



The State of Eritrea

Ministry of Land, Water and Environment



**National Action Plan for Reducing
Mercury Use in the Artisanal and
Small-scale Gold Mining (ASGM) Sector**

2020

Acknowledgements

The preparation of the National Minamata Initial Assessment (MIA) Report and the National Action Plan (NAP) on reducing mercury use in Artisanal and Small Scale Gold Mining has enlisted the assistance, participation and cooperation of various key stakeholders.

First of all I would like to sincerely thank H.E. Mr. Tesfai G.Selassie, Minister of Land, Water and Environment for his valuable support and continuous guidance and advice throughout the preparation process of the two documents.

I would also like to extend my gratitude to the Ministries of: Energy and Mines, Trade and Industry, Transport and Communication, Health, Labor and Social Welfare, Finance, Local Government, Justice and other institutions such as, Regional Administrations, Eritrean Institute of Technology, Eritrean Standard Institution, Custom office, Hamelmalo Agricultural College, Bisha and Zara mining share companies for providing reliable data and information as well as for their active involvement in the process.

Further, my thanks go to the Bureau of Standard and Evaluation of the Higher Education and Research Institute consultants for preparing this document in accordance with guidelines provided by the Minamata Convention.

I also extend my gratitude to the team of experts emanated from the key stakeholder institutions for providing data and information pertinent to these documents from their respective institutions and for reviewing the document meticulously in their area of expertise.

I am also grateful to all UNITAR and UNEP Experts for their relentless efforts in providing technical support, continuous guidance, as well as, for their efficient facilitation of the financial transaction for the project preparation. Finally I would like to acknowledge GEF and Minamata Secretariat for their financial supports.

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Foreword

Mercury, the only metal in liquid state at normal temperature, occurs free in a limited amount in nature. It is used in the manufacture of a variety of widely used products such as thermometers, barometers, fluorescent lamps, consumer batteries, insecticides, amalgams used to fill dental cavity, paints. Mercury is also applied in industrial catalysis and processes of gold recovery from its cores.

Because it is highly toxic with great ability to be transported, mercury and mercury containing products could trigger a number of irreversible damages to human health and the environment. Disruption of the nervous system, damage to brain function, DNA damage and chromosomal damage, allergic reaction and negative reproductive effects are some of the well documented impacts of mercury on human health. Recognising the grave threat that mishandling of mercury pose to human health and the environment, the international community endorsed the Minamata Convention on Mercury, the objectives of which is to secure global cooperation in controlling mercury pollution and its impacts on human health.

Eritrea has yet not acceded to the Convention, but it controls the import and use of mercury in the country. Nevertheless, mercury application in illegal artisanal gold mining by people who have no knowledge about its health and environmental hazards is worrisome. Breakdown of mercury containing minerals and soil through exposure to erosion agents, as well as release of mercury into the air from fossil fuel combustion in the transport and power sectors, open air solid waste combustion, application of insecticides and artificial fertilizers, disposal of mercury containing products and wastewater from mines are major sources of mercury pollution that require special attention in our country.

As the issue leaves no room for complaisance, the Ministry of Land, Water and Environment initiated a survey study to prepare National Minamata Initial Assessment (N-MIA) report by assessing the different sources of mercury and estimating the levels of its releases and emission into the environment. Furthermore, a National Action Plan (NAP) has been prepared specifically to indicate future road of eliminating mercury use in artisanal gold mining activities. Both documents contain comprehensive information on mercury and mercury containing products management infrastructures, including institutional, legal, administrative and technical aspects along with the nature of import, use, storage and disposal in the country. Likewise, appropriate consideration was given to the synergic advantage to be accrued from the implementation of the multilateral environmental agreements related to mercury management vis-a-vis the Stockholm, Rotterdam and Basel Conventions.

In conclusion, while I confirm Eritrea's commitment to contribute its part towards the achievement of global goals in addressing the challenges of mercury related pollution, I would like to express my sincere appreciation to all the stakeholders, including policy makers, government agencies, non-governmental organisations and the general public as well as the international partners who made contribution in producing both the N-MIA and NAP documents; and I call for their further committed cooperation in implementing the action plans proposed in both documents.

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List of ACRONYMS

AMV	African Mining Vision
ASGM	Artisinal and Small-scale Gold Mining
ASM	Artisinal and Small-scale Mining
AZ	Administrative Zone
CEDAW	Convention on the Elimination of All forms of Discrimination Against Women
CSO	Civil Society Organization
GEF	Global Environment Facility
GIS	Geographic Information System
GoSE	Government of the State of Eritrea
ILO	International Labour Organization
LSM	Large-scale Mining
MDAs	Ministries, departments and agencies
MPP	Macro-Policy Paper
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoF	Ministry of Finance
MoH	Ministry of Health
MoJ	Ministry of Justice
MoLG	Ministry of Local Government
MoLHW	Ministry of Labor and Human Welfare
MoMR	Ministry of Marine Resources
MoTI	Ministry of Trade and Industry
MRM	Mineral Resources Management Division
NAP	National Action Plan
NIDP	National Indicative Development Plan
NRA	National Revenue Authority
NSA	National Security Agency
NSC	National Steering Committee
PFDJ	People's Front for Democracy and Justice
SAG	Stakeholder Advisory Group
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
SGBP	State Gold-Buying Programme
SPCF	Strategic Partnership Cooperation Framework
TTT	Train-The-Trainers
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNITAR	United Nations Institute for Training and Research
WHO	World Health Organization

Glossary of Terms

Artisanal mining means non-mechanized mining operations of an essentially manual nature carried out by Eritrean individuals or groups of such persons¹;

Artisanal and Small-scale Gold Mining (ASGM) means gold mining conducted by individual miners or small enterprises with limited capital investment and production². (In the context of Eritrea, ASGM only refers to Artisanal Gold Mining (AGM) as no Small Scale Gold Mining exists.)

ASGM actor: A person involved in the domestic ASGM supply chain (diggers, processors, license holders, licensed traders, unlicensed traders, goldsmiths, exporters)

ASGM stakeholder: A person or an institution indirectly involved in ASGM (customary chiefs, village chiefs, youth leaders, farmers, shop holders, health officials, and representatives of the Ministry of Mines and Energy at both the central and district level).

Formalization of the ASGM sector can be understood as a process that ensures that ASGM actors are licensed and organized in representative entities that represent their needs; policies are implemented, monitored, and enforced; and ASGM actors receive technical, administrative, and financial support that empowers them to adhere to requirements prescribed by national regulations³.

Miner: A general term referring to a person directly involved in production. Most of them are manual miners, such as diggers and processors.

¹ Proclamation No. 68/1995 “a Proclamation to promote the Development of Mineral Resources”

² Minamata Convention on Mercury: Article 2

³ UNITAR and UN Environment, 2018. Handbook for Developing National ASGM Formalization Strategies within National Action Plans. Geneva, Switzerland: UNITAR and UN Environment. <https://www.unitar.org/cwm/mercury-0>

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The ASGM overview report of Eritrea and its national action plan (NAP) was developed in response to Article 7 of the Minamata Convention on Mercury. Although Eritrea is not party to the Minamata Convention, the country has been taking several efforts to ensure mercury is not used in the artisanal mining and hence reduce its health and environmental impacts. Mercury use in the artisanal mining is prohibited by law in Eritrea.

Eritrea is endowed with significant mineral resources including gold, copper, zinc, silver, potash and other industrial minerals and construction rocks. The mining sector is among the key drivers of the national economy and, indeed, the mining sector's contribution to the national economy is significant. Eritrea's ASGM sector is linked to all the Sustainable Development Goals (SDGs) enlisted in United Nations Agenda 2030 and the goals and priority areas in the African Union Agenda 2063, as well as many of Eritrea's priority development areas. Moreover, the NAP has the potential to meet the objectives of the four pillars of the strategic partnership cooperation framework (SPCF) between the Government of the State of Eritrea (GoSE) and the United Nations 2017-2021, including improving the basic social services, enhancing environmental sustainability and resilience by reducing mercury emissions and releases to water, land and air, enhancing public sector capacity and inclusive growth, food security and sustainable livelihoods. Moreover, the NAP can help to realize the principles set forth in Mining Proclamation No. 68/1995, notably that Eritrea's mineral resources "Make a significant contribution to the economic development of the country" and that they are developed and conserved "for the benefit of the people".

Different Ministries, Departments and Agencies (MDAs) such as the Ministry of Land, Water and Environment, Ministry of Energy and Mines, Ministry of Health, Ministry of Labor and Social Welfare (MoLSW), and Academic Institutions (Eritrean Institute of Technology, Hamelmalo Agricultural College) have been actively involved in preparation of the NAP.

Despite mercury use in ASGM and activities deeper than five meters being prohibited by the mining proclamation, a considerable number of people continue to be engaged in illegal artisanal mining activities. The study revealed that ASGM is a poverty-driven, seasonal activity, practised in five out of six of Eritrea's administrative zones (AZs). The major ASGM sites are mainly concentrated in the gold-rich quartz veins of Gash Barka AZ, with a large expanse that covers the whole western lowland of Eritrea.

The ASGM overview has been extensively assessed, identified and developed. A mixed-methods approach, combining qualitative and quantitative data collected from both primary and secondary sources was used in the ASGM overview. Data and information was collected from a literature review, key informants' interviews and field visits. During the study 15 sites were visited and more than 170 different stakeholder representatives, including a significant number of women, were consulted.

Through these findings, the workforce involved in artisanal mining is estimated to be 25,440 and annual gold production is calculated at about 324,360 g, of which 185,487 g (57%) was obtained using mercury. The baseline estimate of mercury used in the ASGM sector is calculated to be 204,036 g per year. Gold extraction and processing in Eritrea are conducted using rudimentary techniques and is labour intensive at all stages. Generally, women make up 20 per cent of the whole workforce and are mainly involved in the panning of gold. Children participate in different kinds of jobs along with their families (due to data constraints, a reasonable estimate is not possible to make). In terms of health impacts, women and children are directly exposed through ASGM activities, as mothers and their breast fed children are exposed to mercury through inhalation during the gold amalgamation process (roasting). The most pressing environmental impacts stemming from ASGM activities in Eritrea are the release of mercury to air and the degradation of lands by mining pits.

The national action plan (NAP) is designed to aid in the protection of human health and the environment from anthropogenic emissions and releases of mercury in the ASGM sector. In outlining and developing the NAP, necessary and conditional components have been pursued, considering the overall and current situations of the country.

The NAP's national goal is to reduce, and where feasible eliminate, the use of mercury and the emissions and releases of mercury to the environment from ASGM activities. This goal is developed in response to the country's commitment for ensuring environmentally sound management of chemicals in general and specifically mercury, as well as an overall commitment to sustainable development. To achieve effective and efficient ways to implement the NAP's priorities, four broad objectives have been set. These are legal framework and institutional strengthening, resource assessment, promotion, awareness raising and communication, and ensuring public health and safety related to the ASGM activities.

Currently formalization of ASGM will not be implemented in this NAP, mainly due to the fact that artisanal mining deeper than 5 meters is strictly prohibited as per the proclamation and knowledge about the mineral resources of the country is limited and hence difficult to delineate potential areas for artisanal mining sites. Therefore, mineral resource assessment should be carried out as a priority, as outlined in this NAP.

Generally, in this NAP, nine strategies including corresponding activities have been proposed for implementation for the purpose of the national goal, which is reducing and finally eliminating mercury use in ASGM activities. The overall strategies are: strategy to promote sustainable livelihoods for those that engage in ASGM; geo-prospecting and delineating land for ASGM; improving, monitoring and enforcement of regulations in respect to the ASGM and mercury management; institutional strengthening for NAP implementation; awareness raising for the ASGM communities and stakeholders; public health strategy on mercury exposure of ASGM miners and their communities; and preventing the exposure of vulnerable populations (women and children) in ASGM activities and providing necessary information about the ASGM activities.

The NAP is prepared in line with the strategic plans of stakeholder institutions and is proposed for implementation over five years (2021–2025). The overall budget required for the implementation of the proposed action plans is estimated as **USD 3,066,050**. The budget is further broken-down among the different action plans: **USD 147,000**, for legal frameworks and institutional building, **USD 2,325,000** for resource assessment, **USD 302,050** for promotion, awareness raising and communication, **USD 200,000** for ensuring health and safety related to ASGM activities and **USD 22,000** for monitoring and evaluation of NAP implementation. Sources of funding for the implementation of this NAP are expected to be obtained from development partners with substantial in-kind Government contribution.

Worldwide, the Artisanal and Small-scale Gold Mining (ASGM) sector provides direct livelihoods for an estimated of 16 million and indirect livelihoods for about 100 million people^{4,5}. However, the sector, which is largely informal and is often associated with the use of mercury in order to isolate the gold, also constitutes 37% of the global anthropogenic atmospheric mercury emissions to the environment.⁶

Mercury is a heavy metal which causes adverse neurological and other health effects, particularly in unborn children and infants. The global transport of mercury in the environment and its adverse effects were among key reasons for decisions at the global level to address the problem. Member States of the United Nations have therefore negotiated and adopted the Minamata Convention on Mercury, a global treaty to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.

As outlined in its national environment proclamation, the Government of Eritrea is committed to support global actions to protect the environment and human health from pollution and hazardous chemicals⁷. Despite the fact that Eritrea has not yet ratified the Minamata Convention, the country is determined to support the objectives of this Convention.

Eritrea is endowed with significant mineral resources including gold, copper, potash, zinc, silver and marble, and the mining sector is among the key drivers of the national economy⁸. The sector's recent growth is important for economic diversification, especially in view of the modest and declining contributions from the agricultural sector, which employs most Eritreans but suffers from recurrent droughts. Indeed, the mining sector contribution in to the national economy is significant. However, while the sector has attracted a significant number of industrial mining companies, limited attention has been given to artisanal and small-scale gold mining (ASGM) in particular. Although this subsector is poverty-driven, it is actively practised, to a limited level. At the same time, the sector has been a cause of a number of environmental and health impacts that are of public concern; such as, land degradation, water and soil contamination, occupational health and safety issues, and others. The National Action Plan is the country's first initiative to address its ASGM activities in a comprehensive manner, addressing its use of mercury as part of broader issues of sustainable and socio-economic development.

Eritrea's ASGM sector, with all of its diversity (see section 3), is linked to the country's priority areas, the Sustainable Development Goals (SDGs) 2030 and AU Agenda 2063. As stated in the Macro-Policy Paper (MPP) and the Charter of the People's Front for Democracy and Justice (PFDJ), Eritrea's vision is to achieve rapid, balanced, home-grown and sustainable economic growth with social equity and justice, anchored on the principles of self-reliance. Accordingly, Eritrea's National Indicative Development Plan (NIDP) 2009-2013 set out the following priorities (which remain valid):

- ▶ Building a society with a great sense of common and shared destiny;
- ▶ Fostering the development of mature community-based democratic institutions;
- ▶ Creating an initiative society capable of adopting scientific and technological advances;
- ▶ Creating a conducive operating environment for effective development planning, economic management, and efficient delivery of public services;
- ▶ Promoting rapid, sustainable and equitable economic development in which all members of society participate and ensuring development of a competitive and internationally integrated economy with human development, food security and poverty eradication.

