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REPORT

Saramacca Canal System Rehabilitation Project Phase 1

Updated Environmental Social Impact Assessment and Management Plan- Final

Client:	Ministry of Public Works
Reference:	BH4546-RHD-ZZ-XX-RP-Z-0007
Status:	S5/P03
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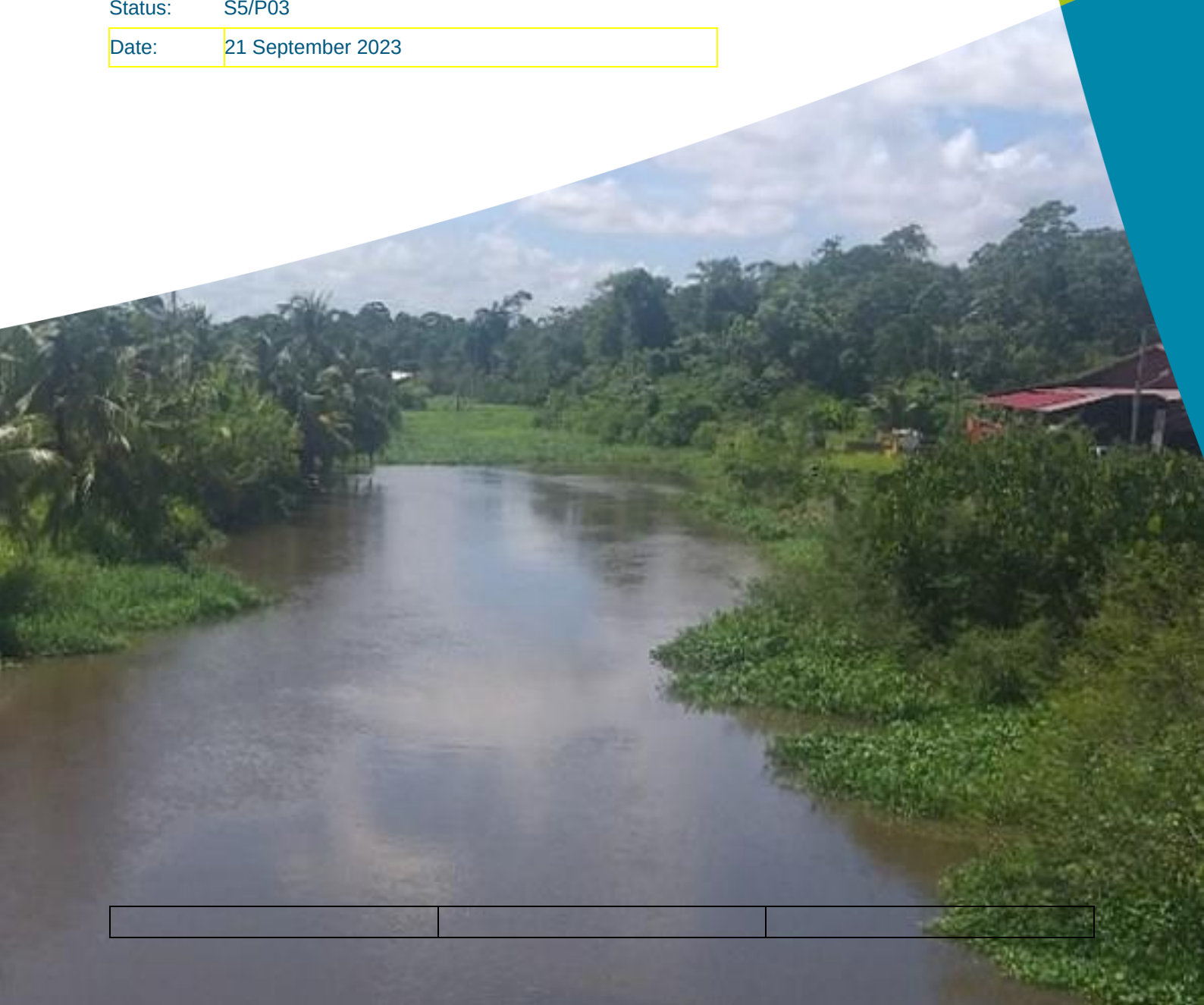

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S5-P03	12-4-23	Final version after review SCU and WB	Marieke Heemskerk/ Shareen Koenjbiharie	Ravindra Patandin	Eric Brasser
S5-P03	07-09-23	Final Version updated after review NIMOS for EIA process as per EFA	Marieke Heemskerk/ Shareen Koenjbiharie	Ravindra Patandin	Eric Brasser

