toxicity to many living organisms, at even low concentrations, is the primary reason for which it is guided globally by the International Cyanide Management Code (ICMC). Due to the ineffective gold recovery processes employed by some ASGM operators in Ghana, the tailings contain economically significant quantities of gold easily recoverable by cyanide leaching, a process which has led to the re-mining of tailings using cyanide illegally by some ASGM operators, with its attendant environmental challenges.

4. ***Erosion and Sedimentation:*** Surface mining is associated with clearing of vegetation for the establishment of mine infrastructure as well as enabling access to the gold ore. This vegetation loss leads to increased turbidity, sedimentation and siltation which can cause a decline in fish resources and irreparable ecological degradation of aquatic environments. It can also lead to flooding and drying up of water resources. Panning, dredging (an illegal activity in ASGM), and other processes on the river banks, beds and surrounding areas, discharge huge amounts of loose silt and heavy metals into the river system. The suction force of the dredger and the siltation of the water bodies, impact negatively on aquatic fauna. Direct discharge of slimes and effluents into surface water bodies also result in pollution of these water resources.

10.1.2 Impact on Land Resources

In many areas where ASGM activities take place, large tracts of land, including forest reserves, are often stripped of vegetation cover in order to get access to ore material that is mined on the surface or even in sub-surface or deep mining. This exposes the land's surface directly to rainfall, enhances infiltration by rain water into soils and removes material that binds soil particles together, leading to erosion and transport of soil material away from mining sites. Increased surface run-off (water) also erodes topsoil, resulting in soil infertility. In addition, such areas are prone to severe evapo-transpiration leading to loss of soil water, which tends to loosen soil particles and further increases the rate of erosion. Fauna and flora are also affected as some are dislodged from their habitats, destroyed or lost as a result of removal of vegetation. Soil nutrients, elements and microbes, essential for growth of plants and animals, are also affected. Additionally, because of the constant change in location of artisanal miners, lands are often abandoned and exposed to erosion, disrupting the soil ecosystem.

When rocks are stripped of the soil cover, minerals that are contained in the rock become unstable and break down in the presence of water (from rainfall) and air, to release various elements that make up the rock (Plumlee, 1999). Depending on their chemical nature, these elements released from their primary or original rock through breakdown or dissolution, can affect the immediate environment in various ways. Gold mining by ASGM operators in the Prestea, Obuasi and other mining areas, would, after processing, leave behind waste that is rich in arsenic, which finds its way into the surrounding soil and water bodies. For example, because arsenic even in small concentrations can be very toxic, release of this element will pollute or contaminate the surrounding soil, plants, streams or rivers in an area. This can eventually affect the people in the area as some depend on the soil for their source of livelihood (ASM Handbook for Ghana, 2017). It must be noted that, for arsenic rich ores, the background concentrations of arsenic in the soil may already be elevated. However, mining may exacerbate the situation.

Again, rocks that are exposed in mine pits, trenches and excavations also become susceptible to breakdown and release of their

constituent elements, which ultimately contribute to soil pollution or contamination. Further, when miners fail to reclaim mining areas, they leave behind deep pits that serve as traps, as well as a longer-term public health hazard as pits accumulate standing water, creating breeding grounds for insects that carry diseases. The proliferation of abandoned pits has caused havoc in mining communities and exacerbates the degradation of the land. Related to this is the frequent collapse of the mines and pits. Between 1990 and 2005 it was reported that, 'gold mining activities in Ghana contributed to land degradation and loss of cultivable land, resulting in a massive loss of forest cover (26%) and arable lands (15-20%) at the Tarkwa, Anyafuri, Dunkwa, Esaase and Bogoso mining areas' (Mensah et. al., 2015).

Artisanal and small-scale gold miners extensively use mercury during processing to extract gold from gold-bearing materials. Some of these practices of obtaining gold tend to directly contaminate wastewater that runs off into the environment as well as surrounding soils. Clearing of the mining sites and burning of bushes contribute to deforestation, especially when galamsey operators mine directly in forest areas[6]. Since 1940, there has been a 90% reduction of Ghana's primary rainforest. A study conducted by Schueler (2011), as referenced by Mensah (2015), reported that in the Western part of Ghana, surface mining accounted for 58% of the region's deforestation, 45% loss of farmland and widespread spill-over effects resulting from mining activities in reserved forests. The methods used in surface mining by large-scale, artisanal and small-scale miners, have destroyed productive land and caused severe deforestation. Mensah et. al., (2015) also reported that the exploitation of such mineral resources alters the microbial communities, thereby resulting in low soil fertility and productivity.

10.1.3 Impact on Air Quality

ASGM practices often release lots of dust during extraction, transport and processing of ore materials, which affect the quality of air both at the mine site and in the surrounding areas. Depending on the nature, composition, size, fraction and wind direction for example, these dust particles can affect the health of ASGM operators as they unknowingly inhale these particles whilst working (Plumlee, 1999). Communities in the vicinity of the ASGM site can also be affected as dust particles are transported and inhaled. Waste materials left at ASGM sites after mining and processing, can also be picked up and transported by wind to affect air quality in areas surrounding ASGM sites. Such transported material can seriously impact the quality of air, long after mining has ceased in an area. In addition to mercury pollution from the burning of amalgam, small-scale mining operations are known to generate respirable dust particles from the ore reduction process which can cause dust-related diseases.

10.1.4 Impact of Noise and Vibrations

ASGM operators recently began to employ sophisticated extraction and processing methods that generate lots of noise and vibrations. For example, tools, equipment or machinery including excavators, bulldozers, vehicles, bore mills and other mechanised processing and grinding equipment can seriously affect the health of ASGM operators and the local mining communities. In some cases, unauthorised drilling and blasting of ore materials lead to deafening noises and vibrations with potential to cause hearing impairment and cracks in residential facilities of neighbouring communities. ASGM operators and mining groups are also directly affected because they do not often determine or monitor the extent of impacts or use safety equipment to reduce the effects.

10.1.5 Impact of Mine Waste Materials

ASGM waste materials, including waste rock (gangue) and tailings (fine-sized materials left after processing), are often dumped in and around mine sites. Over time, these materials break down as a result of interaction with water, air and organisms to release various elements and/or substances into the surrounding environment. In some cases, toxic elements such as mercury, arsenic, cadmium and lead, which either become present as natural components in the waste rock or which get introduced during processing, are released into and contaminate the surrounding environment (Plumlee, 1999).

10.2 Mercury contamination

There is evidence of mercury contamination in biotic and abiotic samples in proximity to ASGM sites in Ghana. In their review of available data on mercury concentrations in environmental media in Ghana, Rajaee et. al. (2015a) found that while soil and water samples were generally below guidelines, some individual soil samples taken at mining sites greatly exceeded relevant guidelines (e.g., 185.9 µg/g Hg, at an abandoned Tarkwa mine site (Bonzongo et. al., 2004); 330.0 µg/g, in an

[6]ASGM licences are not issued for mining in forest reserves.

ASGM community in the Upper East region (Rajaee et. al., 2015b), compared to Canadian Environmental Quality Guidelines (6.6 µg/g for residential soil; and 50 µg/g for industrial soil). For sediment mercury concentrations reviewed, about 60% surpassed the U.S. EPA guideline of 0.18 µg/g Hg dry weight (d.w.). Sediment mercury concentrations were generally higher in sites closer to ASGM activity, and one study found mercury concentrations that were at least double the concentration from samples downstream of an ASGM site compared to upstream samples (Nartey et. al., 2011). Though most fish samples reviewed contained detectable levels of mercury, the concentrations were generally below Food and Agricultural Organization/World Health Organization (FAO/WHO) and U.S. EPA guideline values (0.5 and 0.3 µg/g, respectively).

11 Health Information

11.1 Health Effects of Mercury Exposure

When mercury enters the environment, certain microorganisms can transform the elemental mercury into methyl mercury, a highly toxic form of mercury that builds up in fish, shellfish, and people that consume the fish. Methyl mercury can cause damage to the developing brains and nervous systems of children even before they are born.

Health effects of mercury and its related compounds include damage to the central nervous system, thyroid glands, kidneys, lungs, immune system, eyes, gum, skin, neurological and behavioural disorders such as tremors, insomnia, memory loss, neuromuscular effects, headaches, cognitive and motor dysfunction, mental retardation, seizures and delayed development (WHO, 2017). The Minamata disease is a mercury-related disease, caused by methyl mercury poisoning in the body and it is characterised by neurological symptoms of paraesthesia, ataxia, general muscle weakness, dysarthria, narrowing of the visual field, hearing difficulties and others (Harada, 1995).

In a survey among miners, the mercury induced health outcomes identified by the miners were skin irritation, respiratory problems, muscular tremors, numbness of extremities, atrophy, vomiting, gastro-intestinal problems, and death (Tschakert et. al., 2007). Researchers found that the concentrations of blood mercury were negatively associated with the levels of creatinine, urinary proteins and estimated glomerular filtration rate (eGFR). Proteinuria and reduced eGFR is common in mine workers exposed to excess mercury (Afrifa et. al, 2017). Similarly, the thyroid hormone levels of the hormones T3 and T4 were negatively associated with blood mercury levels (Afrifa et. al., 2018). The researchers concluded that exposure to mercury levels above the occupational threshold, may affect thyroid hormone levels.

11.2 Exposure to Mercury

Some studies investigating urinary mercury levels of Ghanaian miners, found levels varying from 5.2 – 43.8 µg/L, with the highest concentration found in those involved in the amalgam burning process (Kwaansa-Ansah et. al., 2019; Paruchuri et. al, 2010; Basu et. al., 2015; Rajaee et. al., 2015). A related study found 20% of residents in a mining community having unusually high urine mercury levels (Adu-Poku et. al., 2019).

Other studies that examined urinary mercury levels among miners and non-miners, have identified higher levels among miners compared to non-miners. A study found the mean urinary mercury concentration in small-scale miners (1.23 µg/L; range: 0.32–3.62 µg/L) to be higher than that in farmers (0.69 µg/L; range: 0.08–2.31 µg/L) within the same mining community (Kwaansa-Ansah, et. al., 2019). In a related study, the median total specific gravity-adjusted urinary, hair, and household soil mercury, were significantly higher in miners (5.18 µg/L, 0.967 µg/g, and 3.77 µg/g, respectively) than in non-miners from the same community [(1.18 µg/L, 0.419 µg/g, and 2.00 µg/g, respectively (Rajae et. al., 2015)]. The study concluded that overall, miners had elevated urinary and household soil mercury levels, though some non-miners approached and exceeded guideline values, suggesting a health risk for non-mining residents living within these communities.

An assessment of mercury contamination among residents in a mining community near the Pra River Basin, found human hair mercury levels varying between 0.97–6.59 µg/g depending on seasonality. The mercury levels were elevated in the dry season compared to the rainy season. This finding might be associated with the higher availability and increased consumption of fish during the dry season (Donkor et. al., 2006). In another study investigating blood mercury levels among artisanal miners, 58% of the miners exceeded the occupational threshold of 5 µg/L (Afrifa et. al., 2018). When asked, the miners identified the burning process after amalgamation, mercury contamination of water due to spillage and rain, as the main reasons for mercury contamination.

These findings indicate that miners and community members in ASGM sites in Ghana, are directly exposed to mercury during the mining processes, and also indirectly through environmental contamination and subsequent ingestion of mercury compounds in water and fish.

11.3 Common Health Risks in ASGM Communities

A myriad of health risks and issues were described by ASGM miners and their family members during the WHO rapid health assessment study (WHO Rapid Health Situation Assessment Report-Ghana, 2020). Some of the occupational health and safety risks reported were, accidents and injuries, drowning in pits, falls into pits, mental health problems including depression, working in confined spaces, exhaustion and fatigue, noise, heat and humidity. Health issues that were attributed to mining activities were respiratory diseases, pneumoconiosis, tuberculosis, hypertension, headache, STIs including HIV/AIDS, malaria, cholera outbreaks, chest infections, kidney failure, lead poisoning, numbness in extremities, palpitations, bodily pains and skin rashes (WHO/GHS/MoH Rapid Health Situation Assessment Report-Ghana, 2020).

Environmental health issues associated with ASGM according to key informants, were lack of sanitation facilities at mining sites, open defecation, polluted drinking water, chemical pollution of rivers, consumption of fish contaminated with chemicals, soil contaminated with heavy metals, and mercury vapour in air around the burning sites. In a related assessment study, it was observed that mercury was burnt in residential areas where community members including, women and children, were exposed to the vapours, and in almost all cases was burnt without the use of a mercury vapour capture device. In the absence of measures to capture the mercury released from the burning process, workers directly inhale this dangerous vapour. Further, if the burning is done in residential areas, other community members, including children, can be exposed to the vapours in ASGM communities.

ASGM communities and miners are also exposed to other heavy metals with related health risks. Concentrations of arsenic, chromium, copper, manganese, aluminium, nickel, selenium and zinc, exceeded the normal urine concentrations in miners (Basu et. al., 2011). In stream water, arsenic, aluminium, manganese, chromium and nickel, were identified at levels higher than the WHO recommendations for drinking water. During the dry season, this water was used by 70% of the community as drinking water. Mine-pit water containing high levels of aluminium and arsenic, located in the same community, was used for bathing and *pito* (local beer) brewing (WHO/GHS/MoH Rapid Health Situation Assessment Report-Ghana, 2020).