⁴ Seccatore, J., Veiga, M., Origliasso, C., Marin, T. and De Tomi, G., 2014. "An Estimation of the Artisanal Small-Scale Production of Gold in the World." *Science of The Total Environment* 496 (October): 662–67. <https://doi.org/10.1016/j.scitotenv.2014.05.003>.

⁵ Stylo, M. S., De Haan, J. S. and Davis, K., forthcoming. Collecting, managing and translating data into National Action Plans for Artisanal and Small Scale Gold Mining. Manuscript submitted for publication with The Extractive Industries and Society.

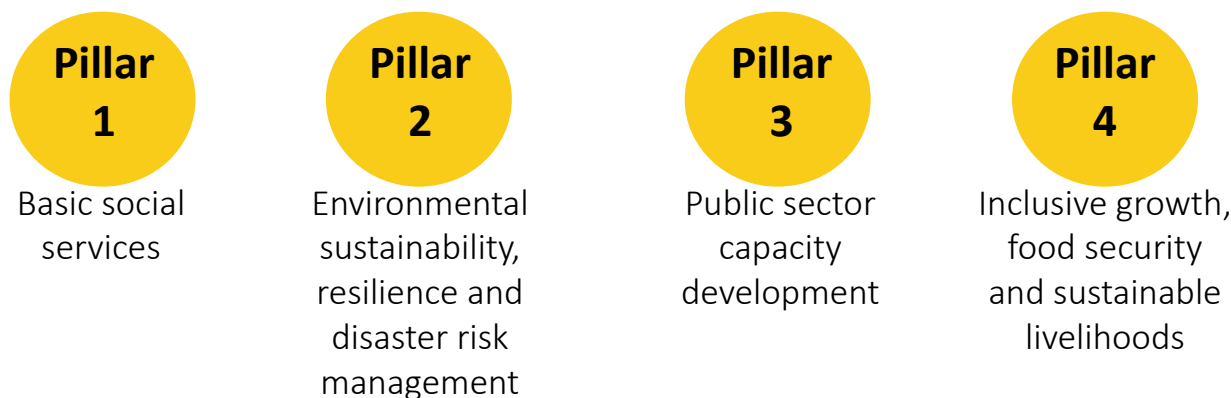
⁶ UNEP, 2013. "Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport." UNEP Chemicals Branch, Geneva, Switzerland. <http://wedocs.unep.org/bitstream/handle/20.500.11822/7984/-Global%20Mercury%20Assessment-201367.pdf?sequence=3&disAllowed=y>

⁷ The Eritrean Environment Protection, Management and Rehabilitation Framework Proclamation No. 179/2017

⁸ It accounts for about 22% of GDP (Statista, 2018. <https://www.statista.com/statistics/510486/gross-domestic-product-gdp-per-capita-in-eritrea> (Accessed November, 2018))

⁹ <https://www.worldbank.org/en/country/eritrea/overview>

The Strategic Partnership Cooperation Framework (SPCF) between GoSE and the United Nations 2017-2021 contributes to the National Indicative Development Plan through four strategic pillars:



In terms of the SPCF's pillars, the NAP can greatly contribute to pillar 1, especially improving occupational health and safety and improving water, sanitation and hygiene in and around ASGM communities. Likewise, the NAP can greatly contribute to pillar 2, enhancing environmental sustainability and resilience by decreasing ASGM's mercury emissions and releases to water, land and air; and perhaps less straightforward, in the long term the NAP can greatly contribute to pillars 3 and 4. The strategies for vulnerable populations along with other strategies, can greatly enhance institutional capacity and coordination for a more effective service delivery for all Eritreans involved in the ASGM sector (pillar 3). Eventually the proposed strategies of the NAP can help to realize the principles set forth in Mining Proclamation No. 68/1995, notably that Eritrea's mineral resources "make a significant contribution to the economic development of the country" and that they are developed and conserved "for the benefit of the people".

As such, the NAP serves as an unprecedented opportunity to ensure sound management of Eritrea's ASGM sector, in line with the priorities and principles set out in the MPP (1994), the National Charter of PFDJ (1997), NIDP 2009-2013, SPCF 2017-2021, national environment Proclamation No. 179/2017, Mining Proclamation No. 68/1995, AU Agenda 2063 and UN Agenda 2030.

The workshop started in July 2017, and since then, the country has been engaged in developing the National Action Plan in order to reduce and where possible eliminate the use of mercury in the ASGM sector through active participation or involvement of relevant stakeholders. The project was executed by MoLWE with the technical support from UNITAR and UN Environment. During the inception workshop, a National Steering Committee (NSC) was established which has a mandate of coordinating and making the strategic decisions for the NAP and for supporting its development. The mechanism is hosted by various Ministries, Departments and Agencies (MDAs) of relevance for ASGM and mercury, notably the Ministry of Land, Water and Environment, Energy and Mines (MoEM), Health (MoH), Finance (MoF), Education (MoE), Trade and Industry (MoTI), Labor and Social Welfare (MoLSW), Local Government (MoLG), Justice (MoJ), Agriculture (MoA), and Marine Resources (MoMR). The project was financed by the Global Environment Facility (GEF).

The ASGM overview and NAP preparation was led by the Bureau of Standards and Evaluation of the National Higher Education and Research Institute. Under the guidance of the MLWE, a technical working group comprised of experts from the Eritrean Institute of Technology, Ministry of Energy and Mines, Ministry of Labour and Social Welfare, Ministry of Health, Regional offices, and Department of Environment was established. The methodology for the development of the ASGM overview and NAP included a desk review, stakeholders' consultation, field research and various consultative workshops. Relevant stakeholders from ASGM communities, civil society and the private sector have further been consulted during the field study and have provided valuable inputs to this end.

A summary of the National ASGM overview that serves as the basis for the development of the NAP is presented in this section. The methodology used, and summary of the key topics including previous experience in ASGM, geographic distribution of ASGM, gold production and mercury baseline estimates, mining and processing information, legal and regulatory status, leadership and organization of artisanal gold mining at the local levels, gold and mercury trade, impacts on local development, women and children in ASGM, environmental and health impacts, access to health care are described in the following sections

1. Methodology

The research methodology was based on UNITAR's *Socio-economic ASGM Research Methodology*¹⁰ and UN Environment's *Estimating Mercury Use and Documenting Practices in artisanal and Small-Scale Gold Mining*¹¹. The study employed a mixed approach, combining qualitative and quantitative data collection from both primary and secondary sources; it was carried out in three phases:

- ▶ Desk review which basically include literature review, identification of stakeholders and sites, preparation of base map, questionnaire, work plan and logistics.
- ▶ Key-informants interview: Based on the questionnaire developed, data was collected through interviews of different stakeholders such as; local administrators, ministry representatives, experts and others.
- ▶ Field study; Out of twenty nine ASGM sites, fifteen (52%) different ASGM sites (as per Annex 2) and nearby towns were visited. During the visit, semi-structured interviews and focus group discussions were held with individuals involved in the domestic gold supply chain, including diggers, processors, transporters, gold and mercury traders, health workers, community leaders, farmers, and goldsmiths. Additional information was also gathered through field observations. During this phase, more than 170 stakeholders were interviewed, including a significant proportion of women.

2. Geographical Distribution of the ASGM Sector

Most of Eritrea's gold sites including ASGM are hosted in the low-grade metamorphic rocks of the greenstone belt. The ASGM activities mainly occur on primary gold deposits or in the alluvial gold deposits on the lower course of the stream where sediments accumulate. Although there are several large-scale (LSM) mining companies, currently there is no single small scale gold mining in Eritrea (in fact this mining category is not recognized in the mining law). Therefore, 'ASGM' in this report only refers to the artisanal type of gold mining. In some sites, the LSM is situated in proximity with ASGM. However, there are no cases where the AGM activity is within the license area of LSM, which could cause conflicts of interest with LSM. So far, there is no evidence of ASGM tailings reprocessed at LSM facilities.



Figure 1: Eritrea's Administrative Zones

¹⁰UNITAR, 2018. Socio-economic ASGM Research Methodology. Geneva, Switzerland. https://www.unitar.org/sites/default/files/media/file/final_socio-economic_methodology.pdf

¹¹ O'Neill, J.D., and Telmer. K.H., 2017. Estimating Mercury Use and Documenting Practices in Artisanal and Small-Scale Gold Mining (ASGM). Geneva, Switzerland: UN Environment. <http://wedocs.unep.org/handle/20.500.11822/22892>

ASGM occurs in all administrative zones, except in Southern Red Sea (Figure 1). The majority of sites are mainly concentrated in the gold-rich quartz veins of Gash Barka AZ, particularly Shambuko, Molki, Mogolo, Barentu, Sele'a, and Haykota sub-zones; Hademdem, Kosolda, and Mogolo are some of the main ASGM sites¹² (Figure 2).

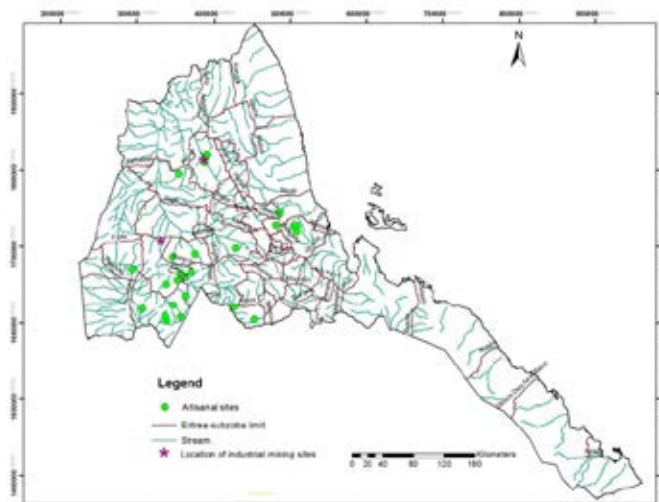


Figure 2: The geographical distribution of ASGM sites in Eritrea

3. Workforce, Gold Production and Mercury Baseline Estimates

Mercury use and artisanal mining deeper than five meters is prohibited by the mining proclamation (68, 1995). However, people do continue to be engaged in ASGM activities, notably since the 2009 drought (Teklemariam, 2015)¹³. To date, no comprehensive assessment has been carried out on ASGM, and hence there is no clear information on the number of people employed directly in the sector. A compilation report mainly based on projections on early studies for selected countries in sub-Saharan Africa estimates ASM employment in Eritrea to reach a figure of 400,000 and 2,400,000 for those directly and indirectly involved in ASGM respectively¹⁴. However, the ASGM study in this NAP reveals that the actual number of people in the sector is significantly smaller; hence the Hilson and McQuilken (2014) report is not considered accurate and realistic, and is not used as a reference figure.

All the current ASGM activities in Eritrea are regarded as informal. Thus, there are no official figures on artisanal activities, both the population of artisanal miners and earnings. Consequently, it was a challenge to decipher quantitative estimates on mining population and gold production. However, during the ASGM Overview study, estimated baselines for the of workforce, gold production and mercury use were developed, based on the methodology stated in section 2. Accordingly, 25,440 workers are estimated, based on both the visited areas and the extrapolation (See table 15 in the Annex). Moreover, annual gold production was estimated at 324,360 g, of which 185,487 g was obtained using mercury. The baseline estimate for the amount of mercury used is calculated to be 204,036 g.

¹² Mercury of Energy and Mines (MoEM), 2015: Database, Traditional Mining Activities, (Tigrigna): Asmara, Eritrea.

¹³ Teklemariam, S., 2015: Artisanal/small scale gold mining activity and its role in sustainable livelihood of the rural community: a case of Hademdem village, Gash-Barka Region, Eritrea, MA thesis. International institute of social studies, The Netherlands, p. 44.

¹⁴ Hilson, G., and McQuilken, J., 2014. Four decades of support for artisanal and small-scale mining in sub-Saharan Africa: A critical review, *The Extractive Industries and Society*, 1, 104-118.

4. Mining and Processing Information

Gold extraction and processing in Eritrea are conducted using rudimentary techniques and are labour intensive at all stages. In hard rock mines, ore is extracted with a chisel, sledge hammer and iron bars. In alluvial mines, ore is extracted with shovels and hoes. In both cases, the ore is put in strong bags of approximately 15 kgs and is either processed on site or transported to another area where water is available.

In the case of alluvial deposits, the ore is directly panned as the gold is already liberated by mechanical disintegration in the course of the stream. In the case of hard rock deposits, the gold particles are still hosted by gangue minerals (commonly quartz vein which may bear sulphides) and need to be further processed to be liberated. This is done by manual crushing, with the use of hammers. Subsequently, the crushed ore is milled to a smaller size using mortars to liberate the gold from the gangue, and is then panned.



Figure 3. Panning of ore to concentrate gold

Panning was witnessed as mostly done by women. In this process, the concentrate is placed in a pan to which water is added (Figure 3). The pan is steered in a circular movement so that lighter ore particles flow over the edge and that heavier particles – including gold– remain in the pan. Mercury is added at the very last stage, when most of the gangue mineral has been removed and only heavier materials such as iron along with gold still remain. The mercury and gold then form an amalgam, which is squeezed by hand in a piece of fabric to eliminate the excess liquid mercury not bound up with gold. This excess mercury is reused in other amalgamation process, and the same process goes on until no more liquid mercury is left.

The amalgam is then roasted using a spoon or a small dish in a simple coal stove (Figure 4). As a result of low levels of awareness of the harmful effects of mercury exposure, no fume hoods or retorts are used and the amalgams are burned openly (as per Annex C of the Minamata Convention, these are considered the two of the worst practices). Even worse, the amalgam is often burned inside the house to hide this practice, as most miners are aware that mercury use in ASGM is prohibited under the mining law (see the next subsection), although they do not fully understand why. This is of concern in terms of health and safety of the workers and their families.



Figure 4. Open burning of the amalgam (Kerksha area near Kosolda); before mercury liberation (left) and after mercury liberation (right)

At (Kosolda), magnets are used to separate magnetized iron rich minerals from the concentrate prior to amalgamation. However, it has not been observed in other mine sites, although it could be a useful method to reduce miners' dependence on mercury, since magnetized iron rich minerals occur in various ASGM sites.

5. Legal and Regulatory Status

The Ministry of Energy and Mines (MoEM) is the sole and formal licensing agency having the responsibility of administering, regulating and coordinating the activities of the energy and mining sector. The Department of Mines (DoM) of MoEM is mandated with the responsibility of ensuring sustainable management of mineral resources. It encompasses the Geological Survey, Mineral Resource Development and the Mineral Resource Management (MRM) Divisions. The exploration and mining operations are regulated under the MRM; whereas ASGM activities are monitored by the regional representatives.

Artisanal mining in Eritrea is governed under the mining regulation of "Proclamation No. 68/1995; a proclamation to promote the Development of Mineral Resources". Important provisions of the mining proclamation pertinent to granting artisanal licenses as defined in Chapter 3, Section 1, Article 14 are as follows:

1. An artisanal mining license may be granted in respect to part of the surface area of an existing exploration license provided that:
 - a. The artisanal mining license is restricted to construction minerals to a depth of five metres and/or mineral water and geothermal deposits.
 - b. The Licensing Authority is satisfied that the activities of the artisanal miner will not interfere with the operations of the existing license.
2. An artisanal mining license may be granted for minerals other than construction minerals, mineral water and geothermal deposits if the land in question is not the subject of any existing license or prior license application provided that mining in the artisanal license is restricted to a depth of 5 metres.
3. An artisanal mining license may be transferred, assigned, encumbered or inherited subject to the approval of the Licensing Authority.

