REPUBLIEK SURINAME

FIRST NATIONAL ACTION PLAN ON ARTISANAL AND SMALL-SCALE GOLD MINING IN SURINAME

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First National Action Plan on Artisanal and Small-Scale Gold Mining in Suriname

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Implementation of Article 7.3 of the Minamata Convention

Financed by:

Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining (EMSAGS), United Nations Development Programme (UNDP), Global Environment Facility (GEF)

This National Action Plan was drafted in 2021 by the following experts: Mrs. Nathalie Emanuels, Mr. Glenn Gemerts, Mrs. Marieke Heemskerk, Mr. Jan Quik.

The final draft of the National Action Plan was completed in November 2023, after consultations with key stakeholders and local communities.

This National Action Plan was previously edited in 2021 by Mrs. Gina Griffith, former Office Director Office of Environmental Legal Services of the National Institute for Environment and Development in Suriname (NIMOS) and finalized by Mrs. Nathalie Emanuels, technical consultant.

1 FOREWORD

Suriname acceded to the Minamata Convention on 02 August 2018. Article 7 of the Minamata Convention stipulates that those countries with ASGM using mercury in their territory, take steps to reduce and where feasible eliminate the use of mercury in ASGM. Countries where ASGM is more than insignificant, have the added requirement of also develop a National Action Plan (NAP). This NAP describes how Suriname plans to achieve mercury reductions in its ASGM sector.

Traditionally Artisanal and Small-Scale Gold Mining has always been a source of income for parts of the community. The negative impact of mercury on health and environment in Suriname cannot be overlooked and needs to be addressed.

The National Institute for Environment and Development in Suriname (NIMOS) under the Ministry of Spatial Planning and Environment is the government body responsible for development of Suriname's NAP for ASGM.

The development of this plan initially started in 2019 and has faced several challenges, including the impact of COVID 19 pandemic which hampered the planned field consultations. In 2021, NIMOS invited a multidisciplinary team of national experts to develop the NAP in consultation with relevant national stakeholders. The plan firstly built on previous experiences and knowledge regarding the management and reduction of mercury use within ASGM and secondly aligns current projects and programs that contribute to mercury reduction and phase out. The document must be considered a living, dynamic document that will be further specified, modified, and enhanced in response to lessons learned from local pilot activities, national socio-economic, technical and/or political changes, and new global insights.

This plan is fully aligned with the national policy and legislation regarding the mining sector as well as Suriname's Environmental Framework Law.

Technical assistance was provided by the UN Environment and Global Environment Facility (GEF) provided through the project "Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Gold Mining" (EMSAGS).

The government of Suriname would like to express its sincere gratitude to GEF, UNDP Suriname and all stakeholders, for their support in implementing the project in the country. Special word of appreciation to all whom have contributed to the finalization of this document.

Minister of Spatial Planning and Environment

Drs. Marciano Dasai

COUNTRY MAP AND KEY STATISTICS

Figure 1. Map of Suriname with its districts

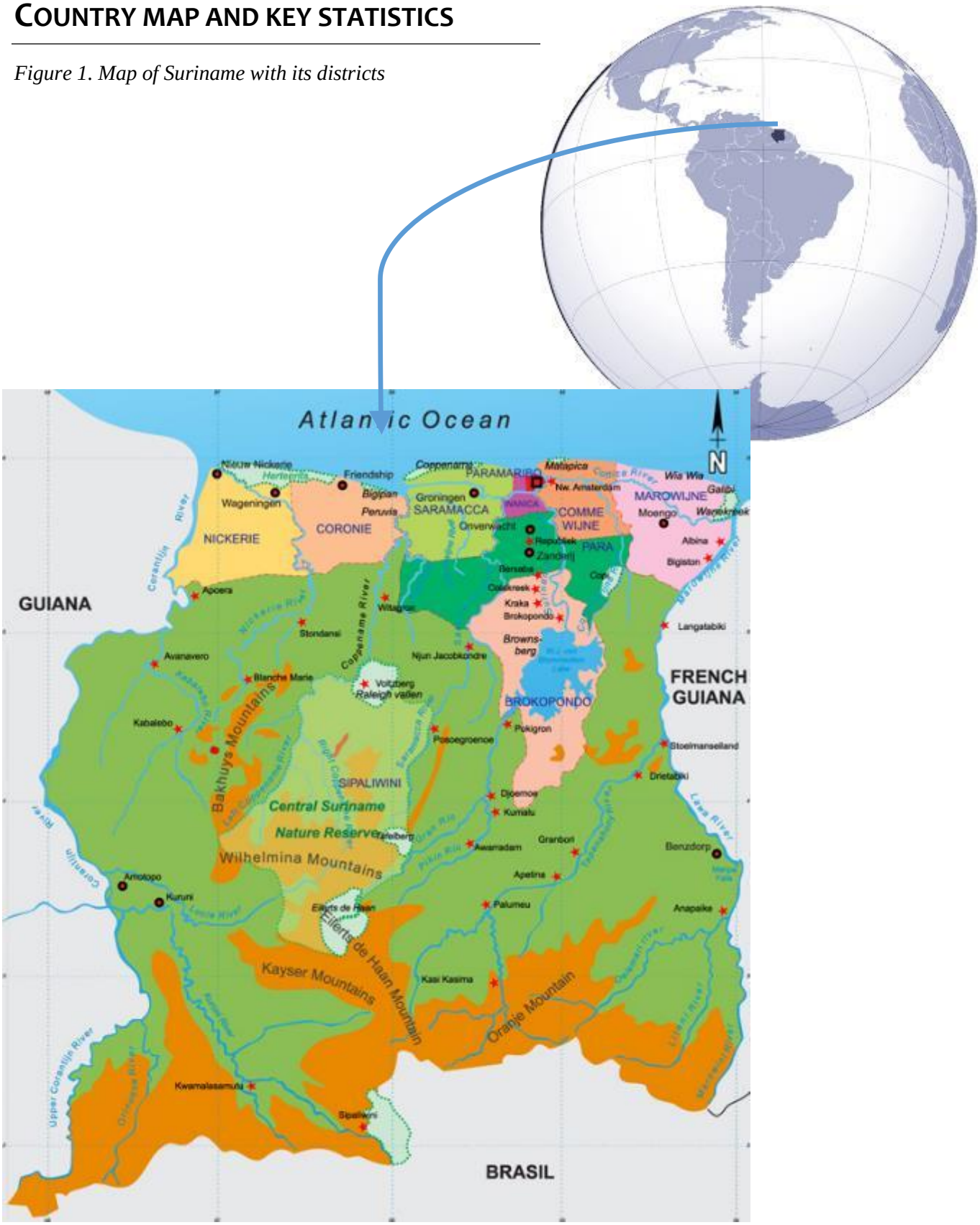

Table 1. Fact sheet Suriname

Variable	Value
General	
Capital	Paramaribo
Total Population, 2015 (Mid-year population)	583,200 (2017 estimate, ABS 2018)
Population density	3.56 hab/km^2
Official language	Dutch
Land area	163,820 km^2 (ABS 2018)
Climate and environment	
Average temperature (Min - Max)	27.8 (24 - 30.9)
% forest (Mostly tropical rainforest)	93% (REDD+ Suriname)
Economic	
GDP market prices, 2021 (current prices, in USD billion)	USD 2.47 Billion (IMF, 2021)
Real GDP growth, 2021	0.7% (IMF, 2021)
Per capita national income, 2021	USD 4.03 thousand (IMF, 2021)
Inflation rate (annual percentage change), April 2021	52,1% (IMF, 2021)
Hourly minimum wage, per 1 March, 2019	SRD 8.40/hr (USD 0.40) (Government of Suriname, 2019)
Unemployment rate, total 15+ (2020)	8.7% (World Bank, 2020)
Mining (bauxite, oil and large-scale gold sectors)	
National Oil Company	Staatsolie Maatschappij Suriname N.V.
State mining company (gold and construction materials)	Grassalco N.V.
Multinational mining companies active in Suriname	ZiJin Rosebel Goldmine NV[1] Newmont Mining Cooperation (US)
Extractive industry as % of GDP	~30% average in past decade (World Bank, 2017)
Value of gold exports, 2019 Gold as % of total exports, 2019	USD 2.04 billion (OEC, 2021) 78.4% (OEC, 2021)

[1] Formerly known as Iamgold Rosebel Goldmine (CAN) on February 1st, 2023 the acquisition to Zijin Rosebel Goldmines NV was finalized.

Main export countries for gold (ASGM and Large-scale), 2019	Switzerland, United Arab Emirates, Belgium, and US (in order of importance)
ASGM	
ASGM production as % of total gold production	~60% (World Bank, 2017)
Number of persons directly involved in the ASGM sector in the interior	20,000 (Heemskerk et al., 2021)

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ABBREVIATIONS AND ACRONYMS

ASGM	Artisanal and Small-scale Gold Mining
ASGMs	Artisanal and Small-scale Gold Miners
AZP	Academic Hospital Suriname
BATs	Best Available Techniques
BOG	Bureau for Public Health
CBvS	Central Bank of Suriname
CL	Central Laboratory
CSOs	Civil Society Organizations
EMSAGS	Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GMD	Geological and Mining Service of Suriname
GOS	Government of Suriname
Grassalco N.V.	Grasshopper Aluminum Company of Suriname
Hg	Mercury
LSM	Large-Scale Mining
MIA	National Minamata Initial Assessment
MinVG	Ministry of Public Health
MWI	Medical Scientific Institute
MZ	Medical Mission Primary Health Care Suriname
NAP	National Action Plan
NGO	Non-Government Organization
NIMOS	National Institute for Environment and Development in Suriname
NMA	National Environmental Authority
OECD	Organization for Economic Co-operation and Development
OGS	Commission for organizing the Gold Sector in Suriname
RGD	Regional Health Service
SDGs	Sustainable Development Goals
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization
WOA	Whole Ore Amalgamation

GLOSSARY OF TERMS

Acceptable threshold for mercury levels	BAT for metallic and inorganic Hg: Blood - 25µg/L, Urine - 100µg/L.
Amalgam	An alloy of mercury with one or more other metals, in this case: gold.
Artisanal and Small-scale Gold Mining	For the purpose of this NAP, ASGM is defined as: "Mining with rudimentary methods of exploration and exploitation, performed in the informal or semi-formal sphere, and executed by a work force that does not have a formal mining education. The Suriname mining legislation does not provide a direct definition of "artisanal" mining; only "small-scale" mining has been defined, as mining of which: "…its operations [are] characterized by small capital investment, low levels of technological sophistication, and at least 51% ownership by Surinamese citizens."
Concentrate amalgamation	Concentrate amalgamation occurs when miners reduce the mass of ore through concentration by generally at least 100 times before mercury is applied. In this case the amount of mercury used is, on average, roughly 1.3 units mercury for each unit of gold produced.
Cyanide leaching or Gold cyanidation	A hydrometallurgical technique for extracting gold from low-grade ore by converting the gold to a water-soluble coordination complex. It is the most commonly used leaching process for gold extraction.
Elemental Mercury	Chemical element with the symbol Hg and atomic number 80.
Gravity concentration	Gravity concentration is a process to concentrate the mineral of interest (in this case gold) using the difference of specific gravity of gold and gangue minerals. This process, which is the main though behind the regular sluice, reduces the total volume of the milled ore and concentrates the gold particles within it.
Hg: Au ratio	the amount (kg) of mercury used to produce one kg of gold.
Mercury compound	Any substance consisting of atoms of mercury and one or more atoms of other chemical elements that can be separated into different components only by chemical reactions.
Mercury use	The net loss of mercury during ore processing.
Milling	Passing gold ore through a mill. This process reduces grain size and liberates gold from other minerals in the ore.
Minamata Convention on mercury	A multilateral environmental agreement that addresses specific human activities which are contributing to widespread mercury pollution.
"More than insignificant" ASGM sector.	The term "more than insignificant" is undefined in the Convention. Criteria or metrics that States might consider to determine whether ASGM activities are "more than insignificant" may include: the number of miners, the number or size of mining sites, and/or the ASGM impacts on public health and the environment.
National Action Plan	Government endorsed country strategy to reduce, and possibly phase out, mercury from the national ASGM sector.
Ore / Gold ore	Rock containing gold that is targeted by miners.
Whole ore amalgamation	Whole ore amalgamation occurs when miners add mercury to a large amount of the ore with little prior concentration. This is a mercury intensive process that uses 3 to 50 units of mercury for each unit of gold recovered.

ACKNOWLEDGEMENT

This National Action Plan for Reducing Mercury Pollution Caused by Artisanal and Small-scale Gold Mining in Suriname was prepared by an interdisciplinary project team in collaboration with the National Institute for Environment and Development in Suriname (NIMOS). Technical assistance was provided by the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) provided through the project “Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining” (EMSAGS).

The project team is grateful to the various stakeholders and community members who contributed along the way with information, insights and feedback on earlier draft versions of the report.

2 EXECUTIVE SUMMARY

2.1 *ENGLISH*

Minamata Convention: The Minamata Convention is a global treaty with the objective to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Minamata Convention pays particular attention to the Artisanal and Small-scale Gold Mining (ASGM) sector, which is currently the largest source of mercury pollution in the world. On March 8th 2018, the National Assembly of Suriname ratified the Minamata Convention on Mercury.

National Action Plan: Article 7.3 of the Minamata Convention stipulates that countries with ASGM using mercury in their territory, take steps to reduce and where feasible eliminate the use of mercury in ASGM. Countries where ASGM is more than insignificant, have the added requirement of also develop a National Action Plan (NAP). This NAP describes how Suriname plans to achieve mercury reductions in its ASGM sector.

Methodology: This NAP was developed between June and October, 2021. The NAP relies primarily on secondary data, complemented with information obtained from stakeholder consultations. An online validation session was held on October, 21st of 2021. The document was further updated between May and August 2023, followed by 2 consultation sessions (September 2023) with local communities. This to ensure that the additional feedback from stakeholders was sufficiently addressed within the document. Lastly in November 2023 a national validation workshop was organized to include additional feedback from all stakeholders.

National Context: Suriname is located on the northern tip of the South American continent, north of Brazil. Suriname's economy is highly dependent on extractive industries. In the 1990s, ASGM became an important sector within Suriname's economy, and is concentrated in the Greenstone Belt area. In 2019, gold export from ASGM totalled 15,176 kg Au, or approximately 40 percent of total national gold exports. ASGM provides a livelihood –directly and indirectly- to an estimated 10 to 15 percent of the national population.

Baseline: Mining falls under the responsibility of the Ministry of Natural Resources, using the Geological and Mining Service as the executing agency. Suriname does not have legislation specifically for the ASGM sector. Also, the Suriname legal framework contains no regulations about the sale and general use of mercury, or about the use of mercury in mining.

Approximately 20,000 individuals work in the Suriname ASGM sector in the interior, among whom 2/ are migrants and about 20 percent women. There is no national nor regional level organization representing the interests of the ASGM sector. Annual earnings of workers in ASGM teams may be around 194 g Au/year (~USD 9,000). Typically, gold is sold to legal gold buyers in the urban areas, mostly Paramaribo.

Almost all ASGM operations in Suriname rely on gravity concentration, using mercury amalgamation. Common ASGM processing methods involve sluicing, often with hammer mills to further liberate gold and improve recovery. The overall Hg:Au ratio for Suriname ASGM operations has been estimated at 3.3:1. A relatively new development is heap leaching of tailings, using a leaching reagent that contains cyanide.

Of the four "worst practices" to eliminate, named in the Minamata Convention (Annex C, 1b), two are common in Suriname, namely: (i) Whole ore amalgamation and (ii) Open burning of amalgam or processed amalgam. For Suriname, there are no reliable data on the frequency and spread of (iv): Cyanide leaching of mercury contaminated tailings. Using the UNEP Mercury Inventory Toolkit methodology, the amount of mercury used in the Suriname ASGM sector is estimated at 77.844 kg

Hg/yr. Mercury releases into the natural environment were calculated as: 16.266,6 kg Hg/yr in the air; 22.988,4 kg Hg/yr in water; and 22.904 kg Hg/yr on land.

Since the 1990s, studies have documented elevated levels of mercury in air, surface water, river sediment, fish and humans. Recent research shows that pregnant women in the interior have significantly higher levels of both total and methylmercury in hair and blood, as compared to urban women. Indigenous and tribal women in the interior are particularly vulnerable to mercury intoxication and related Adverse-Birth-Outcomes and preterm birth. Diet and especially fish consumption are largely responsible for health inequities in mercury exposure.

Within the Suriname health sector, there is some knowledge about health impacts of mercury, but generally not in depth and not within all organizations. Also, there is no case definition of mercury intoxication and there are no safe reference values for mercury levels in human and biological samples. Suriname does not have a structural program for Human Biomonitoring of mercury exposure among vulnerable populations.

Since the 1990s, several government, donor and industry driven initiatives have been developed to reduce mercury output from the ASGM sector. Most of these efforts were short-lived and did not reach the desired results. Obstacles included failure to convince gold miners of the benefits of alternative methods, lack of continuity in guidance and funding, and the absence of well-equipped governmental institutions to monitor, control and develop the sector towards sustainability. Current initiatives aimed at reducing ASGM sector environmental and health impacts include the EMSAGS project; Planet GOLD; a partnership between WWF and the Association of Responsible Mining (ARM); a project by the Artisanal Gold Council (AGC); and an initiative of Newmont in association with Solidaridad. There is no central coordination of these projects.

National Objectives and Reduction Targets: Baseline values of mercury output were used to develop different scenarios that present a move from Whole Ore Amalgamation towards Concentrate Amalgamation, while simultaneously increasing retort use. Suriname's reduction target for mercury within ASGM reads:

"Within ten years, in 2034, Suriname will have reduced mercury use in the ASGM sector with 30%. A 30% reduction implies that the amount of mercury used in the ASGM sector will be at maximum 43 tons Hg/yr (± 15%) or 55 tons Hg/yr (± 15%) dependent on what baseline estimate is used".

Achievement of this target is challenged by: the inadequate legal framework; inadequate regulation and weak/lacking control of the ASGM sector; and weak institutional embedding of knowledge and awareness of the Minamata Convention within the relevant Ministries and government departments.

Quick wins (achievable in 3 years) include:

- Health organizations have the capacity to spread awareness in interior communities;
- Expanded options for human biomonitoring;
- Revised labor, environmental and mining laws; and
- Strengthened government institutes responsible for ASGM.

Medium term (5 years) objectives include:

- 50% of ASGM operations always use retorts;
- 20% reduction of ASGM operations using whole ore amalgamation; and
- 10% of ASGM operators has received instructions/ trainings on geological and mining knowledge to responsibly extract gold.

Longer term (10 years) objectives include:

- 80% of ASGM operations always use retorts;
- 70% of mining operations only use concentrate amalgamation; and
- 50% reduction of mercury release in the environment.