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Glossary of Terms

Term	Definition
Community	Usually defined as a group of individuals broader than the household, who identify themselves as a common unit due to recognised social, religious, economic or traditional government ties, often through a shared locality.
dBA	Decibel using the A-weighted setting
Grievance	An issue, concern, problem, claim (perceived or actual) or complaint that an individual or group wants the project to address and resolve.
Grievance Redress Mechanism	This is a process by which project beneficiaries or Project Affected Persons can raise their concerns and grievances to project authorities.
LA(eq)	Continuous Sound Pressure Level, or LAeq, is the constant noise level that could result in the same total sound energy being produced over a given period.
Livelihood	The term 'livelihood' refers to the full range of means that individuals, families, and communities utilise to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.
Project Affected Persons	A person who has been affected due to loss of land, house, other immovable assets, livelihood or a combination of these due to project activities
Resort	Sub-section of a district, resembling a neighbourhood or municipality. Suriname's 10 districts are divided in 63 resorts.
Safeguard	A measure taken to protect someone or something or to prevent something undesirable. In the WB context, they are WB policies designed to prevent and mitigate undue harm to people and their environment in the development process
Stakeholders	All individuals, groups, organisations, and institutions interested in and potentially affected by a project or having the ability to influence a project.
Vulnerable People	Distinct groups of people who might suffer disproportionately from project impacts such as people below the poverty line, the landless, the elderly or disabled, women and children, indigenous peoples, and ethnic minorities.

Acronyms

CESMP	Construction Environmental and Social Management Plan
CFP	Chance Finds Procedure
DO	Dissolved Oxygen
E&S	Environmental and Social
EC	Electrical Conductivity
EFA	Environmental Framework Act (2020), Suriname
EHS	Environmental, Health and Safety
ERP	Emergency Response Plan
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender Based Violence
GoS	Government of Suriname
GRM	Grievance Redress Mechanism
H&S	Health and Safety
HR	Human Resource
ITCZ	Inter Tropical Convergence Zone
JSA	Job Safety Analysis
MI-GLIS	Management Institute for Land Registration and Land Information System
NE	North East
NIMOS	National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu en Ontwikkeling Suriname)
NMA	National Environmental Authority (Nationale Milieu Autoriteit)
OP	Operational Policy (World Bank)
PAP	Project Affected Person
PCR	Physical Cultural Resource
PPE	Personal Protective Equipment
PW	Ministry of Public Works (official name after July 2020)
PWTC	Ministry of Public Works, Transportation and Communication (until July 2020) (Openbare Werken, Transport en Communicatie)
RPF	Resettlement Policy Framework
SCU	Saramacca Canal Unit (within PW)
SE	South East
SECP	Stakeholder Engagement and Communication Plan
TPH	Total Petroleum Hydrocarbon
WB	World Bank

Executive Summary

The Project: This document presents the Environmental and Social Impact Assessment (ESIA) and the Environmental and Social Management Plan (ESMP) for selected works under the "Saramacca Canal System Rehabilitation Project" (hereafter: the Project); a World Bank (WB) assistance program to the Government of Suriname (GoS). This Project will finance structural and non-structural measures to improve resilience against flooding in the Greater Paramaribo area. Structural measures will improve the discharging capacity of the Saramacca Canal through two main activities: (a) rehabilitation of the sluices and locks and (b) increase in conveyance through re-profiling and clearing, and possible selected interventions on the secondary and tertiary canals. The non-structural measures will strengthen the capacity of the GoS to manage and operate the Saramacca Canal System. The structural measures under the Project are divided into two separate parts, respectively, (1) urgent (or so called **no-regret**) rehabilitation works and (2) other improvement measures.

This version of the document (ESIA +ESMP) covers the scope of the urgent / no-regret measures, which include:

- Canal Maintenance Works,
- Rehabilitation of the Doorsteek Sluice and Ship Lock,
- Rehabilitation of the Uitkijk Ship Lock.

The **WB Environmental and Social Safeguards** demonstrate the WB's commitment to sustainable development, through a set of the Environmental and Social Standards (ESS) and earlier Operational Policies (OP) that are designed to support Borrowers' projects with the aim of ending extreme poverty and promoting shared prosperity. These are a mechanism for addressing environmental and social issues in project design, implementation and operation. This Project started before October 2018, but the OPs still apply formally. However, the ESSs have also been taken into account in this study.