In addition, Chapter 2, Article 30 (6) on health, safety and environmental protection, of the proclamation states that:

"The holder of an artisanal mining license shall take all environmental protection measures commensurate to the operations; in particular, he/she shall fill pits and plant trees and shall not be allowed to use mercury or similar materials in the operation."

However, at present, all of the ASGM activity in Eritrea is informal and there are presently no artisanal operators holding a mining license.

6. Leadership and Organization of ASGM at the Local Level

The local organization and leadership of Eritrea's ASGM take many forms, depending on the social structure of the mining community and the type of deposit. The ore deposit and related mining design typically determines the group size. In hard rock deposits, vertical shafts tend to confine the group size to fewer than 10 miners. However, groups working in tunnels may exceed 20 members, depending on the length of the quartz vein.

On the other hand, locations with alluvial deposits tend to have larger populations per mining area/locality as they have more pits. The number of pits in kona mine site, Barentu subzone, for example reaches up to 120. Usually, a pit accommodates 6 to 10 miners depending on the internal structure of the pit. Miners make division of labour as diggers, transporters and panners. Miners organize themselves per a pit (called a "Maetot" or an "Illa" in local dialects) as family members, relatives and friends. There is no chieftom stratification and organization of any form (like association or cooperatives) in Eritrea.

7. Gold and Mercury Trade

Between 1991 and 1998, the period following Eritrea's liberation from Ethiopia, gold from the artisanal miners had been purchased by licensed gold buyers (Table 1). The gold underwent laboratory testing in the Department of Mines prior to entry to the National Bank. However, with the increase of the global gold price, the amount of gold sold to the National Bank has declined as it was unable to keep up with the dynamics of the global market; instead it was smuggled to Sudan for better prices.

The main sites of ASGM in Eritrea are predominantly concentrated in the gold rich quartz veins of Gash Barka Administrative Zone (AZ). Important Artisanal gold mining sites in Zoba are found within Shambuko, Molki, Mogolo, Barentu, Zara and Haykota sub-zones; Hademdemi and Mogolo constitutes the majority of activities¹⁵. Anseba, Debub and Semenawi-Keyih-Bahri administrative zones have moderate ASGM sites. Kohain (Debub AZ) has also been a significant ASGM site in the last decade. The production of gold from ASGM for the previous years can be summarized in table 1.

Table 1. Gold production from Artisanal Mining (1993 to 2009).

No	Year	Amount of gold produced in (gramme)	Area processed
1.	1993	12,115.23	Kohain and Haykota
2.	1994	78,278.33	Kohain, Shilalo and Haykota
3.	1995	57,027.5	Shilalo and Haykota
4.	1996	92,478.72	Kohain, Shilalo and Haykota
5.	1997	950,369.85	Kohain, Shilalo and Haykota
6.	1998	583,383.12	Kohain, Shilalo and Haykota
7.	1999	503,383.12	Zara
8.	2000	268,772.29	Zara
9.	2001*	48,317.00	Zara
10.	2002	Not available	-
11.	2003	18,157.28	Zara and Gash Barka areas
12.	2004	32,809.5	Zara and Gash Barka areas
13.	2005	24,660.03	Zara and Gash Barka areas
14.	2006	10,668.19	Zara and Gash Barka areas
15.	2007	73,597.5	Zara and Gash Barka areas
16.	2008	28,681.5	Zara
17.	2009	28,220.00	Zara
Total		2,753,891.66	

*the amount of gold produced during 2001 is only covered for six months. NB: The amount gold shown in table 1 only includes the gold sold to the National Bank

¹⁵Ministry of Energy and Mines (MoEM), 2015: Database, Traditional Mining Activities, (Tigrigna): Asmara, Eritrea.

As shown in table 1, generally the amount of gold sold to the national bank showed consistent increments between 1993 and 1999, but significantly dropped in 2001 and continued declining until the last report in 2009. The reduction could be attributed to various factors including the war with Ethiopia, and smuggling of gold to other countries for better prices.

Artisanal miners are not allowed to export gold, and are still required to sell it to the National Bank through licensed gold dealers. The current supply chains associated with ASGM are completely informal. According to the information gathered from the interviewee, the gold is smuggled abroad. These findings may partly explain a spectacular rise in gold production that was recently announced in Sudan, which seems to be too large to be explained by domestic production only¹⁶. Informal intermediaries, who typically serve as agents to bigger gold buyers, buy gold directly on ASGM sites and in ASGM communities. As per the information from respondents, the town of Asheshi (Barentu Subzone) is considered as a hidden centre of the gold and mercury trade for nearby ASGM sites.

The consultation and field survey revealed that gold is purchased at a price ranging from 450 Nakfa to 550 Nakfa, which is equivalent to approximately 33.3USD per gram on average¹⁷.

Regarding mercury trade in the region, Africa's largest importer of mercury is Sudan. During the last 10 years Sudan has imported more mercury than any other country in sub-Saharan Africa¹⁸. According to a study by COWI and the World Bank on mercury trade in the region, Sudan seems to be a market on its own where the official import corresponds accurately to the estimated consumption in the country¹⁹. Indeed, to date, there is no evidence that mercury imported into Sudan is re-exported further to neighbouring countries such as Chad, Central African Republic, and Eritrea. However, during the field study, many ASGM miners reported that mercury is supplied illegally from Sudan, through the same network of traders that smuggle gold over the porous border; currently there is no indication of other mercury supply routes to the country. It has also been reported that the price of mercury has been increasing in Eritrea from less than 30 Nakfa (2USD) in 2000 to about 300 Nakfa (20 USD) per cup of a pen (approximately 3 grams); an increase of 1000%.

8. Impacts on Local Development

Despite significant environmental and health impacts (see sections 11 and 12), and not unlike other countries in the region, ASGM constitutes partially an important source of income, poverty reduction and local development in rural areas of Eritrea. ASGM is pursued in some areas of the country, where many people use the activity to diversify their livelihoods by combining the activity with subsistence agriculture. Artisanal miners are often motivated by reduced agricultural production caused due to the shortage of rain, the need for fast cash, and the lack of alternative economic activities²⁰. ASGM is active mainly during the dry season when the farms require less work. While subsistence agriculture typically constitutes the primary activity, workers engage in ASGM activities to supplement household income and to spread risk.

Based on the field survey, it has been calculated that ASGM miners extract on average 0.15 grams of gold/day, which translates into approximately 75 Nakfa or 5 USD/day as per the local revenue sharing (the income fluctuates strongly over time depending on gold findings).

Generally, the revenues are not sufficient enough to bring significant changes in the miners' lives and ASGM's economic impacts are not always directly visible. Nevertheless, for some, it has improved their household status. It allows miners to support their families with food, medicines and school fees, and it has allowed some of them to construct a decent home. However, this is not always the case as most of the young miners spend parts of their revenues on alcoholic drinks. Moreover, beyond satisfying direct basic needs for their families, miners have difficulty in making significant savings to invest in long-term plans.

¹⁶ African Mining Brief, 2014: Sudan announces a 64 tons increase in gold production. <http://www.ambriefonline.com/2014/11/sudan-announces-64-tons-increase-gold-production> (accessed November, 2018).

¹⁷ Using an exchange rate of 1USD=15Nakfa, as was observed during the period of field research. This exchange rate is used in the remainder of the NAP document.

¹⁸ UNEP, 2017. Global mercury supply, trade and demand. United Nations Environment Programme, Chemicals and Health Branch. Geneva, Switzerland, Report, 80pp.

¹⁹ World Bank, 2016. Mercury trade and use for artisanal and small-scale gold mining in Sub-Saharan Africa, draft final report, COWI A/S, 7 September 2016.

²⁰ Teklemariam, S., 2015. Artisanal/Small Scale Gold Mining Activity and Its Role in Sustainable Livelihood of the Rural Community: A Case of Hademdem Village. Gash Barka Region, Eritrea.

9. Women and Children in ASGM

In view of inadequate data, it has not been possible to establish a sound estimate of women's participation in ASGM sector, but in the majority of the ASGM sites that were visited, women made up approximately 20% of the workforce. Most of the women involved in ASGM are either married or single mothers and hold great responsibilities in the household affairs, including child-care. Child-bearing mothers are also involved in ASGM activity, but constitute only a small proportion.

Panning of gold is mainly done by women, as excavation and digging of ore entail physical efforts and hardship and deemed by most of the inhabitants as a task for men. However, depending on the local culture and ethnicity, the role of women was seen to vary from community to community. In the Kunama community, women's roles are versatile, ranging from digging to processing. While in the Nara and Tigrigna communities, women are mainly engaged in gold panning, hauling, and selling water and food on-site. In the Tigre ethnic community, the role of women is solely limited to water and food preparations. Moreover, in some cases, the number of women in the mercury amalgamation and burning (to liberate gold) outweighs men and are disproportionately exposed to the mercury hazard; the exposure is of critical significance to pregnant and child-bearing mothers. This constitutes a significant barrier for women's involvement in the ASGM supply chain.



Figure 5: Vulnerability of breastfed baby during processing of ore, Kosolda.

Children who sometimes accompany the women during the panning and amalgamation process are equally vulnerable (see Figure 5).

In some instances, children assist their parents mainly in fetching water, loading ore, and crushing rocks, while some are involved in digging and excavation work. Although children are not directly involved in the mercury amalgamation process, exposure to emissions and releases is likely through inhalation from open burning emissions.

10. Environmental Impacts

One of the most pressing environmental impacts stemming from some ASGM activities in Eritrea is land degradation caused by the formation of the mining pits, usually left un-rehabilitated once the mining activities have been ceased. The mining proclamation clearly stipulates the responsibilities for land reclamation by stating that the holder of a mining license shall progressively restore or reclaim the land covered by the license for beneficial future use, except if such progressive restoration or reclamation is not feasible as determined by the Licensing Authority²¹. However, due to the fact that ASGM is practised informally and miners' awareness is very limited, land reclamation practice is very rare. As a result, the land becomes barren and less suitable for agricultural production, and it also presents a risk as human beings and livestock may fall into abandoned mining pits, and the ground is likely to be contaminated. Furthermore, during the rainy season, such pits filled with water serve as a breeding ground for mosquitoes, thereby aggravating the risk of malaria outbreaks. Moreover, poor tailings management is another concern. During the Italian colonization (considered as 1890 to 1941), gold mining was carried out using mercury amalgamation in various parts of Eritrea. Consequently, tailings were dumped without proper waste management. Although most of tailing waste from abandoned mining locations are eroded by flooding, a portion of it still exists. The current management practice is also poor in the ASGM activities, with little reprocessing or onward sales identified, due to low quantities and grades. As a result, nearby water sources and soils could have been contaminated and further assessment is required.

²¹ Mining Proclamation on Chapter II, No 30, 5



Figure 6. Left over Tailing around Rikeb (close to Zara River)

Another major environmental and health impact that has been discussed previously is mercury release from ASGM. In 1999, the Eritrean Geological Survey conducted an assessment of heavy metal contamination in Hykota, Augaro and Zara ASGM sites²². The study confirmed that none of the water samples analysed contains mercury exceeding the WHO Guideline threshold values. However, out of the 43 soil samples taken from waste, flood plain and agricultural land, seven samples contained mercury above the threshold value of 1ppm. The sampling sites were in the immediate vicinity where mercury amalgamation was carried out. It appears that the mobility of mercury is limited and that in-site evaporation of mercury from tailings and immediate surroundings takes place at a considerable rate in Eritrea's hot climate. It is a concern that the soil samples that tested for the highest values of mercury were from a farming area (at Hykota). For more valuable use in the future, the assessment needs updating to confirm if the case still prevails.

11. Health Impacts

In terms of health impacts, women and children are directly exposed to mercury in ASGM, as has been discussed under section 9. Indeed, unaware of mercury's health impacts, many mothers involved in mercury amalgamation breastfeed their babies without washing their hands, and many infants could be exposed by direct ingestion from their mother's unwashed hands. This mercury intoxication could lead them to deleterious health effects. The presumed relationship between mercury exposure and health impact in Eritrea's ASGM areas needs to be further investigated with a more rigorous research design.

Besides mercury exposure, Eritrean ASGM miners face various other occupational health and safety threats. Occupational safety is of concern for miners working in tunnels and pits, where they face the risk of pit collapse. Moreover, in the case of narrow tunnels, which tend to have limited air circulation or ventilation, miners risk dying from suffocation. Other health complaints that ASGM miners frequently deal with include back-pain and muscle aches resulting from their demanding physical work. Moreover, skin irritation or disease (e.g. gingivitis, skin itching and skin wound, dermatitis stomatitis) and pulmonary problems such as bronchitis and pneumonia are commonly reported by miners. In addition, miners are exposed to dust generated by crushing, grinding, and sifting of gold-containing ore. The crystalline silica (SiO₂) content of dust associated with some gold ore can exceed 30%, and airborne levels of crystalline silica in ASGM sites can exceed exposure limits²³. Although it has not been documented in detail, the field study indicated symptoms associated with silicosis in ASGM. Among adult ASGM miners, neurological disorders such as muscle weakness, walking problems and limited body coordination have also been observed which may likely be caused by mercury poisoning but equally requires further research.

²² Eritrea Geological Survey (EGS), 1999. Heavy metal concentration in Artisanal mining. Unpublished report.

²³ Gottesfeld, P., Andrew, D., Dalhoff, J., 2015: Silica exposures in artisanal small-scale gold mining in Tanzania and implications for tuberculosis prevention. *J. Occup. Environ. Hyg.* 12 (9), 647–653.

12. Access to Health Care

As part of the country's commitment to improve the livelihoods of its people, the number of health facilities in Eritrea has progressively increased since independence (24 May 1991), not only in numbers but also in rehabilitation of dilapidated facilities. The national health care delivery system has three tiers; primary, secondary and tertiary care level.

The primary level comprises community health services, health stations and community hospitals. The community health service is defined as a catchment area with an estimated average population of 500-2,000 people. Health services are delivered by trained community health workers. The community health workers are supported through regular supervision and training. In addition, there are health stations which provide promotive, preventative and basic curative service and serve a population of about 5,000-10,000 within a 10 km radius. Moreover, the staff at the primary level varies from 15-20 personnel, including a number of certified medical doctors²⁴. However, health facilities can be more than 20km away from some ASGM sites. Likewise, access to clean water and sanitation is also limited. Moreover, health workers' knowledge on the health impacts of mercury is inadequate. Diagnosis of such health problems is also difficult at the health care centres and hence victims are referred to hospitals far from the ASGM site. There may be also cases where victims refrain from visiting the hospital²⁵.

²⁴ Idem

²⁵ Haile, M., Hussein, O., and Haile, Y. (2017). Adverse Health Effects of Mercury Use on Illegal Gold Miners: A Study in Garasi, Eritrea. *Advances in Biochemistry*, 5(2), 16.

Current Situation

The ASGM overview study confirmed that mercury has been used in some artisanal mining sites, with the annual use estimated at 204,036g. Such practices could cause serious long-term environmental and health impacts for people directly or indirectly involved in the sector. To avert the deleterious potential impacts, there is a dire need to formulate mechanisms that provide alternative livelihoods to ASGM, and thereby ensuring a reduction in mercury use and, to the extent possible, eliminated.