National implementation strategy: The implementation strategy describes four primary outcomes (action areas). The log frame links these outcomes to more targeted activities (outputs), a timeline and a budget. The outcomes with related outputs are summarized below:

Outcome 1: Legal and Institutional reform to effectively reduce mercury use

- Legal reform that limits Hg output
- Development and legal integration of national standards for Hg concentrations
- Institutional reform that enables control and enforcement of laws in the mining sector, especially ASGM areas
- Enhanced level of awareness of the Minamata Convention among policy makers and government staff

Outcome 2: 30% reduction of Hg output from ASGM operations by 2032

- Whole ore amalgamation is reduced to 30% of all ASGM activities
- Elimination of cyanidation of mercury contaminated tailings
- Retort use has increased to 80%

Outcome 3: Program of recognizing and dealing with adverse health impact is in place

- Awareness among health policy makers and health practitioners of Hg-related health impacts
- Awareness among all vulnerable populations of Hg-related health impacts
- Stable or reduced Hg values in vulnerable people
- Human biomonitoring program active
- Gold shops have taken adequate measures to reduce Hg levels in air to acceptable levels
- Meaningful participation of Indigenous and tribal Peoples in management and control of Hg use in their customary territories

Outcome 4 Awareness and education

- Regularly articles are published linking Minamata implementation to everyday live
- Annual awareness activities focused on policy makers and health workers
- Government institutes develop annual awareness programs and activities in line with Minamata objectives

Monitoring and Evaluation: Crucial to execution and success of this NAP is the collection of reliable and timely baseline information. As the national Minamata focal point, NIMOS is the most suitable agency to oversee monitoring and evaluation of the NAP. To make this possible, NIMOS must receive up-to-date (field) data from different government agencies. It is NIMOS' task to receive and compile the different ministerial reports, and disseminate information about progress towards the NAP targets and outcomes to the National Government, civil society, and the Minamata Convention Secretariat.

2.2 *NEDERLANDSE SAMENVATTING*

Minamata Conventie: De Minamata Conventie is een wereldwijd verdrag met als doel de gezondheid van de mens en het milieu te beschermen tegen de schadelijke gevolgen van kwik en kwikverbindingen. De Minamata-conventie besteedt bijzondere aandacht aan de kleinschalige goudsector, die wereldwijd de grootste bron van kwikvervuiling is. Op 8 maart 2018 heeft de Nationale Assemblee van Suriname het Minamata-verdrag over Kwik geratificeerd.

Nationaal actieplan: Artikel 7.3 van het Minamata-verdrag bepaalt dat landen met een kleinschalige goudsector die kwik gebruikt, stappen zullen ondernemen om het gebruik van kwik in deze sector te verminderen en waar mogelijk uit te bannen. Landen waar de kleinschalige goudsector meer dan onbeduidend is, hebben de extra vereiste om een Nationaal Actieplan (NAP) te ontwikkelen en implementeren. Dit NAP beschrijft hoe Suriname kwikgebruik in de kleinschalige goudsector wil terugdringen.

Methodologie: Het NAP is ontwikkeld tussen juni en oktober 2021. Het NAP is voornamelijk gebaseerd op bestaande rapporten en gegevens, aangevuld met informatie die verkregen is via consultaties met belanghebbenden. Op 21 oktober 2021 vond er een virtuele validatiesessie plaats. Tussen Mei en Augustus 2023 is het document verder aangepast met informatie verkregen uit de additionele consultaties met belanghebbenden, tevens zijn 2 consultatie sessies (September 2023) gehouden met lokale gemeenschappen. Dit bleek noodzakelijk teneinde te geraken tot een breed gedragen en implementeerbaar actieplan. Tenslotte is er in November 2023 een finale validatie workshop georganiseerd. Tijdens deze workshop werden belanghebbenden voor een laatste keer in de gelegenheid gesteld om feedback te geven op de inhoud van het document.

Nationale context: De economie van Suriname is sterk afhankelijk van de mijnbouw sector. In de jaren negentig werd kleinschalige goudwinning een belangrijke sector binnen de economie van Suriname. Kleinschalige goudwinning is geconcentreerd in het Greenstone Belt-gebied. In 2019 bedroeg de export van goud dat gewonnen is door kleinschalige goudzoekers 15.176 kg Au, oftewel ongeveer 40 procent van de totale nationale goudexport. Kleinschalige goudwinning voorziet – direct en indirect – in het levensonderhoud van naar schatting 10 tot 15 procent van de nationale bevolking.

Baseline: Goudwinning valt onder de verantwoordelijkheid van het Ministerie van Natuurlijke Hulpbronnen, waarbij de Geologisch Mijnbouwkundige Dienst (GMD) als uitvoerende instantie functioneert. Suriname heeft geen wetgeving specifiek voor de kleinschalige goudsector. Ook bevat het Surinaamse wettelijke kader geen regelgeving over de verkoop en het gebruik van kwik, inclusief in de mijnbouw.

In de Surinaamse kleinschalige goudsector in het binnenland werken naar schatting zo'n 20.000 personen, van wie ongeveer twee-derde deel uit migranten bestaat, en ongeveer 20 procent vrouw is. Er is geen nationale of regionale organisatie die de belangen van de kleinschalige goudzoekers behartigt. Het jaarlijkse inkomen van kleinschalige goudzoekers kan ongeveer 194 g Au/jaar (~USD 9.000) zijn. Meestal wordt goud verkocht aan formele goudkopers in de kuststreek, voornamelijk in Paramaribo.

Bijna alle kleinschalige goudoperaties in Suriname gebruiken concentratiemethoden op basis van gravitatie, waarbij er kwik toegevoegd wordt om een amalgaam met goud te vormen. Kleinschalige goudzoekers gebruiken in de meeste gevallen een daal (sluicebox) om het erts te verwerken. Vaak worden er ook hamermolens ingezet om goud verder vrij te maken en de opbrengst te verbeteren. De Hg:Au-verhouding voor een typische kleinschalige goudoperatie in Suriname is geschat op 3.3:1. Een relatief nieuwe ontwikkeling is het uitlogen van gouderts met een cyanidemengsel.

Van de vier "slechtste handelingen" die in navolging van de Minamata Conventie moeten worden uitgeband (Annex C, 1b), komen er twee veel voor in Suriname, namelijk: (i) Het vormen van een kwik-amalgaam met het volledige erts (*Whole Ore Amalgamation*) en (ii) Open verbranding van amalgaam

of bewerkt amalgaam. Voor Suriname zijn er geen betrouwbare gegevens over de frequentie van (iv): Het uitlogen met cyanide van met kwik verontreinigde bakasanti (*tailings*). De hoeveelheid kwik die in de Surinaamse kleinschalige goudsector wordt gebruikt, is geschat op 77.844 kg Hg/jr. Het verlies van kwik in de natuurlijke omgeving is berekend als: 16.266,6 kg Hg/jr in de lucht; 22.988,4 kg Hg/jr in water; en 22,904 kg Hg/jr op het land.

Sinds de jaren negentig hebben studies verhoogde niveaus van kwik in lucht, oppervlaktewater, riviersediment, vissen en mensen vastgesteld. Recent onderzoek toont aan dat zwangere vrouwen in het binnenland, in vergelijking met vrouwen uit de stad, significant hogere niveaus van zowel totaal kwik als methylkwik in hun haar en bloed hebben. Inheemse en tribale vrouwen in het binnenland zijn vooral kwetsbaar voor kwikvergiftiging en gerelateerde ongewenste geboorte-uitkomsten en vroeggeboorte. Dieet en met name visconsumptie zijn grotendeels verantwoordelijk voor verschillen in blootstelling aan kwik.

Binnen de Surinaamse gezondheidssector is er enige kennis over de gezondheidseffecten van kwik, maar over het algemeen niet diepgaand en niet binnen alle organisaties. Er is geen nationale definitie van kwikvergiftiging en er zijn geen veilige referentiewaarden voor kwik vastgesteld voor mensen of het milieu. Suriname heeft geen structureel programma voor biologische monitoring (biomonitoring) van blootstelling aan kwik onder kwetsbare bevolkingsgroepen.

Sinds de jaren negentig zijn er verschillende initiatieven ontwikkeld, aangestuurd door de overheid, donoren en de industrie, om de kwikuitstoot van de kleinschalige gousector te verminderen. De meeste van deze inspanningen waren van korte duur en hadden niet het gewenste resultaat. Obstakels waren onder meer het feit dat goudzoekers moeilijk te overtuigen zijn van de voordelen van alternatieve methoden, gebrek aan continuïteit in begeleiding en financiering, en het ontbreken van goed uitgeruste overheidsinstellingen om de sector te monitoren, te controleren en te ontwikkelen richting duurzaamheid. Huidige initiatieven gericht op het verminderen van de milieu- en gezondheidseffecten van de kleinschalige goudsector zijn onder meer het EMSAGS-project; Planet GOLD; een partnerschap tussen WWF en de Association of Responsible Mining (ARM); een project van de Artisanal Gold Council (AGC); en een initiatief van Newmont in samenwerking met Solidaridad. Er is geen centrale coördinatie van deze projecten.

Nationale doelen en reductiedoelstellingen: Basis referentiewaarden van kwikgebruik in Suriname zijn gebruikt om scenario's te ontwikkelen. Deze scenario's zijn gebasseerd op het terugdringen van Whole Ore Amalgamation, en gelijktijdige toename van het gebruik van retorts. Suriname's reductiedoelstelling voor kwik binnen de kleinschalige goudsector luidt:*"Binnen tien jaar, in 2032, zal Suriname het kwikgebruik in de kleinschalige goudsector met 30% hebben verminderd. Een reductie van 30% houdt in dat er nog maximaal 43 ton Hg/jr (± 15%) of 55 ton Hg/jr (± 15%) in de kleinschalige goudsector gebruikt wordt, afhankelijk van de gebruikte basiswaarde".*

De verwezenlijking van deze doelstelling wordt bedreigd door: het ontoereikende wettelijke kader; inadequate regelgeving en zwakke / ontbrekende controle van de kleinschalige goudsector; en zwakke institutionele inbedding van kennis en bewustzijn van het Minamata-verdrag binnen de relevante ministeries en overheidsdiensten.

Quick wins (haalbaar in 3 jaar) zijn onder meer:

- Versterkte capaciteit binnen gezondheidsorganisaties om bewustzijn over de gezondheidsrisico's van kwik in binnenlandse gemeenschappen te verspreiden;
- Uitgebreide mogelijkheden voor menselijke biomonitoring;
- Herziene arbeids-, milieu- en mijnbouwwetten; en
- Versterkte overheidsinstellingen die verantwoordelijk zijn voor KGW.

Middellange termijn (5 jaar) doelstellingen zijn onder meer:

- 50% van de ASGM-operaties maakt altijd gebruik van retorten;
- 20% reductie van kleinschalige goudoperaties die Whole Ore Amalgamation gebruiken; en

- 10% van de eigenaren van kleinschalige goud-operaties heeft instructies/trainingen ontvangen over geologische en mijnbouwkennis om op verantwoorde wijze goud te winnen.

Langere termijn (10 jaar) doelstellingen zijn onder andere:

- 80% van de kleinschalige goudoperaties maakt altijd gebruik van retorten;
- 70% van de kleinmijnbouw operaties gebruikt alleen kwik in de laatste concentratie-fase; en
- 50% vermindering van het vrijkomen van kwik in het milieu.

Nationale implementatiestrategie: De implementatiestrategie beschrijft vier primaire resultaten (actiegebieden of outcomes). Het logframe koppelt deze resultaten aan meer gerichte activiteiten (outputs), een tijdlijn en een budget. De resultaten met gerelateerde outputs worden hieronder samengevat:

Resultaat 1: Juridische en institutionele hervorming om het gebruik van kwik effectief te verminderen

- Juridische hervorming om Hg-gebruik en -uitstoot te beperken
- Ontwikkeling en juridische integratie van nationale normen voor kwikconcentraties
- Institutionele hervorming die controle en handhaving van wetten in de mijnbouwsector mogelijk maakt, met name de kleinschalige goudwinnings-gebieden
- Verbeterd bewustzijn van het Minamata-verdrag bij beleidsmakers en overheidspersoneel

Resultaat 2: 30% reductie van de Hg-output van kleinschalige goudoperaties tegen 2034

- Maximaal 30% van de kleinschalige goudoperaties werkt op basis van Whole Ore Amalgamation
- Eliminatie van het gebruik van cyanide voor het uitlogen van ertsen en residuen die met kwik verontreinigd zijn
- Retortgebruik is gestegen tot 80%

Resultaat 3: Programma voor het herkennen van, en omgaan met, nadelige gezondheidseffecten van kwik is aanwezig

- Bewustwording onder beleidsmakers op het gebied van de gezondheidszorg, en gezondheidswerkers, van Hg-gerelateerde gezondheidseffecten
- Bewustwording bij alle kwetsbare bevolkingsgroepen van kwik-gerelateerde gezondheidseffecten
- Stabiele of verlaagde Hg-waarden bij kwetsbare mensen
- Biomonitoringprogramma, vooral voor kwetsbare groepen, actief
- Goud opkoophuizen hebben adequate maatregelen genomen om het kwikgehalte in de lucht tot acceptabele niveaus te verlagen
- Betekenisvolle deelname van inheemse en tribale volkeren aan het beheer en de controle van het kwikgebruik in de territoria waar zij wonen en die zij in vruchtgebruik hebben

Resultaat 4 Bewustwording en educatie

- Er komen regelmatig artikelen in de media die de implementatie van het Minamata-verdrag koppelen aan het dagelijks leven
- Jaarlijkse bewustmakingsactiviteiten gericht op beleidsmakers en gezondheidswerkers
- Overheidsinstellingen ontwikkelen jaarlijkse bewustwordingsprogramma's en activiteiten in lijn met de doelstellingen van Minamata

Monitoring en evaluatie: Cruciaal voor de uitvoering en het succes van dit NAP is het verzamelen van betrouwbare en actuele baseline-informatie. Als landelijk aanspreekpunt voor Minamata is het NIMOS de meest geschikte instantie om toezicht te houden op de monitoring en evaluatie van het NAP. Om dit mogelijk te maken, moet het NIMOS actuele (veld)gegevens ontvangen van verschillende overheidsinstanties. Het is de taak van NIMOS om de verschillende ministeriële rapporten te ontvangen en samen te brengen. Het NIMOS zal deze informatie over de voortgang ten aanzien van de NAP-

doelen en resultaten verspreiden naar de nationale regering, het maatschappelijk middenveld, en het secretariaat van het Minamata-verdrag.

3 INTRODUCTION

3.1 *SURINAME'S APPROACH ON THE IMPLEMENTATION OF ARTICLE 7.3 MINAMATA CONVENTION*

The government of Suriname, more specific the Ministry of Natural Resources as main responsible authority for the ASGM sector and the Ministry of Spatial Planning and Environment, responsible for the general environment policy as well as national focal point for the Minamata Convention agreed upon a dual policy. Firstly, working towards mercury reduction and where possible ban the emissions of mercury and mercury related compounds as a result of ASGM to the environment. Secondly, transforming the ASGM sector towards a sustainable economic activity by introducing mercury-free methods within the ASGM industry.

3.2 *ABOUT THIS NATIONAL ACTION PLAN*

This document presents the National Action Plan (NAP) for the Artisanal and Small-scale Gold Mining (ASGM) sector in Suriname. The NAP was prepared as part of Suriname's commitments as party to the Minamata Convention.

The Minamata Convention is a global treaty with the objective to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. Along with mercury mining and trade, the Minamata Convention pays particular attention to the ASGM sector, which is currently the largest source of mercury pollution in the world, accounting for 38% of total anthropogenic emissions (UN Environment, 2019). Article 7.3 of the Minamata Convention requires that countries with ASGM using mercury in their territory, take steps to reduce and where feasible eliminate the use of mercury in ASGM. Countries where ASGM is more than insignificant, have the added requirement of also *develop and implement* a National Action Plan that describes how they will achieve mercury reductions.

On March 8th 2018, the National Assembly of Suriname ratified the Minamata Convention on Mercury. Subsequently, on August 2nd, 2018, the Government of Suriname deposited its instrument of accession, thereby becoming the 95th Party to the Minamata Convention. It also notified the Secretariat that it's ASGM is more than insignificant. In Suriname, as in most low- and middle-income countries, ASGM is an important livelihood strategy and its primary source of anthropogenic mercury emissions. As such, Suriname is required to develop a National Action Plan to reduce, and where feasible, eliminate mercury use in ASGM.

The National Institute for Environment and Development in Suriname (NIMOS) is the government body responsible for development of Suriname's NAP for ASGM. In June 2021, NIMOS invited a multidisciplinary team of national experts to develop the NAP in consultation with relevant national stakeholders. This NAP must be considered a living, dynamic document that will be further specified, modified, and enhanced in response to lessons learned from local pilot activities, national socio-economic, technical and/or political changes, and new global insights.

This NAP proceeds as follows.

- In the remainder of this **Chapter 2**, the **methods** used to compile the NAP are described and **general information and key indicators about Suriname** are presented.

- **Chapter 3** presents **baseline data about the ASGM sector** in Suriname, which will help place the proposed activities into context. It describes, among others, the ASGM population and organizational structures, ASGM methods and the use of mercury therein, and national estimates about the quantity of mercury used and released into the environment. Also results of recent human health studies are presented.
- **Chapter 4** proposes **national objectives and reduction targets**, which were formulated in close collaboration with responsible government agencies, industry stakeholders, and representatives of Non-Governmental Organizations (NGOs).
- **Chapter 5** embodies the core of the NAP, as it lays out the **implementation strategy** aimed at reduction of mercury use in the ASGM sector. It includes a work plan with actions to eliminate worst practices; necessary steps to facilitate regulation of the ASGM sector; and proposed strategies for reducing emissions, releases, and risks of exposure. This chapter also presents an **outreach plan** to accompany the listed interventions and a **public health strategy** to prevent exposure of vulnerable populations. The included timeline and general budget allow for further scheduling and planning.
- The **Evaluation Mechanism** in **Chapter 6** briefly describes how the national plan's strategy will be evaluated and tracked.
- The **Annexes** contain bulky data and additional contextual information.

3.3 *METHODOLOGY*

The draft NAP document was developed in a period of five months, between June and October, 2021.

The team used the NAP Guidance document[2] from the Minamata Convention to guide the development of this report. Background information was obtained through desk research, which was updated and completed with primary data obtained from expert interviews. Throughout the writing process, the consultancy team worked in close collaboration with NIMOS through regular meetings and feedback sessions.

In order to assure that the NAP is a nationally supported document, NIMOS and the team of experts organized stakeholder consultations with representatives from government, industry, and civil society. In addition, the draft NAP was presented to different stakeholder groups during an online validation session. NIMOS assisted to establish contact with the different stakeholders and representatives from both NIMOS and the Ministry of Natural Resources were present during the several consultation sessions. However, some key stakeholders were of the impression that the stakeholder consultations were limited due to the fact that it was not possible to organize stakeholder sessions with miners and vulnerable groups. This resulted in a revision of the document from May till August 2023 to ensure that the views of the additional consulted stakeholders were included prior to the endorsement of the document by the Ministry of Natural Resources. During this revision the Ministry of Natural Resources provided guidance by selecting or approving the scenario most feasible for implementation. Lastly, in September 2023 the revised document was presented to 2 different communities from Brownsweg and Nieuw Jacob Kondre. Lastly a final validation workshop was organized in November 2023. All the feedback received was included in this final document. An updated list of consulted stakeholders is presented in Annex 1.