This document (ESIA+ESMP) was developed in accordance with the Milieu Raamwet S.B. 2020, no 97, (Suriname Environmental Framework Act 2020), WB OP 4.01 and the WB/PW approved Preliminary ESIA/ESMP (2018). In addition, the generic Environmental Assessment Guidelines of the National Institute for Environment and Development in Suriname (NIMOS, 2009) and the various project documents including the Basis of Design (2022), Preliminary Design Report (2022), the Survey Report (2022), the Stakeholder Engagement and Communication Plan (2021), and the Resettlement Policy Framework (RPF) have been considered. This document outlines the identified impacts, as well as mitigation and enhancement measures to eliminate or reduce negative impacts, and maximize positive project benefits during the preparatory, construction, operation and decommissioning phases. Measures during the preparatory phase focus on stakeholder engagement and communication activities, the contracting requirements and the development of plans, such as waste reuse and disposal. Actions during the construction phase include measures to enhance local labour opportunities and conditions; optimize health and safety; prevent or minimize pollution (air, noise, water and soil); and avoid or minimize negative livelihood and displacement impacts. The operations will overall improve the drainage of the surrounding area and thus enhance the living conditions in the low-income neighbourhoods. Primary responsibility for most measures is with the selected contractor(s) and the Ministry of Public Works (PW, previously PWTC). A description of reporting requirements for the Saramacca Canal Unit (SCU) under the Ministry of PW, as well as Implementation Arrangements and Responsibilities are also included in this document.

Roles and responsibilities

The Ministry of PW, in accordance with the legal obligations tied with the WB financing agreements, is responsible for ensuring that Project implementation will be carried out in compliance with the provisions set by the ESMP. The Ministry of PW, supported by the SCU, has the direct responsibility for the implementation of instruments and procedures associated with management of social and environmental matters and impacts.

The development of a Construction Environmental and Social Management Plan (CESMP) will be the responsibility of the contractors. Contractor compliance with the CESMP will be overseen by a Supervisory Consultant on behalf of the SCU.

Works Contractor Requirements

The bidding document shall include **environmental and social aspects**. These requirements must be part of the contract, so they can be enforced and penalties put in place in case of non-compliance. In the selection of the contractors, due attention should be given to bidders' methods statements and management procedures to ensure efficiency and sustainability of the Project. Environmental and social clauses to be included in contracts include environmental and social management as outlined in this document; labour management; occupational health and safety; stakeholder engagement and communication; community health and safety; avoidance of displacement of people and assets, damage to property and livelihood impacts; protection of cultural resources; waste management; minimization of suspension of sediments into the water of the Canal; supply chain management; and water quality monitoring.

Monitoring and Reporting on the environmental and social mitigation provisions is an essential part of the environmental and social management process. Corrective and preventive actions are required in the case of non-compliance and non-conformance. During construction it is useful to also identify actions that can improve project outcomes. It is recommended that the Ministry of PW contracts an independent supervision consultant for overall contract supervision, monitoring and verifying provisions of the ESMP. The Works Contractor is responsible for implementation of the mitigation measures related to canal maintenance and the rehabilitation of sluices and ship locks, including those of their subcontractors and main suppliers. The Ministry of PW-SCU together with the Supervision Consultant will monitor the performance of the Contractor, including the implementation of the CESMP and related sub-plans prepared by the Contractor. The Contractor is expected to have addressed in their CESMP the following environmental and social management plans: risk management including roles and responsibilities, labour management, communication and complaints procedure, community and occupational (workers) health and safety, incident and accident reporting procedure, workers training, waste management, road and water traffic management, emergency response and management of excavated materials. Furthermore, the contractor is to report all E&S issues to the PW-SCU regularly in progress meetings and in monthly reports. In addition, incidents & accidents are to be reported to PW-SCU within 24 hours.

Stakeholder Engagement and Communication Plan. The WB and the Ministry of PW recognize the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Therefore, this document is tightly linked to the Stakeholder Engagement and Communication Plan (SECP) that was developed in December 2021. The SECP contains a Grievance Redress Mechanism (GRM), as required by the WB. The purpose of the GRM is to ensure that any person who feels affected by the activities supported by the Project can convey her/his complaint. In the context of environmental and social management, the selected works contractor will need to develop its own Communication and Complaint Mechanisms, based on the guidelines outlined in the Project SECP, and WB OP 4.01.

Budget. The mitigation measures are mostly covered under the works contracts. These measures are good practice for contractors and are therefore not considered additional costs. The ESMP budget for other measures and activities is estimated at USD 115,000. This budget is based on the information known at this stage. The amount may change as the project details continue to be developed and finalised.