National Goal

This strategic plan consists of nine strategic action plans which would assist the government of Eritrea in its endeavour, in eliminating mercury use in the sector. This endeavour will reduce mercury exposure and its effect on human health and the environment.

Objectives

In order to achieve sound management and elimination of mercury use in ASGM, it is necessary to achieve the following objectives:



To develop and/or implement, national regulations, programmes and action plans that promote environment conservation and safety measures;

To assess the mineral resource potential and where feasible, delineate areas for licensed ASGM

To build and strengthen human and institutional capacity, to enhance communities' awareness on mercury risks and the adverse effects of ASGM activities.

In order to achieve the aforementioned goals and objectives, a set of action plans has been developed, as described in the subsequent sections.

1. Strategies

This section describes a set of implementation strategies for realizing the NAP's general and specific objectives listed in the previous section. As the small-scale gold mining has not been practised in the country, the NAP implementation strategies are focused only on artisanal gold mining.

Several strategies are needed for NAP implementation. Specifically, strategies for geo-prospecting, improving monitoring and enforcement in managing mercury, institutional strengthening on NAP implementation, improving public health, protecting vulnerable populations, and providing communities with information, are discussed under this section. Each intervention consists of main actors, a specific timeframe, indicators for measurement, an estimated budget and potential funding sources.

Formalization of the ASGM sector in Eritrea is difficult to implement due to the following factors:

- ▶ The existing mining proclamation strictly prohibits the use of mercury in artisanal mining as well as any artisanal mining deeper than 5 meters.
- ▶ The ASGM overview confirmed that artisanal mining in Eritrea is not a major source of income; rather it is done seasonally as a supplement to other socio-economic activities. Communities, particularly farmers engage in the activity to support livelihoods when summer rains fail and the yield declines. Under such conditions, it is difficult to identify a population that is continually involved and fully dependent on the sector.

As such, no steps for formalization in the short-term are addressed.

Despite the absence of a geo-prospecting assessment as part of the NAP strategies (according to the Annex c of the Minamata Convention), in Eritrea's case it is deemed vital to incorporate geo-prospecting. The main bottle neck for the government to proceed in recognizing the ASGM sector is the lack of nationwide knowledge of gold deposits, where low grade or small-sized deposits are assigned to ASGM. An elevated level of geological knowledge is key to understanding the drivers for the mining sector, as stated as follows:

"If ASGM is to be successfully realized as part of a nation's mining sector, it must be rooted in a geological rationale. Understanding ASGM as the economic manifestation of a geological reality redefines the debate about ASGM from being a social problem to being a mineral opportunity that has the potential to significantly contribute to poverty reduction."²⁶

At this juncture a full assessment of the mineral resources is proposed to categorize concession areas according to their potential for ASGM or Large Scale Mining (LSM), as such, a nationwide assessment of the geology, geochemistry and geophysics has a paramount importance. These studies are time consuming and challenging to mobilize technical and financial resources in such a short time.

Therefore, considering the above justifications, currently it is difficult to put forward a timeframe for formalization of the ASGM sector in a short term. Consequently, in terms of best practices, given the current legal framework in Eritrea, it is also difficult to present a concrete strategy for the promotion of best practices in terms of formalization at this stage. Rather, it will be a matter of identifying the best existing international practices that can be applied in Eritrea to reduce the adverse impacts of mining practices on the health of communities involved in gold mining and on the environment.

²⁶ Barreto L., 2011. Analysis for stakeholders on formalization in the artisanal and small-scale gold mining sector based on experiences in Latin America, Africa, and Asia, Alliance for responsible Mining, Report

A. Strategy for Geo-Propecting and Delineating Land for Mining activity

Several geological assessments have been conducted by MoEM's Geological Survey and various exploration companies. However, only limited geological information is available concerning ore deposits of the country. This is the bottle neck to making decisions on whether to allocate deposits for ASGM activity. Therefore, it is of paramount importance to assess and identify the gold resources that could serve as a basis to delineate land either for ASGM or LSM and also to make decisions²⁷ on formalization of the ASGM sector.

The activities of this strategy need significant financial resources. Therefore, it is proposed to break down the budget in order to conduct the activities area by area and into phases.

To address these strategic issues, the following steps are envisioned:

Airborne Geophysics and Remote Sensing

The geological information of the country is very general and scant for decision making. To fill the information gap, a nationwide geological survey needs to be conducted. For this purpose, an airborne geophysical survey is preferred for economic reasons, its wide coverage and rapid outcome necessary for decisions for further detailed studies. The airborne geophysical survey will consist of a specialized field of high-resolution magnetics, radiometric, electromagnetics (EM) and gravity. Moreover, remote sensing is also essential to support the airborne geophysical survey in providing data on prospecting sites. It is carried out from interpretation of landsat images at various resolutions and bands. A GIS platform is the main tool in integrating the different methods to identify prospecting sites.

Both the airborne geophysical surveys and remote sensing interpretation will reveal the following results

- ▶ Recognize structures and enables more confident mapping in identifying buried ores.
- ▶ Provides overlap of geological processes from the regional to local scale. An overall study will be launched to identify the potential mineralized sites of each and every region and thereby delineate them properly for further assessments and developments.

Develop Geo-data, Geological Mapping and Geochemical Sampling

Geological mapping will be conducted on the prospecting areas identified from regional airborne geophysical assessment and remote sensing as well as incorporation of previous data, if available. In addition, geochemical sampling will be carried out to further localize the mineralization. The scale of mapping in both cases will be done in detail. A comprehensive resource evaluation will be examined to know the reserve and subsequently delineate the areas.

Categorize Gold Potential Areas According to the Estimated Reserve and Delineate Areas

After a thorough assessment of the geology, geochemistry and geophysics, potential mineral deposits will be identified. The deposits will be categorized as low, medium and high potential sites for gold and areas will be delineated accordingly. The shallow low gold reserve sites of primary deposits as well as the alluvial gold will be reserved as ASGM targets.

Land Use Mapping

Land use mapping is the process of attaining land use maps containing spatial information on the arrangements, activities and inputs that people undertake in a certain landcover type, to produce, change or maintain it. Remote sensing application using GIS is an important tool in classifying the land use clusters and will be used for this study. Potential gold sites will be incorporated in the land-use map in relation to the physical coverage at the surface level, such as forests, farmlands and wetlands. The land use mapping will also assist in visualizing the impact of artisanal mining on the environment.

²⁷ "Shallow" refers to easily accessible gold deposits, with rudimentary tools. However, further definition could come from laws/regulations

Table 2: Action Plan on geo-prospecting study to delineate ASGM areas

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
A. Study on geo-prospecting to delineate AGM areas	Conduct airborne geo-physical survey and Remote sensing interpretation	HIGH	MoEM	2021-2023	External Internal	2,000,000	Geophysical maps and interpretation with anomalies Satellite map interpretation
	Develop geo-data, geological mapping and geochemical sampling	HIGH	MoEM	2021-2023	External Internal	200,000	Geological report and geochemical result with anomaly. The geodata base updated.
	Categorize gold potential areas according to its estimated reserve and delineate areas	HIGH	MoEM	2023-2024	External Internal	100,000	Map of prospect produced with report
	Conduct land use mapping	HIGH	MoEM	2024	External Internal	25,000	Land use map produced
Total Budget						2,325,000	

B. Strategy to promote sustainable livelihoods for those that engage in ASGM

As the legal situation does not provide for opportunities to formalize the sector, engagement with strategies and programmes that improve agricultural productivity are seen as key to supporting farming communities in sustaining their livelihoods that do not require additional activities, such as ASGM. ASGM is mainly considered a consequence of agricultural factors, rather than on ongoing sector itself.

Most of the ASGM communities in reality have their main economic activity as agriculture, yet are obliged to engage themselves in other sectors, like ASGM, as the result of poverty and poor harvests, due to the recurrent droughts. This incidence of poverty becomes higher and unbearable in rural areas, attributable to the poor performance of agriculture, due inter-alia to climate variability, unsustainable land management practices, declining productivity and the inability of farmers to access markets and other social services due to poor rural infrastructure. In order to alleviate this, efforts and support will be geared to improving productivity through the maintenance and provision of sustainable agriculture, anchored in self-reliance as well as full participation of the people.

Sustainable agriculture is designed to respond both to the needs of the population as well as to natural and ecological constraints in designated areas. The resources that are available in the specific areas, such as labour, land and water would be identified and developed to achieve the objectives of sustainable agriculture²⁸.

There are many serious challenges that must be addressed to develop the agriculture sector to fully realize its potential in the designated areas. Improving the technology base and total factor productivity including by reducing its dependency on uncertain and erratic rainfall patterns are the major challenges. Smoothing seasonal input-output fluctuations, expanding the use of modern farm inputs and modernizing farming practices are among the steps that can be undertaken to develop agriculture and make it sustainable, alongside other national programs and projects. Hence, the following objectives have been envisaged.

²⁸ Delivering together for Eritrea's development & self-reliance. Asmara - Eritrea, 2014

Transform the traditional agricultural practices to modern agriculture by improving agricultural infra-structures and equipment

The traditional way of farming which is common in most part of the country does not enable farmers to generate income sufficient for the provision of food and nutrition security, and certainly not enough for the improvement of their standard of living. The existing traditional farming system and some inadequate commercial farming drives a large part of the rural populations towards ASGM activities, in order to satisfy their food demand at the household level²⁹. To alleviate the issue of ASGM, initiatives and endeavours have to be taken to transform from the current agricultural practices to more productive agricultural techniques, by improving corresponding infrastructures and equipment.

Agricultural modernization prepares conditions for industrialization by boosting labour productivity, increasing agricultural surplus to accumulate capital, and increasing foreign exchange via exports in line with UN sustainable development goals (SDGs), in particular SDGs 1, 2, 5 and 8. The process of agricultural modernization is critical for economic transformation, achieving food security and improving nutrition.

There are two key areas to make agricultural transformation a reality. First, it is critical to make modern technologies available. While modern agricultural technologies can come from private and public sectors, the GoSE will play a major role in investing in agricultural research and development (R&D). This is due to the difficulty for a private enterprise to fully capture the benefits of developing such technologies. National agricultural research systems established will work at provincial levels to find new technologies suitable for local conditions, and the state will harness efforts and extension systems to disseminate these technologies. The next key area for agricultural transformation is adoption of modern technologies, as farmers may not use such technologies even if they are available. Many technologies such as high-yielding seeds require stringent conditions for water, inputs, and know-how. Furthermore, insemination of cows and delivery of productive variety of poultry is sought. Therefore, the GoSE will prepare and present conditions of modernized agriculture towards improved market infrastructure for farmers to access finance, technology and sell their agricultural products. The GoSE will also strive to build human capital to ensure a skilled labour force to master new technology, handle logistics and boost each node of the value chain³⁰.

Design agricultural extension programs in order to strengthen and expand training and advisory services

Agricultural extension programs improve yields and incomes for farmers. Trained agents visit communities to ensure the dissemination of current best practices, and organize cooperatives, These agricultural workers are expected to travel extensively across the designated areas while ensuring they maintain consistent and high-quality work with limited training. Agricultural extension (also known as agricultural advisory services) plays a crucial role in boosting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of economic growth. Extension provides a critical support service for rural producers meeting the new challenges confronting agriculture: transformation in the various field of agri-business. Agricultural extension programs are designed to increase agricultural productivity and farmers' incomes in an environmentally sustainable manner and to rationalize the use of public resources in support of agricultural services. The designed agricultural extension programs will be central in the established strategy in order to:-

1. Reduce poverty and improve the conditions of life in the rural areas;
2. Secure gender equality through empowerment of women;
3. Improve agricultural productivity;
4. Optimize the use of available resources; and
5. Protect the environment by generalizing the delivery of professional agricultural services to all levels of the farming community.
6. Establish a tailored training program according to the ASGM communities' needs to enter into agri-business, such as animal husbandry, poultry and bee-keeping. This will include a "hands-on" training concept for each field of agri-business.

²⁹ The Minimum integrated household agricultural package (MIHAP) – for self-sufficiency in small farm household in Eritrea, Booklet.

³⁰ Indicative development plan – for developing a dynamic economy and better quality of life of all citizens 2009 – 2013. First Draft, Asmara – Eritrea

The main strategy components that are needed to be undertaken at Zoba (regional administration) level will comprise of:

- i Strengthening the delivery of the agricultural extension services and providing support for farmers' organizations through the provision of transport, equipment, rehabilitation of facilities and incremental operating costs;
- ii Improving the technical and management capacity of agricultural staff through training by the provision of equipment, supplies, facilities and transport for regular in-service training of extension staff and the rehabilitation of at least two agricultural training colleges; and
- iii Support for financial management, accounting and auditing, monitoring and evaluation and regular supervision at all levels of the national agricultural extension system.

Promote agricultural efficiency and productivity through the use of modern farm inputs

Access for farmers to modern agricultural inputs will help them achieve greater economic stability by making more food available, improving its quality and making it accessible to more people. Farm inputs (such as fertilizers, pesticides) explore changes in the production, availability and cost of farming. These modern farming inputs generally consists of feedstuffs, fertilizers and permitted plant protection products, as well as cleaning agents and additives used in food production, which specifically includes land, soil, fertilizers, animal feed, seed, water, labour and energy. Seeds are critical to successful crop production and inevitably, farm productivity and profitability³¹.

Therefore, in order to promote efficiency of farm operations and to increase agricultural output in areas of comparative advantage, farm land and machinery services will be centrally organized at Zoba level and provided to farmers on a need basis. Likewise, modern agricultural inputs will also be procured centrally and distributed through the channels of ministry of local government (MoLG). Multiplication of seeds and planting materials centers will be established and pertinent agencies will be in place to organize and manage farming support services in key areas of the region.

Facilities access to financial resources for small-holder farmers

Eritrea, like many other developing countries, is highly dependent on agriculture for income generation and job creation for its citizens. Because the sector is mainly composed of smallholder farmers, lack of finance remains one of the leading obstacles to development. Financial resources are required for both on and off-farm pursuits. This also has been a challenge for all groups who often lack collateral or other requirements for accessing credit from a bank. Financial literacy also plays a role, as people may not understand the importance of saving and financial planning or the steps required to access formal financial services. Therefore, provision of this critical support service - i.e. access to credit - will be strengthened in response to the needs of the beneficiaries and suitability of conditions³².

To that end, the GoSE will be committed to establish a government bank that would exclusively provide financial services to farmers by establishing a credit guarantee scheme, and the development of new financial products by the bank that would cater to the corresponding needs. Concurrently, training and awareness raising campaigns will also be organized to the level that would inspire and encourage beneficiaries to understand saving and financial planning. In places where banking systems are under-developed, micro-credit institutions are designed to promote economic empowerment of low income societies, in particular women, through stimulating economic growth by households as well as development of local entrepreneurs³³.