[2] http://www.mercuryconvention.org/DNNAdmin/AllENGLISHNewsEntry/tabid/3444/articleType/ArticleView/articleId/323360/language/en-US/NAP-Guidance-document.aspx

Financial support for development of the NAP was obtained through the GEF funded project "Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining" (EMSAGS). EMSAGS is implemented by the Ministry of Natural Resources and the national implementing partner, NIMOS and other responsible partners, with support from the United Nations Development Programme (UNDP).

3.4 *LIMITATIONS*

A primary limitation during the development of the first draft NAP document was that the assignment did not allow for the collection of baseline data in ASGM areas, or for extensive validation in the field. As a result, the team did not have access to up-to-date estimates of mercury use in different types of ASGM operations in Suriname. Neither did the team have data on the frequency and spread of worst practices such as Whole Ore Amalgamation (WOA) or cyanide leaching of mercury. This paucity of information complicated setting realist reduction targets. The validation in the field was compensated during the revision of the document by organizing stakeholder consultations in selected communities.

A second limitation was that, given the low level of self-organization among ASGM miners, it was challenging to engage with a representative group of small-scale gold miners and obtain their opinion about reduction targets and proposed activities. A consultation meeting was held with the Foundation holders of Mining rights (*Stichting Houders Mijnbouw Rechten* – SHMR) but we cannot guarantee that this group represents the interests of all ASGM subgroups. This limitation was partly compensated for by the team members' many years of experience working with ASGM miners.

3.5 *SURINAME: NATIONAL CONTEXT*

Suriname, located just north of the equator on the South American continent, is bordered by the Atlantic Ocean in the north, French Guiana in the east, Guyana in the west and Brazil in the south. The infrastructure consists of approximately 26000 km of roads, while navigable rivers extent to 15000 km. Table 1 presents key facts and figures about the country.

Suriname's economy is highly dependent of the extractive industries (gold, oil, and previously bauxite). Mining plays a dominant role in driving growth, employment, and government revenues but also makes the country vulnerable to commodity price fluctuations. Historically, extractive industries have accounted directly for approximately 30 percent of GDP and as much as 90 percent of exports.

The gold mining sector in Suriname can be divided in large-scale mining (LSM), medium-scale mining operations and artisanal and small-scale mining operations (ASGM). The Minamata convention defines ASGM as: "…gold mining conducted by individual miners or small enterprises with limited capital investment and production". In Suriname, it typically refers to a type of mining with rudimentary methods of exploration and exploitation, performed in the informal or semi-formal sphere, and executed by a work force that does not have a formal mining education. The sector includes a wide range of smaller and larger mining operations, ranging from single panners to operations that make use of large trucks, bulldozers and excavators. For the purpose of this document, we classify these relatively larger Surinamese gold mining operations also as ASGM operations, even though, in the national context, they are sometimes referred to as medium-scale firms. In past years, some of these larger ASGM

operations have up-scaled by hiring professional geologists and mining engineers, or through cooperation with foreign Junior exploration companies.

As for large-scale gold mining, the two multinational gold mining firms actively involved in commercial gold production are Zijin Robel Goldmines NV and Newmont Suriname. In 2019, RGM produced 8.4 tonnes of gold, and Newmont Suriname 12.9 tonnes of gold.

The state-owned mining firm Grassalco N.V. installed a medium-scale gold production unit in the Maripaston area (Para district), with as main objective to set up a responsible gold production unit as an example for local ASGM miners. Due to several reasons this project was less successful and is currently on a low profile and evaluated by the new management of Grassalco N.V.

In the 1990s, ASGM became an important sector of Suriname's economy. Today it accounts for about 40 percent of national gold production (Table 2). In a 2017 report, the World Bank detailed the significant opportunity for the Government of Suriname (GOS) to improve sector governance and revenue generation from mining. It needs to be noted that such measures require strong and well-equipped institutes.

In recent years, a lack of government control, the lack of necessary mining skills and techniques, and poorly enforced regulation of ASGM have resulted in significant environmental and social impacts. Among others, the uncontrolled use of mercury in ASGM and its negative effect on people, soil, rivers and inland waterways, has become a major source of concern in the country and needs to be dealt with involving all stakeholders.

Relevant ASGM statistics are presented in Table 2.

Table 2. ASGM statistics

Indicator	Values
National gold export from ASGM, 2019	15,176 Kg (1)
Value of national gold export from ASGM	637,779,927 USD (1)
Share of national gold production produced by ASGM, 2019	41.6%
Royalty on gold produced by ASGM	2.75%

Sources: 1. *Unpublished data from Currency Committee, dated August 17, 2020 and May 23, 2019;* 2. Social Solutions, 2020

4 BASELINE INFORMATION

3.1. LEGAL AND REGULATORY STATUS OF ASGM

Suriname's national legislation applicable to gold mining and its environmental and health management is spread out over several laws and regulations. There is no legislation specifically for the ASGM sector. The section on small-scale mining (Ch. VII) in the 1986 Mining Decree poorly applies to the current working methods, organization, and impacts of ASGM, and does not include regulations with regard to environmental and human health[3]. The Suriname legal framework contains no regulations about the sale and use of mercury, and there also is no legislation that addresses the use of mercury in mining. In the past 30 years, the Government of Suriname made several attempts to modernize mining legislation and institutions according, and better regulate ASGM, without success. The most important legal instruments in the context of ASGM and the Minamata Convention are listed in Table 3.

Table 3. Laws and regulations related to ASGM and the use of mercury

Law	Articles	Relevant regulations
1986 Mining Decree[4]	4.1	Mining must take place with consideration of applicable standards on safety and health of staff in particular, and the community in general, as well as valid standards for the protection of ecosystems.
	20	Allocation of Land; 1.For certain minerals and for a specific period of time, land can be designated by Government Decree for mining operations: a. in national interest; b. for granting of mineral rights under special conditions. Explanatory note art 20; land can be granted for small scale mining purposes or for the development of special mining activities (see also art 36-40, explanatory note)
	39.1	Small-scale gold mining is "the reconnaissance, exploration, and exploitation of a mineral deposit whose nature, mode of occurrence, and quantity allows for economical mining by simple means and techniques" (Art. 39.1.g.)
	16 and 17	Minimal environmental provisions for the mining sector. Mining must be carried out with consideration for valid norms in terms of safety and health of employees, the community, and ecosystems. Upon terminating a mining right, the right holder shall execute all necessary measures in the interest of

[3] During the Validation workshop stakeholders mentioned the importance of redefining the definition of ASGM to the current Surinamese circumstances in year 1 of NAP implementation.

[4] DECREET van 8 mei 1986, houdende algemene regelen omtrent de opsporing en ontginning van delfstoffen (Decreet Mijnbouw) (S.B. 1986 no. 28), S.B. 1997 no. 44.

		public safety and protection of the environment. Mercury is not mentioned.
Decree Negative List 2003[5]		A special license is required to import elemental mercury.
Penal Code (*Wetboek van Strafrecht*)	226 and 227	It is unlawful to knowingly or unknowingly be responsible for the sale, delivery or handing out of goods that are harmful for life or health, without the buyer or recipient being aware of the harmful character.
Environmental Framework law[6]	27 and 35	The –still to be established- National Environmental Authority [7] (NMA) will determine what substances are considered contaminants, as well as legal cut-off values for concentrations of these chemicals. The NMA will also establish norms concerning the production or release of contaminants into the environment by equipment and machinery.
Safety Law (G.B. 1947 no. 142); Labour Inspection Decree (S.B. 1983 no.42), Occupational Accidents Regulation (G.B. 1947 no. 45)	Various labour laws	Activities that pose a threat to the safety or the health of the employees have to be abandoned. Employers may not expose their employees to harmful fumes of mercury.

4.2 *GEOGRAPHIC CONSIDERATIONS*

Suriname is geologically part of the Guiana Shield, which is mainly composed of granitoid rocks, gneisses, metasediments and metavolcanics dating back to the Lower Proterozoic (1900-2000 million years BP). The Guiana Shield covers an area on the northern coast of the South American Continent and has a recognized mineral potential of several commodities such as gold, diamantes, hydrocarbons, dimension stone and base metals.

[5] Besluit Negatieve Lijst (S.B. 1999 no. 34, z.l.g. bij S.B.2006 no. 20); see also Wet Goederenverkeer (S.B. 2003 no. 58 z.l.g. bij S.B. 2004 no. 121).
[6] Milieu Raamwet S.B. 2020, No. 197. Law of 07 May 2020 containing legislation for sustainable environmental management.
[7] The NMA will function as an independent governing body, with a legal personality, and hold office in Paramaribo. The present-day office Coordination Environment within the Cabinet of the President will be renamed NMA, and the NIMOS will become part of this entity (Environmental Framework Law, Memorandum of Understanding).

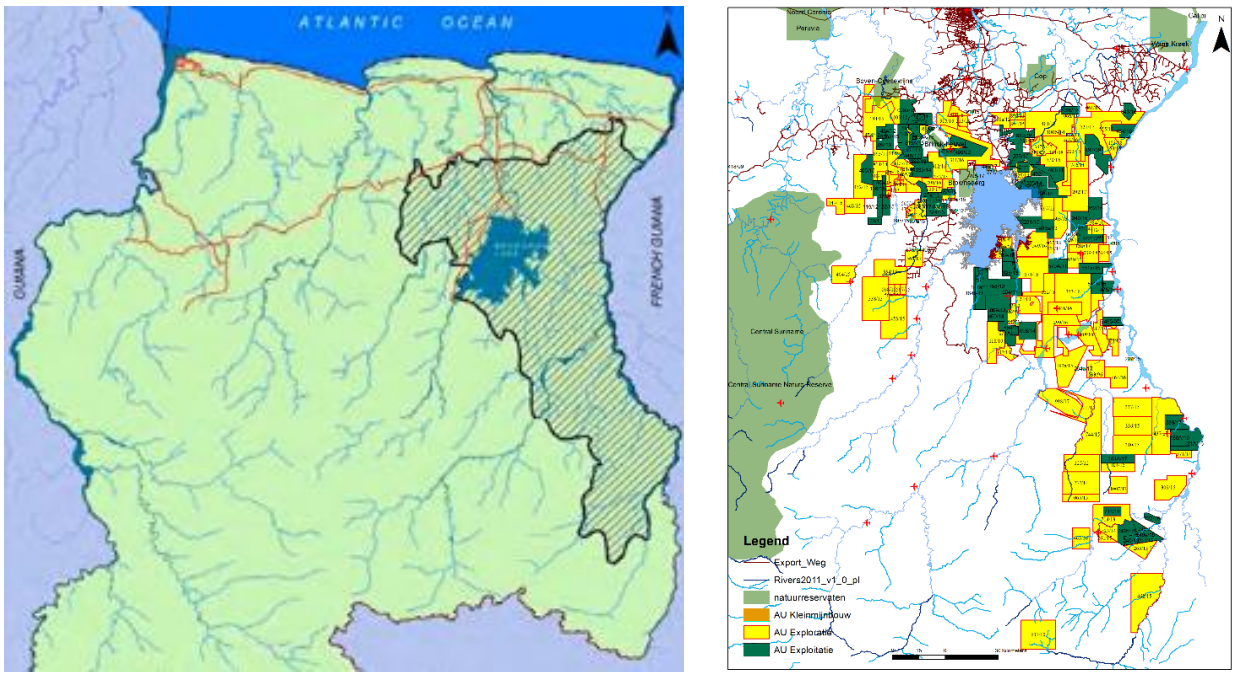

Figure 2. Suriname Greenstone Belt (left) and mining concessions (right)

Gold mineralisation is mostly associated with the so-called Greenstone Belt of Suriname which forms a triangular area of approximately 24,000 km^2 in the NE-SW part of the country (Figure 2, left). In the Greenstone Belt, gold is genetically associated with rocks of volcanic origin. Primary occurrences of gold have been migrated due to several influencing factors such as granite intrusions, metamorphism and deformation (Figure 3). The entire country has been mapped by aerial photography; however, the accessibility and availability of detailed topographic maps is poor.

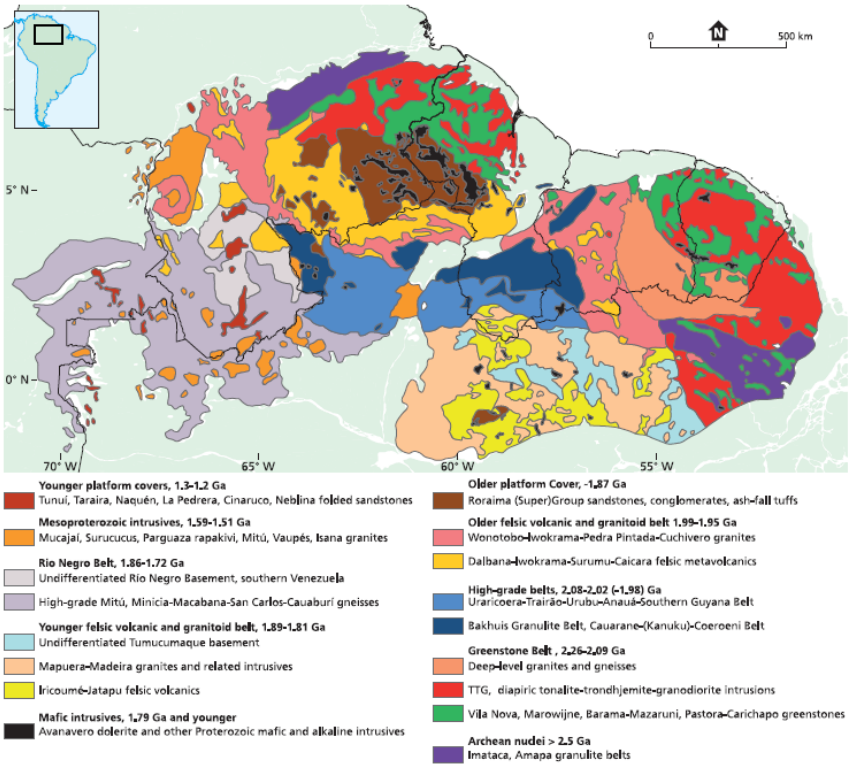

Figure 3 Simplified geological map of the Guiana Shield (Kroonenberg et al., 2016)

Gold occurrences are linked to several type of deposits such as saprolite (fully weathered material, can be 10-60 m or even 100 m thick), the transition zone rock type, below the saprolite (partly weathered material with visible structures, can be 80-100 m or more) and primary rock (mostly metabasalts with variable depths). In the past, ASGM mostly dealt with placer and other easy minable deposits. As these easy minable deposits are depleted or not fully mined due to lack of for e.g., technology, knowledge of the deposits, the mining activities have moved into all sort of deposits including primary outcrops, such as quartz veins which are gold bearing (figure 4). The gold typically occurs as free grains of native gold. These veins are mined, depending on the depth, by means of shafts.

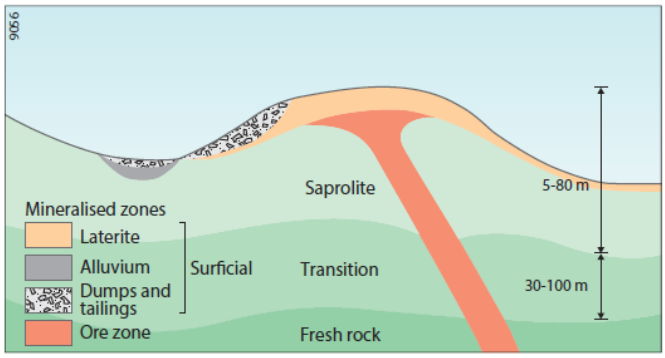

Figure 4 Schematic profile indicating the relationship between primary and secondary gold deposits in the Rosebel area (Netherlands Journal of Geosciences Foundation, N. Kioe A Sen et al., 2016)

Gold mining rights have been extended for most of the Greenstone Belt area (Figure 2, right). Only two firms, Zijin Rosebel Gold Mines NV and Newmont Suriname practice large-scale mining based on mineral agreements with the government and approved by the National Assembly of the Republic of Suriname.

4.3 DEMOGRAPHIC AND OTHER INFORMATION ABOUT MINING COMMUNITIES

Approximately 20,000 individuals work in the Suriname ASGM sector in the interior (Table 4). About half of these persons are involved in the mining process, while the other half provide auxiliary services such as transportation, lodging, food and drinks, entertainment, mechanics services and so forth. When also counting dependents and persons providing services to the ASGM sector but living in the urban centres ASGM may provide a livelihood to 50,000-75,000 individuals, or about 10-15 percent of the Suriname population.

Table 4. ASGM population and demographic estimates

Indicator	Value
ASGM population total, incl. service providers	20,000
ASGM population only persons in mining process	10,000
% Women in total ASGM population	20%
Number of children in ASGM work areas (most not working), under 16	400
Number of children involved in ASGM in Suriname, teenagers 16-17	125
Average age women (range)	41 (22-68)

Average age men (range)	42 (16-70)

Source: Heemskerk et al., 2021

The ASGM population in Suriname consists for about one third of Surinamese nationals and two thirds of foreign migrants, primarily Brazilian *garimpeiros*. In addition, small but growing numbers of other migrants work in Suriname's ASGM sector; mostly women from the Dominican Republic, Cuba, Guyana and Venezuela; and predominantly men from China. The population is characterized by low levels of formal education. Surveys in the ASGM population have found that about half of the population has not completed elementary school, and some 10 percent has not received any formal education (Social Solutions, 2012).

Access to health care and information is limited. There are no clinics in the often-isolated ASGM areas, and the costs in money and time to travel to the nearest clinic are high. A language barrier for migrants, lack of health insurance, and a high level of trust in home remedies are further reasons that gold miners do not visit a clinic (Social Solutions, 2020; Heemskerk et al., 2021).

4.4 *ECONOMICS; EARNINGS PER CAPITA, GOLD TRADE AND EXPORT*

Workers in the ASGM sector usually work as *porcentistas*[8], earning a percentage share (usually 3-5%) of production. Because ASGM production is highly uncertain, volatile, intermittent, and typically unrecorded, it is difficult to estimate a typical or average monthly or annual wage. A recent study in Suriname ASGM areas reported average earnings of gold miners (*porcentistas*) in Suriname of 194 g. Au/year; ~ USD 9,000 (Heemskerk et al., 2021). This production figure is similar to estimates in earlier studies in Suriname (Heemskerk, 2000; Heemskerk et al., 2016). Average ASGM earnings compare favourably to the minimum wages in Brazil (USD 2190/year) and Suriname (USD 1250/year).

ASGM service providers who work as members of a mining team, such as cooks and excavator operators may earn fixed monthly incomes or a percentage of production, while other service providers in the interior are typically paid per service. Regardless of how much they earn, virtually everyone in the ASGM economy earns his or her wage in gold rather than money. In addition, a significant number of persons and firms in the capital city Paramaribo and other urban areas provide services to, and benefit economically from, the ASGM sector. These goods and services providers outside the mining areas include local airline companies, cab drivers, supermarkets, fuel sellers, equipment dealers, bar and hotel owners, and many others.