11.4 Injuries in ASGM

The use of safety procedures and Personal Protective Equipment (PPE) among ASGM operators is low. One study found that about 70% of ASGM had never used PPE in their work (Hilson et. al, 2006). Injury rates in ASGM workers were identified to generally vary between 5.0 – 5.9 injuries per 100 person years, with miners working in licensed mines being in the lower spectrum (Calys-Tagoe et. al., 2015; 2017). A cross-sectional survey, which examined hospital records and media in Ghana, identified fractures and contusions to be the most frequent injuries occurring to artisanal gold miners. Reasons for the injuries were mostly collapsing pits and falls (Kyerematen-Amoah et. al., 2015).

A series of mining and non-mining related accidents were reported during the rapid health assessment by the WHO. Common mining accidents reported include falls into unprotected pits, entrapment in collapsing pits, cuts from machines, bruises, fractures and lacerations from falling rocks and trees (during blasting), drowning in pits, injuries from slipping in the pits and loss of fingers and limbs in explosions. Others were road traffic accidents, work related violence, interpersonal violence and animal bites (mainly snake bites) (WHO/GHS/MoH Rapid Health Situation Assessment Report-Ghana, 2020). From the assessment, most miners admitted that PPE would be good, but some conceded that it will be inconvenient to work with PPE and considered investment in PPE as a waste of money and time. For example, the heat would not allow them to wear protective clothing, the helmet would be too sturdy to get through the narrow mining tunnels and boots were not practical for climbing the steep pit walls.

11.5 Access to Healthcare, Water and Sanitation Services

According to the WHO/GHS/MoH Rapid Health Situation Assessment (2020), miners often go directly to the hospitals in the district capital but are unable to access the needed care because of the lack of insurance coverage or inability to afford the treatment. They prefer to continue treatment with traditional remedies after the first line of treatment in health facilities.

Those without National Health Insurance Scheme (NHIS) subscription, often resort to home-made remedies or traditional medicines sold by vendors who come to the villages. Check-ups were also perceived to be too expensive. First aid care is very

limited, so when miners are injured, they usually visit the hospitals and Community-based Health Planning and Services (CHPS) compounds directly without prior treatment. Some of the mining communities surveyed did not have any health facility.

Some of the obstacles to health care access were, inability to get treated at the nearest CHPS compound, non-availability of needed drugs at the CHPS compounds, bad road conditions and the non-availability of public transport to get to the health facilities at some sites. Miners were often referred to hospitals for further care, after initial treatment at the CHPS compounds. Accessing the referral hospitals, however, is associated with additional transportation costs which makes it prohibitive for the miners. The non-availability of certain drugs at the CHPS compounds requires miners to travel, sometimes over long distances, to buy their medicines at private pharmacies. Though some miners are covered by the NHIS, many drugs are not covered by the scheme. During the ban on ASGM when reserves on money was particularly low, affordability of health services and transportation to access care, became a problem for the miners due to the relatively high cost of transport. Another obstacle to visiting health facilities to access care was the fear of being identified as an illegal miner since they were afraid of being handed over to the police. Some had taken injured colleague miners to health facilities and abandoned them at the facility due to fear of being arrested.

12 Towards Decision Making Process

The National Action Plan on Artisanal Small-scale Gold Mining was prepared based on a desktop review of available reports, consultations with key stakeholders, and the results of the 2019 Baseline Analysis of Mercury Use and Practices in Artisanal and Small-Scale Gold Mining in Ghana. Information was gathered through the various reports including, numerous government reports, reports of international organisations working in Ghana, academic studies and media accounts. A full list of references is provided in Annex B. The National Government, Inter-Governmental Organisation (IGO), Non-Governmental Organisation (NGO) and other stakeholders also contributed their time, resources and information to the NAP through direct consultations. A list of stakeholders consulted is provided in Annex C.

For the Baseline Inventory of Mercury Use in Artisanal and Small-Scale Mining in Ghana, a range of stakeholders in the mining regions were consulted, notably district officers of the MC, local community leaders, local branches of the small-scale miners' associations, mine owners, gold traders and others. Importantly, many small-scale gold miners generously allowed the team to observe their operations and collect measurements. They also provided a wealth of local information about ASGM practices on the ground, through interviews and consultations.

Drawing on the baseline inventory report, mercury reduction targets were realistically set and national strategies developed. Based on the national strategies, specific actions have been proposed to:

(1) oversee the implementation of the strategies;

(2) analyse the progress made during implementation;

(3) evaluate gaps and weaknesses in implementation; and

(4) make recommendations for improved processes towards the achievement of the strategies identified.

SECTION IV
National Objectives and Reduction Targets

Problem Statement:

ASGM is practised by an estimated one million people and indirectly impacts about 4.5 million people in Ghana. Emissions in this sector represents about 12.7% of total mercury emissions. The baseline inventory indicates that 42.5 - 62 tonnes of mercury is used in the ASGM sector annually. ASGM, particularly illegal practices, cause negative impacts on the environment and the humans who live and work near and around mining communities in Ghana. According to the WHO/GHS/MoH Rapid Health Situation Assessment (2020), a myriad of health risks and effects were described by ASGM miners and their family members. Some of the occupational health risks reported were accidents and injuries, drowning in pits, falls into pits; mental health problems including depression, working in confined spaces, exhaustion and fatigue, noise, heat and humidity.

Health effects that were attributed to mining activities were respiratory diseases, pneumoconiosis, tuberculosis, hypertension, headache, STIs including HIV/AIDS, malaria, cholera outbreaks, chest infections, kidney failure, lead poisoning, numbness in extremities, palpitations, bodily pains and skin rashes (WHO/GHS/MoH Rapid Health Situation Assessment Report-Ghana, 2020).

Overall Objective:

Reduce and where feasible, eliminate the use of mercury and mercury compounds in ASGM to protect human health and environment.

Specific Objectives:

- Develop and promote the use of mercury-free alternatives that are cost-effective, efficient and available;
- Reduce the risk of exposure of vulnerable populations and populations with high risk of exposure to mercury;
- Minimise mercury emissions and releases to the environment; and
- Strengthen health systems to detect, treat and manage mercury-related health conditions.

Reduction targets:

Table 7 provides the estimated national mercury reduction targets based on the baseline (2019) of 42.5 - 62 tonnes of mercury used in ASGM per annum.

Table 7: Estimated National Mercury Reduction Targets (2025-2050)

YEAR	REDUCTION TARGET
2025	10%
2030	25%
2040	35%
2050	50%

SECTION V
Implementation Strategy

(a) Actions to Eliminate Worst Practices

The Convention requires that Parties give special priority to eliminating certain worst practices in mercury use by ASGM in order to prevent the worst emissions and exposures. These actions can complement the longer-term task of transitioning the sector away from mercury altogether. As defined by the Convention, worst practises are:

- Whole ore amalgamation;
- Open burning of amalgam;
- Burning amalgam in a residential area; and
- Use of cyanide on mercury-contaminated tailings.

Objective 1: Prevent Whole Ore Amalgamation (WOA) from taking hold in Ghana.

In Ghana, the most common method for gold extraction is concentrate amalgamation. Even though WOA is not widely practised in Ghana, strong efforts should be made to educate and sensitise miners on it because it is ineffective and does not benefit miners. It involves higher usage of mercury, than concentrate amalgamation does.

There is the need for awareness creation on regulations regarding mercury use in ASGM as contained in existing Environmental Protection Agency (EPA) regulations and the Mercury Law. This should be included as part of permitting conditions and rigidly enforced.

Objective 2: Eliminate open burning and burning in residential areas

Open burning of amalgam without mercury vapour capture is common in Ghana. To discourage this practice, the EPA, as part of its regulatory functions, the Minerals Commission (MC), under its regulations relating to environment, health and safety, CSOs, miners and GNASSM, should sensitise miners about common environmental effects. Steps should also be taken to provide retorts in the medium to long term and where practicable, mercury free technology should be encouraged. A law could be adopted to explicitly prohibit open burning, and require the use of mercury capture devices. However, such a regulation is likely to be widely ignored unless the concerns of miners about mercury capture devices are addressed. During previous projects deploying mercury capture devices, miners expressed concern about the cost, reliability of design and the time required for use. To address these concerns, the government could consider:

- Sensitising miners on the health and environmental effects of open burning of amalgam on both miners and the communities in which they operate. An attempt must be made to develop strategies to manage and contain the effects of open burning.
- Working to design more affordable and easy -to-use retorts and making them readily available.
- Training of miners on the proper use and management of retorts to prevent secondary exposures. Retort devices can become contaminated with mercury from use, and if not handled properly, can themselves become sources of exposure.
- Encouraging local fabrication and distribution of retorts by private enterprises.

Objective 3: Prohibit burning in residential areas

Burning amalgam in residential areas is widespread in mining communities in Ghana, especially when processing facilities are located close to populated areas. This is a dangerous practise because the more vulnerable members of the population, such as women and children, can be exposed to high levels of mercury. Even when retorts are used in such cases, there is still the danger of exposure, because no retort is 100% effective at capturing mercury. To address this worst practice, the government can do the following:

- Educate miners about the dangers of this practice to encourage compliance. To convince miners of the dangers of mercury use in these areas, demonstrations could be conducted using hand held measuring devices for mercury that show dramatic spikes in mercury concentrations in air during amalgam burning. This direct evidence of mercury exposure, can be very persuasive to miners.

- Explicitly prohibit burning in residential areas which according to UNIDO guidelines mean at least 500m away from residential areas. These prohibitions can be incorporated in the existing regulatory framework of either the EPA or the MC.
- Ensure that general medical screening of miners and host communities are undertaken to determine mercury levels in their bodies.

Objective 4. Prevent cyanide processing of mercury contaminated tailings

The use of cyanide as a primary extraction method by small-scale gold miners, is not widely practised in Ghana. Cyanide as a lixiviant for gold extraction from tailings of small-scale mining from the concentration process, can be part of a larger systematic solution to the use of mercury in ASGM. Currently, gravity concentration method is used by small scale miners to extract the initial quantity of gold, after which the tailings are sold to processors who use more sophisticated and well-controlled methods to extract the remaining gold, using cyanide or other leaching methods.

Most tailings are derived from the gravity concentration of ore, and mercury is added to the concentrate to form amalgam. In principle, the tailings should not be contaminated with mercury. However, due to poor tailings management practices, there is a possibility of contaminating tailings with mercury when amalgam is burned openly.

To prevent the use of cyanide on mercury contaminated tailings, the following are recommended:

- Sensitisation and education of miners on best mercury tailings management practice;
- Enforcement of existing regulations or permit requirements on containment of the tailings;
- Separation of processing areas from amalgamation areas to prevent their contamination with mercury;
- Development of protocols for testing of tailings to be used by processors and buyers to ensure that they treat mercury-free tailings only;
- Creation of containment for mercury contaminated tailings, and
- Development of techniques for removal of mercury from mercury-contaminated tailings.

(b) Steps to Facilitate Formalisation or Regulation of ASGM in Ghana

Revision of the regulatory framework

- Create categories for artisanal, small and medium scale mining operations based on identified parameters;
- Strengthen existing formal and informal organisational structures;
- Include small-scale gold miners' representations on the District Mining Committees;
- Devolve approval of licences to local authorities; and
- Expand the licensing regime to include independent mineral processing centres.

Streamline licensing and make it more accessible

- Computerisation of a harmonised application form and permitting process; and
- Involvement of stakeholders in the development of fee structures for licences and permits.

Step up and maintain effective enforcement

- Inclusion of NGOs, CSOs and small-scale miner's associations as part of the District Mining Committee (DMC);
- Training of miners on the regulatory framework and the use of new technologies;
- Establishment of procedures for the evaluation of the tracking systems for earth moving equipment;
- Promotion of the use of drones to support enforcement efforts;
- Strengthening the specialised courts designated to deal with illegal mining. This should include training of judges and prosecutors in adjudicating mining related issues.

Increasing the amount and improving availability of geological data.

- Increase funding to the GGSA to upscale

mineral exploration activities for small scale miners;
- Decentralise the mineral cadastral system;
- Make relevant data on mineralisation available and accessible to the public through electronic means and at the district offices of the MC. Work with miners and others to determine how best to do this;
- Work with commercial financers, through workshops, interviews and relevant government institutions, to determine what geological assessments are needed (for example, as collateral), which would make them more likely to finance ASGM operations.

Demarcate more land for titling to ASGM

- Work with Ministries and other stakeholders with responsibilities for allocating land use, to determine how to better coordinate information and planning, so that all land uses are mapped and represented (e.g., forestry, agriculture and mining). Begin a process to determine how to resolve conflicting land use rights including in cases where rights overlap;
- Enforce the provisions of the Minerals and Mining Act that require the relinquishment of portions of mineral exploration concessions to government;
- Set aside a portion (percentage) of demarcated areas for women miners, or at least give women miners the first opportunity to apply for certain concessions;
- Formalise land acquisition transaction processes between chiefs and small-scale gold miners.