³¹ Indicative development plan – for developing a dynamic economy and better quality of life of all citizens 2009 – 2013. First Draft, Asmara – Eritrea

³² Indicative development plan – for developing a dynamic economy and better quality of life of all citizens 2009 – 2013. First Draft, Asmara – Eritrea

³³ Indicative development plan – for developing a dynamic economy and better quality of life of all citizens 2009 – 2013. First Draft, Asmara – Eritrea

Table 3: Action Plan on developing sustainable for the ASGM communities to shift their engagement

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
Promote sustainable livelihoods for those that engage in ASGM	Transform the traditional agricultural practices to modern agriculture by improving infrastructure & equipment	HIGH	MoLG MoA	2024	External Internal	176,550	<ul style="list-style-type: none"> Infrastructure developed Equipment procured Technological base provided
	Design agricultural extension programs in order to strengthen & expand training & advisory services	HIGH	MoLG MoA	2024	External Internal	4,500	<ul style="list-style-type: none"> Advisory delivery strengthened Capacity building improved Training programs conducted Number of trainees
	Promote agricultural efficiency & productivity through the use of modern farming inputs	HIGH	MoLG MoA	2024	External Internal	51,000	<ul style="list-style-type: none"> Machinery services provided Modern agricultural inputs distributed
	Facilitate access to credit for small-holder farmers	HIGH	MoLG MoA	2024	External Internal	1,600,000 2,000,000	<ul style="list-style-type: none"> Financial services established Financial literacy improved Number of small folders with access to credit
Total Budget						232,050	

C. Strategy for improving, monitoring and enforcement of regulations in respect to ASGM

According to the mining proclamation (68/1995), it is strictly prohibited any artisanal mining activity deeper than 5m as well as to use mercury in artisanal mining activities. Regular monitoring and inspection activities on key sites are crucial in order to ensure the enforcement of the regulation. In the long term, an amendment of the mining proclamation could be considered to reflect the reality of artisanal mining after conducting a thorough geo-prospect assessment.

In the more immediate term, the strategy is developed to improve monitoring and enforcement of the regulation applicable to ASGM. Regional administrators from AZs and subzones are tasked with inspecting and enforcing the compliance of ASGM miners with the regulatory framework. However, limited knowledge and the existing legal infrastructure is inadequate to exercise the effective informant and monitoring responsibilities. Therefore, the following measures are envisioned and an action plan to improve monitoring and enforcement of the regulation relevant to ASGM is shown in Table 4.

Develop Directive Concerning the Enforcement of the Regulation:

Based on the national environment proclamation No. 179/2017 and Mining Proclamation No. 68/1995, a new directive pertinent to elimination of mercury use and ASGM activities deeper than five meters will be developed and enacted.

Establish Multi-Stakeholder Local Oversight Committee:

The committee will include inspection officers from the regional administration, community leaders and other relevant stakeholders. The involvement of community members (including youth and women) and civil society (e.g. academia) can enhance the legitimacy, accountability and transparency of the monitoring process. Moreover, they can put peer pressure on miners and traders to comply with national regulations. The roles and responsibilities of each and every member of the committee will be established in an attempt to pursue and ensure the complete and appropriate implementation or application of the existing regulations.

Provide Training and Monitoring Infrastructure for Established Local Oversight Committee:

The training will assist committee members to effectively deliver specific roles and responsibilities vis-a-vis the defined sets of activities which will be developed. The necessary facilities will be made available to regional administrators and the local oversight committees to ensure efficient monitoring and enforcement activities.

Avoid the Entry and Trade of Mercury At Possible Sites:

Provide training and inspection equipment for all responsible personnel in order to curtail mercury trafficking

Conduct Inspection in ASGM Sites:

The necessity of vigilant and efficient systems of labour inspection is now widely recognized and measures will be taken to ensure the implementation of the proposed and other relevant legal tools. The inputs of the labour inspectors to rectify issues in the aspect of the alleged cases were indeed poor due to human, capital and technical problems. The findings acquired demonstrate an inevitable urge to undertake routine and follow-up inspections holistically and with all reasonable speed.

Table 4: Action Plan to improve monitoring and enforcement in managing mercury

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
B. Improve monitoring and enforcement in managing mercury	Develop directive concerning the enforcement of the regulation	HIGH	MoLWE MoEM	2021	External Internal	15,000	Directives developed
	Establish multi-stakeholders local oversight committee	HIGH	MoEM	2022	External Internal	12,000	Local oversight committee established
	Provide training and monitoring infrastructure for established local oversight committee	HIGH	MoLWE MoEM	2022	External Internal	20,000	<ul style="list-style-type: none"> Type and number of training conducted Number of beneficiaries Monitoring infrastructure introduced
	Avoid the entry and trade of mercury at possible sites	HIGH	MoTI	2021-2025	External Internal	35,000	<ul style="list-style-type: none"> Penalties imposed
	Conduct Inspection in ASGM Sites	HIGH	MoLSW	2022-2025	External Internal	20,000	Nature and frequency of inspection visits conducted
Total Budget						102,000	

D. Strategy for Institutional Strengthening on NAP Implementation

Different activities relevant to mercury and ASGM including research, assessments, promulgation of regulation, and awareness campaigns have been carried out by various stakeholders at the national level. However, the co-ordination among the main actors has been limited and the required outcome have not been met.

Since the NAP is cross sectoral in nature, coordination and collaboration among relevant stakeholders has a vital role in meeting its successful implementation. Moreover, effective coordination and collaboration is important to avoid overlap of efforts and hence minimize wastage of resources. To this end, it is essential to establish appropriate structures to promote coordination and collaboration among the stakeholders and the following activities have been proposed:

Establish National Coordination Mechanism (NCM) for NAP Implementation

The national stakeholders' involvement in the development of the NAP has been crucial and it includes workshop participation and contribution, data gathering, field visits, priority setting of actions and review of the document. Relevant stakeholders' commitment is also essential for successful NAP implementation and primarily the national coordination mechanism needs to be established, building on the structures established in the NAP. List of stakeholders along with their responsibilities in the proposed national coordination mechanism is provided in Table 5.

Table 5. Proposed National Steering Committee (NSC) and their respective responsibility

Institution	Responsibilities
Ministry of Land Water and Environment	Focal point for the national implementation of the project and in charge of developing environmental policies laws, regulations and guideline, will coordinate the overall implementation of the NAP process.
Ministry of Energy and Mines	Managing the administration and regulation of mineral rights and minerals. Mines and mining policy formulation and implementation. The Ministry will provide statistics and data on ASGM. Conducting geological survey and data collection activities
Ministry of Health	Health policy formulation and implementation in relation to ASGM, developing national health strategies for the sector, and training local health care officers and medical service providers
Ministry of Finance	The Ministry will contribute in particular with information about the economic importance of ASGM and market-based mechanisms for reducing mercury use, developing tax regulations.
Ministry of Education	Strategies for community outreach and stakeholder involvement. Consider the incorporating the ASGM issues into the school curriculum
Ministry of Trade and Industries	Provide information and support activities related to mercury trade, formalization, and market-based mechanisms for reducing mercury use.
Ministry of Labor and Social Welfare	Formalization of ASGM sector and ensuring the implementation of the enforcement of legal provision designed in safeguarding the safety and health of workers and issues of child labour as well as in maintaining labour standards
Ministry of Local Government	Coordinates the hands-on activities pertinent to implementation of the NAP, implementing the decentralization of mandates and financial and human resources through capacity building of local government services.
Ministry of Justice	Legislation and Policy formulation
Ministry of Agriculture	Developing policies, laws, regulations and guidelines to mitigate ASGM's impact on farmland and forests
Ministry of Marine Resources	Developing fisheries and marine policies, laws and regulations on mercury related marine pollution; facilitating and promoting synergies between ASGM and the marine sector

Long Term Capacity Building Needs and Priorities of Competent Authorities to Implement the NAP

The ASGM overview revealed that the institutional, human and technical capacity of stakeholders for monitoring of ASGM activities is currently inadequate. It would be hard to achieve the objectives of the NAP without adequate capacity of the stakeholders. Accordingly, action plan on capacity building for relevant stakeholders is proposed. The capacity building will include among others, training, transfer of technology, knowledge and skills, as well as financial support. Details of the action plan are shown in Table 6.

Establish Database Systems to Facilitate NAP Implementation

The ASGM overview, the mercury inventory and the assessment of infrastructure and regulatory frameworks revealed stakeholders have inadequate or no established database system relevant to chemicals including mercury management, however very few institutions have already developed a computer-based database system. As many of the action plans are inter-sectoral in nature and cut across the activities of various ministries and interested institutions, a well-established database system shared among stakeholders is essential for the effective implementation of the NAP. For this reason, action plan is proposed for the establishment of an integrated database system (as shown in table 6 below).

Monitor the Effectiveness of Regulatory Consideration to Further Enhance Capacities of Relevant Stakeholders

Legal frameworks exist that are applicable for mercury use and ASGM activities; to strengthen the control mechanisms, development of pertinent directives has been proposed. However, human capacity to undertake the monitoring and enforcement activity across relevant stakeholders is limited. Therefore, conducting continuous capacity enhancement activities for stakeholders involved in NAP implementation is important.

Maintain an Efficient Communication Schedule between all Relevant Stakeholders

Table 6: Action Plan on Institutional Strengthening on NAP Implementation

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
C. Institutional Strengthening on NAP implementation	Establish national steering committee for NAP implementation	MEDIUM	MoLWE	2021	External Internal	3,000	Composition of the NSC
	Develop capacity building that meets the long term needs and priorities of competent authorities to implement the NAP	HIGH	MoLWE	2022 - 2023	External Internal	15,000	<ul style="list-style-type: none"> Number and type of capacity building activities Number of beneficiary individuals/institutions
	Establish database system to facilitate NAP implementation	LOW	MoLWE	2024	External Internal	20,000	<ul style="list-style-type: none"> Database System Type of data and information gathered
	Monitor the effectiveness of regulatory consideration to further enhance capacities of relevant stakeholders	HIGH	MoEM	2023	External Internal	3,000	<ul style="list-style-type: none"> Number and level of monitoring activities conducted Monitoring reports and decision made
	Maintain an efficient communication schedules between all relevant stakeholders	MEDIUM	MoLWE	2022 and 2025	External Internal	4,000	<ul style="list-style-type: none"> Number of meetings and issues communicated Participation and activity rate
	Total Budget						45,000

E. Strategy on Awareness Raising for the ASGM Communities and Stakeholders

The ASGM overview has revealed that there is no permanent artisanal miner in any of the sites assessed and people usually engage themselves in artisanal mining when summer rain fails (thus ASGM is seen as poverty-driven activity). The mining practice in Eritrea is rudimentary and labour intensive and lacks standard safety measures. The knowledge and awareness among most of the miners, local communities and stakeholders about mercury use and its associated health and environmental effects is very limited. Raising communities' awareness about ASGM in general and mercury in particular (as per the Minamata Convention, Annex C "Strategies for providing information to ASGM and affected communities") would contribute significantly to minimizing the effects of mercury exposure on human health and environment. To this end, relevant action plans are proposed as showcased in Table 7:

Develop Awareness Materials Related to Environmental and Social Impacts

Necessary awareness materials, including manuals, pamphlets, brochures, posters, and leaflets in all relevant local languages will be prepared and distributed to all target groups. Awareness materials will be prepared in consultation and active participation of the respective local communities and stakeholders.

Conduct Awareness Raising Campaigns in ASGM Communities

The proposed plan on awareness raising embraces seminars/meetings, broadcasting and dissemination of information through available media outlets and other related communication tools. Implementation guidance of this program will be developed in the context of social, economic and cultural principles of the communities. The campaigns should focus on the following issues:

The health and environmental impacts of ASGM

The health and environmental impacts of Mercury

Provisions of regulatory tools on ASGM and mercury use

Organize Environmental and Social Training of Stakeholders

The training is aimed to upgrade the skill and knowledge of the experts of all relevant stakeholders on the risks and hazards that could arise as the consequences of mishandling of ASGM and mercury use. Recruitment of competent experts and development of appropriate training materials will be made in consultation with all relevant stakeholders.

Table 7: Action Plan on awareness raising for the ASGM communities and stakeholders

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
D. Awareness raising for the ASGM communities and stakeholders	Develop awareness materials related to environmental and social impacts	MEDIUM	MoLWE	2021	External Internal	8,000	Training Materials developed
	Conduct awareness raising campaigns on ASGM communities	HIGH	MoEM	2022 - 2024	External Internal	25,000	<ul style="list-style-type: none"> Awareness campaigns conducted Participation rate
	Organize environmental and social training for stakeholders	MEDIUM	MoLWE	2022	External Internal	17,000	<ul style="list-style-type: none"> Number of training session conducted Participation rates
Total Budget						50,000	

F. Public Health Strategy on Mercury Exposure of ASGM Miners and Communities

The 2021 National Health Sector goal is aimed at ensuring, 'essential quality health and health related services are efficiently and equitably available to all Eritreans, in line with their specific individual, and communal health needs'. The MOH has been making significant efforts to improve access to health services. The ASGM overview report revealed that most of the ASGM mining sites have limited access and are more than 5 km away from the nearest health facility. This strategy is proposed to ensure ASGM communities' access to adequate health facilities and hence minimize the risks arising from ASGM activities and mercury use.

Evaluate Public Health Status of the ASGM Communities through Appropriate and Recognizable Channel

It is evident that rudimentary and labour intensive ASGM practices coupled with poor safety measures could lead to health and environmental risks. However, the existing information about the health problems and occupational risks encountered among the miners and communities is inadequate to evaluate the health status of the ASGM miners and the communities. The limitation of data and information is attributed to remoteness of health facilities from ASGM sites; victims tend to avoid admission to health facilities due to limited awareness of the risks and effects, and a paucity of appropriate information from patients in cases where there is access. In addition to the overall capacity action plan proposed in other sections of the NAP, establishment of an appropriate channel of communication (reporting) and a well-designed reporting format is necessary for the timely evaluation of the health status of ASGM communities and hence this action plan is proposed.

Harness Shared Resources to Collect Public Health Data and Undertake Follow-Up Actions

It is indicated that the pertinent bodies allocate and spend corresponding resources to assess and analyse public health data for the purpose of further actions. However, resource allocation for ASGM-related concerns have not been accommodated. Moreover, dissemination and sharing of existing data and information among the institutions is inadequate and hence implementation of action plans have been exclusive. The resources required for the action plans must be assessed, identified, mobilized and integrated in order to address all the aforementioned gaps. Hands-on training on management of resources must also be organized and conducted.

Train Health Care Workers on How to Recognize, Diagnose and Treat Mercury Poisoning

It has been confirmed the existing health facilities do not have health personnel with the skills to detect and diagnose mercury intoxication. Upgrading the capacity of the health personnel on the basis of the recent technologies and techniques is of paramount importance in preventing and controlling health risks that arise from the ASGM practices and mercury exposure. The training for health workers should encompass recognizing, diagnosing and treating mercury toxicity.

Develop an Appropriate Treatment Protocol in the Health Systems

In the health care setting, systems of instruction have to be constituted in order to describe a procedure to be adhered to investigate a particular set of findings in a patient or the method which should be followed to control a certain disease. Having a protocol could help in stating "what the study will do?", "how it will be done and why it is being done?". Clinical protocols are used to allow health care providers to offer appropriate diagnostic treatment and care services (offer diagnostic, treatment, care services to patients, variance reports to purchasers and quality training to clinical staff). Clinical protocols are keys to quality health care delivery and hence the action plan is proposed.