1 Introduction

1.1 This ESIA and ESMP

This document presents the Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) for selected works under the “Saramacca Canal System Rehabilitation Project” (hereafter: the Project); a WB assistance program to the Government of Suriname (GoS). This Project will finance structural and non-structural measures to improve resilience against flooding in the Greater Paramaribo area. Structural measures will improve the discharging capacity of the Saramacca Canal through two main activities: (a) rehabilitation of the sluices and locks and (b) increase in conveyance through re-profiling and clearing, and possible selected interventions on the secondary and tertiary canals. The non-structural measures will strengthen the capacity of the GoS to manage and operate the Saramacca Canal System.

The structural measures under the Project are divided into two separate parts, respectively, (1) urgent (or so called **no-regret**) rehabilitation works and (2) other improvement measures.

The No-regret measures, include (a) Maintenance of the Saramacca Canal, including removal of aquatic weeds/floating vegetation, trimming of bank vegetation, sediment removal at the connection of the side canals Spoorsloot, Kasabaholokreek and Magenta Canal with the Saramacca Canal (see Figure 2) and embankment reprofiling and backfilling with the excavated sediments from these three locations and b) Rehabilitation of the Doorsteek sluice and ship lock and Rehabilitation of the Uitkijk Ship Lock. The other improvement measures in the Saramacca Canal are still being defined and are not part of this ESIA/ESMP.

This version of the document (ESIA +ESMP) covers the scope of the urgent / no-regret measures, which include the Canal Maintenance Works and the Rehabilitation of the Doorsteek sluice and ship lock, as well as the Uitkijk ship lock rehabilitation works. This report is the result of task 5 stage 2 of the Terms of Reference (ToR) of the Consultant.

The WB is committed to supporting Borrowers in the development and implementation of projects that are environmentally and socially sustainable, and to enhancing the capacity of Borrowers’ environmental and social frameworks to assess and manage the environmental and social risks and impacts of projects.

This document presents the ESIA of the selected works under the Project. An ESIA assesses the environmental and social risks and impacts of the Project throughout the Project life cycle. Any ESIA must be proportionate to the potential risks and impacts of the Project. The No regret works may be classified as Low Risk as impacts on the biophysical and socioeconomic environments are expected to be limited in nature. This classification justifies a limited ESIA. Notwithstanding, the ESIA assesses, in an integrated way, all relevant direct, indirect and cumulative environmental and social risks and impacts throughout the Project life cycle.

This ESIA includes an ESMP. An ESMP is an instrument that details (a) the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental and social impacts, or to reduce them to acceptable levels; and (b) the actions needed to implement these measures. The purpose is to ensure that mitigation measures are translated into practical management actions that can be adequately resourced and integrated into the Project phases. The ESMP is, therefore, a management tool used to ensure that undue or reasonably avoidable adverse impacts of construction and operation are prevented or reduced and that the positive Project benefits are enhanced.

1.2 Methodology

This document for selected works under the Saramacca Canal System Rehabilitation Project is designed to establish objectives and principles, and organizational arrangements for the management, mitigation and optimization of social and environmental Project matters and impacts, in line with the Milieu Raamwet S.B. 2020 no 97 (Suriname Environmental Framework Act 2020) and WB OP on Environmental Assessment (OP 4.01).

In addition, the following resources were considered:

- The generic Environmental Assessment Guidelines of NIMOS (2009).
- Stakeholder feedback during several stakeholder consultation meetings
- Discussions with, and feedback from, the Client (Ministry of PW and the SCU), the Project consultancy team, and the WB team for the Project.
- Project documents including:

    - Preliminary Environmental and Social Impact Assessment (ESIA) with an Environmental and Social Management Plan (ESIA-ESMP). Saramacca Canal System Rehabilitation Project (2018) The Preliminary Design Report (2022)
    - The Design Basis Phase 1 Report (2022)
    - The Stakeholder Engagement and Communication Plan (2021)
    - The Survey Report (2022) and other secondary sources (see References)

1.3 Legal, Policy and Institutional Framework

This section provides an overview of applicable environmental legislative and regulatory framework, with a specific focus on the Saramacca Canal improvement works. It also encompasses Suriname's commitments as a signatory to international conventions and agreements. Relevant international standards and procedures governing this type of activity are also addressed.