Persons in the ASGM areas typically pay all their expenses in the mining areas in gold. They use their gold to buy groceries and fuel, pay for transport services, and settle their bills in the local bars and brothels. When gold miners visit the urban areas –primarily Paramaribo- or when they need cash money for other reasons, they sell their gold. Typically, gold is sold to legal gold buyers in Paramaribo (or Albina). In 2020, 12 firms had obtained licenses from the Currency Commission (Deviezen Commissie), which operates as an autonomous authority reporting to the Cabinet of the President[9]. Each export license is linked to a buying license, meaning every firm with a license to export gold is also legally entitled to buy gold. In addition to these twelve gold exporters/buyers, there are six gold buyers with a license from the Currency Commission that do not have an export license. These gold buyers need to sell the gold they purchase from

[8] Porcentistas, Portuguese for percentage

[9] Anonymous personal communication August 10th, 2021

ASGM producers to one of the firms with an export license. Active gold buyers typically operate multiple buying houses (affiliates), which are mostly located in Paramaribo. Only six firms with an export license are actually exporting gold.

The gold buyers purify the gold that is offered for sale using a burner or an oven. They determine the purity of the gold with the water density test. After purification, testing and weighing, the buying house pays the gold miner the actual spot price, compensated for the purity, minus approximately 8-9%. The 8-9% contains 6.75% that must be paid to the government; namely 2.75% royalty, 1.5% license duty and statistical fee, and another 2.5% that could not be explained by the consulted government official (anonymous). In addition, 0.25% is subtracted to compensate for fees that are paid to the Kaloti Suriname Mint House, plus the buyer covers a fee for his own expenses (transportation, administration) and profit margin (1-2%) (Heemskerk, 2020).

4.5 *GOLD PROCESSING METHODS*

Almost all ASGM methods activities used in Suriname rely on gravity concentration (on land or on a raft) use mercury amalgamation of sediments. The most common ASGM processing methods involve sluicing (with or without excavator), some with the addition of crushing, using hammer mills to further increase gold liberation and recovery. Annex 2 provides an overview of mining methods used in Suriname. Mercury is used excessively with all these methods and whole ore amalgamation is common.

Chinese ASGM teams in Suriname have been observed to use heap leaching methods, using a chemical known as Jinchan™ leaching reagent, which contains cyanide. These teams tend to buy tailings of ASGM teams in the area, which are known to still contain a considerable amount of –liberated and unliberated- gold. Given the excessive use of mercury in ASGM operations, it is probable that these tailings contain mercury. Processing mercury contaminated material with cyanide exacerbates mercury pollution by delivering mercury to the environment as dissolved mercury-cyanide compounds. These toxic compounds are more easily dispersed in waters and make mercury more bio-available (UNEP, 2012).

The Minamata Convention (Annex C, under 1b) identifies four worst practices in ASGM, with regard to mercury output and pollution. These practices must be listed among the "actions to eliminate" in the National Action Plan: (i) Whole ore amalgamation; (ii) Open burning of amalgam or processed amalgam; (iii) Burning of amalgam in residential areas; and (iv) Cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury.

In **Whole Ore Amalgamation** (WOA), mercury is brought into contact with 100% of the ore ('whole ore'). WOA includes the following gold mining practices:

- Throwing mercury on the ore, use high pressure hoses to mix the ore with mercury prior to sluicing
- Placing mercury in the sluice box
- Placing mercury in a container with riffles directly behind the milling system (local names: *brandkas, moni-kasi, moni-bakkie*), so that all milled material will get into contact with mercury.

Consultations and observations suggest that WOA is virtually always used in milling operations, and in less than half of sluicing operations.

Open burning of amalgam or processed amalgam is quite common. In a 2014 survey among 168 gold miners in different Suriname regions, only 8.8 percent reported always using a retort when burning amalgam. Two-thirds of surveyed gold miners (64.9%) reported covering the gold pan (batea) with large leaves to prevent the vapor from escaping into the air, but the efficiency of this method in preventing mercury release into the air is questionable.

Burning of amalgam in residential areas is uncommon. Gold mining operations typically burn the amalgam at their work location; in the forest away from the communities.

Cyanide leaching of tailings occurs in Suriname through application of Jinchan™ leaching reagent (Jinchan), which contains Cyanide. Gold miners working with this leaching reagent work with tailings of other operations, which may contain mercury. There are no data on the number of operations that use this method. To date, gold leaching with conventional sodium cyanide (NaCN) has not been observed in ASGM operations in Suriname.

4.6 *BASELINE ESTIMATES OF THE AMOUNT OF MERCURY USED IN ASGM, AND OF ASGM PRACTICES*

Virtually all ASGM miners use mercury during the mining process (Duijves and Heemskerk, 2014). The use of mercury has no scientific base but a rather practical trial and error approach combined with the miners' experience. Gold miners working with a hammer mill typically place mercury in the "safe" (brandkast); a metal container with ridges attached behind the mill. Hammer mill operators typically place between 1 and 4 kg of mercury in the crusher safe per cycle. If the system uses a copper plate, they may rub another ~ 200 gr of mercury on the copper plate during the mining cycle. In sluicing (Brazil: *chupadeira*) systems, mercury is added during different stages of the mining cycle. A significant share of operations relies on whole ore amalgamation, where mercury is applied to the unprocessed ore (Duijves and Heemskerk, 2014). This practice is classified as one of the four worst-practices under the Minamata Convention (Box 1 and Annex C).

Figure 5. Locations where mercury is usually added; in the "safe" of the hammer mill (1), on the copper plate (2), on the ore while sluicing (3), and/or when washing the sluice box (4). Methods 1-2-3 are examples of Whole Ore Amalgamation.

It is difficult to estimate how much mercury gold miners use and loose per Kg gold extracted because many factors play a role in each individual processing case, including mining method, grain size of the gold, characteristics of the ore, whether or not the place has been mined before, amount of recycling, and the personal experience and perceptions of the mine manager or boss.

Not all mercury used by ASGM is lost into the environment, because gold miners recapture mercury in different stages of the processing cycle. For example, after amalgamation and before burning, gold miners recapture mercury by squeezing the amalgam through a piece of fabric.

Worldwide, the mercury (Hg) to gold (Au) ratio used in ASGM varies from roughly 1:1 to >20:1 in selected worst cases (Persaud and Telmer, 2015). Based on interviews with gold miners, Heemskerk et al. (2016) estimated the Hg:Au ratio for Suriname ASGM at 3.3:1. That is, for every Kg of gold produced, an estimated 3.3 Kg of mercury is emitted into the natural environment. This estimate is in line with an earlier estimated Hg:Au ratio for the Guianas by Legg et al. (2015) of 3:1.

The method of estimating the amount of mercury used in ASGM is described in the National Inventory of Mercury Releases in Suriname, 2019 (NIMRS, 2019), which was carried out using the level 2 toolkit of UNEP. The estimation was based on an inventory of the methods and techniques used in ASGM in Suriname by the Commission for Regulation of the Gold Sector (OGS), as well as quantitative data on ASGM activities and annual gold production in Suriname provided by OGS, the Central Bank of Suriname (CBvS) and other stakeholders (Annex 3).

Using the four different ASGM extraction categories as defined by the level 2 UNEP toolkit and applying the input factors as proposed in this toolkit, an annual amount of 62.159 kg mercury used was calculated. The calculated amounts of mercury used per extraction category are presented in Table 5.

The National Inventory report mentions existing procedures in Suriname ASGM to recover mercury from the tailings. When checked, evaluated and monitored this and other improvements in ASGM techniques and procedures may help reduce mercury emissions.

Table 5. Calculated yearly mercury use per extraction category of ASGM (NIMRS, 2019)

Extraction Category	**Input factor (kg Hg/kg Au)**	**Yearly gold production (kg/y)**	**Calculated Yearly mercury use (kg Hg/ y)**
Whole ore amalgamation without retort	5	10.278	51.390
Whole ore amalgamation with retort	4,25	547	2.324,75
Concentrate amalgamation without retort	1,3	4.926	6.403,8
Concentrate amalgamation with retort	0,55	3.710	2.040,5
Total		**19.461**	**62.159,05**

4.7 *MERCURY RELEASES IN SOIL, AIR AND WATER*

All present and historic ASGM sites are to be considered as contaminated sites (Figure 2). In order to estimate what proportion of the mercury used in the four ASGM extraction categories of Table 5, the level 2 toolkit suggests different distribution factors for mercury releases to air, water and land. The results of these mercury releases are presented in Table 6. More detailed information about these estimates is provided in Annex 3, and in the National Inventory of Mercury Releases in Suriname (2019)[10].

Table 6: Calculated annual mercury releases to air, water and land from ASGM (NIMRS, 2019)

[10] https://drive.google.com/file/d/10TMOD56vZaUh8TspM69bYniJVcq8tHDF/view

Extraction Category	Calculated annual mercury use in ASGM (kg/y)	Calculated mercury releases air (kg/y)	Calculated mercury releases water (kg/y)	Calculated mercury releases land (kg/y)
Whole ore amalgamation without retort	51.390	10.278	20.556	20.556
Whole ore amalgamation with retort	2.324,75	139,49	1.092,63	1.092,63
Concentrate amalgamation without retort	6.403,8	4.930,93	768,46	704,42
Concentrate amalgamation with retort	2.040,5	918,23	571,34	550,94
Total	**62.159**	**16.266,6**	**22.988,4**	**22.904**

4.8 *ENVIRONMENTAL IMPACTS OF ASGM*

The main environmental impacts associated with ASGM are listed in Table 7 below.

Table 7: Summary of environmental impacts of ASGM

Impact	Specification and quantification
Mercury contamination	Estimated annual loss of mercury into the natural environment by ASGM miners has been estimated at about 16 T Hg/yr in air; 23 T Hg/yr in water and 23 T Hg/yr on land ([a]). The user ratio AU:Hg by ASGM miners was estimated at 1:3.3 [(b)].
Chemical hazards	Use of cyanide-salts and similar chemicals as leaching reagents in an unsafe and irresponsible way, leaving waste behind. Cyanidation of mercury contaminated tailings causes enhanced liberation of mercury in the environment.
Deforestation	Gold mining is responsible for 73% of annual deforestation in Suriname, primarily due to ASGM [(d)].
Sedimentation of natural water bodies	Sedimentation of rivers and creeks in and downstream of ASGM areas. An estimated 4,989 km of Suriname waterways is in direct contact with gold mining activities [(f)]. In aquatic systems, high loads of suspended and deposited fine sediment affect light penetration, temperature adjustment, electrolytes, bottom conditions, and retention of organic matter. Such conditions, in turn, adversely affect aquatic life. Nearby communities experience reduced access to safe drinking water.
Climate change	From 2000-2015, gold mining resulted in GHG emissions of 55.05 million tCO_2 (3.67 million t CO_2/year) [(e)].
Landscape alteration	Digging into hills; decimation of hills; leaving mining pits unfilled.
Change of navigation channels in river	Mining rafts suck up gravel from the river bottom, and deposit it elsewhere, often in heaps around their working area. This practice alters river flow and complicates navigation for water users. Only when mining on land, water from creeks is used, and tailings flow back into the forest

	or waterways. These practices alter the course, depth, water flow, and navigability of rivers and creeks.
Wildlife	Relatively benign impact due to hunting by gold miners [(c)].
Loss of Biodiversity	Illegal/informal ASGM activities in protected areas [(g)].

Sources: (a) National Inventory of Mercury Releases in Suriname, 2019; (b) Social Solutions, 2016; (c) Social Solutions, 2017; (d) SBB, 2015; (e) REDD+, 2017; (f) Rahm et al. 2015; (g) Renforesap (Strengthening the network of protected areas in the Guiana Shield and their contributions to sustainable development in respect of local cultures, values and lifestyles) project 2018-2020.

4.9 *INFORMATION ON AVAILABLE EVIDENCE OF HEALTH IMPACTS AND MERCURY EXPOSURE*

The general outcome of several studies carried out in Suriname since the 1990s is that there are elevated levels of mercury in air, surface water, river sediment, fish and humans. These findings illustrate that mercury (mainly in the form of methylmercury) is accumulating along the food chain, causing health hazards especially for women of child-bearing age and their offspring, who live in ASGM regions.

From studies done in collaboration with the Medical Mission Primary Health Care Suriname (Scheepers P. and Jubitana B., 2017; Ottenbros, Boerleider et al., 2018) it was concluded that the implementation of a health education programme within an existing local healthcare structure proved effective. These studies also showed that there is an interest in mercury free gold mining.

Recent studies from the Meki Tamara project (Wickliffe et al.; submitted 2021; Zijlmans, Wickliffe, Hindori-Mohangoo et al., 2020; Baldewsingh et al., 2021) show that pregnant women in the interior have significant higher levels of both total and methylmercury in hair (3.64 μg/g) compared with pregnant women from Paramaribo (0.63 μg/g) and Nickerie (0.74 μg/g). Similar results were found for mercury levels in blood. The mercury levels found in women from the interior are above health action levels established by the USEPA and the WHO. Methylmercury makes up 86% of the total mercury level in blood and 97% of the total in hair. This demonstrates that diet and especially fish consumption are largely responsible for the mercury exposures in pregnant women in Suriname. The main known health effects of exposure to mercury include neurological, kidney, cardiovascular and immune system effects. Health impacts to young women and new-borns due to mercury exposure are subject of present studies.

In the interior, it has been found that Indigenous women have, on average, higher mercury levels compared to women of Maroon origin and also higher rates of Adverse-Birth-Outcomes and preterm birth. Studies performed among French Guiana indigenous peoples in the border area with Suriname show similar results (Cordier et al., 1998; Dolbec and Fréry, 2001; Fréry et al., 2001), suggesting that the Southern Indigenous Peoples are particularly vulnerable to the adverse health impacts of mercury contamination – even though they have very little direct involvement in the ASGM sector. These results highlight the importance of effective risk reduction measures in support of Indigenous mothers, families, and communities.

Consultation with a representative of Mulokot, a Wayana Indigenous Peoples organization, suggests that the Wayana are well aware of the adverse health impacts of mercury. However, as they have no formal rights to their lands and no authority to act against gold miners in their customary territories, they feel powerless to do something about it.

Data on occupational exposure to mercury vapour and its possible impact on the health of the workers are still scarce for Suriname. Annex 4 provides a more detailed synopsis of these studies.

4.10 *HEALTH SECTOR KNOWLEDGE, AWARENESS, AND PRACTICES RELATED TO MERCURY*

Health sector stakeholders with an explicit role in researching and mediating the health impacts of mercury use in ASGM include:

- The Ministry of Public Health (MinVG) is the primary central government body responsible for national health policy.
- The Bureau for Public Health (BOG) is a working arm of the Ministry of Public Health, which focusses on preventative health care and general health promotion.
- The Toxicology Focal Point of the MinVG, which is the national focal point of the Intergovernmental Forum on Chemical Safety.
- The Regional Health Services (RGD) is the public provider of health services in the coastal districts. The RGD operates more than 50 health facilities, including regular primary health clinics, labs, post-natal care centers, and pharmacies, and actively provides health awareness information about a variety of topics including HIV/AIDS and Non-Communicable Diseases.
- The Medical Mission Primary Health Care Suriname (MZ) provides health services in the interior districts of Suriname through 50 health care centers, serving approximately 54.000 people. The working-expenses of the Medical Mission are for 100% financed by the Ministry of Public Health. Additional costs are financed by projects by a variety of donors.
- The Medical Scientific Institute of the Academic Hospital Suriname (MWI-AZP) executes biomedical scientific research that benefits Suriname health care.
- The national Malaria Program provides malaria awareness, test and treat services in the Suriname interior, with a specific focus on the ASGM areas. It is the only government organization with a broad network of staff and affiliates working in all ASGM areas of the country.

Based on consultations with representatives of these various institutes (Annex 1 - List of consulted stakeholders), the following conclusions were drawn about the knowledge, awareness and practices of health sector stakeholders with regard to the health impacts of mercury and the Minamata Convention.

- There is no generally known, central focal point for the Minamata Convention within the Ministry of Public Health or other health sector institutes. Nevertheless, some of the institutes have designated persons or departments who are responsible.
- There is some knowledge about health impacts of mercury, but in general not very in depth and not within all organizations. Both higher staff and middle and lower cadre need more training and information.
- Several stakeholders such as BOG, MZ and AZP have participated or are still involved in scientific studies on exposure to mercury and its health effects in Suriname. Such studies have focused on pregnant women, newborns, workers in ASGM and general population in ASGM areas.
- The listed stakeholders (see under 3) were also involved in public information campaigns. Public health information is, however, dependent on specific projects and not part of regular

programs. BOG, MZ and AZP wish to continue with public information campaigns, but a good case definition of mercury intoxication and more knowledge about different routes of exposure must be developed. MZ has developed information materials on the health effects of mercury for interior populations.

- The Malaria Program has much experience working with gold miners and surrounding communities.
- There are well equipped laboratory facilities with trained staff to analyze mercury in both food and human samples at the Central Laboratory (CL) of BOG. The lab has experience with Human Biomonitoring.
- There are no national standards for limits of mercury exposure, a case definition of mercury intoxication, or safe reference values for mercury levels in human and biological samples. This received some attention in the past, but the process should be well coordinated with input from all stakeholders, and subsequently formalized.
- Chelation therapy is known as a remedy for persons with mercury intoxication, but application of this treatment in Suriname is not known.
- Although initial steps were taken, no structural program for regular Human Biomonitoring among vulnerable populations has been developed. This is in part due to a lack of resources. MZ is contemplating to initiate such a program, pending available resources.
- Stakeholders agreed that the Central Lab (CL) of the BOG would be best suited to analyze mercury in human samples. If a lab is selected for doing mercury analyses, it should be a national lab. The existing clinical labs, including those at the hospitals, possess facilities to take the samples and transport them to the BOG-CL. For the analysis of mercury in food, BOG-CL seems best suited, but also the Authority of Industrial Quality in Fishery and Aquaculture (Vis Keurings Instituut, VKI) and the Anton de Kom University of Suriname (AdeKUS) lab were suggested.
- Main obstacles for the design and implementation of a national health strategy for the Minamata Convention are a lack of finance/available means; limited continuity of policy strategies; and staff changes. Stakeholders identified as additional obstacles: a lack of technical staff, lack of legislation, conflict of interest, and absence of political will.

4.11 *LEADERSHIP AND ORGANIZATION OF ASGM AT NATIONAL AND LOCAL LEVELS*

The Constitution of Suriname[11] clearly states that the owner of all natural resources and the main authority responsible for legal development and control in Suriname lies with the Government of Suriname. Mining falls under the responsibility of the Ministry of Natural Resources, using the Geological and Mining Service as the executing agency. The largest share of areas that are suitable to ASGM have been titled out as industrial mining rights. Subsequently the rights holders allow ASGM miners to work on their rights against a percentage share of the earnings, typically between 10 and 12 percent. Some, but not all, concession title holders also have their own ASGM operation(s). In areas that are part of the customary land rights of Indigenous peoples and Maroons, these forest peoples may also act as de facto concession title owners. The allocation of mining rights overlapping with the customary lands of Maroons and, to a lesser extent, Indigenous Peoples, is increasingly leading to tension between these forest peoples, the national government, and mining rights holders.

According to the 1986 Mining Decree, small-scale mining should exclusively take place in areas designated for this purpose by the Minister of Natural Resources (Art. 36.3). In the 1980s and ‘90s, the GMD explored the mineral potential of several areas, but none were set aside for

[11] Article 41 of the Constitution of the Republic of Suriname (1987)

ASGM in these years. Around 2013-14, the OGS identified four areas[12] that were allocated to ASGM workers. This initiative did not achieve the desired result; few gold miners were willing to work in these areas, mainly because prospecting suggested that there was too little gold.