Build and Strengthen Inter-Sectoral Engagement between Health and Other Relevant Ministries

Building and strengthening of interdependence among sectors is important to ensure efficient flow of information and undertake concerted efforts. In this effort, work unit independence (WUI) will be mapped out through regular meetings. For strengthening further the inter-sectoral engagement, a network of communication will be established to ease the flow of information among the relevant stakeholders. For example, farmers, who undertake ASGM when they need to supplement their income, may come across agricultural extension workers more often than health workers. Such engagement may be beneficial in communicating health issues in an inter-sectoral manner.

Table 8: Action Plan on Public health strategy on the exposure of ASGM Miners and the community

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
E. Public health strategy on the exposure of ASGM Miners and their communities	Evaluate the public health status of the ASGM communities through appropriate and recognizable channel	HIGH	MoH	2021 - 2022	External Internal	30,000	Report on the well-being and health condition
	Harness shared resources to collect public health data and undertake follow-up actions	MEDIUM	MoH	2022 - 2024	External Internal	15,000	<ul style="list-style-type: none"> Data availability and adequacy Follow action undertaken
	Develop an appropriate treatment protocol in the health systems	HIGH	MoH	2021 - 2022	External Internal	80,000	Treatment protocol (medical guidelines) developed
	Strengthen inter- sectoral engagement between health and other relevant Ministries and agencies	MEDIUM	MoH	2021 - 2022	External Internal	25,000	Strength of the stakeholders
Total Budget						150,000	

G. Strategy to Prevent the Exposure of Vulnerable Populations (Women and Children) in ASGM Activities

The risks for work related injuries and illness in vulnerable populations, as in all workers of all ages, can be reduced through adherence to routine safety and health precautions. Nevertheless, this could only be done or allowed to be done in the forms of employments or works that would not have potential effect on their health and well-being of those particular individuals (i.e. Precarious Works). The labour law has implicitly and explicitly addressed these provisions. Under the provisions of the labour law, women, children and disabled persons have been bestowed special working conditions on the basis of every background and concerns on the concrete foundations of dialogues between the social partners.

Based on the letter and spirit of the labour law³⁴, in any given circumstance, vulnerable populations should not be required to be involved in the work or forms of employment that threaten their safety and health. Employers are obliged to assess and analyze the risks that could possibly arise out of the workplaces and take every available preventive and control measure, so far as is reasonably possible at their disposal to safeguard the safety and health of the workplace. Any employer should ensure that the work they provide for children does not involve prohibited activities. However, in practice, this is to no avail in the ASGM sector.

ASGM studies have shown that most of the vulnerable groups, such as children, women and even girls are engaged in most available occupations of the ASGM sector as per the needs that arise. Women usually do the jobs in order to increase the incomes of their families as well as improve their standards of living. Hence there is a clear indication that they are not recruited or employed on the basis of contracts or deals to earn salaries or wages. Mining activities in which they get themselves engaged is not their sole source of income but rather it is the main source of seed money as it is meant to support or supplement the agricultural chores in which they depend on. Nonetheless, prolonged efforts are needed to prevent exposure of vulnerable populations to occupational hazards or risks. The action plan for the strategy to prevent the exposure of vulnerable populations in the ASGM is presented in Table 9.

³⁴Labour Proclamation No. 118/2001

Eliminate Child Labour Practices in All the Dangerous Occupations that Threaten the Health of the Children in ASGM

The practices being experienced in ASGM by children cannot be considered as child labour because involvement is limited to supporting families and are not paid. Hence as per the definition granted by the ILO, such kinds of works are termed as 'Child work' which attempts to imply they are not forced to do the jobs on employment basis. Nevertheless, whatever terms is used, the activities should not threaten the safety and health of children. Even Labour Law issues a special provision of article that details list of activities prohibited or not allowed to be done by children, in which works connected with toxic chemicals, mines and quarries as well as heavy weight are one of them³⁵. Therefore, children under the age of 18 should be protected at all costs by applying policies and measure with respect to enforcement, education and training, information sharing and creating opportunities.

Targeted Outreach and Awareness Raising on the Risks of Children's Work in ASGM Practice

It has been assessed that most of the children working in ASGM sites have limited knowledge about the effects or risks of their occupations. Children tend to be given more menial tasks, usually without instruction and training as well as without close supervision. The potential risks and the effects that children could face in the workplaces are critical. To avoid the occurrence of such incidents, it is vital to nurture greater awareness to ensure the rejection of child labour or child work among the target groups (children, their families and communities) in comprehensive and inclusive ways. The awareness program will include demonstrations and will be conducted through meetings and seminars.

Mainstream Child Labor Issues into Program and Information Sharing on Child Labor

Efforts have been made to eliminate child labour. However, there remains a lot to be done to ensure the desired level, especially with respect to information sharing. It is essential to acquire more, better and reliable information about the extent and dynamics of child labour, and thereby share the information with all pertinent bodies through appropriate and proper channels. The fight against child labour should bring in results through unprecedented cooperation or collaborations among all institutions. Prolonged efforts are required to mainstream those issues into programs for the purpose of information sharing and undertake necessary actions.

Table 9: Action Plan to prevent exposure of vulnerable populations (women and children) in ASGM activities

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
F. Prevent exposure of Vulnerable populations (women and children) in ASGM activities	Eliminate child labor practices in all the dangerous occupations that threaten the health of the children	HIGH	MoLSW	2021 - 2023	External Internal	10,000	Compliance of establishments
	Targeted outreach and awareness raising on the risks with dangerous chemicals	HIGH	MoLSW	2022 - 2023	External Internal	15,000	<ul style="list-style-type: none"> Awareness and outreach programs/activities conducted Participation rate
	Information sharing on child labor	MEDIUM	MoEM	2021 - 2025	External Internal	10,000	Adequate information on child labor
	Mainstream child labor issues into program and information sharing on child labor	MEDIUM	MoLSW	2023 - 2025	External Internal	15,000	Main-streamed information
Total Budget						50,000	

³⁵ Labour Proclamation No. 118/2001. Article 69 (precarious works for youth employees)

H. Strategy for Providing Necessary Information about the ASGM Activities

The strategy for providing necessary information builds on all previous strategies and especially the strategy for engaging stakeholders in the NAP implementation, evaluation and updating. The action plan for providing necessary information about the ASGM activities are shown in Table 10.

Establish Information Gathering Mechanism

Information pertinent to ASGM activities could be gleaned for the purpose of knowledge and experience sharing, conducting further assessment and analysis as well as undertaking relevant actions. Since information gathering entails significant efforts, establishment of a committee is necessary. The composition of the committee includes all the stakeholders (listed in table 5) and designated to identify, collect and assess information as well as store the information on the established database.

Develop and Implement Outreach plan in information sharing

The outreach plan articulates the required information to be shared, target audience, approaches and media outlets. The information to be shared will include (though not limited to):

- ▶ Mercury use and its harmful effects on human beings and the environment
- ▶ Children's and women's specific vulnerabilities regarding mercury poisoning and other ASGM-related health hazards
- ▶ The identified worst practices that occur in Eritrea, most notably the open burning of mercury amalgams in residential areas and in people's houses
- ▶ Other health hazards associated with ASGM activities and the impacts they may have on human beings
- ▶ Simple steps that can be taken to mitigate other health and environment impacts (e.g. land rehabilitation)
- ▶ Improving overall hygiene, sanitation and other health issues in communities around ASGM sites

The proposed primary target audiences in the outreach plan include;



Moreover, the proposed secondary target audiences in the outreach plan include:



Local colleges, regional administrators and local and national media
(important stakeholder in executing the outreach plan)



The wider public
(all stakeholders identified in table 5)

It is important that the messages are short, simple, and relevant so that they can be understood by a large audience, including less educated people and living in rural areas. Translation into local languages is therefore essential, including good usage of pictures and infographics. It is best to develop constructive and forward-looking messages about the health and environmental impacts of mercury use in ASGM.

Finally, a combination of various media will be employed to ensure that the various target audiences are reached in a customized and effective manner. In the employment of each media, different stakeholders will play leading roles in sensitization activities so that they successfully target with appropriate messages, for example by engaging with women. The table below illustrates the different media that are envisioned for different target audiences.

Table 10. Identification of media for target audiences

Media	Informal Gold Traders	ASGM communities	Communities downriver	Regional admin	Wider public
Regular health and environment promotion activities	x	x	x		
Pamphlets	x	x	x		
Posters	x	x	x		
Guidebooks	x				
Radio	x	x	x	x	x
TV	x	x	x	x	x

Table 11: Action Plan on providing necessary information about ASGM activities

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
Strategy for providing necessary information about the ASGM activities	Establish information gathering mechanism	HIGH	MoLWE MoEM	2021	External Internal	10,000	Information gathered
	Develop an outreach plan specific gathering information and identify appropriate means of communication	MEDIUM	MoLG	2022	External Internal	10,000	Appropriate Plan
Total Budget						20,000	

I. Monitor and Evaluate the Implementation of the NAP

The National Steering Committee will monitor the implementation of the NAP in consultation with the regional administrations, community leaders and other local stakeholders. This coordination will enhance the legitimacy, accountability and transparency of the monitoring process. All this will be done under supervision of MoEM and MoLWE. The action plan for monitoring and evaluation of the implementation of NAP is presented in the table12.

Table 12: Action Plan on monitoring and evaluation on the implementation of the NAP

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
H. Monitoring and Evaluation on the implementation of NAP	Prepare formats for monitoring and evaluation reports	HIGH	MoEM MoLWE	2021	External Internal	4,000	Format developed
	Develop Monitoring and evaluation Schedule	HIGH	MoLWE	2021	External Internal	1,000	Establishment of Appropriate plan
	Gather information on NAP implementation on regular basis	MEDIUM	MoLWE	2021	External Internal	10,000	Development of Appropriate plan
	Conduct evaluation workshop	MEDIUM	MoLWE	2025	External Internal	7,000	<ul style="list-style-type: none"> Information and feedback gathered Participation rate
Total Budget						22,000	

2. Work Plan

Table 13: Work Plan for the Implementation of the NAP

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
A. Study on geo-prospecting to delineate AGM areas	Conduct airborne geo-physical survey and Remote sensing interpretation	HIGH	MoEM	2021 - 2023	External Internal	2,000,000	<ul style="list-style-type: none"> Geophysical maps and interpretation with anomalies Sat. map interpretation
	Develop geo-data, geological mapping and geochemical sampling	HIGH	MoEM	2021 - 2023	External Internal	200,000	<ul style="list-style-type: none"> Geological report and geochemical result with anomaly. The geodata base updated.
	Categorize gold potential areas according to its estimated reserve and delineate areas	HIGH	MoEM	2023 - 2024	External Internal	100,000	Map of prospect produced with report
	Conduct land use mapping	HIGH	MoEM	2024	External Internal	25,000	<ul style="list-style-type: none"> Land use map produced

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
B. Promote sustainable livelihoods for those that engage in ASGM	Transform the traditional agricultural practices to modern agriculture by improving infrastructure & equipment	HIGH	MoLG MoA	2024	External Internal	176,550	<ul style="list-style-type: none"> Infrastructure developed Equipment procured Technological base provided
	Design agricultural extension programs in order to strengthen & expand training & advisory services	HIGH	MoLG MoA	2024	External Internal	4,500	<ul style="list-style-type: none"> Advisory delivery strengthened Capacity building improved Training programs conducted Number of trainees
	Promote agricultural efficiency & productivity through the use of modern farming inputs	HIGH	MoLG MoA	2024	External Internal	51,000	<ul style="list-style-type: none"> Machinery services provided Modern agricultural inputs distributed
	Facilitate access to credit for small-holder farmers	MEDIUM	MoLG MoA MoF	2024	External Internal	1,600,000 2,000,000	<ul style="list-style-type: none"> Financial services established Financial literacy improved Number of small folders with access to credit
C. Improve monitoring and enforcement in managing mercury	Develop directive concerning the enforcement of the regulation	HIGH	MoLWE MoEM	2021	External Internal	15,000	Directives developed
	Establish multi-stakeholders local oversight committee	HIGH	MoEM	2022	External Internal	12,000	Local oversight committee established
	Provide training and monitoring infrastructure for established local oversight committee	MEDIUM	MoLWE MoEM	2022	External Internal	20,000	<ul style="list-style-type: none"> Type and number of training conducted Number of beneficiaries Monitoring infrastructure introduced
	Avoid the entry and trade of mercury at possible sites	HIGH	MoTI	2021 - 2025	External Internal	35,000	Penalties imposed
	Conduct Inspection in ASGM Sites	HIGH	MoLSW	2022 - 2025	External Internal	20,000	No. of inspection activity

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
D. Institutional Strengthening on NAP implementation	Establish national steering committee for NAP implementation	MEDIUM	MoLWE	2021	External Internal	3,000	Composition of the NSC
	Develop capacity building that meets the long term needs and priorities of competent authorities to implement the NAP	HIGH	MoLWE	2022 - 2023	External Internal	15,000	<ul style="list-style-type: none"> Number and type of capacity building activities Number of beneficiary individuals/institutions
	Promote agricultural efficiency & productivity through the use of modern farming inputs	HIGH	MoLWE	2024	External Internal	51,000	<ul style="list-style-type: none"> Machinery services provided Modern agricultural inputs distributed
	Establish database system to facilitate NAP implementation	LOW	MoLG MoA MoF	2024	External Internal	20,000	<ul style="list-style-type: none"> Database System Type of data and information gathered
	Monitor the effectiveness of regulatory consideration to further enhance capacities of relevant stakeholders	HIGH	MoEM	2023	External Internal	3,000	<ul style="list-style-type: none"> Number and level of monitoring activities conducted Monitoring reports and decision made
	Maintain an efficient communication schedules between all relevant stakeholders	MEDIUM	MoLWE	2023 and 2025	External Internal	4,000	<ul style="list-style-type: none"> Number of meetings and issues communicated Participation and activity rate
E. Awareness raising for the ASGM communities and stakeholders	Develop awareness materials related to environmental and social impacts	MEDIUM	MoLWE	2021	External Internal	8,000	Training Materials developed
	Conduct awareness raising campaigns on ASGM communities	HIGH	MoEM	2022 - 2024	External Internal	25,000	<ul style="list-style-type: none"> Awareness campaigns conducted Participation rate
	Organize environmental and social training for stakeholders	MEDIUM	MoLWE	2022	External Internal	17,000	<ul style="list-style-type: none"> Number of training session conducted Participation rates

Strategy	Actions	Priority	Activity Lead	Timeline	Funding Source	Activity Cost \$US	Indicator
F. Public health strategy on the exposure of ASGM Miners and their communities	Evaluate the public health status of the ASGM communities through appropriate and recognizable channel	HIGH	MoH	2021 - 2022	External Internal	30,000	Report on the well-being and health condition
	Harness shared resources to collect public health data and undertake follow-up actions	MEDIUM	MoH	2022 - 2024	External Internal	15,000	<ul style="list-style-type: none"> Data availability and adequacy Follow action undertaken
	Develop an appropriate treatment protocol in the health systems	HIGH	MoH	2021 - 2022	External Internal	80,000	Treatment protocol (medical guidelines) developed
	Strengthen inter-sectoral engagement between health and other relevant ministries and agencies	MEDIUM	MoH	2021 - 2022	External Internal	25,000	Strength of the stakeholders
G. Prevent exposure of vulnerable populations (women and children) in ASGM activities	Eliminate child labor practices in all the dangerous occupations that threaten the health of the children	HIGH	MoLSW	2021 - 2023	External Internal	10,000	Compliance of establishments
	Targeted outreach and awareness raising on the risks with dangerous chemicals	HIGH	MoLSW	2021 - 2023	External Internal	15,000	<ul style="list-style-type: none"> Awareness and outreach programs/activities conducted Participation rate
	Information sharing on child labor	MEDIUM	MoEM	2021 - 2025	External Internal	10,000	Adequate information on child labor
	Mainstream child labor issues into program and information sharing on child labor	MEDIUM	MoLSW	2023 - 2025	External Internal	15,000	Main-streamed information
H. Provide necessary information about ASGM activities	Establish information gathering mechanism	HIGH	MoLWE MoEM	2021	External Internal	10,000	Information gathered
	Develop an outreach plan specific gathering information and identify appropriate means of communication	MEDIUM	MoLG	2022	External Internal	10,000	Appropriate Plan

<i>Strategy</i>	<i>Actions</i>	<i>Priority</i>	<i>Activity Lead</i>	<i>Timeline</i>	<i>Funding Source</i>	<i>Activity Cost \$US</i>	<i>Indicator</i>
I. Monitoring and Evaluation on the implementation of the NAP	Prepare formats for monitoring and evaluation reports	HIGH	MoEM MoLWE	2021	External Internal	4,000	Format developed
	Develop Monitoring and evaluation Schedule	HIGH	MoLWE	2021	External Internal	1,000	Establishment of Appropriate plan
	Gather information on NAP implementation on regular basis	MEDIUM	MoLWE	2021	External Internal	10,000	Development of Appropriate plan
	Conduct evaluation workshop	MEDIUM	MoLWE	2025	External Internal	7,000	<ul style="list-style-type: none"> • Information and feedback gathered • Participation rate
Total Budget						\$3,066,050	
Source of Fund: External (Multilateral and Bilateral Donors)						\$2,759,445	
Internal (In Kind 10%)						\$306,605	

The Ministry of Land, water and Environment (MoLWE) will coordinate the inter-ministerial technical working group and cooperate with other relevant ministries and institutions in implementing this plan. The MoLWE will also play a coordination role in organizing meetings on planning implementation, planning formulation, or project proposal development for implementing the program of works identified in this specified plan.