Financing the process of formalisation

Taxation and fees

- Institute a fixed rate of taxation based on categorisation;
- Reconsider the taxation regime to broaden the tax base;
- Provide tax incentives for equipment that supports mercury free processing technologies; and
- Regional harmonisation of taxes and fees to reduce smuggling of gold.

Promoting access to finance

- Organise business training workshops for miners; working with banks and microfinance institutions to identify ways of financing small scale miners;
- Training on formal documentation such as book-keeping and record keeping;
- Upscale existing mechanisms to promote involvement of private investors;
- Direct investment funding of small-scale mining.

Improving Environmental Management

Re-evaluate the requirements for an environmental permit, based on different types of operations

- Develop Environmental and Social Management Framework (ESMF) for blocked-out areas.
- Individual small-scale operators to develop Environmental Management Plans (EMPs) in line with the ESMF.
- Revise the existing environmental overview form for small-scale mining to include more detailed information on mercury use and tailings management.
- Include more stringent conditions on mercury use, tailings use and toll treatment, in environmental permits. Some measures, such as use of retorts, prevention of contamination of tailings by mercury by using separate areas for amalgamation, can be introduced into permits immediately. Other restrictions such as on use of mercury, can be considered over time after widespread introduction of alternatives. Restrictions can also vary by size or production level.
- Undertakings intending to use cyanidation should meet conditions in the International Cyanide Management Code.

Reclamation/rehabilitation and mine closure

- Improve the enforcement provisions in the permitting processes with respect to rehabilitation/reclamation and closure of mines;
- Develop guidelines for reclamation/rehabilitation at mine closure. These can differ according to the type of mines. The guidelines must emphasise prevention of environmental impacts during operations, because rehabilitation is more expensive than prevention.
- For highly contaminated mercury areas, methods for dealing with contaminated soils must be developed, in line with the requirements of Article 12 of the Minamata Convention.

- Provide training to miners on how to do reclamation/rehabilitation.
- Test new, efficient cost-effective methods for reclaiming degraded lands. In particular, provide demonstrations on reclamation of highly mercury-contaminated areas.
- Develop modalities for the posting of bonds by small-scale miners for reclaiming degraded lands.

Institutional capacity enhancement

- Enhance the capacity of government agencies, miners and other stakeholders in improved management, regulation and enforcement.

Develop capacity of regulatory agencies to deliver services to miners

- Enhance capacity of EPA regional/area officers as well as MC mining district officers, to provide technical assistance to small scale miners.
- Each MC District Office should identify funding opportunities and share with small- scale mining operators.

Enhance capacity of stakeholders to understand, adhere to and enforce regulations

- Provide more training to DMCs and miners on regulations, mining and processing technology as well as financial matters.

Improve communication and collaboration among regulators and other actors

- Promote and encourage the use of software such as GalamSTOP in coordinating activities among agencies that regulate various aspects of ASGM.
- Consider other means of strengthening collaboration among ministries,such as creating integrated cross-ministerial teams on particular topics, or having regular cross-ministerial training. Having a one-stop shop at the District Offices will also encourage closer collaboration among agency staff co-located together.
- Develop an integrated platform by linking all databases of relevant stakeholders to facilitate collaboration among them.

Improve miners' access to markets

- Better define the gold supply chain and trading routes regionally and internally in Ghana, and then work to involve all actors in the supply chain in formalisation efforts. This can build on a current study on mercury and gold trade in the ECOWAS region. The study, sponsored by UNIDO, has an overall objective to enhance a coordinated implementation of the Convention in the ECOWAS region, with a focus on the most relevant trade regulation for the ASGM sector. The project will include:

  - An overview of current legislation on the use of mercury in ASGM and broader mercury use in the country;
  - Current import and export regulations for traded mercury;
  - Statistics on mercury import/export, where available;
  - Legal regulations of gold exports and its taxation;
  - An overview of gold export procedures, including gold valuation processes and fees, such as assay fees;
  - Statistics on gold import/export and estimated production, where available.
- Examine current system of licensed gold buyers and licensed exports, and make any necessary adjustments to ensure these are serving the needs of miners, as well as offering appropriate monitoring and control. There should not be excessive barriers to sales such as minimum amounts, requirements to sell to only limited exporters etc. There must be access to licensed buyers in all mining areas;
- Develop locally designed certification schemes that establish criteria of environmental and social performance for a more stable and/or expanded markets for the certified gold that is produced;
- Educate miners about the requirements of major international supply chain efforts such as the OECD due diligence guidelines, in order to make miners more globally competitive;
- Establish a mechanism to investigate methods (such as blockchain or others) to trace gold sales from point of sale through export which establish verifiable sourcing, giving downstream buyers confidence in the origins of the gold.

Improve community relationship with ASGM and maximising the sector's benefits

- Part of the successful formalisation of ASGM in the long term, will entail changing public perceptions of it, especially in communities where ASGM is practised. A more positive image will contribute to the “social license to operate” in communities and will also improve risk perception of financial entities and regulators. Public education and outreach are important in this regard, as is encouraging

miners to be "good neighbours" and encouraging broader social development and diversification of livelihoods, in order to best capture the wealth generated by mining into long term development. This is one of the goals of the Minerals and Mining Policy of Ghana.

Encourage more active communication and engagement between miners and community during the permitting process

- Improve on avenues for notifications and publications in communities before and after granting concessions (e.g., Community Based FM stations, information centres;
- Sensitise miners on the Corporate Social Responsibility (CSR) policy;
- Encourage artisanal and small-scale miners to undertake CSR activities within their operational areas;
- Compile, publish and disseminate the register of CSR activities.

Develop sustainable livelihood projects to complement mining and capture wealth for development.

- Conduct a thorough evaluation of previous diversified livelihood projects to evaluate lessons learned, including Friends of the Nation (FoN) project on improving livelihoods for youth.
- Define and elaborate on the full benefits of complementary livelihoods beyond monetary considerations to attract miners, or youth considering mining, to alternatives which may require less manual labour, less bureaucracy and more reliable benefits.
- Facilitate implementation of sustainable livelihood projects in ASGM areas that complement (rather than compete with) mining livelihoods, such as providing services to miners, manufacturing and providing equipment, etc.

(c) Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury

Objective 1:
Reduce mercury use in ASGM by twenty five percent (25%) by 2030.

Objective 2:
All artisanal and small-scale gold miners to adopt occupational and environmentally safe practices by 2030 with sixty percent (60 %) coverage by 2025.

Even when the four worst practices are eliminated, mercury may still be used in ASGM. The Convention requires Parties to take steps to reduce, and where feasible eliminate, mercury use and exposures from ASGM. Ultimately, the transition to mercury-free processing methods, is the only way to eliminate the public health risk from mercury. Under the NAP, Ghana can pursue measures to reduce mercury exposure while at the same time promoting the transition to mercury-free ASGM. At the same time, miners can be encouraged to adopt best sustainability and occupational health practices overall.

Minimise exposure to mercury while in use by miners:

- Increase sample size for the baseline study to estimate emission levels and mercury uses in order to thoroughly understand current practices, and where exposures are occurring during processing, for instance, including alluvial dredging operations and colluvial operations that require milling.
- Provide training to miners on the use of PPEs; incident management (for example mercury spills); best management practices; storage and handling of mercury etc to minimise mercury exposures.
- Institute measures to protect water resources from mercury contamination; specifically prohibit amalgamation within 10-100 meters of water bodies depending on whether the latter is a river, stream or dam of freshwater and prohibit discharge of tailings into water bodies. This must be a condition in the environmental permit.
- Set aside areas for the processing of ore (Hg amalgamation) at mining sites and restrict access to such areas. These requirements must be part of the conditions in the environmental permits.
- Require miners to follow guidelines for mercury storage (see UNIDO Technical Guidelines on Mercury Management in Artisanal and Small-scale Mining).
- Repeal the Mercury Law, 1989 (PNDCL 217) and replace with a new law that broadly covers the provisions of the Minamata Convention on Mercury and gives effect to Ghana's obligation particularly in areas that have not been addressed by existing legislation including limit on the amount of mercury to be used by ASGM operators, no open burning, etc.

Significantly intensify training, technical assistance and capacity building for miners, and other stakeholders on mercury free mining practices

The Inter-Ministerial Committee on Illegal Mining (IMCIM) between 2018 and 2019 trained about 4000 miners on sustainable mining and mineral processing practices. These activities should continue with a focus on detailed technical training on mercury-free mineral processing.

- Evaluate previous training programs to assess lessons learnt about designing new programs (e.g., the recent IMCIM training; the Tarkwa Mining Centre set up under the EU-funded Ghana Mercury Pollution Abatement Project; recent miner training program sponsored by the Australian High Commission). The evaluation should examine the outcomes of these programs and identify what worked well and what did not, including increasing contact hours for training, and encourage specialisation and focus training of small-scale gold processors as well as promote and provide support for peer-to-peer training.
- Based on lessons learnt from previous training, design and carry out miner training on mercury-free technologies, working with such a number of processors as would enable the capture of mercury use equal to the mercury reduction targets. This probably would mean starting with the Tarkwa & Dunkwa Mining Districts, and rolling out to others on an ongoing basis. When designing training, a variety of complementary approaches must be used such as hands on demos, videos, etc. Where possible, those directly involved in mining must be used in miner training, since miners are the most credible spokespersons for other miners. Education on harmful effects of mercury exposure must be included to inspire the miners to convert to mercury-free techniques. Design and develop a mercury-free technology database and update it frequently.
- Set up model mercury-free mines to use as hands-on training sites. There must be an evaluation on how best to do this, based on previous experience with the GNASSM Concession at Tarkwa.
- Include law enforcement, regulators, traditional authorities and community members in the training.
- Create and share success stories to demonstrate how improved practices aid ore recovery and thus profits. Miners are more likely to adopt new methods if they lead to increase in profits (i.e., evidence-based advocacy).
- Institutionalise expertise and training resources in tertiary institutions, NGOs, and mining associations such as GNASSM.
- Develop training modules that can be used by a wide variety of trainers, including community organisations, small scale mining associations, NGOs, etc. in order to accelerate dissemination of information.
- Ensure that issues surrounding ASGM are taught as part of the regular curricula of universities (not only in mining but also health, policy, environmental science, community development programmes, etc.).

Provide assistance to miners on creating tailored mercury free processing workflows.

There is no one "silver bullet" technique that will allow all miners to convert to mercury-free processing. The choice of mercury-free technologies will depend on many factors, including ore type. Miners will need assistance on tailoring their processing workflows to their ore body and work setting.

- Work with researchers to investigate best methods to reduce/eliminate mercury use based on the range of typical ores and technologies available in Ghana. This should include bench and field scale testing of these methods on a range of ore types. Methods may include;
  - Partial amalgamation, where miners get coarse gold first with gravity only, and then apply mercury to the remaining concentrate, which reduces amount of mercury needed;
  - Gravity-only concentration (including centrifuges, jigs, shaking tables) with subsequent direct smelting;
  - Use of magnets for separation in deposits with magnetite;
  - Flotation;
  - Coal-oil agglomeration.

Using this information, create a catalogue of typical mercury-free or low-mercury workflows for ore types typically encountered in Ghana. This can include the mercury free methods described above and cyanidation which is an already proven method. This type of work has already been funded on a pilot level by US Embassy, implemented by FoN and UMaT, and could be expanded to encompass a wider range of technologies and ore types.

- Provide extension services/ongoing assistance and demonstration of mercury-free techniques. Particularly in mining district centres, experts

should provide advice to miners on tailoring processing workflows to different types of ores.

Undertake other actions to accelerate the transition to mercury free processing

- Collaborate with researchers to develop new methods for mercury-free processing.
- Create mercury-free centralised processing centres in high intensity mining areas. It is to be noted that some private centralised processing facilities already exist, so these are obvious sites on which to focus initial mercury-free training.
- Institute an award for miners with good mining and environmental practices.
- Consider novel forms of re-organising ASGM businesses to implement more efficient mercury free processing models. For example, in the "hub and spoke" model, several small gravity-only systems (spokes) feed their tailings to a central secondary processing "hub" where the residual gold is extracted, using a professionally run industrial scale process. This leaves the gravimetric plant areas free of tailings, while also increasing the overall amount of gold recovered from a given batch of ore. Also, the hub can serve as the focal point of regulation and monitoring. This model can be implemented under a single business umbrella, where profits come from both the gravity systems and the tailings treatment; or a more dispersed system where independent gravity plants sell tailings to the tailings processor (sometimes called a "toll miller.") This latter arrangement will require easy, affordable and trusted assay methods to determine right price for tailings;
- To begin to address exposures from historically contaminated sites, identify, map and characterise high priority contaminated sites, as required by Article 12 of the Convention and carry out studies on clean-up and/or reprocessing of these tailings. It may be possible to recover costs of this activity through the simultaneous recovery of gold from these legacy tailings;
- Develop appropriate strategy for identifying and assessing sites contaminated by mercury, e.g., clean-up guidelines for tailings sites, consistent with guidelines for managing contaminated sites proposed under Article 12 of the Minamata Convention.