ASGM miners can work alone, but most of them work in teams of between three and eight persons. In a team, the boss or equipment owner carries all expenses and is responsible for providing food, shelter, equipment, tools, and mercury. In exchange, the equipment owner received 70-82 percent of earnings. The workers share the remaining 18-30 percent.

Several studies executed in regards of the formulation of the project documents for donor funding[13] have determined that in Suriname, ASGM miners are poorly organized. There is no national nor regional level organization representing the interests of the ASGM sector, and the very few local ASGM organizations/collectives are plagued by internal strife and financial mismanagement[14].

4.12 *INNOVATIVE EXPERIENCES IN ADDRESSING ASGM*

In the 70's and 80's, the GMD published a manual for small and medium gold exploration in Suriname (Dahlberg, 1979). This manual presented prospecting and exploration and exploitation techniques in a practical manner, based on geological knowledge. There were also plans to develop a training school for miners in the Loksie Hatti area, near the Saramacca River. These GMD initiatives were not developed any further due to political developments in Suriname in the 80's.

In the late 1990s, the Geological and Mining Service (GMD) and the Organization of American States (OAS) supported by Pan American Health Organization (PAHO) started with the introduction of retorts in ASGM areas. Participating gold miners found the retorts too small and taking too much time. Other retort introduction projects took place in 2005/6 (GMD with WWF-Guianas), 2009 (GMD with WWF-Guianas; and Thera's Publications/Godolo Foundation with support from UNDP), and 2012/13 (Commission Regulation of the Gold Sector – OGS); all without much success. In the mid-2000s, the World Bank funded a project from the US-based organization Artminers to perform mercury awareness training and introduce CleanGold sluices. These sluices were not adopted by gold miners.

In 2011, a School of Mining and Mineral Processing (SMMP) was established with support from Suriname Environmental and Mining Foundation (SEMIF). The SMMP constructed a "Satellite field station for capacity building" with ASGM equipment such as i-cons and shaking tables, but courses were never given. In 2016 University of Applied Sciences and Technology (UNASAT) used this infrastructure for the provided training project which was financially supported by Newmont Suriname. Due to lack of funding the UNASAT initiative was discontinued. In 2011, the Anton de Kom University of Suriname (AdeKUS) and WWF-Guianas collaborated in a project to explore use of the jig as an Hg-free method and gave demonstration trainings to gold miners in Nieuw Koffiekamp and Brokopondo area. In 2015, the School of Geology and Mining Technology (SGMT) at the UNASAT started offering

[12] One in the Paramacca area, two along the road to Atjonie, and one specifically for gold miners from Nw. Koffiekamp.

[13] Project document "Supporting mercury phase-out in the Guianas" financed by the Fonds Français pour l'Environnement Mondial (FFEM) or French Global Environment Facility) and coordinated by WWF Guianas and WWF France (2017)
Project document for the project "Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining" (2017)

[14] Own experience, most recent reports of UNDP, and other donor reports

course on Hg-free gold mining technologies, including field training for students (with support from Newmont Suriname).

One of the challenges in generating interest from ASGM miners in these Hg-free methods is that many of the projects were set up as demonstration projects. ASGM workers have been skeptical about the potential of these methods to process the amounts of ore that they usually mine. It is also a fact that these miners are not yet prepared to move through a more sustainable approach in their mining operations. Another challenge is that there is no law prohibiting the use of mercury in ASGM, nor enforcement of any environmental regulations in these areas. Hence there is little incentive for miners to abandon mercury, which is cheap, is easy to use and move, does not require electricity or the use of clean water, and is extremely effective.

In 2011 state mining firm Grassalco N.V. started operating an Hg-free mining plant at Maripaston. One of the objectives of the initiative was to set up a profitable Hg-free operation. However, from the beginning on the profits of this operation were rather poor due to several reasons such as; geological parameters which were insufficiently accounted for; poor ore quality (low cut-off grade), etc. As a result of the disappointing profits the focus of this initiative shifted from mining tailings to mining primary ore.

The second objective of this initiative was to have a demonstration and training site of Hg-free mining for ASGM miners. This was also less successful as the miners were not trained. One of the successful interventions is that ASGM miners on the premises of Grassalco N.V. are obliged to use a retort in their operations. In 2020 a new a management was installed which resulted in an evaluation of the low-profile activities. As the NAP is being developed this evaluation is still on-going.

In 2016, Newmont Suriname funded try outs with Hg-free equipment, and supported an Hg-free pilot project with local gold miners, supported by UNASAT students. These try outs were successful but not sustainable as continuous funding was not secure. The initial objective of institutionalizing ASGM training in the UNASAT program was not reached mainly due to a lack of funding.

Current initiatives/projects:

There is a total of 5 initiatives or projects[15] in the planning or being implemented. In general, these projects have similarities and all aim to reduce mercury use by implementing alternative techniques. In Annex 5 a summary of these initiatives is provided. The Government of Suriname, namely the Ministry of Natural Resources should be the main Ministry responsible for the overall coordination of these projects. This is of eminent importance to prevent waste of finances and to ensure efficiency. During interviews with representatives from Suriname's only University, it was mentioned that there is willingness to conduct research to assist in the development of the goldmining industry in a more sustainable way. There is a great need for modern testing equipment, such as hydrocyclones, Knelson concentrators and Shaking tables. The way forward acknowledged by different stakeholders is to invest in alternative techniques adapted to Surinamese mining conditions.

[15] 1. EMSAGS project
2. Supporting Mercury Phase out project
3. GEF Gold+ project
4. Newmont initiative/Solidaridad
5. AGC + US State Department of States

4. NATIONAL OBJECTIVES AND REDUCTION TARGETS

4.1 PROBLEM STATEMENT

The National Inventory of Mercury Releases in Suriname of 2019 provides a baseline estimate of **62 Tons of Hg (± 15%) per year** used in the Suriname ASGM sector. As explained below we estimate an even higher Hg release of **78 Tons of Hg (± 15%) per year.** Mercury use in the national ASGM sector is characterized by:

- ⊗ **Excessive and haphazard mercury use** in virtually all ASGM operations, with little recycling. As easily extractable gold supplies give out, gold miners start using relatively more mercury.
- ⊗ Application of **worst practices**, including *whole ore amalgamation*[16], *open air burning of amalgam*, and *cyanide leaching of tailings that are possibly mercury-contaminated (Box 1)*.

The NAP focusses on elimination of these worst practices by calling for a halt to whole ore amalgamation and cyanidation of mercury-contaminated tailings, while simultaneously promoting retort use.

Working towards reduction and eventual elimination of mercury in Suriname's ASGM sector is hampered by baseline conditions in the legal, institutional and political spheres, including:

- ⇨ **Inadequate legal framework**. Absence of legal instruments to regulate purchase, use, and waste management of mercury and mercury contaminated materials in the ASGM sector.
- ⇨ **Inadequate regulation and weak/lacking control** of the ASGM sector, in part due to limited permanent presence of government authorities in a large share of ASGM areas.
- ⇨ **Insufficient, weak institutional embedding**, **knowledge and awareness** of the Minamata Convention within the relevant Ministries and government departments.

4.2 REDUCTION TARGET

The reduction target towards elimination of mercury within ASGM reads as follow:

Within ten years, in 2032, Suriname will have reduced mercury use in the ASGM sector with 30%. A 30% reduction implies that the amount of mercury used in the ASGM sector will be at maximum 43 or 55 tons Hg/yr (± 15%) dependent on what baseline estimate is used.

To enable mid-term and long-term targets the following scenarios support the set target.

Scenarios for the reduction of mercury release due to ASGM

The Level 2 UNEP tool for estimating mercury emissions in ASGM defines the following four extraction categories (modes of working):

1. Whole Ore Amalgamation (WOA)
2. Whole Ore Amalgamation with use of Retort (WOAR)
3. Concentrate Amalgamation (CA)
4. Concentrate Amalgamation with use of Retort (CAR)

[16] This includes placing mercury on the sluices, or in the brandkas/moni kas of the hammer mill, see Box 1.

During the execution of the level 2 mercury inventory, an estimate was made of the percentage of total annual gold production based on each of these four modes of working. This estimate was based on information provided by OGS in 2018.

Based on new insights and experience, and following consultation with the Foundation for Holders of Mining Rights (*Stichting Houders Mijnbouw Rechten, SHMR*), the conclusion is made that the proportion of miners who use WOA was underestimated at the time. Therefore, a revised estimate was made of the different proportions of the four mining modes. These two “baseline estimates” are respectively called “low” and “high” and will both be used in the following two scenarios. Both baseline estimates are presented in Table 7.

Table 7 Estimated baseline proportions of four gold mining modes

	Low	High
WOA	53%	70%
WOAR	3%	5%
CA	25%	20%
CAR	19%	5%
TOTAL	100%	100%
TOTAL Hg RELEASE	62.411 kg	77.844 kg

The idea behind these scenarios is a gradual shift from Whole Ore Amalgamation towards Concentrate Amalgamation. At the same time the use of retorts should increase. The combination of both changes will result in less mercury being released into the environment. **Scenario 1** is a conservative estimate resulting in a 30% reduction in mercury release by 2034 and a 60% reduction by 2044. **Scenario 2** will result in a 50% reduction in mercury release by 2034 and 80% reduction by 2044. When mercury free methods of gold mining will be used the release of mercury can be further reduced. Cyanide leaching of old tailings however should not be allowed because in this process mercury from these tailings will be mobilized and released to water and air.

In Figures 6-9 the effects are shown of changes in the proportion of each mode of mining on the total release of mercury in a period of 20 years from now.

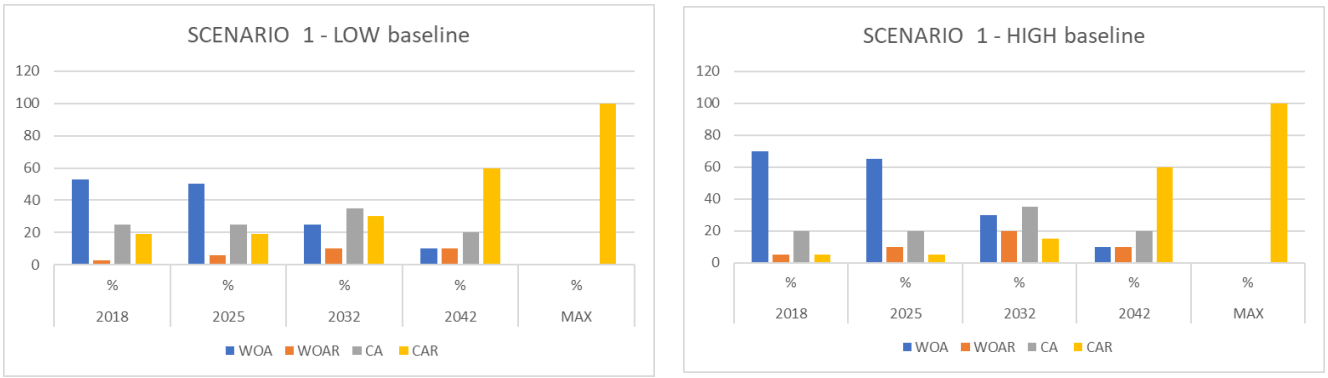

Figure 6 Scenario 1: Shift in modes of mining during the period 2022 - 2042 (based on low and high baseline)

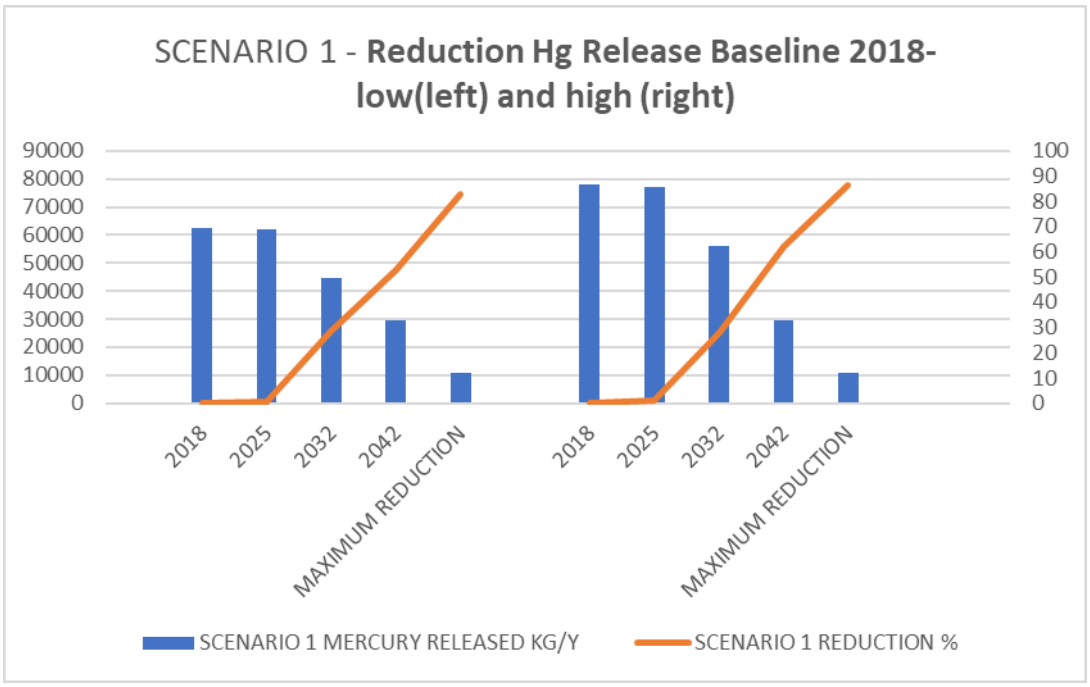

Figure 7 Scenario 1: Reduction in mercury release starting from low and high baseline situation

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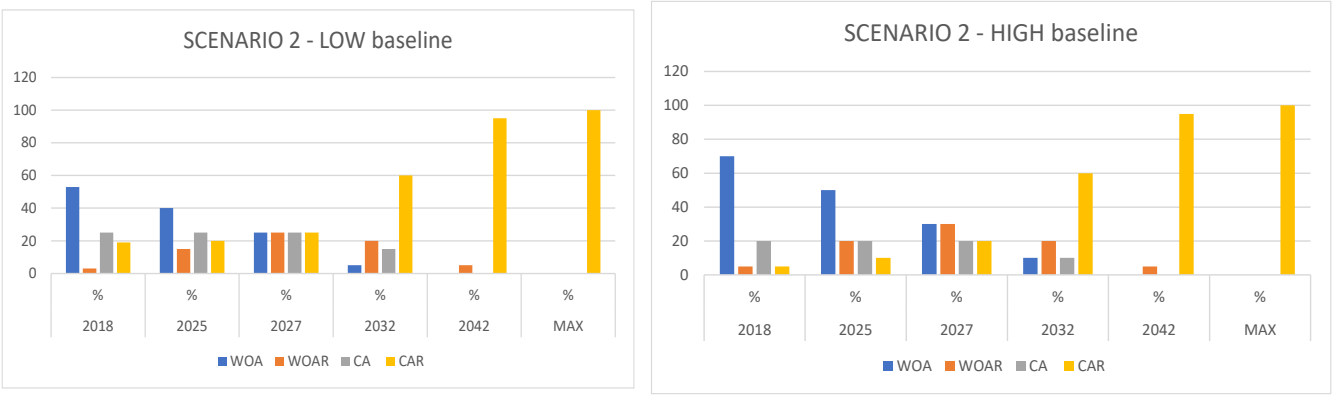

Figure 8 Scenario 2: Shift in modes of mining during the period 2022 - 2042 (based on low and high baseline)

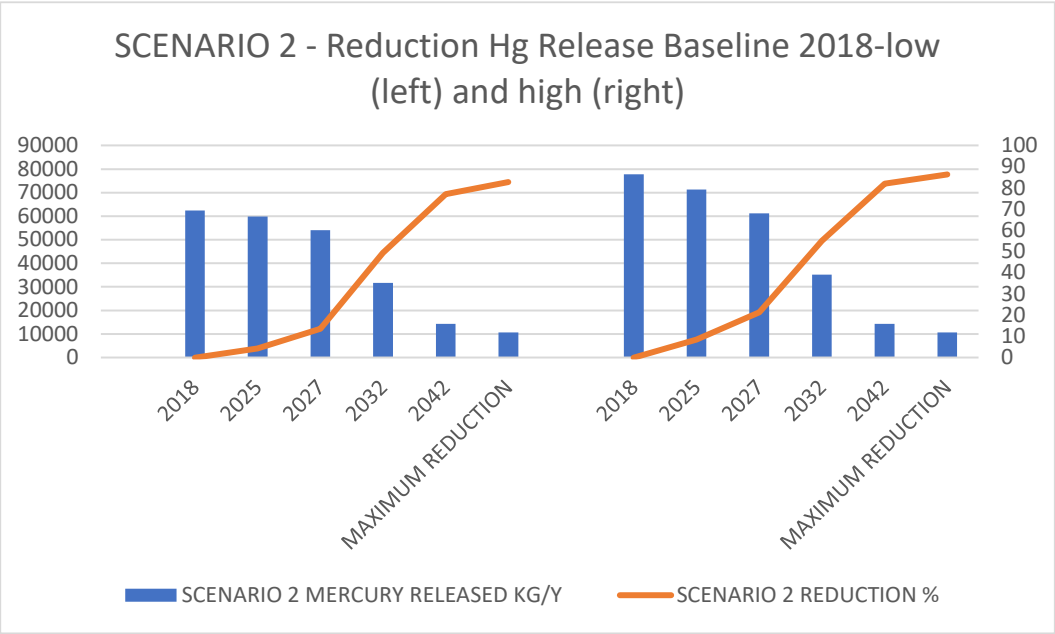

Figure 9 Scenario 2: Reduction in mercury release starting from low and high baseline situation

After consultations with the Ministry of Natural Resources and NIMOS it was determined to implement the more conservative **Scenario 1**, which objective is to reach 30% mercury release reduction by 2034. This can be achieved by gradually eliminating whole ore amalgamation combined with a substantial increase in the use of retorts.

Table 8 Summarized explanation of the methods used

E	D	C	B	A
WOA	**WOA***	**WOA*/CA/R**	**CAR**	
extensive use of mercury	extensive use of mercury	more conscious use of mercury -partly mercury on sluice, partly Conc.Amalg.	limited use of mercury	no use of mercury
no tailings containment	tailings contained/controlled	tailings contained/controlled	tailings contained/controlled	tailings contained/controlled
no Hg recycling	Hg recovery from tailings and by squeezing amalgam	Hg recovery from tailings and by squeezing amalgam	Hg recovery from tailings and by squeezing amalgam	Hg recovery during process when remining old sites
no use of retorts	some use of retorts (20 %)	regular use of retorts (50%)	always use retorts (100%)	
	OR			
	cyanidation of tailings without Hg recovery			
Hg : Au = 5:1	**Hg:; Au = <4 : 1**	**Hg : Au =< 2.5 : 1**	**Hg:Au = < 1 : 1**	**Hg:Au = 0 : 1**

4.3 NECESSARY PRECONDITIONS

Meaningful reduction and ultimate elimination of mercury use in the ASGM sector is contingent on achievement of the following key preconditions, within three years (by 2027):

Legal Reform: *The Government of Suriname will develop, approve, and adopt legal instruments that stipulate regulations and related sanctions related to the trade in, and use, spillage, and waste management of mercury related to the ASGM sector*. Definition of ASGM in national context!