In order to review the effectiveness and the efficiency of the NAP, the MoLWE and the stakeholders shall establish two main evaluation mechanisms as follows:

The **FIRST EVALUATION** is to be a mid-term evaluation that will be conducted after two or three years of implementation of the NAP to evaluate the outputs, identify the challenges and set a direction for future implementation. The objective of this evaluation is to review the progress of NAP implementation and make modifications accordingly.

The **SECOND EVALUATION** is considered to be the final evaluation of the achievements of the NAP that will be done at the end of its implementation phase. In this evaluation the necessary approaches and techniques will be availed as per the necessity of the plan to evaluate the overall achievement as well as the positive impacts. Key points for comparing achievements can be made through updating the trends and corresponding set of parameters. The achievements will also be reviewed based on the designed objectives and strategies related to reduction and elimination of mercury use in ASGM.

Table 14: Objective, strategies and indicators of NAP implementation

Objectives/ targets	Strategies	Indicators
Legal framework and institutional building	Institutional strengthening on NAP implementation	• Participation rate of the national steering committee
		• Number and type of capacity building activities undertaken
		• Number of beneficiary individuals and institutions
		• Database system established and amount of data gathered
	Improving, monitoring and enforcement of regulations in respect to ASGM and management of mercury	• Directive developed
		• Local oversight committee established
		• Type and number of training provided
		• Number of beneficiaries who get the training
		• Nature and frequency of inspection visits conducted
		• Penalties imposed
Resource assessment	Study on geo-prospecting to delineate ASGM areas	• Final Report and disclosure of the Geo-physics survey
		• Developed geo-data and geological mapping of each region
		• Cut off grade of gold reserve estimated
		• Delineate potential gold sites for ASGM & LSM
		• Land use map produced

Objectives/ targets	Strategies	Indicators
Promotion, awareness raising and communication	Promotion, awareness raising for the ASGM communities and stakeholders	• Infrastructure developed
		• Technological base for agricultural practices provided
		• Modern agricultural equipments and inputs distributed
		• Number of small folders with access to credit
		• Training materials developed
		• Number and types of campaign conducted
		• Number and types of training programs developed
		• Number and type of trainings provided
		• Participation and response rate of the ASGM communities
	Provide necessary information about the ASGM Activities	• Nature and frequency of information gathered
• Adequacy of dissemination channels		
• Feedback and response rate of the ASGM communities		
Ensuring Health and safety related to ASGM activities	Prevent the exposure of vulnerable populations (Women and Children) in ASGM activities	• Participation rate of the vulnerable populations in the sector
		• Awareness and outreach programs conducted
		• Nature and frequency of inspection visits conducted
		• Sharing of adequate information on child labor
	A public health strategy on the exposure of ASGM miners and their communities to mercury	• Prevalence of occupational diseases
		• Medical guidelines (health protocol) developed
		• Severity and frequency rate of incidents occurred

1. Annex I - Terms of Reference for the national expert and focal point responsible for developing the national ASGM overview

GEF-funded Project on the Development of the Minamata Initial Assessment (MIA) and the National Action Plan (NAP) for Artisanal and Small Scale Gold Mining (ASGM) in Eritrea

Context

The Minamata Convention on Mercury is a global treaty to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention was adopted on 10 October 2013 at a Diplomatic Conference held in Kumamoto, Japan, and will enter into force on the ninetieth day after the date of deposit of the fiftieth instrument of ratification, acceptance, approval or accession.

Eritrea has not yet signed the Convention but has undertaken meaningful steps to further the ratification of the Convention and has notified the Minamata Secretariat about the more than insignificant presence of ASGM activity using mercury on its territory. The Convention has entered into force on 16 August 2017. In order to facilitate early implementation of the Convention through the use of scientific and technical knowledge and tools by national stakeholders, the UNITAR and the Ministry of Land, Water and the Environment (MoLWE) are executing a Global Environment Facility (GEF) funded project on the 'Development of the Minamata Initial Assessment (MIA) and the National Action Plan (NAP) for Artisanal and Small Scale Gold Mining (ASGM) in Eritrea'. The project is executed by the United Nations Environment Programme (UN Environment).

The project has the following three components and respective subcomponents:

Component 1: Global technical support for MIA and NAP development

Component 2: Minamata Initial Assessment (MIA) and National Action Plan (NAP) development

- 2.1 Identified and strengthened national coordination mechanism and stakeholder advisory group that will guide the project implementation
- 2.2 National institutional and regulatory framework and national capacities on mercury management assessed.
- 2.3 National inventories of mercury sources and releases and strategy for the identification of mercury contaminated sites developed.
- 2.4 Challenges, needs and opportunities to implement the Minamata Convention assessed and recommendations to ratify and implement the Minamata Convention developed
- 2.5 Draft NAP developed as per Annex C of the Minamata Convention

Component 3: MIA validation and NAP endorsement and submission to the Minamata Secretariat

Objective

The activities listed under these Terms of Reference contribute to the second component, and more specifically to its subcomponent of the development of the national overview of the ASGM sector to inform the NAP development. Article 7 of the Minamata Convention addresses ASGM as the primary source of anthropogenic mercury emissions, and postulates the obligation of countries with 'more than insignificant ASGM activity' to develop NAPs. Annex C, Paragraph 1 lists several obligations, including among others the development of (c) "Steps to facilitate the formalization or regulation of the artisanal and small-scale gold mining sector"; and (d) "baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing". In order to respond to these obligations, NAP executing countries should strive to create a national overview of the ASGM sector that is as comprehensive as possible in order to inform the mercury inventory as well as policy interventions that aim to regulate and formalize the sector (UN Environment National Action Plan Guidance, 2015)³⁶.

³⁶ <http://www.unep.org/chemicalsandwaste/NationalActionPlan/tabid/53985/Default.aspx>

The activities and outputs contribute to component 4, specifically the development of a national overview of the ASGM sector. The objective is to develop a qualitative and quantitative overview of the ASGM sector which is as comprehensive as possible and includes particularly the use and releases of mercury, to guide early implementation of the Minamata Convention. In combination with the mercury inventory, which will be undertaken by other consultants, the findings under this activity will contribute to the baseline inventory of the MIA and form the basis of the NAP. The ASGM overview will feed directly into the objectives, strategies and goals set for the NAP, and will further inform components 5 and 6 of this MIA+NAP project.

For this purpose, all information available about the ASGM sector relevant for this project will be compiled in a national scoping of information, including a desk study. This will include but go beyond the studies compiled and made available by the national assessment on existing sources of information. The resultant information will help to identify information gaps and information perceptions, which will be filled/complemented with an extensive field studying ASGM sites to be undertaken in close collaboration with UNITAR and with the support of several national consultants. The specificities of the ASGM research are further elaborated in UNITAR's "generic methodology of a socio-economic ASGM field study" and Artisanal Gold Council's (AGC) forthcoming "toolkit for developing baseline estimates".

Key activities

In undertaking the below activities, UNITAR's, AGC's and UN Environment's aforementioned methodologies will be extensively consulted. The process of developing the national overview should be viewed as iterative and will depend on the existing knowledge base and relationship with miners and other relevant stakeholders. As a consequence, the activities are not necessarily listed in chronological order and some of the activities will need to be implemented in parallel, with the information gained under one activity feeding into the other activity.

Establishing a work plan

The national expert will develop a work plan in collaboration with the national project execution team and UNITAR. This work plan will be circulated for comments and approval to the National Coordination Mechanism (NCM); input from the Stakeholder Advisory Group (SAG) will also be solicited.

Conduct an ASGM national scoping

As further detailed in UNITAR's forthcoming methodology on the socio-economic ASGM study, the national scoping of information about the ASGM sector will consist of a desk study and stakeholder interviews. The national ASGM expert shall not be responsible for the legal and institutional evaluation which is part of the national scoping.

The information collected in the national scoping shall be summarized and discussed in a national scoping report. Importantly, this report shall include an evaluation section about data gaps between the desk study report and the above-listed topics, and perceptions and reliability of the collected data. The report shall be shared with the national execution team, the NCM, the SAG and UNITAR, and their feedback shall be incorporated in the next report of the national ASGM study.

The national ASGM expert shall receive considerable support from MoLWE and UNITAR in conducting the national ASGM scoping.

Develop a strategy for the ASGM field study

Building on the data gaps identified in the national scoping report, and in close collaboration with the national project execution team and UNITAR, the national expert shall develop a strategy for the ASGM field study. The national expert shall identify and list topics that need to be further explored, elaborated and triangulated in the ASGM field study. Based on the identified topics, additional research questions and sub-questions for surveys and semi-structured interviews shall be developed that will complement those developed under UNITAR's methodology. The strategy shall further include a description of and justification for the methodologies to be used for the quantitative and qualitative field studies. This shall include inter alia the sampling method, the selection of individual ASGM sites, the confidential treatment and management of data, the use of software in analysing data, etc.

In close collaboration with the national project execution team, the national expert shall assist in formulating the required profile of consultants responsible for (co-)executing the ASGM field study and if appropriate, help in selecting suitable individuals. Suitable individuals must understand the technical, social, economic, political, and ore processing context and it is important that they are perceived by miners as neutral actors.

Conduct the ASGM field study

In line with the strategy composed for the ASGM field study, and with the assistance of other national researchers, MoLWE and UNITAR, the national expert shall conduct the ASGM field study.

With support of the national MIA+NAP project coordinator, the national expert shall obtain approval to visit ASGM sites through telephone contact, e-mail requests, data request letters, and personal meetings, as needed. The expert drafts a support letter for data collection to be signed by the MIA+NAP project coordinator, or his/her superiors as suitable per national conditions. The support letter can be used in all data requests.

The national expert shall seek to establish positive relations with mining communities at key sites. As appropriate, he/she ensures that the field researchers explain the research background, purpose and envisioned results and confidential treatment of data, and obtain approval of possible recording or note taking before collecting information.

The national ASGM expert shall collect data in the field together with other national researchers. The national expert will provide the other researchers with guidance and support in data collection and in data analysis.

Under the assistance of the other national ASGM researchers, the national expert will see to it that the data is appropriately managed, stored, coded, categorized and analyzed as decided upon in the ASGM field study strategy. The data will be made available to the national project coordinator and UNITAR.

The national ASGM expert shall respect ethical research principles and practices as outlined in UNITAR's socio-economic ASGM research methodology.

Develop the ASGM baseline estimates

This activity is an integral part of both the national scoping and the field study, but since it is one of the most essential elements of the ASGM overview, it is discussed separately. The national expert shall cooperate very closely with the national inventory expert, who is responsible for developing the mercury inventory in the Toolkit with input from (inter alia) the ASGM baseline inventory data delivered by the national expert. More information about the (general) baseline inventory can be found in the UNEP Toolkit inventory template³⁷, and guidance can be retrieved from AGC's Practical guide on 'Developing Baseline Estimates of Mercury Use in Artisanal and Small-Scale Gold Mining Communities'³⁸. The basic purpose of the ASGM baseline inventory is to obtain an estimation of the amount of mercury used in ASGM. The following key information is required for this:

- ▶ Mercury-gold ratio
- ▶ Extraction and processing techniques used
- ▶ Total gold produced

This information must be complemented with social, economic, health and environmental data listed in UNITAR's socio-economic ASGM research methodology.

Under assistance from the national ASGM consultants, the national expert shall collect all relevant data as has been specified above and elaborated in the ASGM field study strategy.

The collected data will be analysed by the national ASGM overview expert and by the national inventory expert as per Toolkit methodology and reported in a preliminary national inventory report; all under assistance of the hired national consultants.

Consultations or meetings with stakeholders will be conducted. The stakeholders' comments/inputs will be considered and taken into account in the analysis and reporting, as appropriate and as per agreement with the national project coordination team, the NCM and UNITAR.

³⁷ <http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Toolkit/Hg-Toolkit-IL1-report-Template-April2015.docx>

³⁸ http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/AGC%20Inventory%20Guide_v1_Oct2015.pdf

Draft national ASGM study report

A first draft of the national ASGM study report (including baseline estimates) will be finalized by the national expert and his team based on their own input, and electronic and hard copies will be submitted to the national project execution team, the NCM, the SAG and UNITAR for their feedback. The required elements of the research report are outlined in UNITAR's ASGM research methodology. Besides these elements, the national ASGM expert shall include recommendations for the NAP.

After revision in line with feedback received from the national project execution team, the NCM, the SAG and UNITAR, a second draft of the national ASGM study report will be submitted to them for a second round of feedback.

After revision in line with the feedback received in the second round, the national ASGM expert will finalize the national ASGM study report.

Deliverables

- ▶ Work plan
- ▶ National information scoping report (excluding the legal and institutional analysis)
- ▶ National research strategy for the ASGM study
- ▶ Raw data set available
- ▶ First draft of the ASGM (desk + field) study report including baseline estimates
- ▶ Second draft of the ASGM (desk + field) study report including baseline estimates
- ▶ Final ASGM study report, including recommendations for the NAP

Qualifications

Minimum of 3 years of experience with preparation of quantitative and qualitative assessments and reports related to mining, chemicals in society and the environment, on mercury, POPs, etc.