(d) Strategies for managing trade and preventing diversion of mercury and mercury compounds

Objective:

Establish effective systems to manage trade including the prevention of diversion of mercury and mercury compounds from foreign and domestic sources by 2030.

Main Targets

- Setting up an effective legal mercury trade and distribution system;
- Identification of routes of illegal trade for the purpose of control and enforcement; and
- Compliance with trade requirements of the Convention.

Specific Targets and Activities

Systems for tracking imports/re-exports and distribution created by 2020

- Repeal the existing Mercury Law 1989 (Act 217) and replace it with a new law that covers obligations assumed under the Convention taking into account other existing laws;
- Develop a national policy on life cycle management of mercury;
- Compile current and accurate data on legal imports, and their intended uses (indicated in the import licence). Consider how to collect and maintain these data electronically in a consolidated way on an ongoing basis;
- Create systems for tracking destination and use of mercury once it is in Ghana, such as:
- Domestic point of sale tracking and inventory (at least for certain size/volume of transactions);
- Electronic manifests for transportation of mercury (at least over a certain volume) in order to track distribution throughout the country.

Institutional framework for controlling mercury trade and distribution clarified

- Undertake a complete institutional mapping of who is responsible and where authorities lie under the Mercury Law for licensing imports, verifying imports, tracking of licensed sellers, etc. Based on the outcome of the mapping, explore redesignation of roles and responsibilities.
- Enhance cooperation between institutions responsible for licensing and clearing imports of mercury.
- Conduct training for stakeholders responsible for clearing of mercury, such as National Security, Customs Division of the GRA and the Ghana Institute of Freight Forwarders.

Investigation and mapping of illegal trade flows/routes conducted

- Investigate and map out illegal trade flows, to identify hotspots for illegal trade including hazardous substances and wildlife trade. Conduct a study on illegal trade flows, to identify hotspots for illegal trade and to prioritise enforcement especially at the Togo border, in Tema, and in the Takoradi harbour.
- Investigate if mercury entry follows other routes for other illegal trade, such as illegal hazardous substances and wildlife.

Capacity of key institutions for cross-border cooperation strengthened

- Harmonise trade codes for mercury;
- Share database among relevant stakeholders;
- Strengthen cooperation on enforcement;
- Conduct cross-border training for border agencies.

Compliance with harmonised common external tariff regime within the ECOWAS region enhanced

- Harmonise taxes and royalties across the region to remove incentives for smuggling gold, which is often connected to illegal mercury trade.

Provisions on mercury trade and supply under the Convention implemented

- Set up necessary systems for implementing trade procedures outlined in Article 3 of the Convention.
- Identify focal points for giving Prior Informed Consent (PIC) as required by Article 17 of the Convention.

Establish a working group of EPA, trade, commerce, customs, freight forwarders, mercury traders, miners' associations and others to establish criteria for allowing imports: e.g., under what circumstances will consent be granted for mercury imports?

(e) Strategies for involving stakeholders in the implementation and continuing development of the plan

Objective: Ensure the continuous involvement of all relevant stakeholders in the effective implementation of the NAP.

Specific targets and Activities

- Identify relevant stakeholders and integrate them into the existing multi-stakeholder coordinating mechanism. Create specific roles/positions on the Minamata Convention Implementation Committee, (MCIC) or subcommittees thereof, for a range of stakeholders (miners, NGOs, local authorities, etc.) in the monitoring and evaluation of NAP implementation;
- Partner with relevant NGOs to carry out awareness creation on the Convention in mining communities and among the general public; and
- Once NAP is completed, make efforts to engage miners, mining communities and relevant stakeholders in its implementation and periodic review processes.

(f) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury

This NAP includes a public health strategy for prevention and control of exposure of artisanal and small-scale gold miners and their communities, to mercury. The process of developing the strategy essentially involved three main activities:

- An institutional capacity assessment;
- A rapid health situation assessment in ASGM communities; and
- Stakeholder validation and dissemination workshop.

The goal of the institutional capacity assessment was stocktaking of the relative readiness of the existing structures to address both health determinants and health outcomes related to ASGM. This involved assessment of core capacity gaps in existing policy framework, implementing capacity and level of effective implementation both at the national and sub-national levels.

The purpose of the rapid health situation assessment, which involved primary data collection in health care facilities and in ASGM communities, was to: (i) Describe the health issues as reported by artisanal and small-scale gold miners and health care providers living and working in ASGM areas; (ii) Describe health risk perceptions in artisanal and small-scale gold miners; (iii) Describe access to health care, healthcare seeking behaviour patterns and challenges related to these issues; and (iv) Assess the local health system to determine the relative readiness of existing local public health institutions and structures, to implement envisaged/desired

interventions, likely to be included in the public health strategy.

After the above assessments, a national stakeholders' dissemination workshop was held, involving decision-makers at national, regional and local levels, in the areas of health, environment and mining. Findings and recommendations captured in the assessment reports were presented to participants. Based on identified prioritised issues from the study findings, stakeholders developed a draft national public health strategy to address the health challenges associated with ASGM in Ghana.

The public health strategy has four (4) main focus areas, namely:

- Mitigation of direct health impacts of mining;
- Mitigation of indirect health impacts of mining;
- Strengthening health system capacity; and
- Strengthening capacity of other institutions.

Highlights of major components of the strategy are outlined below (see details of the strategy in Section VI of the workplan).

(g) Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, to mercury used in ASGM

Strategies to prevent exposure of vulnerable populations to mercury are discussed under each focus area. Prioritised activities to be implemented are also discussed under each strategy.

Mitigation of direct health impacts of mining

a) Awareness raising

- Educate miners through workshops and symposia on the need to use safety equipment.
- Educate mining community members on healthy living using community information centres, community radio stations and town hall meetings.
- Educate members of ASGM communities on the importance of healthy living.
- Media engagement and sensitisation of media personnel to serve as advocates.

b) Promote safer mining practices

- Document all safe mining practices;
- Develop and produce training materials on safe mining;
- Educate miners on safe mining practices and processes;
- Regularly train miners on how to reinforce pits;
- Monitor mining sites quarterly to ensure that pits are reinforced.

Environmental management and hygiene

- Educate communities and miners on hygienic practices through community durbars and town hall meetings.
- Provide communities with safe drinking water through provision of boreholes.
- Provide communities with public sanitary facilities where they are lacking.

Mitigation of indirect health impacts of mining

a) Promote self-regulation of mining activities

- Consult and agree with the traditional authorities and strengthen their traditional controls over mining.
- Community sensitisation and awareness creation on harmful effects of mining to engender community policing.
- Institute incentives to foster commitments to self-regulation.

b) Environmental management

- Implement water safety management plans;
- Implement the buffer zone policy;
- Promote land reclamation;
- Promote cleaner production processes and efficient waste management;
- Conduct market surveillance to monitor the levels of food contamination in mining and selected areas outside mining communities.

c) Promote diversified livelihoods

- Conduct diversified livelihood training programs in agro-businesses e.g., bee keeping, grass cutter and snail rearing.
- Provide funding arrangements to support agribusiness e.g., warehousing
- Promote continuing education policy to

help miners develop vocational and trade skills.
- Provide support for trading in goods and services.

d) Promote community-based financing
- Establish miners' associations /unions and comprehensive welfare schemes.
- Lobby development partners and banks for micro projects.
- Promote CSR among miners.

Health system capacity strengthening

a) Health promotion and awareness raising.
- Develop and produce health promotion materials on ASGM & Health.
- Train staff of the health promotion units on ASGM & Health
- Provide Information, Education and Communication (IE&C) materials to miners and their communities to raise awareness on health risks and disease prevention measures
- Submit yearly reports on ASGM and Health activities.

b) Develop and implement policies and guidelines targeted at improving healthcare provision related to ASG miners and their communities
- Develop health sector policy and guidelines for mitigating ASGM-related occupational and environmental health hazards among miners and their communities, clearly defining policies for protection of vulnerable groups.
- Prepare treatment protocols for mercury-related health effects and other health problems related to ASGM

c) Build capacity of health care workers in the management of mercury-related health effects and other health problems related to ASGM
- Train public health service providers to prevent, detect and monitor human exposure to mercury;
- Train clinicians to recognize symptoms and signs of mercury exposure, as well as diagnose and treat populations affected by mercury exposure;
- Train public health workers in mining districts in response to public health emergencies like chemical spills, collapsing mine pits etc.
- Monitor human exposure to mercury among mining community members.

d) Improve access of miners and members of mining communities to health care
- Improve accessibility of miners and mining community members to primary health care facilities.
- Improve access of miners and mining communities to essential and emergency clinical care services at the primary level.

(h) Strategies for providing information to artisanal and small-scale miners and affected communities

Objective:
Establish effective communication systems to provide and disseminate information on best practices and benefits in ASGM, as well as the impact of mercury use on miners and mining communities.

Specific targets and Activities
- Undertake a baseline survey to assess the level of awareness of mercury issues among all relevant stakeholders.
- Develop a communications strategy about mercury, its use in ASGM and its impacts on health and the environment,
- Sensitise and train the media on best practices and benefits in ASGM as well as the impacts of mercury use.
- Utilise multiple media avenues including, electronic, print, social media etc, to share information on best practices and benefits in ASGM as well as the impacts of mercury use on mining communities and the general public.
- Train and share relevant information with targeted audiences (e.g., traditional authorities, community opinion leaders, youth, schools and vulnerable populations etc.) on best practices in ASGM and benefits, as well as adverse impacts of mercury use.

(i) Additional strategies including market-based mechanisms

As suggested in point 2 of the Annex C of the Convention

Objective:
Strengthen adherence to recognised responsible mining standards and certification

Specific targets and Activities:

- Promote internationally recognised responsible mining standards and certifications such as fair mined certification, OECD due diligence;
- Provide technical assistance to ASGM to meet existing standards and certifications to export responsible and sustainably mined gold;
- Introduce standards and certification for mercury-free processing plants;
- Provide support to the PMMC to export responsible and sustainably mined gold to the international market;
- Strengthen capacity of ASGM through national forums, trainings and facilitation of advisory services to interested ASGM associations, to ensure accurate reporting.

SECTION VI
Detailed Implementation Workplan

The workplan detailing strategies, actions, priorities, lead institution(s), timelines, funding sources, estimated budget, estimated results as well as the indicators and means of verification for the implementation of the NAP are provided in Table 8 below.

Strategy	Action (s)	Priority	Activity lead (s)	Timeline		Funding source (s)	Activity cost (USD)	Expected result (s)	Indicator/ Means of Verification
				Start date	End date				
Revision of the legal/regulatory framework (Minerals and Mining Act and Subsidiary legislations)	Create classification of Small -Scale Mining (SSM) on identified parameters as indicated in the Minerals and Mining Regulation.	High	MC	2021	2023	MC Development partners	500,000	SSM classified	Copy of the reviewed legislation
	Strengthen formal and informal organisational and operational structures	Medium	MC	2021	2025	MC	500,000	All formal and informal organisational structures strengthened Small -scale miners represented on District Mining Committees	Copy of relevant laws indicating structures/ organisations Revised law with inclusion of NGOs and ASGM representatives as part of District Mining Committee
	Devolve issuance of licences to the MC	High	MLNR MC	2021	2025	MC Development partners	100,000	Issuance of licences devolved to local authorities	Amended law to allow local authorities issue licences

Strategy	Action (s)	Priority	Activity lead (s)	Timeline		Funding source (s)	Activity cost (USD)	Expected result (s)	Indicator/ Means of Verification
				Start date	End date				
	Enforce the licensing regime for mineral processing centres	Medium	MC EPA	2021	2025	MC EPA	200,000	Licensing regime for mineral processing centres enforced	Number of licences issued to mineral processing centres
Streamline licensing and make it more	Computerisation of a harmonised application form for licensing and permitting processes	Medium	MC EPAWRC	2021	2025	MC EPA WRC	250,000	Application form for licensing and permitting processes computerised and harmonised	Computerised harmonised application form
	Enhance stakeholder participation in the revision of licence and permit fees	High	MC EPAWRC	2021	2025	MC EPA WRC	400,000	Stakeholders' participation in the revision of licences and permit fees enhanced.	Meeting reports indicating list of all relevant stakeholders
Step up and maintain effective enforcement	Sensitisation and training of miners on laws and regulations and new technologies	High	MC EPA WRC UMaT	2021	2025	MC EPA Development Partners NGOs/CSOs	700,000	Miners trained on laws and regulations and the use of new technologies	Number of trainings conducted and miners trained on laws and regulations and use of new technologies
	Establish procedures for the monitoring and evaluation of tracking systems for earth moving equipment	High	MC EPA	2021	2025	MC EPA Development Partners NGOs/CSOs	350,000	Procedures for the evaluation of tracking systems for earth moving equipment established	Document on procedures published
	Promote the use of drones to support enforcement efforts	High	MC EPA	2021	2025	MC EPA Development Partners NGOs/CSOs	1,500,000	Use of drones to support enforcement efforts promoted	Number of drones licenced Number of trainings organised on the use of drones for enforcement Number of persons trained