Minamata Convention embedded at institutional level: *The Government of Suriname will invest in Minamata Convention related capacity building, knowledge and awareness in government ministries and departments directly and indirectly related to the governance of natural resources, environment, and health – and specifically the ASGM sector.*

External drivers for change:

- ⊗ Position of Suriname in the international context (international negative reputation), impact on bilateral and multi-lateral relations (UNCTAD)
- ⊗ International projects for donors (IMF (macro level IDB, preconditions for the loans)
- ⊗ Incentives from projects
- ⊗ Suriname is a member to the UNCBD and currently the Convention is preparing its new cycle of measures to protect and/or conserve biodiversity

4.4 NATIONAL OBJECTIVES

National objectives for the reduction of mercury use in the ASGM sector, and ultimate elimination of its harmful effects on people and the natural environment are classified as:

- ✓ Quick wins; achievable within 3 years – by 2027.
- ✓ Medium-term objectives; achievable in 4 to 10 years – by 2034
- ✓ Long-term objectives; achievable in 11 to 20 years – by 2044

Reduction of impacts on human health	Will be achieved by:
(Continuation of) capacity building in Bureau for Public Health (BOG), Medical Mission Primary Health Care Suriname (MZ) and Regional Health Service (RGD) to provide information and awareness in interior communities, and recognize possible cases of mercury intoxication in children and adults.	2027
Expansion of options for biomonitoring of mercury exposure in populations at risk.	2027
Enhance coordination and synergies among different health institutions.	2027
Legal reform	
Adjustment of labor laws to explicitly protect laborers of mining operations and actors in the gold marketing chain against harmful effects of mercury.	2027
Develop state decrees as part of the Environmental Framework law, which define the maximum allowable concentration of mercury in air, water, sediment, fish and people.	2027
Develop state decree to ban and regulate whole ore amalgamation as well as mandate the use of a retort.	2027
Define the ASGM sector in terms of geographical location, size and land rights, etc.	2027
Institutional strengthening	
Appoint key responsible staff for Minamata Convention related activities within each relevant government ministry and department, and an inter-ministerial working group that includes these different persons.	2027
Generate knowledge and awareness of, and interest in, the Minamata Convention and what ratification means for Suriname, among highest ministry and department staff.	2027

Work with OGS and GMD to develop a workable approach to jointly regulate and enforce ASGM operations in the Suriname context.	2027
Enhance technical cooperation between different government institutes by means of joint field activities and other operational projects.	2027
Technical interventions	
Improve coordination between different donor and industry projects aimed at reduction of mercury in the ASGM sector.	2027
At least 3 centers for Hg-free concentrate processing, to serve surrounding ASGM operations.	2034
70% of mining operations only use Hg in the final stage of their operation (CA)[17].	2034
50% of mining operations working with Hg always process amalgam using retorts (WOAR and CAR).	2029
80% of mining operations working with Hg always process amalgam using retorts (WOAR and CAR).	2034
70% of ASGM operations use tailings containment technologies (including Hg recovery from tailings).	2034
10% of ASGM operators has received instructions/ trainings on geological and mining knowledge to responsibly extract gold.	2029
30% of ASGM operators has received instructions/ trainings on geological and mining knowledge to responsibly extract gold.	2034
20% reduction of ASGM operations using whole ore amalgamation (high baseline of 75% WOA/WOAR must be verified).	2029
60% reduction of ASGM operations using whole ore amalgamation (high baseline of 75% WOA/WOAR must be verified).	2034
Reduction of environmental impacts	
57% reduction in Hg release to air.	2034
54% reduction in Hg release to water.	2034

Quality Labeling for ASGM Operations

To make miners and public more aware of the use of different mining modes and facilitate this process of moving away from WOA and towards more use of retorts, the following system of quality labeling is suggested. Five stages of improved modes of mining are defined, each one with a lower Hg : Au ratio, as shown in Figure 10. Also the effect of tailings control and recovery of mercury from the tailings is part of this labeling. In order to establish a mercury to gold ratio for each label, a similar approach was used as in the level 2 initial mercury assessment and these ratio's should be verified or improved by fieldstudies during the first year. The color code scheme can be used to identify, measure and enable incentives to reduce the use of mercury within ASGM. Table 9 shows the result of such an estimate (see Annex 2 for further explanation of methods used).

Table 9 Characteristics of an individual ASGM operation using improved modes of mining going from label E to A. WOA and WOAR* indicate that recovery of mercury from tailings takes place with an efficiency of 25%*

[17] All reduction percentages are based on using scenario 2 with high baseline (see Fig.3). This baseline should be verified and adjusted if needed, in which case the percentages in this table may also need to be adjusted.

Mode of mining/Label	E	D	C	B	A
WOA	100%	0%	0%	0%	0%
WOA*	0%	80%	20%	0%	0%
WOAR	0%	0%	0%	0%	0%
WOAR*	0%	20%	20%	0%	0%
CA	0%	0%	30%	0%	0%
CAR	0%	0%	30%	100%	0%
Hg:Au	5:1	3.8:1	2.1:1	0.6:1	0:1

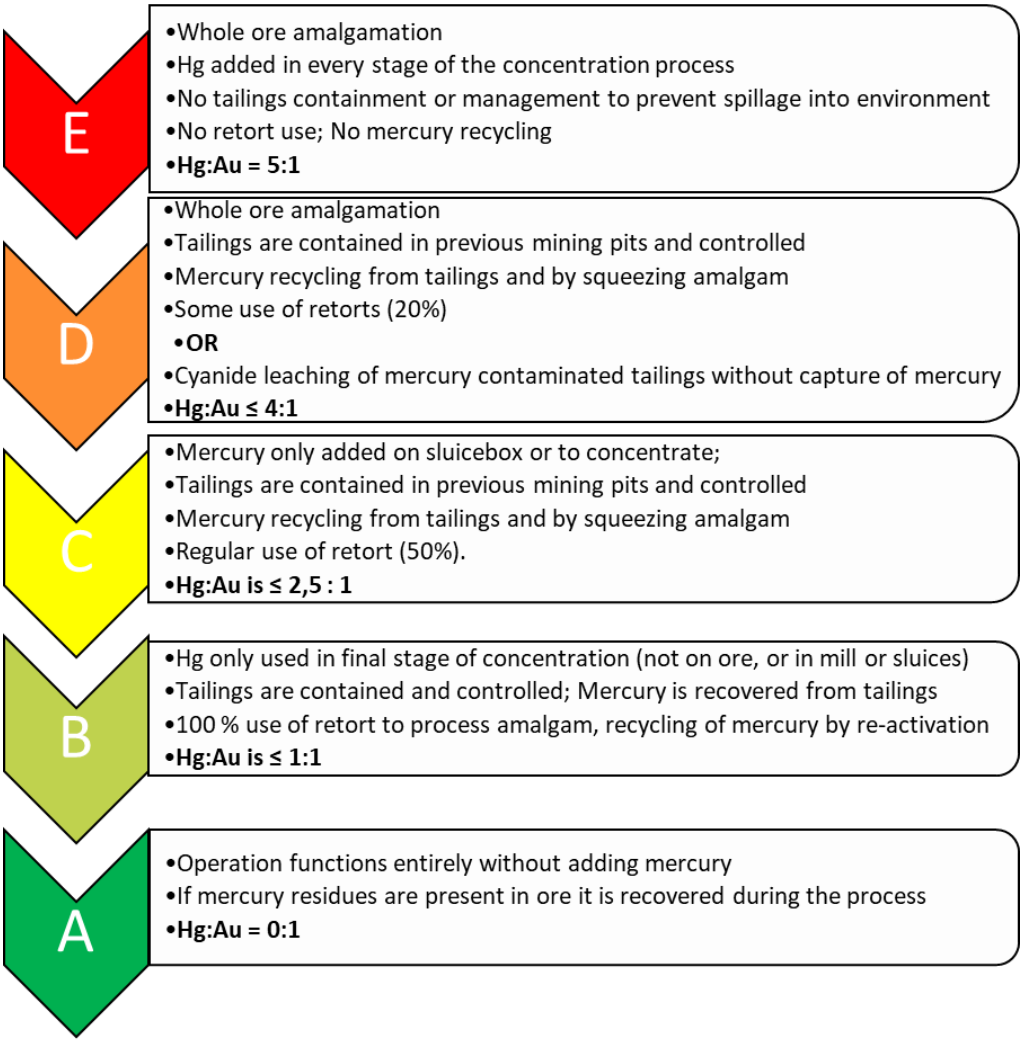

Figure 10 Color code for Mercury use in ASGM

5. NATIONAL IMPLEMENTATION STRATEGY (SEPARATE LOG FRAME DOC)

5.1 GOALS AND OBJECTIVES

The overall goal of the NAP is to reduce the use of Mercury (Hg) in the ASGM sector and to enable an effective health strategy. The identified activities are divided in short-term, within 3 years, mid-term (till 2039) and long-term after 10 years.

By 2034, Suriname will have all legal and institutional measures in place to effectively reduce mercury use; have reduced mercury output by 30%; and adverse health impacts of mercury contamination are recognized and adequately dealt with.

Indicator: Existence of legal and institutional measures; proven Hg output reduction of 30%; Program of recognizing and dealing with adverse health impact is in place.

Means of verification: Reports to the Minamata Convention committee.

Assumptions: Baseline values are known and scientifically determined, OR, year 1 will be used for collection of adequate baseline data. There is ownership and commitment among stakeholders. Relevant government institutes are fully aligned with the NAP.

Outcome 1: Legal and Institutional reform to effectively reduce mercury use

- Legal reform that limits Hg output
- Development and legal integration of national standards for Hg concentrations
- Institutional reform that enables control and enforcement of laws in ASGM areas
- Enhanced level of awareness of the Minamata Convention among policy makers and government staff

Main assumption for achieving meaningful legal and institutional reform is that political will is prevailing and institutional capacity for legal reform is present.

Output 1.1 Legal reform that limits Hg output

The GOS has to adopt legal instruments that discourages the trade in, use of, and spillage of mercury in soils, water and air. Although the import of mercury requires a permit, its use is not forbidden. This allows excessive and irresponsible use of mercury within ASGM. The Environmental Framework law should include articles that prohibit excessive and irresponsible use and spillage of mercury in ASGM as well as articles that oblige use of a retort in ASGM.

Output 1.2 Development and legal integration of national standards for Hg concentrations

In close association with the Toxicology Focal Point, Central Laboratory of BOG and the Anton de Kom University of Suriname, national standards for maximum concentrations of Hg in soils, water, air, fish, and people should be developed. Currently national standards are lacking and in the absence of these standards national institutes use international standards of institutes such as WHO, PAHO, etc. However, it is important that Suriname develops and legally adopts national standards for maximum Hg concentrations in soils, air and water, distinguishing surface water and drinking water, and also air within a workplace or in a residential area. Completely in line with the Minamata Convention overall objective, the development and legally adoption of national standards for Hg concentrations in consumption fish and other foods, as well as in human samples (hair, urine, blood) are of eminent importance.

Output 1.3 Institutional reform that enables control and enforcement of laws in ASGM areas

On short-term the GOS has to strengthen and capacitate one or more national institutes with responsibility for the ASGM sector (GMD, OGS, etc.) to the extent that they have permanent presences in the ASGM areas, resources and authority to act in the case of violation of regulations related to mercury use. The aim should be that at least 10 field stations for ASGM field officers should be established in Suriname ASGM areas.

Output 1.4 Enhanced level of awareness of the Minamata Convention among policy makers and government staff

High level staff as well as field workers of national institutes (GMD, OGS, Min. NH) with responsibility for the ASGM sector should have advanced knowledge about the Minamata Convention, and are aware of their related tasks and responsibilities. This awareness should be reflected in the related activities and actions towards reduction of mercury within ASGM.

Outcome 2: 30% reduction of Hg output from ASGM operations by 2034

- Whole ore amalgamation is reduced to 30% of all ASGM activities
- Elimination of cyanidation of mercury contaminated tailings
- Retort use has increased to 80% of all ASGM activities

Output 2.1 Elimination of Whole Ore Amalgamation

To enable the reduction of mercury with more than 30%, the worst practice within ASGM, WOA should be greatly reduced and eventually eliminated. For monitoring purposes, a sound scientifically based baseline should be established. This baseline should determine the number and proportion of ASGM operations that use WOA/WOAR. Afterwards every 5 years field surveys should be carried out to determine the progress in WOA/WOAR reduction. The current baseline is estimated at annually 78T Hg (scenario 2, high baseline).

Output 2.2 Elimination of cyanidation of mercury contaminated tailings

Cyanidation of mercury-contaminated tailings ASGM operations in Suriname should be securely enforced and closely monitored by field surveys. Institutes responsible for ASGM operations should be equipped to monitor as well as enforce regulations.

Output 2.3 Retort use increased to 60%

The use of retorts should be promoted and incentivized to increase its use. Worldwide the use of retorts has proven to be effective in reducing mercury release into the atmosphere. Retorts should be locally manufactured and customized to specific needs and easily available.

Outcome 3: Program of recognizing and dealing with adverse health impact is in place

- Awareness among health policy makers and health practitioners of Hg-related health impacts
- Awareness among all vulnerable populations of Hg-related health impacts
- Stable or reduced Hg values in vulnerable people
- Human biomonitoring program active
- Gold shops have taken adequate measures to reduce Hg levels in air to acceptable levels
- Meaningful participation of Indigenous Peoples and Maroons in management and control of Hg use in their customary territories

Output 3.1 Awareness among health policy makers and health practitioners of Hg-related health impacts

Regular monitoring of mercury exposure and possible adverse health effects among vulnerable populations takes place and physical health impacts of mercury intoxication are not detected. Health policy makers and practitioners should have a good understanding of the health risks related to mercury, the possible symptoms of mercury intoxication, and are informed about prevention and treatment.

Output 3.2 Awareness among all vulnerable populations of Hg-related health impacts

Vulnerable populations, including those with occupational exposure to Hg, should be aware of the health impacts of mercury, possible symptoms of mercury intoxication, prevention measures and treatment options. The awareness should also be reflected in the willingness to participate in research regarding occupational hazards and health impact studies.

Output 3.3 Stable or reduced Hg values in vulnerable people

The exposure to Hg and measured values of Hg intoxication in vulnerable groups (Indigenous Peoples, Maroons, pregnant women, children, gold miners) should be reduced to an acceptable level or have remained stable. The measurable indicators are Hg levels in hair, blood, urine; Hg levels in fish and soils; Minamata disease symptoms in children. Furthermore, institutes should be equipped with both resources, professional capacity and lab capacity available.

Output 3.4 Human biomonitoring program active

Through a biomonitoring program the Suriname Ministry of Health will feature to detect, monitor and respond to health impacts of mercury. Preconditions for the realization of this program are availability of health experts, willingness of targeted populations to participate in the research and the ISO 15189 accreditation of the Central Laboratory should be guaranteed.

Output 3.5 Gold shops have taken adequate measures to reduce Hg levels in air to acceptable levels

Gold buying houses in Suriname will be obliged to install a high-quality filter system to reduce Hg levels in and around gold shops to acceptable levels. Enforcement as well as monitoring will be executed by relevant trained professionals of responsible institutes. During monitoring, measurements of vapors in working areas, and Human Biomonitoring (HBM) of staff should not surpass national and international safety standards. The use of internationally accredited mercury vapor monitor or analyzer is a precondition for successful monitoring of gold shops.

Output 3.6 Meaningful participation of Indigenous Peoples and Maroons in management and control of Hg use in their customary territories

Indigenous Peoples and Maroons report that they participate actively in management and monitoring of mercury use within their living areas. Indigenous Peoples and Maroons should have authority to set conditions on ASGM operations operating within a 10 km radius of their communities.

Outcome 4: Awareness and education

- Regularly articles are published linking Minamata implementation to everyday live
- Annual awareness activities focused on policy makers and health workers
- Government institutes develop annual awareness programs and activities in line with Minamata objectives

Output 4.1 Regularly articles are published linking Minamata implementation to everyday live

The 3 previous outcomes to some degree have awareness activities, thus there are specific awareness activities which enhance the implementation of the NAP. In this paragraph these identified actions are highlighted. Publishing articles regarding Minamata implementation increases awareness among general public. These articles can also be used to share information about specific topics.

Output 4.2 Annual awareness activities focused on policy makers and health workers

The Minamata technical focal point, the Min. NH, plays an important role and should be responsible for annual public activities focused on policy makers and health workers, NAP implementation and related activities that are the responsibility of different stakeholders.

Output 4.3 Government institutes develop annual awareness programs and activities in line with Minamata objectives

Each year, the Suriname government or its partners develop/organize awareness activities in line with the Minamata Convention/NAP objectives, i.e., a seminar, a radio/TV infomercial and by other means. These programs should be complementary to donor awareness programs. Government institutes should allocate sufficient budget for these activities.

5.2 ACTIVITIES, BUDGET AND TIMELINES (SEE SEPARATE LOG FRAME)

Data of activities and budgets is limited to information regarding donor funding. Government budget is unknown and information regarding especially funding for health-related projects is incomplete. This information should be updated with information from relevant Ministries or institutes.

6. MONITORING AND EVALUATION

Successful implementation of the NAP requires careful monitoring, evaluation an engagement with key stakeholders throughout the process. Monitoring and evaluation allows for measuring progress towards the goals and objectives. It also enables timely adjustments if earlier assumptions appear to be invalid, or if socioeconomic, political, legal or environmental conditions change. Monitoring and evaluation indicators are presented in the log frame (Chapter 5). Engagement with key stakeholders enables ownership towards the process of implementation of the NAP and timely adaptation of activities.

6.1 BASELINE INFORMATION

Of utmost importance to execution and success of this NAP is the collection of reliable and timely baseline information. Present mercury reduction targets were based on OGS estimates about the relative frequency of specific ASGM methods. These estimates could not be validated. There are consultancy reports on the use of retorts and mercury awareness among ASGM miners, for example, but these studies are typically several years old, and it is unclear whether they still reflect the actual situation in ASGM areas. A recent (2021) mixed-method survey extrapolated that approximately 20,000 persons work in the Suriname ASGM sector. For the NAP targets, it is important to know how many of these people use WOA; what proportion uses retorts; what proportion of the various subgroups are aware of, or concerned about, mercury intoxication; and how many persons experience or have experienced mercury related health impacts. Without verified baseline figures, it is a challenge to monitor whether Suriname is progressing from year to year.

The implementation plan projects the collection of baseline data in the first year after national endorsement of the NAP. At minimum, baseline data should include the following indicators:

Baseline indicator	Differentiated by:
Proportion of ASGM operations using WOA, and reasons to do so.	- Mining method (sluicing, ground sluicing, milling). - Nationality and gender of the mine owner. - Operation size (# people working, # of equipment).
Proportion of ASGM operations possessing and/or using a retort, and reasons to do so.	
Information about tailings management and mercury recovery.	
Average annual amount of mercury used per ASGM operation.	
Proportion of different vulnerable groups (pregnant women and their newborns, ASGM miners, workers in gold shops, Southern Indigenous Peoples, Inhabitants of Maroon communities) who express knowledge and awareness about health impacts of mercury, including means of exposure, symptoms of mercury intoxication, protection mechanisms, measurement and treatment options, and risk perceptions.	- Ethnic and occupational background. - Demographic markers such as age, gender, nationality, educational achievement. - Levels of knowledge and awareness.
Adequacy of the Suriname legal and institutional framework to address trade in, use of, and impacts of mercury.	