Education: Master's degree or higher in environmental science and management, or similar related fields of relevance to the tasks;

Demonstrated experience in collection and analysis of complex datasets, and with logical and transparent reporting;

Experience in working on quantitative and qualitative research design;

Specific experience in working with complex datasets in Microsoft Excel;

Specific experience in working with data analysis software such as for instance SPSS, AMOS, Nvivo, etc.

Knowledge of other international or bilateral legal instruments or organizations and their policy, programmes and operations is an advantage;

Experience in training and engaging with national stakeholders and institutions is an advantage; good knowledge of relevant stakeholders, including government, industry and civil society;

Capacity to establish and maintain excellent relationships with key partners.

Reporting line:

The incumbent would report to the national MIA+NAP project coordinator and UNITAR. All communication will be in English.

The national expert is requested to undertake significant travel for data collection, stakeholder consultations, and other meetings as per agreement with the national MIA+NAP project coordinator.

Duration of contract: [8] months, 35 weeks

Expected maximum national expert input: [175] days

2. Annex II - Detailed national baseline analysis

A. Methodology

This field research involved qualitative research methods to explore the ASGM activities and focus on the use of mercury in the processes. It also included the socio-economic and environmental sustainability in that specific area of the ASGM sector. The research was conducted in most of ASGM sites of the Gash Barka region such as Shambuko, Molki, Mogolo, Barentu, Haykota, Hademdemi, Kosolda, Ebinto, Dega, Dekemhare, Balak, as well as some ASGM sites of the Anseba (Mensura, Zara and its surrounding), Debub (Daerohaera, Ketina, and SemenawiKeihBahri (ShebbahandGhindae) regions. However, it did not incorporate the Debubawi Keih Bahri, as there are deemed to be no ASGM activities.

The qualitative research that has been availed to understand the socio-economic contributions, limitations and its sustainability, organizational and technical context, environmental impacts as well as policies within the overall specified ASGM sites is pursued by developing comprehensive case studies that offer a deeply contextualized understanding of the situation. This is achieved through the use of semi-structured interviews, group discussions and site observations as the main research tools. To ensure the credibility of the data, triangulation method has been availed towards that end.

The ASGM field study made use of the non-probability sampling whereby respondents are selected on the basis of the judgment of the researcher in order to obtain the actual ASGM miners. Quota sampling was then used for the purpose of showing appropriate representation of the different groups of the ASGM population by making stratification along line their roles or occupations such as diggers, processors, traders, transporters, local leaders, community members and health experts. Alongside the implementation of the research method, it is considered all the necessary research ethics such as respect respondents, beneficence, confidentiality and respect values as well as culture of the community.

Based on the above designed procedures, desk stop study was conducted ahead after a two weeks training on how to collect and analyze data related to ASGM, which helped in preparation of national scoping and field visit to areas of active artisanal and small gold mining (ASGM) sites. Literature review including the existing data from Ministry of Energy and Mines database, contacting the pertinent authorities (such as the branch office of mines within the regional offices to select active ASGM sites), interviewing stakeholders formally and informally, the knowledge attained in training of ASGM were also included as a desk-top study. This was important to finalize the scoping study and develop a strategy for the ASGM survey.

ASGM sites were selected and are usually remote and scattered. Reaching out to artisanal miners and identifying the gold-mercury supply chain has been very challenging as it was illustrated above. The ASGM team considered all the above gaps and prepared the strategy (systematic approach) for the field study, accordingly.

The ASGM survey has been launched by preparing questionnaires, scheduling field sites to be followed by organizing interviews. Separate questionnaires for artisanal miners (including women and child), gold traders, health experts and government authorities around the ASGM sites prepared. In gathering the relevant data, GIS based platform and various tools like digital beam balance, GPS, geologic hammer, compass, and camera has been used to that specific end. To further enable us to process the collected data, ASGM Excel program (Prepared by UNEP) has also been used.

Data collection from the conducted ASGM survey has been followed by data entry, data analysis and finally report writing.

Selection of the ASGM Sites

Selection of the ASGM sites is based on the distribution of the activity, the magnitude of gold production, ore type diversity, and accessibility of mining sites, which was based on previous data gathered from the scoping study. Accordingly the following artisanal sites were selected, from Gash Barka AZ subzones of Shambuko (Kosolda, and Binbina), Molki, Mogolo (Dega and Tambera), Barentu (Ebinto, and Dase), Haykota (Hademdemi and Shambotai), and Mensura, Anseba AZ (Zara and Geleb), Debub AZ includes Kohain subzone (Daerohara, Ketina), and Northern Red Sea AZ (Shieb and Ghindae) regions. However, it doesn't incorporate the Southern Red Sea AZ as there are no ASGM activities. Most of the ASGM sites are selected from Gash Barka AZ as they are prevalent in the region.

The method of calculating the parameters of population and gold production is based on research carried out on representative site visit (Figure 3). The main findings based on this information, data for the inaccessible artisanal sites were extrapolated and together summed up to estimate the parameters at subzone level. The result of subzones collectively forms zonal level and the summation of each zone makes estimates the parameters at country level.

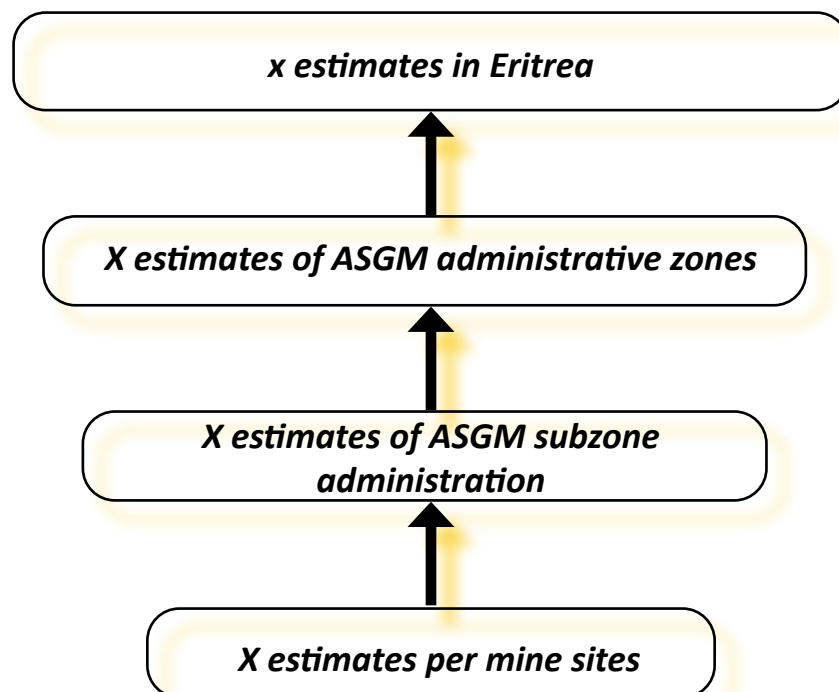


Figure 7. Estimates of population and gold production

B. Result

A 0.15 gram of gold production per person for 4 months, 5 days per week is considered for the calculation of yearly gold production. Based on this consideration the total population of artisanal miners is estimated 25,440. . The population of artisanal miners who extract gold through mercury amalgamation is estimated at 14,548.

In the gold production magnitude, 1.1 mercury to gold ratio is considered, as this factor is the average taken from the field baseline estimates, indeed mercury is put to the ore at the final stage of panning as it is used only to assemble the fine gold particles together. The total gold production estimate is found to be 324,360 grams, whereas the figure for the production of gold using mercury is 185,487grams. The total mercury used in four AZ of Eritrea is calculated to be 204,036gm.

Table 15: Total population of ASGM in Eritrea

Artisanal Site	ASGM site population	Subzone Estimates (extrapolation)			Population of Mercury Users
		Subzoba	Administration Zoba	ASGM population (Sub zoba)	
Mensura	1000	Mensura	Gash Barka	1000	600
Tselim Riesu	100	Lalay Gash	Gash Barka	2650	1590
Mai Kokah	250				
Shilalo-Bayo	275				
Sheshebit	450				
Antore	500				
Bartumbak	100				
Odas	350				
Dekemhare	450				
Binbina-Tekinaba	240				
Cosolda2	3500				
Kona	1000	Barentu	Gash Barka	1500	300
Asheshi	500				
Tambera	1100	Mogolo	Gash Barka	2000	1400
Dega	900				
Tilega	300	Sela	Gash Barka	3400	2720
Debri-Tsaeda	700				
Elidar	2000				
Amar	400				
Shambotay	200	Haykota	Gash Barka	1200	240
Hademdemi	1000				
Ilageden	6000	Molki	Gash Barka	6000	3600
MeAldi	400	Adi-Tekelezan	Anseba	700	560
Grat Ketin	300				
Kuhli Zbi	200				
Ketina	700	Kohain	Debub	1550	0
Daero Hara	650				
Laba River	900	Shiib	Northern Red Sea	900	360
Adi Shuma	150	Ghindae	Northern Red Sea	350	245
Ayenti	200				
Total	25,440			25,440	14,548

* Total Population of ASGM in Eritrea in four administrative zones 25,440

* Total Population of mercury use in four administrative zones 14,548

C. Knowledge Gaps

Major gaps which would serve to enhance the research in the ASGM overview and/or the basis for future interventions:

- i. National prospect and reserves of gold
- ii. Comprehensive national legal and institutional capacities for promotion and protection of human health and environment from the negative effects of mercury.
- iii. Reviews of existing literature on key thematic areas of the ASGM, bringing various findings together and providing updated information.
- iv. Factual numbers for key aspects of the ASGM sector (child labour, women, earnings) are still limited, but this paper demonstrates some of the knowledge gaps in the sector and pulls together important data on selected thematic areas.
- v. Formalization or regulation of the sector on the basis of legal, technical or socio-economic perspectives.
- vi. Atmospheric mercury concentration as well as regional transport of mercury in the designated areas.
- vii. The effects of accidents, noise and dust in the ASGM communities
- viii. Investigation of birth cohorts to improve the knowledge of pre- or postnatal effects of mercury exposure.
- ix. A preliminary knowledge about socio-economic demographic distributions and conditions, especially in respect to family members (numbers and age), hygiene, diet, education, occupation, income expenditure, property, access to media, knowledge about mercury and its related risks. This aims at indicating, based on the routes of mercury, the most susceptible and sensitive group of people in a community to be contaminated as well as about which groups of inhabitants can (cannot) be selected as controls.
- x. Application of knowledge accumulation process (scoring) using clinical and bio-monitoring sample results of mercury exposure..
- xi. Border control and customs of mercury and gold smuggling

3. Annex III - Budget for the Implementation of the NAP

In the implementation of the national action plan for reducing mercury use in the artisanal and small-scale gold mining (ASGM) sector in Eritrea, the total estimated budget is **US\$ 3,066,050**. The proposed budget required for the implementation of these strategies would be sought from respective development partners through the Ministry of Land, Water and Environment (MoLWE) as a national lead agency and other stakeholders on NAP (see table 17).

The development partners input have been actively participated through the Ministry of Land, Water and Environment (MoLWE) as a national lead agency on mercury related issues. Both bilateral and multilateral assistance can be incorporated into the implementation of the NAP.

The donor inputs for the effective implementation of the NAP should be considered and are envisaged to consist of experts, consultants, administrative support, official duty travel, service contract, general operating expenses, training, supplies and materials, equipment and other miscellaneous items for the effective implementation of the plan. The table below shows the proposed budget for implementation of each objective related to the NAP for reducing mercury use in artisanal and small-scale gold mining (ASGM).

Table 16: Proposed Summary Budget for Implementation of the NAP 2021 - 2025

No.	Objectives/Strategies	Proposed Budget (US\$)
1	Legal framework and institutional building	\$147,000
1.1	Institutional strengthening on NAP implementation	\$45,000
1.2	Improving, monitoring and enforcement of regulations in respect to ASGM and management of mercury	\$102,000
2	Resource Assessment	\$2,325,000
2.1	Study on geo-prospect to delineate ASGM areas	\$2,325,000
3	Promotion, awareness raising and communication	\$372,050
3.1	Strategy to promote sustainable livelihoods for those that engage in ASGM	\$302,050
3.2	Awareness raising for the ASGM communities and stakeholders	\$50,000
3.3	Provide necessary information about the ASGM Activities	\$20,000
4	Ensuring health and safety related to ASGM activities	\$200,000
4.1	Public health strategy on the exposure of ASGM Miners and their communities	\$150,000
4.2	Prevent the exposure of vulnerable populations (Women and Children) in ASGM activities	\$50,000
5	Monitor and evaluate the implementation of the NAP	\$22,000
TOTAL SUM		\$3,066,050

Table 17: Potential Partners for the proposed budget of the strategies of the NAP

No.	Strategy	Potential Partners
1.	Strategy for Geo-Prospect and Delineation Land for Mining activity	<ul style="list-style-type: none"> • African Development Bank (ADB), • United Nations Development Programme (UNDP) and • Private mining companies engaged in exploration and mining activities in Eritrea
2.	Strategy to promote sustainable livelihoods for those that engage in ASGM	<ul style="list-style-type: none"> • Food and Agricultural Organization (FAO) • International Fund for Agricultural Development (IFAD) • ADB and UNDP
3.	Strategy for improving, monitoring and enforcement of regulations in respect to ASGM	<ul style="list-style-type: none"> • Global Environment Facility (GEF) • UNEP
4.	Strategy for Institutional Strengthening on NAP Implementation	<ul style="list-style-type: none"> • Global Environment Facility (GEF) • UNEP
5.	Strategy on Awareness Raising for the ASGM Communities and Stakeholders	<ul style="list-style-type: none"> • Global Environment Facility (GEF) • UNEP
6.	Public Health Strategy on Mercury Exposure of ASGM Miners and Communities	<ul style="list-style-type: none"> • World Health Organization (WHO)
7.	Strategy to Prevent the Exposure of Vulnerable Populations (Women and Children) in ASGM Activities	<ul style="list-style-type: none"> • United Nations Children Fund (UNICEF) • International Labour Organization (ILO) • WHO
8.	Strategy for Providing Necessary Information about the ASGM Activities	<ul style="list-style-type: none"> • Global Environment Facility (GEF) • UNEP

4. Annex IV - List of stakeholders and experts involved in NAP project

No.	Expert Name	Organization / Institution	Relevance on the Project	Contact Details
1.	Mr. Kibrom Asmerom	Ministry of Land, Water and Environment	Project Supervisor	kibromaw@gmail.com
2.	Mr. Ermias Yohannes	Ministry of Energy and Mine	Lead Consultant of ASGM overview and NAP	ermias_yohannes@yahoo.com
3.	Eng. Robel Kibrom	Ministry of Land, Water and Environment	Project Coordinator of ASGM overview and NAP	roki0404@gmail.com
4.	Mr. Biniam Ahferom	Ministry of Labour and Social	Task team of identification of population at risk and assessment of potential gender dimensions	biahgh@gmail.com
5.	Dr. Leul Banteyrega	Ministry of Health	Task team of identification of population at risk and assessment of potential gender dimensions	leulb2011@gmail.com
6.	Eng. Issac Sium	Ministry of Energy and Mine	Task team of ASGM overview and NAP	isiu6181@gmail.com