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Enhance the capacity of security forces to support the enforcement of mining laws	High	MC EPA	2021	2025	MC EPA Development Partners NGOs/CSOs	500,000	Capacities of security personnel built	Number of security personnel trained Number of trainings organised
Financing the process of formalisation	Organise training workshop on sustainable financing for miners	High	MC MoF GNASSM Chamber of Mines Financial institutions NGO s	2021	2025	MoF MC NGOs GNASSM Chamber of Mines Financial institutions Development Partners Private sector	300,000	Opportunities for sustainable financing for miners identified and documented	Number of training workshops organised Number of miners trained Number of sustainable financing options for miners identified and documented
	Promote private sector involvement in financing A SGM operations	Medium	MC EPA NGOs	2021	2025	MC	350,000	Private investors are involved in financing ASGM operations	Number of private sector investors financing ASGM operations
	Initiate a taxation regime based on classification of ASGM	High	GRA MC GNASSM	2021	2025	GRA MC	350,000	Taxation regime based on classification of ASGM initiated	Adoption of taxation regime by ASGM miners
	Advocate the expedition of regional harmonisation of export taxes to reduce smuggling of gold	Medium	MLNR MC GRA MOTI MFA&RI ECOWAS Commission GNASSM	2021	2025	GRA MC ECOWAS Commission	500,000	Export taxes across the West African sub-region harmonised	Harmonised regulations on export taxes adopted

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Increase financing to the GGSA to improve availability of geological data	Support the GGSA to upscale mineral exploration activities for small scale miners.	High	MLNR MDF MC GGSA	2021	2025	MC MLNR MDF Development Partners	50,000,000	GGSA supported to upscale mineral exploration activities for small scale miners.	Availability of geological data
	Promote the availability and accessibility of relevant geological data to the public through digitisation	Medium	MC GGSA Chamber of Mines	2021	2025	MC	2,000,000	Geological data is available through electronic means	ICT work station established
	Organise sessions to identify minimum geo - data requirements for accessing funds for ASGM activities from financial institutions	High	MC GGSA EPA MoF Financial institutions	2021	2025	MC MoF Financial institutions	500,000	Type of geo -data required for accessing funds for ASGM operations identified and documented	Report on the meeting
Demarcate more land for titling to ASGM	Organise sessions with MDAs and other stakeholders on improved coordination for spatial and land -use planning in ASGM areas	High	MESTI LUSPA MLNR MC MoFA	2021	2025	MC MESTI LUSPA	7,000,000	Land allocated for ASGM demarcated in line with the provisions of Land Use and Spatial Planning regulations	Availability of spatial plans and maps showing mining zones

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Demarcate more land for titling to ASGM	Demarcate and allocate more areas for women in ASGM	High	MC GNASSM WIM Gh CSOs NGOs	2021	2025	MC GNASSM WIM Gh CSOs NGOs Development partners	600,000	Land available for w omen in ASGM	L and allocated for women in ASGM
Improving Environmental Management	Conduct Environmental and Socia l Impact Assessment (ESIA) to develop an Environmental and Social Management Framework (ESMF) for blocked -out areas	High	EPA MC WRC FC	2021	2025	EPA MC MDF Development partners	5,000,000	ESMF for block out areas developed	ESMF
	Review and update the environmental overview form for small and medium scale mining (Form SMMI1) to include information on mercury use and tailings management	High	EPA GNASSM	2021	2023	EPA	80,000	Form SMMI1 updated to include informationon mercury use and tailings management	Updated SMMI1 form

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Improving Environmental Management	Assess the capacity of relevant ASGM operators on the use of cyanide	High	EPA IDMC GNASSM	2021	2025	EPA IDMC	200,000	Capacity and capabilities of relevant ASGM operators in cyanide use assessed	Number of assessments conducted
	Develop guidelinesfor cyanide use in line with the International Cyanide Management Code (ICMC) for ASGM operators	High	EPA MC WRC GNASSM	2021	2023	EPA MC WRC GNASSM Development partners	500,000	Guidelines for cyanide use in ASGM developed	Guidelines
	Undertake sensitisation for ASGM operators on requirements of the guidelines for cyanide use	High	EPA GNASSM	2021	2025	EPA MC	150,000	ASGM operators sensitised on requirements of the guidelines for cyanide use	Number of ASGM operators sensitised on requirements of the guidelinesfor cyanide use Meeting reports
Reclamation/ rehabilitation and mine closure	Develop guidelines for reclamation/ rehabilitation at mine closure. [7]	High	EPA MC WRC FC GNASSM NGOs/CSOs	2021	2025	EPA MC WRC FC Development Partners	150,000	Guidelines for reclamation/ rehabilitation at mine closure developed	Availability of guidelines for reclamation/ rehabilitation at
	Develop guidelines for the posting of reclamation bonds by ASGM operators for reclaiming degraded lands	High	EPA MC AG MESTI MLNR GNASSM Financial institutions Private sector NGOs/CSOs	2021	2025	EPA MC Development Partners	500,000	Guidelines for the posting of reclamation bonds by small scale miners for reclaiming degraded lands developed	Guidelines for posting reclamation bonds available

[7] These can differ by different types of mines. In these guidelines, emphasize prevention of environmental impacts during operations because rehabilitation is more expensive than prevention.

Strategy	Action (s)	Priority	Activity lead (s)	Timeline		Funding source (s)	Activity cost (USD)	Expected result (s)	Indicator/ Means of Verification
				Start date	End date				
Reclamation/ rehabilitation and mine closure	Develop a regulatory framework for reclamation of mine d out areas in ASGM including posting of reclamation bonds	High	EPA MC AG MESTI MLNR	2025	2030	EPA MC Development Partners	500,000	Regulation on reclamation of mined out areas in ASGM developed with provisions on posting of reclamation bonds	Regulatory framework on reclamation of mined out areas in ASGM
	Build capacity of relevant institutions to enforce compliance with permitting conditions with respect to rehabilitation/r eclamation and closure of ASGM mine sites	High	EPA MC WRC	2021	2030	EPA MC WRC Development Partners	1,500,000	Capacity of relevant inst itutions enhanced to enforc e the provisions in the permitting processes with respect to rehabilitation, reclamation and closure of ASGM mine sites	Report indicating the n umber of capacity building sessions undertaken for relevant national institutions
	Develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds in accordance with Article 12 of the Minamata Convention	High	EPA MC FC Research institutions	2021	2025	EPA MC MMDAs Research institutions Development Partners	1,500,000	Efficient, cost-effective methods for dealing with highly mercury-contaminated areas, in line with the requirements of Article 12 of the Minamata Convention developed	Document on identified strategies for assessing sites contaminated by mercury or mercury compounds

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Reclamation/ rehabilitation and mine closure	Sensitise and train miners and service providers on efficient and cost-effective reclamation and	High	EPA MC FC UMaT	2021	2025	EPA MC Development Partners	1,000,000	Miners and service providers sensitised and trained on various reclamation/ rehabilitation	Sensitisation and training reports
	Pilot phytoremediation method for reclaiming highly mercury-contaminated ASGM sites	High	UMaT	2021	2025	UMaT EPA MC FC Development Partners	1,000,000	Phytoremediation method for reclaiming highly mercury-contaminated ASGM sites piloted	Report of the pilot phytoremediation method for reclaiming highly mercury-contaminated
Institutional capacity enhancement	Enhance the capacity of government agencies, miners and other stakeholders for improved management , regulation and enforcement.	High	EPA MC WRC	2021	2030	EPA MC Development Partners	10,000,000	Capacity of government agencies, miners and other stakeholders for improved management , regulation and enforcement enhanced.	Number of government agencies, miners and other stakeholders trained
Develop capacity of regulatory agencies to deliver services to miners	Enhance capacity of EPA regional/area officers, Minerals Commission mining district	Medium	EPA MC WRC FC MMDAs	2021	2025	GoG (EPA, MC) Development Partners	1,500,000	Capacity of EPA regional and area officers, MC mining district officers and WRC and Forestry Commission	Number of people trained

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Develop capacity of regulatory agencies to deliver services to miners	officers and Water Resources Commission and Forestry Commission to provide technical assistance to small scale miners.							small scale miners, enhanced.	
Enhance capacity of stakeholders to carry out their mandates	Provide more training to stakeholders including DMCs and miners on regulations, mining and processing technology as well as financial matters.	High	EPA MC WRC	2021	2025	GoG (EPA, MC) Development Partners	1,500,000	Capacity of stakeholders including DMCs and miners on regulations, mining and processing technology, as well as financial matters, enhanced.	Number of people trained.
Improve communication and collaboration among regulators and other actors	Review and improve options for enhancing continuous communication among relevant stakeholders to facilitate effective collaboration	High	MC EPA WRC GNASSM MMDAs MOH GHS	2021	2025	GoG (EPA, MC, WRC) Development Partners	2,000,000	Options for enhancing communication among relevant stakeholders, to facilitate effective collaboration reviewed and the reliable option identified and operational.	An effective and efficient platform for continuous communication among relevant stakeholders established

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Improve miners' access to gold markets	Review and improve the gold supply chain and trading routes and appropriately formalise internal gold trade. Build on the current regional study on mercury and gold trade in ECOWAS, including formalisation mechanisms.	High	PMMC MC GNASSM	2021	2025	GoG (MC, Special account for sustainable development of the small -scale mining industry) Development Partners	1,500,000	Gold supply chain and internal trading routes reviewed and improved and internal gold trade appropriately formalised. Further study on mercury and gold trade in the ECOWAS region conducted and formalisation mechanisms improved.	Gold supply cha in and internal trading routes clearly defined, formalised, and documented. Study report on mechanism for formalisation of mercury and gold trade in the ECOWAS region developed.
	Develop locally designed certification schemes that establish criteria of nvironmental and social performance for a more stable and/or expanded markets for the certified gold that is produced. E.g. Code for Risk mitigation Against Formal Trade (CRAFT code)	High	MC EPA GRA GNASSM Ghana Chamber of Mines CSOs/NGOs	2021	2025	GoG (EPA, MC, GRA) Development Partners Chamber of Mines CSOs/NGOs	1,500,000	Locally designed certification schemes established	Certification schemes

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Establish a mechanism to trace gold sales from point of production to point of export	High	MC EPA GRA GNASSM Ghana Chamber of Mines	2021	2025	GoG (EPA, MC, GRA) Development Partners	1,500,000	Mechanism to investigate methods to trace gold sales through export established	System to trace source of gold in trade
	Educate miners about locally designed certification schemes that establish criteria of environmental and social performance for a more stable and/or expanded markets for the certified gold that is produced	Medium	MC EPA GRA GNASSM Media CSOs/NGOs	2021	2025	GoG (MC, EPA, GRA) Development Partners CSOs/NGOs	500,000	Miners' knowledge of locally designed certification schemes enhanced	Awareness creation report Number of miners adopting locally designed certification schemes
Strengthen community relationship with ASGM and maximise the sector's benefits	Identify and integrate miners into existing community structures that will lead to social license and capital for the mi ners and their host communities	High	MC NGOs/CSOs GNASSM Media	2021	2025	GoG (MC) Development Partners	500,000	Miners integrated into existing community structures.	Community -based agreements between miners and their host communities.