Once these baseline data have been collected, it is likely that the NAP targets and indicators listed in the implementation plan must be adjusted to reflect the actual situation in the Suriname interior.

6.2 MONITORING AND EVALUATION MECHANISM

As the national Minamata focal point, NIMOS is the most suitable agency to oversee monitoring and evaluation of the NAP. In order for NAP implementation and evaluation to succeed, NIMOS must receive up-to-date data from different government agencies. Foremost it is essential that OGS and GMD regularly collect field data. These institutions should report to the Ministry of NH, which in turn feeds information about the indicators to NIMOS. Along the same lines, the Ministry of Health should receive health monitoring data for reporting to NIMOS. In addition, other relevant Ministries must train, capacitate and fund people from their research and development departments to collect Minamata related data. During stakeholder consultations the role of the Ministry of Agriculture, Husbandry and Fisheries was highlighted in terms of its role to monitor agriculture as well as enforce the fisheries act in the interior. It is NIMOS' task to receive and compile the different ministerial reports, in order to compile annual or bi-annual multi-sectorial reports that allow for tracking progress towards receiving the NAP goals and objectives. This information is to be disseminated to the National Government, civil society, and the Minamata Convention Secretariat. This structure is depicted in Figure 11.

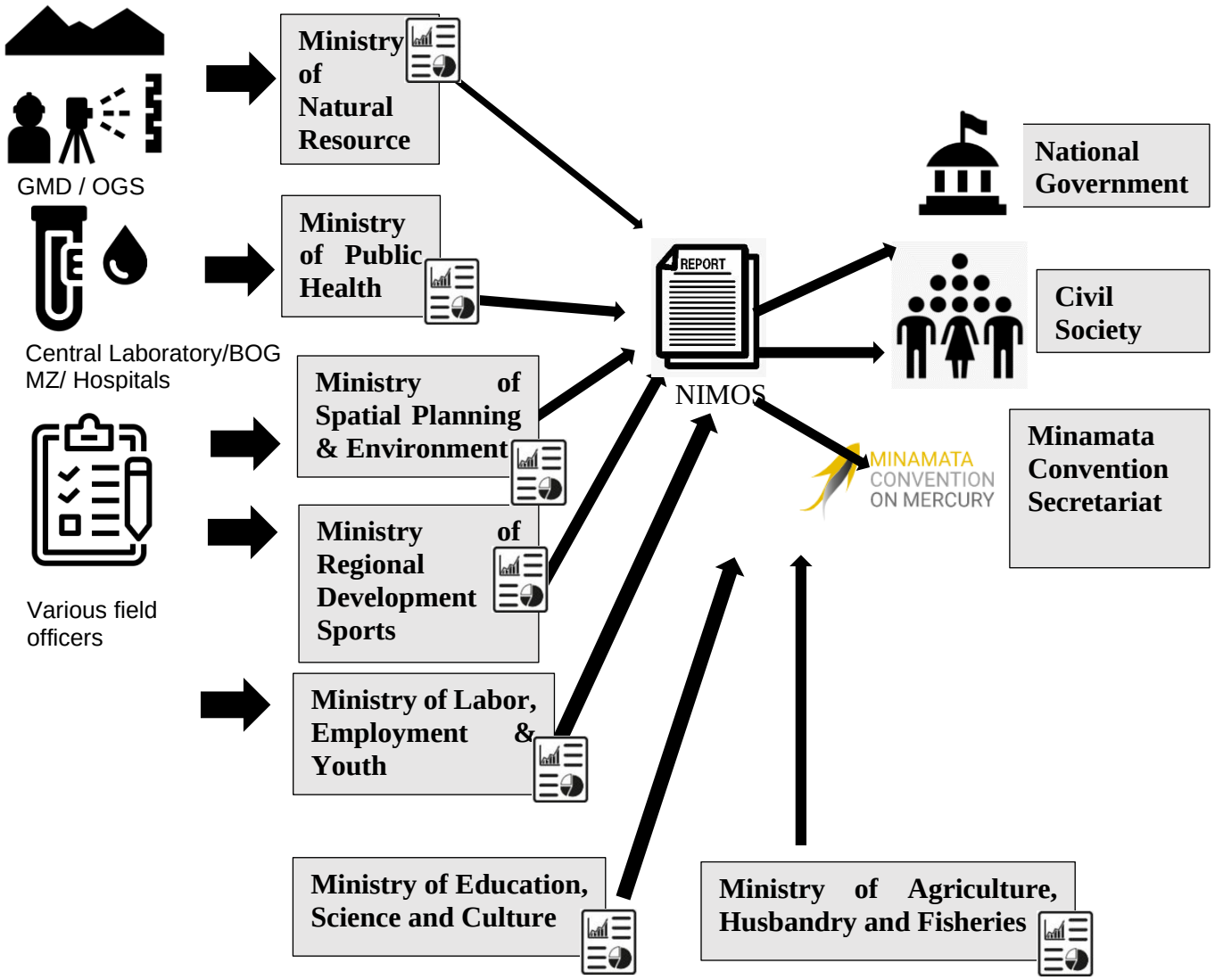

Figure 11 Suggested monitoring and evaluation structure within the Suriname government

At present, the Government of Suriname lacks structures that are able to perform consistent, high-quality monitoring and evaluation of the NAP. Neither NIMOS nor the other key government Ministries and departments (OGS, GMD, Ministry of NH, Ministry of ROM) for implementation of the Minamata Convention, have consistent presence in the mining areas, especially ASGM. Moreover, studies about the ASGM sector that have been performed to date, are typically funded by external donor organizations and executed by consultants. This situation is not sustainable. Donor-driven information gathering also means that the information may or may not include the type of information that is needed for monitoring of the NAP. While using donor funding and external expertise to collect information about the ASGM sector can contribute to national knowledge building, the heavy dependency on external resources and capacity is worrisome.

One way to enhance sustainability of monitoring and evaluation, and in fact of implementation of the NAP, is to legally arrange that a share of gold mining incomes is used to regulate and control the ASGM sector. Currently state incomes from gold mining related taxes and royalties are channeled to the central government budget, from which all government expenses are paid. In practice, this means that the funding for agencies responsible for monitoring the ASGM sector, such as OGS and GMD, have insufficient funds and technical staff to perform field missions. With a fixed share of mining incomes dedicated to sector regulation, including implementation and evaluation of the NAP, and an annual budget line dedicated to the NAP, reduction of mercury in the ASGM sector is relatively more likely to be achieved.

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ANNEX 1. LIST OF CONSULTED STAKEHOLDERS

Name	Organization	Date consulted
H. E. Chandrikapersad Santokhi	President of the Republic of Suriname	June 21st, 2023
Council of Ministers		June 21st, 2023
Mr. Drs. David Abiamofo	Minister of Natural Resources	June 27th, 2023
Mrs. P. Simons MSc.	Director Mining, Ministry of Natural Resources	June 27th, 2023
Mrs. A. Monorath MSc.	Deputy Director Mining, Ministry of Natural Resources	June 27th, 2023
Mr. Cedric Nelom	Acting Director NIMOS	June 27th, 2023
Mr. Herman Jinti	Director Medical Mission	June 27th, 2023
Mr. Fauz Sawirjo	Acting head of the Central Lab of the Bureau for Public Health (BOG)	June 27th, 2023
Mrs. Meredith Cumberbatch	Legal expert from the Ministry of Spatial Planning and Environment	June 27th, 2023
Mr. Drs. Rakesh Gajadar Sukul	Acting Permanent Secretary Ministry of Public Health	September 20th, 2023
Local authority and community members of Brownsweg	All relevant stakeholders from Brownsweg and surroundings	September 8th, 2023
Local authority and community members of Nieuw Jacob Kondre, Balen, Missolibe, and Belowatra	All relevant stakeholders from Nieuw Jacob Kondre and surroundings	September 11th, 2023
Mrs. Lindsey Sanné	GMD, Geological and Mining Service of Suriname (Interim Director)	July 22nd, 2021
Mrs. Radhima Bisai	GMD, Geological and Mining Service of Suriname (Geologist)	
Mr. Ko-Thie Chung	GMD, Geological and Mining Service of Suriname (Geologist)	
Mr. Vikaash Soerdjbalisingh	GMD, Geological and Mining Service of Suriname (Geologist)	
Mrs. Aroena Lalta	Grassalco N.V., State Mining Company of Suriname (HSE Specialist)	July 22nd, 2021
Mr. Benito Bonte	Grassalco N.V., State Mining Company of Suriname (GIS Coordinator)	

Mrs. Zylenna Darson	Grassalco N.V., State Mining Company of Suriname (Operations Manager)	
Mr. Balansi Wilson	OGS, Commission for Organizing the Gold Sector in Suriname (General Manager)	July 22nd, 2021
Mr. Caffe	OGS, Commission for Organizing the Gold Sector in Suriname (Operations Manager)	
Mr. Rozenhout	OGS, Commission for Organizing the Gold Sector in Suriname (Logistics Manager)	
Mrs. Farzia Hausil	WWF Guianas (Senior Legal Officer)	August 19th, 2021
Mr. Ramon Finki	Anton de Kom University (lecturer)	September 2nd, 2021
Mr. Rene Artist	Anton de Kom University (Coordinator Mining Department)	
Mr. Bryan Drakenstein	UNDP (Programme Specialist Environment Suriname)	August 17th, 2021
Mrs. Anuradha Khoenkhoen	UNDP (Programme Assistant Environment Suriname)	
Mr. Steve Badloe	Stichting Mijnbouw Rechthouders Suriname (chair)	October 7th, 2021
Mr. Steve Lemmob	Stichting Mijnbouw Rechthouders Suriname	
Mr. Ted Jbara	Stichting Mijnbouw Rechthouders Suriname	

ANNEX 2. ASGM TECHNIQUES USED IN SURINAME

Panning (*draai baté*) is used for prospecting, but also occasionally as the primary means of gold concentration. As a primary income source, panners seek out rich tailings and creeks. Panners are usually local area inhabitants. In addition, school children who live in communities near mining areas may pan after school or in weekends and school holidays to earn a little pocket money. In addition, panning may be used by opportunistic miners who enter the working location of mechanized mining operations, or wash the tailings. For example, in Companiekreek, panners hang around the tunnels of Brazilian mining crews, to scoop up ore that falls out of the buckets that are hauled up from below. The ore is collected in bags and taken to a nearby water source to wash.

Individuals working with a metal detector (*pew-pew*) are in Brazilian Portuguese referred to as *pewpewzeiros*. They typically work alone but may also operate in groups. Metal detector operators often target either the tailings or stockpiles of other operations, which sometimes causes conflict with mine operators. The operational expense of a metal detector operator is limited to the metal detector itself, which costs approx. USD 1300.

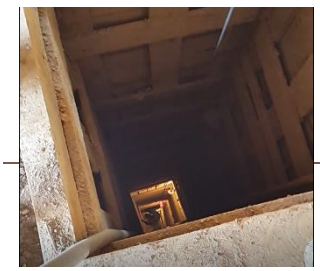
Ground sluicing (sumajé) is a low capital-intensive form of mechanized hydraulic mining, which makes use of a small pump (1 to 3 cylinder). In this system, miners typically work in teams of two, sometimes or occasionally alone. Observations suggest that this system is mostly used by local area inhabitants and hardly by migrant miners or miners from Paramaribo.

	Investment expenses are approximately USD 2000, including 50-100 liter diesel to start.

Sluicing (*spoiti-soigi*) without excavator used to be the method of choice about 20 years ago. Hydraulic power (water under high pressure) is used to remove the overburden and mine the ore, which is sucked up from the pit and led over a sluice box. Mining teams typically consist of four to six persons. Initial investment expenses are approximately USD 25,000 to 35,000.

Sluicing with excavator is, along with milling, the most commonly used ASGM method in Suriname. The excavator is used to remove overburden and heap up gold baring material for processing. Hydraulic power (water under high pressure) is used to further loosen up the ore, which is sucked up from the pit and led over a sluice box.
Mining teams typically consist of 5-6 persons, including the excavator operator. Investment expenses are about USD 150,000, with a secondhand excavator.

Hydraulic mining with screen (*isri daal*); In a few locations, ASGM teams use a large vertical screen panel (e.g., Grizzly screen), fabricated of steel or wood, to sieve the ore. In locations with a lot of pebbles and stones this system is used to separate the larger rocks (which stay behind) from the finer material (which is washed). Also, people who mining river beddings often use a screen to separate the gravel (waste) from the small particles. Teams working with a mining screen typically use two excavators. One excavator is used to mine, while the other excavator places the ore on top of the sieve and cleans up below (the larger pieces).



Tunneling or the use of shafts is not very common for Suriname ASGM miners, but in some locations, it is practiced, including Companiekreek. Local Suriname gold miners usually do not work underground, but

	migrant Brazilian mining teams have been observed constructing well maintained tunnels. The expenses of building a tunnel depend on where the person is, and whether wood can be obtained from the forest or must be bought. With purchased wood, the expenses of building a tunnel are at minimum USD 10,000.

Virtually all crushing occurs mechanically, using a hammer mill (SUR: *kroesher*). The crushed ore goes to an amalgamation box, where mercury is added. Heavy material (e.g. Mercury and gold) remain in the box while lighter material flows over, onto sluices for further concentration of gold. Many crusher users place a copper plate after the amalgamation box or between sluices. The copper plate is rubbed in with mercury so that the gold particles –flattened by the hammer mill, easily stick to it. One milling system is usually operated by approx. three miners. Investment expenses are ~ USD 40,000 per set.

Manual crushing is uncommon in Suriname. Miners may apply this method when, for example, the mining multinational IAMGold do blasting of hard rock with explosives. Gold miners will enter the blast site to get a couple of large rocks, which

are taken away and subsequently grinded manually using an iron pot and an iron rod as a mortar-and pestle.

In several Suriname rivers, ASGM miners operate rafts with divers (*ponton*). Divers, who receive air through a narrow hose, take the suction hose and move it across the river bottom. They may stay under water for about 4 hours at a time. As with the regular hydraulic mining on land, a pump sends the slurry to a sluice, which is mounted on the raft. These simple mining rafts may be operated by two to four persons. The investment cost is about USD 100,000.

Both on the hydropower lake, and in different rivers, ASGM miners operate mechanized mining rafts (*skalian*). The suction hose is mechanically operated from the dredge and does not need divers. The dredges typically contain all

necessities for the miners, including sleeping huts and a kitchen. Mechanized dredges are operated by three

	to four persons. Investment expenses are 0.5-1 Mln USD.
 *Image: G. Griffith. 2021*	Particularly Chinese ASGM teams in Suriname are known to be involved in heap leaching. They use chemicals that are claimed not to be cyanide (by the manufacturer) and "environmentally friendly", though lab analysis shows that they are in fact composed primarily of cyanide. The teams involved in heap leaching often buy the tailings of other ASGM teams in the same area.

ANNEX 3. ADDITIONAL INFORMATION ABOUT MERCURY USE IN SURINAME ASGM, PARTLY BASED ON THE NATIONAL INVENTORY OF MERCURY RELEASES IN SURINAME – 2019

The National Mercury Inventory lists different mining techniques used in the Suriname ASGM sector, based on registration data from the Commission for Regulation of the Gold sector (*Ordening Goudsector* – OGS) (Table 10). It is important to note that these mining techniques are typically not selected on basis of a systematic and well-defined exploration/exploitation program. This practice negatively affects the sustainability of ASGM activities.

Table 10. Number of operations using different mining techniques registered by the OGS

Equipment/ techniques	**number**
Sluicing (SUR: spoiti-soigo; POR: chupadeira)	549
Hammer mills (SUR: kroesjer; POR: Moinho)	656
Sluicing with screen (SUR: Isri daal)	28
Ground sluicing (SUR: Sumaje; POR: Requira)	13
Automated raft (SUR: Skalian; POR: Balsa)	25
Not listed by OGS	
Tunneling (POR: Poço)	?
Panning (SUR: Baté; POR: Bateia)	?
Heap leaching	?
Non-automated raft with divers (SUR: Pondo)	?
Metal detector (SUR/POR: Pewpew)	?

A 2014 study in different ASGM areas found that less than 10 percent of surveyed gold miners consistently used a retort when burning amalgam (Heemskerk and Duijves, 2014). A principal reason for not using a retort is that it takes too long to burn the gold, which is considered a security risk. Another reason is that gold burned in a retort is hard to break and divide.

The average ore grade in the Guiana shield area is about 1.5 g Au/ton, though there are some exceptionally rich areas. Gold miners and mining service providers typically sell their gold to one of the legal gold buyers in Suriname, as described in Chapter 3 of the main report. Table 11 below shows the amount of gold mined in the ASGM sector that was exported from Suriname between 2015 and 2019. It is highly probably that a considerable share of this gold comes from French Guiana, Guyana, and possibly some other countries including Venezuela (Cheung, 2018; Hoever, 2018; Ebus, 2020[18]).

Table 11. Gold from ASGM producers, which is exported by gold exporters with a license from the Currency Committee

Year	Gold export in gram	Value
2015	14,302,651.30	499,983,568.03
2016	10,484,635.80	394,677,921.42
2017	14,529,352.30	546,113,209.51
2018	17,035,034.90	651,118,838.02
2019	15,175,910.48	637,779,927.18

Sources: Unpublished data from Currency Committee, dated August 17, 2020 and May 23, 2019

For the UNEP toolkit, gold extraction techniques are divided into 4 categories:

- Whole ore amalgamation without retort (WOA)
- Whole ore amalgamation with retort (WOAR)
- Concentrate amalgamation without retort (CA)
- Concentrate amalgamation with retort (CAR)

Based on data from the OGS, Suriname's national mercury inventory estimates what proportion of the gold extraction in each region falls under each one of the four UNEP categories. The results are presented in Table 12. The second column gives the number of areas that use one of the four categories. The next columns express the used category of gold extraction as a percentage of the total areas. Based on these data and the UNEP guidelines, the National Mercury Inventory estimated both the percentage of gold produced and amount of mercury released per method. Details of this exercise can be found in the National Mercury Inventory (2019). The estimated total annual amount of mercury released was estimated at 62,159 Kg/Hg/yr.

Table 12. Calculations of percentage of extraction category used in known ASGM areas

Extraction category	# areas	Percentage total (%)	Percentage known (%)	Annual gold production (Kg)	Est. annual mercury production (kg Hg/ y)

[18] https://mercurio.infoamazonia.org/

Whole ore amalgamation without retort	16,9	48	53	10.278	51.390
Whole ore amalgamation with retort	0,9	3	3	547	2.324,75
Concentrate amalgamation without retort	8,1	23	25	4.926	6.403,8
Concentrate amalgamation with retort	6,1	17	19	3.710	2.040,5
Unknown	3	9			
Total	**35**	**100**	**100**	**19.461**	**62.159**

Based on the calculations of mercury releases by mining method, the National Mercury Inventory (2019) calculated the amount of mercury releases to air, water and land per extraction category as follows: Mercury release to (air, water or land) = Est. yearly mercury production per extraction category x distribution factor (air, water or land). The results of these calculations are presented in Table 13.