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Strengthen communication and engagement between miners and community during the licensing and permitting process	Improve on avenues for notifications and publications in communities before and after granting concessions.	High	MC MMDAs GNASSM Media (Community - based FM stations, information centres) NGOs/CSOs	2021	2025	GoG (MC) Development Partners	500,000	Avenues for notifications and publications in communities before and after granting concessions improved.	Report on communication strategies. Register or record of announcement of public notices. Number of objections raised, reduced
	Sensitise miners on the Corporate Social Responsibility (CSR) guidelines	High	MC MMDAs GNASSM Media NGOs/CSOs	2021	2025	GoG (MC, MMDAs) Development Partners	500,000	Miners sensitised on the CSR guideline	Report on sensitisation Number of CSR activities undertaken by ASGM operators
	Compile, publish and disseminate the register of CSR activities	High	MC MMDAs GNASSM Media NGOs/CSOs	2021	2025	GoG (MC, MMDAs) Development Partners	500,000	Register of CSR activities compiled, published and disseminated	Register of CSRs
Develop diversified and sustainable livelihood projects, to complement mining and capture wealth for development	Conduct a thorough evaluation of previous diversified livelihoods projects to evaluate lessons learned,	High	MC Media NGOs/CSOs MMDAs GNASSM MLG DRD MLNR	2021	2025	GoG (MC, MMDAs) Development Partners GNASSM Chamber of Mines MDF	500,000	An evaluation of previous diversified livelihood projects to evaluate lessons learned conducted	Evaluation report

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	including projects by Friends of the Nation (FoN) and other stakeholders, on improving livelihoods for the youth.								
	Conduct an assessment on the full benefits of complementary and alternative livelihoods beyond income (less manual labour, more reliable, less bureaucracy to deal with, other) to attract miners, or youth considering mining, to alternatives.	Medium	MC Media NGOs/CSOs MMDAs GNASSM MLGDRD MLNR	2021	2025	GoG (MC, MMDAs) Development Partners GNASSM	500,000	Full benefits of complementary and alternative livelihoods well defined and elaborated	Assessment report
	Facilitate implementation of sustainable livelihood projects in ASGM areas that complement (rather than compete with) mining livelihoods, such as providing	Medium	MC Media NGOs/CSOs MMDAs GNASSM	2021	2025	GoG (MC, MMDAs) Development Partners GNASSM	500,000	Sustainable livelihood projects in ASGM areas implemented.	Number of sustainable livelihood projects implemented Number of ASGM miners involved in sustainable livelihood projects

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	services to miners, manufacturing and providing equipment, etc.								
Prevent whole ore amalgamation (WOA) from taking hold in the ASGM sector	Sensitise and create awareness about the ineffectiveness of WOA	High	MC EPA MMDAs ASGM Miners GNASSM ASGM communities NGOs/CSOs	2021	2025	EPA, MC, GNASSM, Development Partners	1,500,000	Sensitisation and awareness creation about the ineffectiveness of WOA conducted	Number of awareness creation activities Number of persons sensitised
	Revise EPA schedule to the permit to prohibit WOA	High	EPA MC MMDAs Miners GNASSM ASGM ommunities NGOs/CSOs	2021	2025	GoG (EPA)	500,000	Schedule to the Environmental permit revised	Schedule to the Environmental permit revised
Prevent open burning	Design and develop easy-to-use, effective, efficient, readily available and acceptable retorts	High	MC Relevant research institutions e.g., UMaT Private Sector NGO/CSOs	2021	2025	Private Sector GoG GNASSM	2,500,000	Easy-to-use, effective, efficient, readily available and acceptable retorts designed and developed	Number of improved Retorts designed, developed and in use by miners
	Sensitise and create awareness on the health	High	MC EPA GHS MMDAs	2021	2025	EPA, MC, GNASSM, Development Partners	1,500,000	Sensitisation and awareness creation about the impact of	Number of awareness creation activities

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	and environmental effects of open burning of amalgam		Miners GNASSM ASGM communities ISD NGOs and CSOs					open burning conducted Open-burning reduced	Number of persons sensitised Number of miners not engaged in open burning practices
	Train miners on proper use of retorts	High	MC EPA MMDAs Miners GNASSM ASGM communities NGOs/CSOs Research Institutions (UMaT)	2021	2025	MC, EPA, GNASSM, Development Partners	1,500,000	Skill of miners enhanced on the use of retorts	Number of miners trained; Post training evaluation report
Prohibit burning of amalgam in residential and built-up areas	Sensitise and create awareness on the dangers on health and environmental effect of burning amalgam in residential and built-up areas	High	MC EPA MMDAs Miners GNASSM ASGM communities NGOs/CSOs Traditional authorities	2021	2025	MC, EPA, GNASSM, Development Partners	1,500,000	Sensitisation and awareness creation about the impact of open burning conducted Burning of amalgam in residential and built-up areas prohibited	Number of awareness creation activities Number of persons sensitised Number of miners prohibited from engaging in open burning of amalgam in residential and built-up areas

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Relocate processing centres previously in residential and built -up areas	High	MC EPA MMDAs Miners GNASSM Ore processors ASGM communities NGOs/CSOs	2021	2025	GoG (MC, EPA), Development partners, Ore processors	500,000	Processing centres previously sited in residential and built -up areas relocated	Number of processing centres relocated
Prevent the use of cyanide on mercury contaminated tailings	Sensitise and educate miners on best mercury -contaminated tailings management practices	High	EPA MC MMDAs Chamber of mines Miners GNASSM ASGM communities NGOs CSOs UMaT	2021	2025	EPA, MC, GNASSM, Development Partners, Chamber of Mines	500,000	Miners sensitised and educated on best mercury -contaminated tailings management practices	Number of education and sensitisation sessions undertaken Number of miners sensitised Number of miners using best mercury management Evaluation report on best mercury management practices
	Develop protocol for tailings buyers and processors to ensure that they buy mercury -free tailings only for processing	High	EPA MC GNASSM Chamber of Mines Ore processors Laboratories	2021	2025	EPA MC Development Partners	500,000	Protocols developed Tailings are tested to ensure they are mercury -free before processing	Protocols documented

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Create containment for mercury contaminated tailings in hotspot areas in an Environmentall y Sound Manner (ESM)	High	EPA MC MMDAs CSOs/NGOs Miners ASGM communities	2021	2025	GNASSM EPA, MC, Development Partners	5,000,000	Contaminated mercury tailings contained in hotspot areas in an Environmentally Sound Manner (ESM)	Number of mercury contaminated tailings containments created
	Separate processing areas from amalgamation areas to prevent contamination	High	EPA MC MMDAs CSOs/NGOs Miners ASGM communities			GNASSM EPA, MINCOM, GNASSM, Donor Partners		Processing and amalgamation areas is separated	Number of processing and amalgamation areas is separated Separated sites
	Explore, identify and adopt appropriate technologies (including indigenous) for the remediation of mercury contaminated sites	High	MC EPA Universities and Research institutions (e.g., UMaT, CSIR) CSO and NGOs	2021	2025	EPA, MC GNASSM, Development Partners	1,000,000	Appropriate technologies to remediate contaminated tailings identified and adopted	Number of appropriate technologiesidentified Number of appropriate technologies adopted
Minimise exposure to mercury while still in use by miners	Expandthe baseline study on *mercury use and practices in the ASGM sector*to cover more areas and types of practices	Medium	MC EPA NGOs/CSOs GNASSM UMaT	2021	2030	EPA MC Development Partners	500,000	A comprehensive baseline study	Comprehensive baselinestudy report covering all ASGM districts in Ghana

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Train ASGM miners on BAT/ BEP including mercury management measures outlined in the UNIDO guidelines[8] (e.g., water setbacks, set aside areas for processing; Hg storage guidelines	High	MC EPA GHS MMDAs Miners GNASSM CSOs/NGOs UMaT	2021	2025	EPA MC GHS Development Partners	1,500,000	Miners trained on BAT/BEP – including UNIDO guidelines	Number of miners trained on BAT/BEP Number of training sessions organised for miners on BAT/BEP Number of mine sites implementing BAT/ BEP -including UNIDO guidelines
	Sensitise communities on BAT/ BEP - including mercury management measures (eg. as outlined in the UNIDO guidelines)	High	MC EPA GHS MMDAs Miners GNASSM CSOs/NGOs UMaT	2021	2025	GoG (EPA, MC GHS) Development Partners	1,000,000	Communities sensitised on BAT BEP – including UNIDO guidelines using multi-media approach (TV, radio, flyers, bill boards, local drama, social media etc.)	Number of communities sensitised on BAT BEP Number of sensitised sessions organised for communities on BAT/BEP
Mitigate the direct health impacts of mining	Awareness and education for ASGM operators and community members on mitigation of the safety and harmful health effects of mining	High	MC EPA GHS MMDAs Miners GNASSM CSOs/NGOs UMaT	2021	2025	GoG (EPA, MC GHS) Development Partners	1,000,000	Miners educated on the need and right use of PPEs	Number of miners and community members sensitised Number of miners using the PPEs Number of miners observing safety and health protocols

[8] UNIDO Technical Guidelines on Mercury Management in Artisanal and Small-scale Gold Mining, 2008

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Improve environmental sanitation, hygiene and food safety in ASGM communities	Educate communities and miners on personal hygienic practices	Medium	GHS	2021	2025	GoG (GHS)	500,000	Communities and miners educated on personal hygienic practices	Number of communities and miners educated
	Provide communities with safe drinking water and public toilet facilities where they are not available	High	MMDAs CWS A GWCL WRC GHS	2021	2025	MMDAs CWSA GWCL WRC Development partners	20 ,000,000	Safe drinking water and public toilet facilities provided to communities which do not have them.	Number of communities benefiting from safe drinking water and public toilet facilities
	Develop and implement water safety management plans	High	MMDAs CWSA GWCL WRC GHS	2021	2025	MMDAs CWSA GWCL WRC GHS	2,000,000	Water safety management plans developed and implemented	Water safety management plans
	Conduct market surveillance in mining areas to monitor the levels of food contamination (heavy metals, pathogens)	High	GHS FDA	2021	2023	GHS FDA	1,0 00,000	Market surveillance in mining areas to monitor the levels of food contamination conducted	Surveillance report

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Health promotion and awareness raising	Train health workers on ASGM & related occupational health and safety issues	High	GHS MC EPA NGOs/CSOs	2021	2025	GHS MC EPA NGOs/CSOs	1,500,000	Health workers trained on ASGM & related occupational health and safety issues	Number of health workers trained
	Develop Information Education &Communication (IE&C) materials on health improvement and disease preventive measures for miners and mining communities	High	GHS MC EPA NGOs/CSOs	2021	2025	GHS MC EPA NGOs/CSOs	1,500,000	IE&C materials on health improvement and disease preventive measures developed	Number of IE & C materials developed
	Disseminate Information Education & Communication (IE&C) materials to miners and their communities to raise awareness on health improvement and disease preventive measures	High	GHS MC EPA NGOs/CSOs	2021	2025	GHS MC EPA NGOs/CSOs	1,000,000	IE&C materials disseminated to miners and their communities to raise awareness on health improvement and disease preventive measures	Number of IE& C materials disseminated and used to raise awareness

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Strengthen the reporting systems of health and safety issues related to ASGM miners and their community	High	MoH GHS MC EPA	2021	2025	GoG (MoH, GHS, MC EPA) Development partners	1,000,000	Reporting systems of health and safety issues related to ASGM miners and their community strengthened	Number of health reporting systems strengthened
Develop and implement policies and guidelines targeted at improving health care provision related to ASGM miners and their communities	Develop and disseminate health sector policy and guidelines for mitigating ASGM - related occupational and environmental health hazards among miners, communities and vulnerable groups	High	MoH GHS	2021	2025	GoG (MoH, GHS) Development partners	1,500,000	Policy and guidelines developed and disseminated	Policy and guidelines document

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Support implemention of policies and guidelines targeted at improving health care provision related to ASGM miners and their communities	High	MOH GHS MMDAs GNASSM CSOs/NGOs	2021	2025	GoG (MoH, GHS) Development partners	5,000,000	Policy and guidelines implementation supported	Health care provision measures related to ASGM miners and their communities established
	Develop and disseminate treatment protocols for mercury-related health effects and other health problems related to ASGM	High	MOH GHS	2021	2025	GoG (MoH, GHS) Development partners	1,500,000	Treatment protocols developedand disseminated	Treatment protocols
Build capacity of health care workers for management of mercury - related health effects and other health problems related to ASGM	Train Public health workers in mining district in response to Public Health emergencies like chemical spills, collapsing mine pits etc.	High	MOH GHS	2021	2025	GoG (MoH, GHS) Development partners	1,000,000	Public health workers in mining district trained in response to Public Health emergencies	Number of public health workers trained

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
	Monitor human exposure to mercury among mining community members.	High	MOH GHS	2021	2025	GoG (MoH, GHS) Development partners	1,000,000	Human exposure to mercury among mining community members monitored	Number of monitoring actions
	Train public health service providers to prevent, detect and monitor human exposure to mercury	High	MPH GHS	2021	2025	GoG (MoH/GHS) Development partners	1,500,000	Public health service providers trained	Number of public service providers trained
	Train clinicians in ASGM areas to recognise symptoms and signs of mercury exposure, as well as diagnose and treat populations affected by mercury exposure	High	MOH GHS	2021	2025	GoG (MoH/GHS) Development partners	1,000,000	Clinicians trained to recognise symptoms and signs of mercury exposure, as well as diagnose and treat populations affected by mercury exposure	Number of clinicians trained
	Integrate ASGM, mercury impact and health training into curriculum of medical schools, nursing and public health training institutions	High	MOH GHS Health training institutions	2021	2025	GoG (MoH/GHS) Health training institutions	2,000,000	ASGM, mercury impact and health integrated into the curriculum of medical schools, nursing and public health training institutions	Curriculum updated to include ASGM, mercury impact and health training

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Improve access of miners and members of mining communities to health care	Improve access of miners and mining communities to essential/ emergency clinical care services at the primary level through provision of health care centres built close to mining communities, ambulance service provision and trained health care personnel	High	MO H GHS NAS MMDAs DFR	2021	2025	GoG (MoH, GHS, NAS, MMDAs, DFR)	20,000,000	Access of miners and mining communities to essential/ emergency clinical care services at the primary level improved.	Number of health workers trained on emergency response Number of ambulance services in mining communities Availability emergency response logistics
	Promote awareness and facilitate miner associations and unions to adopt suitable comprehensi ve health insurance for miners	Medium	GNASSM Miners MOH GHS NIC NHIA MC EPA	2021	2025	GoG (MOH/GHS) NHIA MC EPA GNASSM Miners	200,000	Miner associations and unions encouraged to adopt suitable comprehensiv e health insurance for miners	Number of miners associations and unions utili sing suitable comprehensive health insurance including NHIS

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	Indicator/ Means of Verification
				Start date	End date				
Strengthen regulation for chemical control and management as well as emergency preparedness and response related to ASGM	Review existing legislation on chemicals within the ASGM sector	High	EPA MC GHS	2021	2025	GoG (MOH/GHS, MC, EPA)	200,000	Existing legislation on chemicals within the ASGM sector reviewed and amended	Updated legislation on chemicals within the ASGM sector
	Develop guidelines for emergency preparedness and response for ASGM related activities (mass casualties and incidents, etc.)	High	MoH GHS MC EPA GNASSM	2021	2025	GoG (MOH/GHS, MC, EPA) Development partners	500,000	Guidelines for emergency response for ASGM developed	Guidelines
	Conduct sensitisation and training on chemical control and management and emergency preparedness and response	High	MOH GHS MC EPA GNASSM	2021	2025	GoG (MOH/GHS, MC, EPA) Development partners	1,500,000	Sensitisation and training on chemical control and management and emergency response conducted	Number of sensitisation sessions conducted Number of people sensitised

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
Intensify training, technical assistance and capacity building for miners to minimi se mercury use in ASGM	Develop and rollout training for miners on mercury free processing	High	MC MLNR (MMIP); EPA; Academia /Research institutions (UMaT, KNUST, UG) GNASSM CSOs/NGOs	2021	2025	GoG (MC , EPA) GNASSM Private sector (Ghana Chamber of Mines) Development partners	1,500,000	Miners trained on mercury free processing Mining operations transitioned to mercury free technologies	Number of miners trained; Number of mine sites that use mercury free technologies
	Set up model mercury free processing/ mining sites, begin ning with GNASSM concession in Tarkwa	High	MC EPA UMaT GNASSM	2021	2025	GoG (MC, EPA, UMaT) Private sector (Ghana Chamber of Mines) Development partners	1,500,000	Model mercury free processing/mi ning sites established and operationalised Mining and processing activities transitioned to mercury free	Number of model mercury free processing/mining sites established and operationalised Number of mine sites that use mercury free technologies
	Develop training module on mercury free processing to be used by different categories of trainers	High	Academia/ Research Institutions (UMaT, KNUST, UG etc) MLNR (MMIP) NGOs EPA Minerals Commission GNASSM	2021	2025	GoG (MC, EPA, UMaT) Private sector (Ghana Chamber of Mines) Development partners	1,500,000	Training modules for different categories of trainers available and accessible through diverse platforms (online, hard copies etc,) Categories of trainers identified	Number of training module s for different categories of trainers available and accessible Number of category of trainers identified

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Develop guidelines to incorporate topics on mercury use in ASGM in academic curricula of basic and tertiary levels of education courses that border on health, environment, policy, community development/	High	MoE GES NAB Academia/Research Institutions MESTI EPA MoH MC GNASSM	2021	2025	GoG (MoE, GES NAB MESTI EPA MoH MC) Academia/Research Institutions, GNASSM	750,000	Guidelines developed and disseminated	Guidelines developed
Provide assistance to miners on creating tailored mercury free processing workflows	Conduct research on best workflows based on representative ore types and processing activities	Medium	MC GNASSM MLNR(MMIP) Academia / Research Institutions	2021	2025	Development partners	750,000	Adoption of appropriate mercury free workflows	Number of miners using a ppropriate mercury free workflows; Catalogue for typical mercury free or low mercury workflows for characteristic ore type in Ghana
	Provide extension services/ demonstration of mercury free techniques	High	MC EPA GNASSM Academia/Research Institutions NGOs/CSOs	2021	2025	Institutional resources, Donor Grant,	500,000	Enhanced mercury -free techniques among ASGM mine rs	ASGM miners beneficiaries of extension services

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
Undertake other actions to accelerate transition to mercury free processing	Develop and implement an award scheme for ASGM miners with good mining and environmental practices	High	MC GNASSM EPA NGOs/CSOs	2021	2025	Institutional resources, Chamber of Mines, GNASSM, donor grant, sponsorships	500,000	Well motivated miners	An award scheme developed and successfully implemented
	Promote other mercury-free alternatives	Medium	MC EPA GNASSM Private Sector	2021	2025	Development Partners Private sector	1,000,000	More efficient mercury free technologies available	Number of mercury free technologies available and being used in ASM mines
	Identify, map, and characterise high priority historically contaminated sites	High	EPA MC GNASSM	2021	2025	Development Partners	1,000,000	Mercury contaminated hotspots identified and prioritised	A map of high priority historically contaminated sites created
Revision of the legal framework on mercury to give effect to Ghana's obligations under the Minamata Convention	Develop a national policy on life cycle management of mercury	High	MESTI EPA MOTI AGs MC CSOs/NGOs	2021	2025	GoG (MESTI, EPA, MOTI, AGs, MC) Development partners	250,000	National policy on life cycle management of mercury developed	National policy on life cycle management of mercury
	Develop a new regulatory framework on mercury	High	MESTI EPA MOTI AGs MC CSOs/NGOs	2021	2025	GoG (MESTI, EPA, MOTI, AGs, MC) Development partners	500,000	New regulatory framework on mercury developed	New regulatory framework on mercury

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Compile current, accurate data on legal imports, and their intended uses	High	MOTI EPA GRA-CD	2021	2025	GoG (MOTI , EPA, GRA-CD)	250,000	Data on legal mercury imports and usage compiled	Availability of updated annual data on mercury imports and usage
Awareness raising and training on the legal framework on ASGM and Mercury	Conduct awareness raising and training for stakeholders on the legal framework on ASGM and mercury	High	EPA, MOTI, MC, CSOs/NGOs	2021	2025	GoG (EPA, MOTI, MC) CSOs/NGOs Development partners	1,000,000	Awareness raising and training for stakeholders on the legal framework on ASGM and Mercury conducted	A report indicating the number of awareness raising and training sessions A report indicating the number of stakeholders sensiti sed and trained
Map out mercury trade flows/routes and identify illegal flows/routes	Investigate and document illegal mercury trade flows/routes	High	MOTI MoF GRA -CD GPS (Interpol)/ Private investigators/ GNASSM	2021	2025	GoG (MOTI, MoF, GRA -CD GPS) GNASSM	300,000	Illegal mercury trade routes investigated and mapped out	Report of illegal mercury trade routes including maps
Enhancing institutional capacity for cross-border cooperation	Institutional review to identify capacity gaps	High	MOTI M FA & RI GIS GRA -CD GPS	2021	2023	GoG (MOTI, M FA & RI, GIS GRA -CD)	100,000	Institutional capacity gaps identified	Report indicating capacity gaps

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Train frontline officers based on identified gaps to enhance cross border cooperation and control	High	MOTI MFA&RI GIS GRA-CD EPA	2023	2025	GoG (MOTI, MFA&RI, GIS, GRA-CD)	1,000,000	Frontline officers trained	Report indicating the number of frontline officers trained
	Conduct cross border training for border agencies	High	MOTI MFA&RI GRA-CD	2021	2025	GoG (MOTI, MFA&RI, GRA-CD)	1,000,000	Border agencies trained	Training report indicating the number of people trained
Enhance compliance with harmonised common external tariff regime for mercury within the ECOWAS region	Identify impediments to the implementation of the harmonised common external tariff regime for mercury	High	MoF MFA&RI GRA-CD MOTI EPA	2021	2023	GoG (MoF, MFA&RI, GRA-CD, MOTI, EPA)	2,000,000	Impediments to the implementation of the harmonised common external tariff identified and remedied	Report on the impediments to the implementation of the harmonised common external tariff
	Implement remedial actions based on the identified gaps to	Medium	MoF MFA&RI GRA-CD MOTI EPA	2023	2025	GoG (MoF, MFA&RI, GRA-CD, MOTI, EPA)	1,500,000	Improved compliance	Report on improved compliance

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	enhance the implementation of the common external tariff regime for mercury within the ECOWAS region								
	Harmonise taxes and royalties across the region to remove incentives for smuggling gold, which is often connected to illegal mercury trade	High	MoF MFA&RI GRA-CD MOTI EPA	2024	2025	GoG (MoF, MFA&RI , GRA-CD, MOTI, EPA)	1,500,000	Taxes and royalties in the ECOWAS region harmonised	Implementation of harmonised taxes and royalties in the ECOWAS region
Establish systems for the implementation of trade procedures outlined in Article 3 (Mercury supply sources and trade) of the Minamata Convention on Mercury	Strengthen the focal point as required by Article 17 (Information Exchange) of the Minamata Convention to implement Prior Informed Consent (PIC) procedures of	High	EPA MESTI	2021	2025	GoG (EPA ,MESTI) Development partners	1,000,000	Focal point strengthened and resourced	Report of meetings and workshops/ retreats Amount of financial resources allocated

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Establish a Technical Working group (comprising MESTI, EPA, MOTI, M OH, GHS, GRA-CD, MC, GIFF, mercury traders, GNASSM, CSOs/NGOs and others,)to establish criteria for allowing imports (e.g., circumstances under which consentshould be granted for mercury imports)	High	EPA MESTI MOTI MC	2021	2023	GoG (EPA, MESTI, MOTI, MC, MoH, GHS, GRA-CD), GNASSM CSOs/NGOs	500,000	Technical Working group established	Terms of Reference of Technical Working Group Number of meetings, minutes/reports
Strengthen the existing MCIC (the multi - stakeholder coordinating mechanism)	Identify other relevant stakeholders to support the existing MCIC and assign roles to the members of the MCIC in the monitoring and evaluation of	High	EPA MESTI MCIC	2021	2023	GoG (EPA, MESTI) MCIC	100,000	Relevant stakeholders identified with roles assigned and integrated into development of plan	Report on monitoring and evaluation of NAP implementation and their roles in the process Minutes/ reports Terms of reference of MCIC

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Mobilise sufficient resources for effective coordination	High	EPA MESTI MCIC	2021	2025	GoG (EPA, MESTI, MCIC) Development partners CSOs/NGOs	200,000	Enough funds mobilised	Statement of funds mobilised
	Partner with relevant stakeholders to carry out awareness creation on the Convention in ASGM communities and the general public	High	EPA MCIC NGOs/CSOs	2021	2025	GoG (EPA, MCIC)	Refer to awareness creation budget	Relevant constituencies engaged on plan implementation and review	Report on awareness creation Number of communities reached Number of IE&C materials developed and disseminated
	Engage miners, mining communities and relevant stakeholders in its implementation and periodic review processes	High	EPA MCIC	2021	2025	GoG (EPA, MCIC) Development partners	500,000	Miners, mining communities and relevant stakeholders engaged in its implementation and periodic review *processes*	Number of engagements (forums, workshops, conferences) Number of stakeholders engaged
Strategies for providing information to artisanal and small-scale miners and affected communities	Undertake a baseline survey to assess the level of awareness of mercury issues among all relevant stakeholders	High	EPA MC GH S CSOs/ NGOs	2022	2023	GoG (EPA, MC, GHS) CSOs/ NGOs	300,000	Baseline survey to assess the level of awareness of mercury issues among all relevant stakeholders conducted	Baseline report

Strategy	Action(s)	Priority	Activity lead(s)	Timeline		Funding source(s)	Activity cost (USD)	Expected result(s)	
				Start date	End date				
	Develop and implement communication strategy on mercury, its use in ASGM and its impacts on health and the environment	High	EPA MCIC GHS MC	2023	2025	GoG (EPA, MC, GHS) CSOs/NGOs	1,500,000	Communication strategy developed and implemented	Number of stakeholders engaged Number of communication materials developed

SECTION VII
Evaluation Mechanism

In the context of the national strategies enumerated above, specific mechanisms will be instituted to: (1) oversee the implementation of the strategies, (2) analyse the progress made during implementation, (3) evaluate gaps and weaknesses in implementation and, (4) make recommendations for improved processes towards the achievement of the strategies identified.

In the undertaking of these tasks, the following institutions or systems will be utilised.

1. *Minamata Convention Implementation Committee (MCIC)*: The MCIC is the national coordinating mechanism overseeing the management of all projects, initiatives and interventions geared towards the effective implementation of the Convention. |With representatives from all relevant stakeholders on mercury management, this committee shall meet at least twice a year to take stock of all ongoing activities related to mercury management, analyse their relationship with the national strategy and provide appropriate recommendations towards their improvement to make impact at scale.

2. *ASGM Technical Working Group (TWG) of the Minamata Convention Implementation Committee*: This working group which is a technical arm of the MCIC, shall meet quarterly to discuss details of technical issues related to the implementation of initiatives, projects and interventions under the national strategy and make recommendations to the MCIC.

3. *National Stakeholders Forum (NSF)*: This forum will provide an interactive platform of representation for all stakeholders and actors playing various roles in mercury-related activities in the country. This platform of actors will be convened annually to present results on activities undertaken in the year under review and reach consensus on plans designed to achieve targets of the national strategy in the coming year.

4. *Independent Evaluation Expert (IEE)*: To ensure efficiency, effectiveness and value for money on interventions implemented for the achievement of the national strategy, an independent evaluation expert will be appointed to conduct an evaluation at least once every two years of the efficiency and effectiveness of activities undertaken during the period under review.