The total releases to air, water and land from the four main extraction techniques mentioned in the level 2 toolkit are respectively: 16.226,64 kg Hg / year (air), 22.988,34 kg Hg/ year (water) and 22.903,99 kg Hg/ year (land).

Representatives from the Organization of Holders of Mining Rights (*Stichting Houders Mijnbouw Rechten* – SHMR) mentioned that there are miners who apply some degree of tailings control. For instance, one may place a device to collect excess mercury behind the sluice box. Such practices may reduce the release of Hg into the environment.

Table 13. Calculated mercury releases to air, water and land

Extraction Category	**Calculated mercury production (kg Hg/ y)**	**Distribution factor Air**	**Distribution factor Water**	**Distribution factor land**	**Calculated mercury releases air (kg/y)**	**Calculated mercury releases water (kg/y)**	**Calculated mercury releases land (kg/y)**
Whole ore amalgamation without retort	51.390	0,2	0,4	0,4	10.278	20.556	20.556

Whole ore amalgamation with retort	2.324,75	0,06	0,47	0,47	139,49	1.092,63	1.092,63
Concentrate amalgamation without retort	6.403,08	0,77	0,12	0,11	4.930,93	768,46	704,42
Concentrate amalgamation with retort	2.040,5	0,45	0,28	0,27	918,23	5.71,34	550,94

Source: National Mercury Inventory, 2019

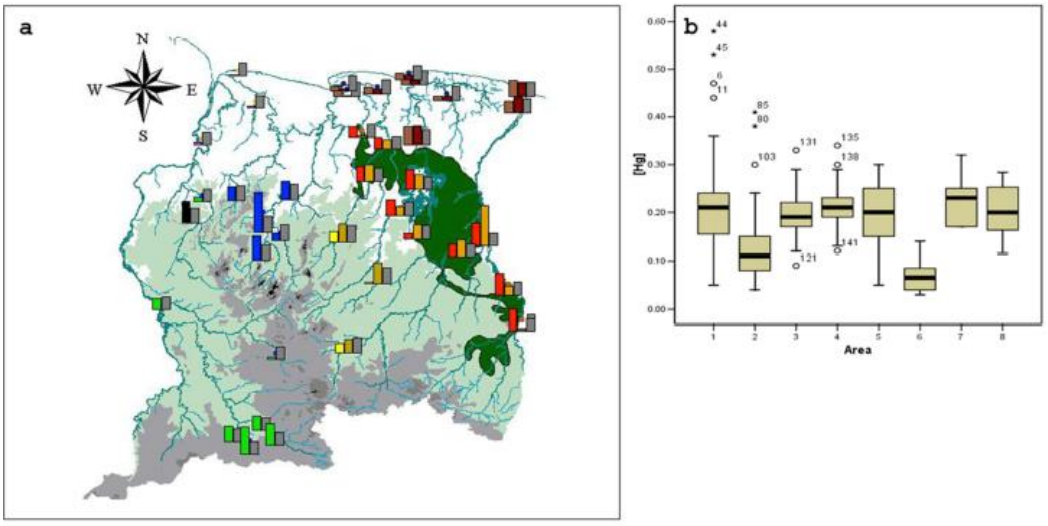
ANNEX 4. HEALTH EFFECTS OF MERCURY REPORTED IN SURINAME

1. Mercury Pollution research in Suriname

Research was done in Suriname of mercury pollution in air, water, river sediment, fish and human hair. Some of these studies are:

- Urban mercury pollution in the City of Paramaribo, Suriname (Wip, et al., 2011)
- Community-led Assessment of Risk from Exposure to Mercury by Native Amerindian Wayana in Southeast Suriname (Peplow & Augustine, 2011)
- Review of mercury pollution in Suriname (Ouboter, 2015)

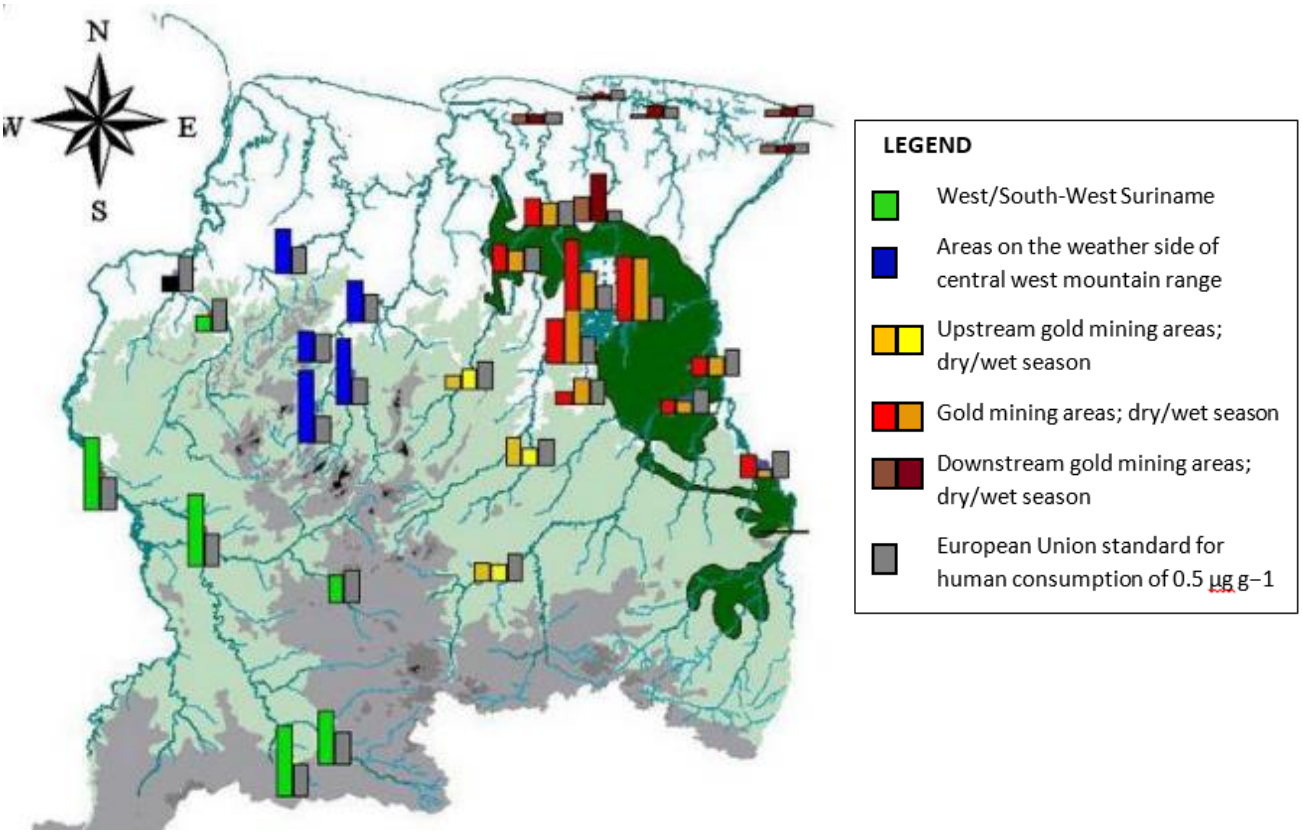
The general outcome of these studies is that there are elevated levels of mercury in air, water, river sediment, human hair and fish. The following figures from Ouboter's review article (see figure 12 and 13) show mercury levels in sediment and fish for whole Suriname.



a. Average mercury levels found in sediments in different river systems in Suriname; Color codes: orange: Gold mining area (GMA); yellow: Upstream gold mining area (UGMA), brown: Downstream gold mining area (DGMA), blue: areas on the weather side of central west mountain range (PWS); black: areas on the lee side
of central west mountain range, not draining the mountain range (PLS); green: West/South-west Suriname (WSW); pink: North West Suriname (NW).

b. Boxplot showing the distribution of mercury levels in sediment, measured in different areas. Codes for areas: 1= GMA; 2=DGMA; 3= UGMA; 4= Brokopondo Reservoir (BR); 5=WSW; 6=NW; 7=PLS; 8=PWS.

Figure 12. Average mercury levels found in sediments in different river systems in Suriname (Ouboter, 2015)



Source: Ouboter et al. 2012

Figure 13. Average mercury levels found by Ouboter et al. (2012) in piscivorous fishes in different river systems in Suriname; Gray bars represent the European Union standard for human consumption.

2. Bioaccumulation and human exposure

When elemental mercury is released in the environment it becomes subject to transformation in other forms such as methylmercury, which is easily absorbed by fish. It then accumulates in the food chain, where it can reach very high concentrations in predatory fish. Eventually methylmercury reaches humans who eat these predatory fish. Methylmercury is a very toxic form of mercury.

When methylmercury enters the human body, it will circulate in the blood and then accumulate in the body. It can be excreted slowly in hair, nails but also in mother milk. Levels of mercury in hair can be measured and provide an historic picture of exposure, whereas mercury levels in blood provide evidence of recent exposure.

Pregnant women and their new-borns are of specific concern. When the mother has been exposed to high levels of methylmercury, the development of the foetus can be harmed, because methylmercury in the blood of the mother will pass the placental barrier and reach the foetus.

People who work with mercury in ASGM are at risk of being exposed to elemental mercury, as liquid or as vapour. The main pathway is by inhaling mercury vapour. Elemental mercury is then circulating in the bloodstream and mainly excreted via urine.

3. Health effects of exposure to mercury

Toxic effects are always dependent on the amount of a substance present in the body. The higher the dose, the stronger the impact on health. International guidelines have been developed to set limits to acceptable amounts of mercury present in hair, blood and urine.

Human biomonitoring studies determine the levels of mercury in hair, blood or urine and give so valuable information about the extent to which an individual or a defined population is exposed to mercury, or sometimes specifically to methylmercury.

Since the 1990's studies have been carried out in Suriname in order to gather quantitative data about the extent of mercury present in the environment as well as in humans. In the early years of the present gold rush, De Kom et al. (1998) measured mercury content in blood and urine samples of Maroon gold miners and a control group of Maroon men. They found elevated mercury levels in the urine samples but not in the blood, suggesting exposure to an elemental or inorganic source of mercury through the inhalation of fumes[19]. Another study that was conducted around the same time found elevated levels of mercury contamination among both gold miners and community members from communities in the vicinity of gold mining areas (Pollack et al., 1998, cited in Ouboter, 2015).

Other studies mostly took place in possibly affected communities. In most Maroon communities that have been studied, researchers have found elevated mercury levels in hair samples[20]; above the EPA reference dose for hair mercury concentration of 1.0 µg/. Elevated mercury levels have been reported for the Matawai communities of Njoeng Jacobkondre and Poesoegroenoe[21] (Ouboter et al., 2007), the Matawai community of Kwakoegron (Peplow and Augustine, 2007; Hawkins et al., 2012), and the Indigenous community of Pikin Saron (Hawkins et al., 2012). As mentioned above, fish and sediments from the Brokopondo hydropower lake contain some of the highest mercury levels measured in Suriname. The researchers found that the average mercury levels in hair samples of inhabitants of Brownsweg, a Maroon community on the edge of the Brokopondo lake, were all close to 2.0 µg/g (Ouboter and Landburg, 2010)[22].

[19] While urine samples can be used to measure total mercury (organic plus inorganic), results of urine testing are a better indicator of inorganic mercury than organic (methyl)mercury. On the other hand, elevated mercury in blood usually indicates exposure to organic mercury (such as from eating fish containing methyl-mercury) or recent exposure to a high level of elemental mercury vapor. For most people, an elevated blood mercury level is associated with eating fish and other seafood containing organic mercury (New York State Department of Health, 2016). Since gold miners do not typically eat a lot of fish, it is understandable that their blood samples did not differ from those of the control group.

[20] Hair samples are particularly effective for measurement of longer-term average exposures. Mercury circulating into the body is incorporated into hair as it grows, and once there the concentration doesn't change. Concentrations in hair have been found to correlate well with concentrations in organs where mercury may accumulate, such as the brain and kidneys, particularly for methylmercury.

[21] Both along the Saramacca River, with the more upstream Poesoegroenoe displaying highest mercury values.

[22] Only 2 of 172 participants displayed Hg levels in hair above 10 µg/g.

This finding was explained by the limited reliance of villagers from the Brownsweg area on the lake for protein intake.

A 2017 study among pregnant women from the Moengo – Albina region, East Suriname, found that the majority of the participants had mercury levels in blood and urine below the reference level (HBM[23] I), respectively 73.7% and 94.7 % (Quik, 2017). For hair the majority of the participants (60.5 %) had mercury levels between reference (HBM-I of 1 µg/g) and action level (HBM-II of 5 µg/g); two participants (2.6 %) had a mercury level above HBM-II. No adverse birth outcomes, stillbirth, preterm deliveries or small for gestational age (SGA), were reported. Neither were there any defects reported in the newborns. The study recommends follow up of the women with high mercury levels in the hair because of their greater risk for adverse health effects and for adverse birth health outcomes.

From studies done in collaboration with Medical Mission Primary Health Care (Scheepers P. and Jubitana B., 2017; Ottenbros, Boerleider et al., 2018) it was concluded that the implementation of a health education programme within an existing local healthcare structure proved effective and levels of knowledge and awareness about possible exposure routes of mercury and negative health effects improved. Most improved was the knowledge on health effects attributable to mercury, more specifically reproductive health effects.

These studies also showed that there is an interest in mercury free gold mining. Before this will be realized, gold miners and villagers can themselves reduce their health risk by taking measures in their own daily lives. Recommendations for that must be based on objective and reliable information, which should be made available to everyone. Also, it was concluded that the feasibility of a biomonitoring program appears to be good.

Recent studies with a clear public health perspective investigated pregnant women in both the coastal area of Suriname and the interior. Some of the findings about exposure and health effects are:

- Methylmercury makes up most of the total mercury measured in hair and blood with median percentages of 97.2% and 85.5% respectively.

- Pregnant women from interior communities have significantly higher concentrations of both total and methylmercury in hair (median total mercury in hair 3.64 µg/g) compared to pregnant women from two urban coastal cities, Paramaribo (0.63 µg/g) and Nickerie (0.74 µg/g).

[23] HBM stands for Human Biomonitoring. The HBM Commission defines two levels: HBM-I and HBM-II. The HBM-I-value represents the concentration of a substance in human biological material below which there is no risk for adverse health effects and, consequently, no need for action. At a concentration level higher than the HBM-I- and lower than the HBM-II-value the result should be verified by further measurements. If these measurements confirm the initial result a search for potential sources of exposure should be undertaken. The HBM-II-value represents the concentration of a substance in a human biological material above there is an increased risk for adverse health effects and, consequently, an acute need for exposure reduction measures and the provision of biomedical advice. The HBM-II-value should thus be regarded as an intervention or action level.

- Total and methylmercury concentrations in blood are also significantly higher in pregnant women from interior sites compared to women from Paramaribo and Nickerie.

- For the pregnant women in the interior, these are above health action levels for total mercury in hair established by the USEPA and the WHO of 1.1 µg/g.

- Most women in the interior regions rely heavily on local fish as part of their regular diet, and many live outsides of areas with active ASGM operations. This study demonstrates that diet and fish consumption largely govern mercury exposures in pregnant women in Suriname.

- Neurodevelopmental assessments of children born to these mothers are underway to examine possible effect (Wickliffe, submitted 2021).

- Prevalence of elevated mercury levels, high perceived stress, and probable depression were 37.5%, 27.2%, and 22.4%, respectively.

- Mercury exposure was significantly associated with preterm birth in the overall study cohort and perceived stress (Gokoel et al., 2020).

- Indigenous participants had higher rates of Adverse-Birth-Outcome (ABO) (29.8% vs. 19.8%) and preterm birth (PTB) (21.2% vs. 12.4%), higher Hg levels, delivered at a younger age, were less educated, and had lower household income compared to Tribal participants.

- These results highlight the importance of effective risk reduction measures in support of Indigenous mothers, families, and communities (Baldewsingh et al., 2021).

ANNEX 5 SUMMARY OF INITIATIVES OR PROJECTS IN SURINAME

Project name	Funded by	Objective	Expected results/Outcomes	Duration
Improving Environmental Management in the Mining Sector of Suriname, with Emphasis on Artisanal and Small-Scale Gold Mining (EMSAGS)	GEF, UNDP, GOS, IAMGOLD, NEWMONT, GRASSALCO, SEMIF, NIMOS	To improve the management of artisanal and small-scale gold mining in Suriname (ASGM) and promote uptake of environmentally responsible mining technologies in order to reduce the negative effects on biodiversity, forests, water, and local communities, while also reducing greenhouse gas emissions.	1. Institutional capacity, inter-institutional coordination and availability of funding increased for improved management of ASGM 2. Policy and planning framework for the management of the environmental impacts of ASGM strengthened 3. Uptake of environmentally responsible artisanal and small-scale gold mining practices increased 4. Knowledge availability and sharing increased at the national and regional scale on environmentally responsible ASGM	2018 - 2025
Support Mercury phase out in the Artisanal and Small-scale Gold Mining Sector, Suriname and Guyana	FFEM, WWF Guianas, ARM, IRD, UNDP	To reduce mercury contamination in the Guianas by phasing out mercury use in the gold mining sector and contributing to reduce mercury emissions from mining deforestation by 2025	1. Reinforcement and regional coordination, of national policies targeting the gold sector, in line with the Minamata Convention" 2. Development of a socially acceptable, technically and economically viable mercury-free gold extraction model" 3. Creation of a Mercury Regional Observatory, compiling and updating key mercury data, to inform decision-making"	
Global Opportunities for Long-term Development of ASGM Sector Plus		To reduce the use of mercury and increase incomes in the ASGM sector in the participating	1. A higher degree of formalization in the sector through multisectoral, integrated	2021 - 2025

- GEF GOLD+ in Suriname		countries through a holistic, multisectoral integrated formalization approach, and increasing access to finance, leading to adoption of sustainable mercury free technologies and access to traceable gold supply chains.	approaches and capacity building of formalization actors. 2. Improved income for ASGM miners through the attainment of better gold prices facilitated by transparent and responsible supply chains 3. Reduced mercury use in ASGM enabled by the increased uptake of mercury-free technologies by miners 4. Knowledge sharing and communication strategies aimed at all ASGM stakeholders to support and increase formalization and mercury reduction developed	
Newmont's collaboration with Solidaridad (new initiative not yet implemented)	Newmont	To enhance, promote sustainable alternative mining techniques among miners from the Paramacca community	To be determined	TBD
Reducing the Use and Release of Mercury by Artisanal Gold	United States Department of States	To improve our understanding of the Surinamese ASGM sector, and	1. a comprehensive introduction to the ASGM sector a comprehensive	2015-2016

Miners in Latin America (2015-2016) by Artisanal Gold Counsil (Canadian based organization)		to begin to develop potential collaborative models and approaches towards mercury reduction in the country's widespread alluvial ASGM operations	introduction to the ASGM sector 2. assessment of the potential for mercury reduction through technical interventions, and assessment of the willingness from various stakeholders including miners, government, NGOs and private industry to identify and develop alternatives to mercury use in ASGM	