The various objectives/targets, strategies and indicators are summarised in Table 9 below:

Table 9: Evaluation Mechanism of the NAP

Objective/target	Strategies	Indicators
Ensure high-level management of NAP strategy implementation	Undertake at least two MCIC meetings annually	Number of MCIC meetings held
		Meeting reports on NAP discussion
Provide tailor-made technical guidance for NAP implementation	Organise at least 4 ASGM Technical Working Group (TWG) meetings annually to discuss details of technical issues related to the implementation of initiatives, projects and interventions under the national strategy and provide recommendation to the MCIC	Number of ASGM subcommittee meetings held
		Meeting reports on ASGM subcommittee meetings
Ensure national stakeholder buy-in on NAP implementation	Organise at least one national stakeholder forum to review meetings on NAP and reach consensus on plans designed to achieve targets of the national strategy in the coming year.	Number of national stakeholder reviews held
		Meeting reports on national stakeholder review forum
Undertake independent evaluation on NAP process	Undertake at least one independent evaluation on NAP strategy implementation every two years	Number of independent evaluations conducted
		Evaluation report

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SECTION VIII
Annexes

Annex A: List of Past Initiatives

Past Initiatives to Address ASGM in Ghana (2008 – 2020)			
Year	Initiative	Partners	Overview
2016	National Action Dialogue	- International Institute of Environment and Development - Friends of the Nation	The Dialogue gathered over 55 stakeholders to discuss and come out with a draft road map for the formalis ation of the ASGM sector. A Learning and Leadership Group was for med to lead the process of reforms in the sector
2015	The preparation for the implementation of the Convention	- European Environment Bureau (EEB)/Food and Agriculture Organization (FAO) - Friends of the Nation	Focused on helping countries to implement obligations related to the Convention, including developing strategies to support NAPs for ASGM in Ghana and Tanzania.
2015	Integrated Assessment of ASGM in Ghana	Graham Sustainability Institute, University of Michigan. USA	Utilized integrated assessment methods to analyse economic, social, health, and environmental data, and co-develop evidence-based responses with relevant stakeholders.
2008 – 2015	Natural Resources and Environmental Governance (NREG) Framework	- World Bank (International Development Association) and development partners - Ministry of Lands and Natural Resources	Technical and budgetary support to improve natural resource and environmental governance through policy and institutional reforms and capacity building (World Bank, 2015). Multi-stakeholder workshops with over 1000 participants in eight ASGM office field locations. Developed Ghana ASGM Framework identifying key issues and outlining a 1 to 10 ten - year development plan for ASGM.
2015 - 2017	Computerised license and Administration System Project	- Australian High - Commission - Ministry o f Lands and Natural Resources (Minerals Commission) - Revenue Development Foundation (NGO experienced in revenue raising).	Technical assistance to improve the effectiveness, accountability and compliance with the management of mineral rights, mining lice nses and royalties. Supported MC to develop a computerised administration system for the processing, management and monitoring of mineral rights and licenses. Aims to help increase investor confidence and improve mining investment.

Past Initiatives to Address ASGM in Ghana (2008 – 2020)			
Year	**Initiative**	**Partners**	**Overview**
2015	Training Programme for Artisanal and Small-Scale Miners	- UMaT - GNASSM	Memorandum of Understanding for UMaT to train GNASSM members in various technical, management health and safety aspects of ASGM. Three - tiered programme (low, medium, high) with associated training manuals to equip miners with skills and promote best practice.
2015	Re - categorisation of Mining Licences	- MLNR - MC	Reviewing the categorisation of ASGM mining licenses to account for changes in characteristics and promote more investment. The measures are aimed at reducing illegal foreign mining and increasing the tax and revenue base of ASGM (MC, 2015).
2016	Improving Livelihood for the Youth	Australian High Commission Friends of the Nation	Aimed at deepening understanding of the factors that drive youth into illegal mining in the Mpohor District, by raising awareness generally of the drivers behind the high number of youth involved in illegal mining in Ghana and the key issues they face to assist in the targeting of policies and programs from civil society, government and international donors; and promoting livelihood enhancement and diversification, through sensitisation workshops and a pilot program for young men and women in the Mpohor District.
2011 – 2020	Certification efforts for ASGM in West Africa	- Alliance for Responsible Mining (ARM) - Fairtrade International - Solidaridad	Range of initiatives linking Western jewellers and consumers directly to ASGM cooperatives to certify the origin of minerals and establish minimum standards of production, and improve traceability and transparency of supply chains (Hilson, 2014; McQuilkin, 2016).

Annex B: List of National Stakeholders Consulted

National Government Stakeholders

- Ministry of Environment, Science, Technology and Innovation
- Ministry of Health
- Ministry of Gender, Children and Social Protection
- Ministry of Lands and Natural Resources
- Ministry of Local Government and Rural Development
- Ministry of Chieftaincy and Culture
- Ministry of Interior
- Ministry of Transport
- Ministry of Foreign Affairs and Regional Integration
- Ministry of Local Government and Rural Development
- Ministry Employment and Labour Relations
- Ministry of Information
- Ministry of Trade and Industry
- Ministry of Finance
- Ministry of Food and Agriculture
- Parliamentary Select Committee on Environment, Science and Technology
- Parliamentary Select Committee on Lands and Forestry
- Parliamentary Select Committee on Mines and Energy
- Environmental Protection Agency
- National Development Planning Commission
- Ghana Revenue Authority - Customs Division
- Ghana Atomic Energy Commission
- Water Resources Commission
- Council for Scientific and Industrial Research/Water Research Institute
- Ghana Health Service
- Department of Factories Inspectorate
- Minerals Commission
- Ghana Standards Authority
- Ghana Cocoa Board
- Attorney Generals Department
- Ghana Geological Survey Authority
- University of Mines and Technology
- Ghana Ports and Harbours Authority
- Forestry Commission
- Precious Minerals and Marketing Company Ltd
- Ghana Extractive Industries Transparency Initiative
- Inter-ministerial Committee on Illegal Mining

International Organisations /Development Partners

- United Nations Industrial Development Organization
- World Health Organisation
- United Nations Development Programme
- UNDP Small Grants Programme
- International Labour Organisation
- Australian High Commission
- Embassy of Switzerland
- Embassy of Japan
- Japan International Cooperation Agency
- Embassy of the United States of America
- Delegation of the European Union to Ghana

- The World Bank
- German Development Co-operation
- Natural Resource Defense Council

Non-Governmental Organisations/Civil Society Organisations

- Friends of the Nation
- Accra Mining Network
- National Coalition on Mining
- Oxfam in Ghana
- WACAM
- Environment Youth Action Network
- Centre for Environmental Impact Analysis
- Centre for Social Impact Studies
- Planetary Harmony Solutions
- Institute of Environmental Compliance and Sustainable Development
- Ecological Restoration
- Ghana National Association of Small-Scale Miners
- ASMAN- Africa Network
- Kasa Initiative Ghana
- Ghana Jewellery Association
- Women in Mining Ghana
- Federation of Ghana Goldsmith & Jewellers
- Solidaridad West Africa

Private sector

- Ghana Chamber of Mines
- Ghana National Chamber of Commerce and Industry
- Ghana Institute of Freight Forwarders
- Association of Ghana Industries

Annex C: Terms of Reference of the Technical Working Group

The Minamata Convention Implementation Committee (MCIC) is a multi-stakeholder and multi-sectoral national coordinating mechanism with the sole task of providing strategic oversight and guidance to all mercury related initiatives in Ghana, to ensure that they are well harmonised/synergised and being implemented within national priorities.

The MCIC constituted a Technical Working Group (TWG) with the following specific Terms of Reference (ToR): to support the Environmental Protection Agency (project coordination institution) in preparing the National Action Plan (NAP) on Artisanal Small-Scale Gold Mining (ASGM) in partial fulfilment of Ghana's obligations under the Minamata Convention on Mercury (Article 7 and Annex C), taking into account the following outputs of the project:

- A national comprehensive analysis of the ASGM sector to support the development and implementation of a road map to reduce mercury emissions and releases;
- An institutional and capacity needs assessment to develop a public health strategy on ASGM; and
- A rapid health situation assessment.

Membership of the Technical Working Group:

No.	Name	Institution
1.	Mr. Nelson Ahedor (Co-chair)	Minerals Commission
2.	Mr. Michael Sandow Ali (Co-chair)	Environmental Protection Agency
3.	Dr. Sam Adu-Kumi (National Project Coordinator)	Environmental Protection Agency
4.	Dr. Carl Osei	Ghana Health Service
5.	Dr. Emmanuel Kyeremateng-Amoah	Ghana Health Service
6.	Mr. Adam Seidu	Ministry of Trade and Industry
7.	Mr. Solomon Kusi Ampofo	Friends of the Nation
8.	Mr. Emmanuel Yirenkyi-Antwi	Ghana National Association of Small -Scale Miners
9.	Dr. Naa Dedei Tagoe	Inter-Ministerial Committee on Illegal Mining
10.	Mrs. Justine S. SeyireDzadzra	Environmental Protection Agency
11.	Mr. Joseph C. Edmund	Environmental Protection Agency
12.	Mr. Lovelace Sarpong	Environmental Protection Agency
13.	Mrs. Felisa Owusu - Darko	Environmental Protection Agency
14.	Mrs Kafui K. Boni	Environmental Protection Agency
15.	Ms. Abena Ayensu	Environmental Protection Agency
16.	Mr. Larsey Mensah	Planetary Harmony Solutions
17.	Mr. Joel Ayim Darkwah	United Nations Development Programme
18.	Mr. Koku Treveh (Deceased)	International Labour Organisation

Annex D: Detailed National Baseline Analysis
See reference 28

Annex E: Institutional Capacity Assessment Report
See reference 45

Annex F: Rapid Health Situation Assessment Report
See reference 70

Annex G: Budget for the Implementation of the NAP (2021-2025)

No.	Implementation Strategy	Estimated Budget (USD)
1.	Revision of the legal/regulatory framework (Minerals and Mining Act and Subsidiary legislations)	1,300,000
2.	Streamline licensing and make it more accessible	650,000
3.	Step up and maintain effective enforcement	3,700,000
4.	Financing the process of formalisation	1,500,000
5.	Increase financing to the GGSA to improve availability of geological data	52,500,000
6.	Demarcate more land for titling to ASGM	7,600,000
7.	Improving Environmental Management	5,980,000
8.	Reclamation/ rehabilitation and mine closure	6,150,000
9.	Institutional capacity enhancement	10,000,000
10.	Develop capacity of regulatory agencies to deliver services to miners	1,500,000
11.	Enhance capacity of stakeholders to carry out their mandates	1,500,000
12.	Improve communication and collaboration among regulators and other actors	2,000,000
13.	Improve miners' access to gold markets	5,000,000
14.	Strengthen community relationship with ASGM and maximise the sector's benefits	500,000
15.	Strengthen communication and engagement between miners and community during the licensing and permitting process	1,500,000
16.	Develop diversified and sustainable livelihood projects, to complement mining and capture wealth for development	1,500,000
17.	Prevent whole ore amalgamation (WOA) from taking hold in the ASGM sector	2,000,000
18.	Prevent open burning	5,500,000
19.	Prohibit burning of amalgam in residential and built -up areas	2,000,000
20.	Prevent the use of cyanide on mercury contaminated tailings	7,000,000
21.	Minimise exposure to mercury while still in use by miners	3,000,000
22.	Mitigate the direct health impacts of mining	1,000,000
23.	Improve environmental sanitation, hygiene and food safety in ASGM communities	23,500,000
24.	Health promotion and awareness raising	5,000,000
25.	Develop and implement policies and guidelines targeted at improving health care provision related to ASGM miners and their communities	8,000,000

26.	Build capacity of health care workers for ma nagement of mercury-related health effects and other health problems related to ASGM	6,500,000
27.	Improve access of miners and members of mining communities to health care	20,200,000
28.	Strengthen regulation for chemical control and management as well as emergency preparedness and response related to ASGM	2,200,000
29.	Intensify training, technical assistance and capacity building for miners to minimise mercury use in ASGM	5,250,000
30.	Provide assistance tominers on creating tailored mercury free processing workflows	1,250,000
31.	Undertake other actions to accelerate transition to mercury free processing	2,500,000
32.	Revision of the legal framework on mercury to give effect to Ghana's obligations under the Minamata Convention	1,000,000
33.	Awareness raising and training on the legal framework on ASGM and Mercury	1,000,000
34.	Map out mercury trade flows/routes and identify illegal flows/routes	300,000
35.	Enhancing institutional capacity for cross-border cooperation	2,100,000
36.	Enhance compliance with harmonised common external tariff regime for mercury within the ECOWAS region	5,000,000
37.	Establish systems for the implementation of trade procedures outlined in Article 3 (Mercury supply sources and trade) of the Minamata Convention on Mercury	1,500,000
38.	Strengthen the existing MCIC (the multi - stakeholder coordinating mechanism)	800,000
39.	Strategies for providing information to artisanal and small-scale miners and affected communities	1,800,000
	TOTAL	**211,280,000**


gef
UNIDO
UNITED NATIONS
NDUSTRIAL DEVELOPMENT ORGANIZATION
epa
World Health
Organization
NRDC