1.3.1 National Laws and regulations

Environmental Framework Act

In March 2020, the 'Milieu Raamwet S.B. 2020 no. 97 (Environmental Framework Act (EFA) S.B. 2020 no. 97)' was approved by the Parliament and published in the Gazette in May 2020. The EFA aims to protect and elevate sustainable management of the environment in Suriname. The Act establishes the National Environment Authority (NMA) as a statutory body responsible for the implementation and enforcement of this law. In July 2020, the institutional structure for environmental management changed with the change of Government. The structural change included the establishment of a Ministry for Spatial Planning and Environment (ROM). The Ministry of ROM aims to coordinate all environmental activities in the country. Legal positioning of the Ministry of ROM became a priority of the Government and a formal working group was established for amending the Environmental Framework Act. The amendment proposes the Ministry to become primarily responsible for coordinating Environmental Policy while the NIMOS is being transformed into the National Environmental Authority.

For the EFA to be operational, a set of subsidiary legislation will need to be promulgated, most of which is already in draft form (see below).

1. The *Duty of Care*, whereby every citizen has a general duty of care regarding the environment, including refraining from acts or omissions that have adverse consequences for the environment.

2. *Environmental and Social Impact Assessment*. Although the EIA process has been administered by NIMOS since 2005, with the promulgation of the EFA it becomes mandatory. EIA regulations have been drafted and will immediately take effect after its promulgation.
3. *Pollution and Standards*. Environmental norms and standards will be developed under the EFA. This will be executed through implementation regulations. This includes the application of environmental permits and the rehabilitation of affected areas. The pollution regulations standardize the determination of contaminants, Maximum Allowable Concentration (MAC) values for the release of contaminants, and procedures for the rehabilitation of contaminated areas. Pollution regulations have already been drafted.
4. *Waste and Hazardous Substances and Emergency Plans*. The NMA will determine norms and procedures for handling of waste (collection, transportation, storage, and transfer) and may, among other things, prohibit the import or export of any waste. Furthermore, the NMA can prohibit hazardous substances or impose procedures for import, export, safe storage, handling, transport, use and disposal. These procedures are part of a permit for hazardous substances. Furthermore, the NMA is authorized to require an emergency response plan for the storage, use, and transportation of contaminants, waste, or hazardous substances.
5. *Environmental Audits*. The EFA provides for the establishment of guidelines and procedures for conducting an audit. These Guidelines had not been prepared as of this writing.

Some other relevant laws/acts/regulations are listed below:

Act	Content
Wetboek van Strafrecht G.B. 1911 no.1 z.l.g bij S.B.2020 no. 42 (Penal Code G.B. 1911 no.1 as amended by S.B. 2020 no.42) Politie strafwet G.B. 1915 no. 77 z.l.g bij S.B. 1990 no. 24 (Police Criminal Act G.B. 1915 no. 77 as amended by S.B. 1990 no. 24)	The 'Wetboek van Strafrecht G.B. 1911 no.1 z.l.g bij S.B.2020 no. 42 (Penal Code G.B. 1911 no.1 as amended by S.B. 2020 no.42)' and 'Politie strafwet G.B. 1915 no. 77 z.l.g bij S.B. 1990 no. 24 (Police Criminal Act G.B. 1915 no. 77 as amended by S.B. 1990 no. 24)', which are both criminal acts, penalize water pollution and littering. In addition, the articles in the Penal Code do not only penalize water pollution, but also air and soil (see art. 225a and 225b of the Code). This was changed in the amendment of 2015.
Decreet Havenwezen 1981 S.B. 1981 no.86 (Harbours Decree 1981 S.B. 1981 no.86)	The 'Decreet Havenwezen 1981 S.B. 1981 no.86 (Harbours Decree 1981 S.B. 1981 no.86)' contains provisions for harbor activities. This decree prohibits the discharge of waste, oil, and oil-contaminated water, and condemned goods into public waterways and harbours.
Wet Maritieme Autoriteit Suriname S.B. 1998 no. 37 (Maritime Authority Act S.B. 1998 no.37)	This Act establishes the Maritime Authority Suriname (MAS) as a corporation under Article 3 in the framework of privatization of public services. The MAS is responsible for safe and efficient maritime traffic to and from Suriname, and for control of water pollution by vessels, in accordance with international conventions ratified by Suriname. The MAS is responsible for the supervision and control of maritime navigation in accordance with the laws of Suriname. The MAS shall further render services to sea-going vessels, in particular with regard to exportation and importation of goods.

Regeling binnenvaart en kustvaart S.B. 1981 no. 16 (Regulation on inland shipping and short sea shippingS.B. 1981 no. 16)	The Act sets out rules for the safety and efficiency of inland and short sea shipping, in particular by establishing rules on vessel registration and measurement, as well as on the competence of captains and skippers. Furthermore, rules on the levying of taxes on vessels are also provided.
Arbeidswet G.B. 1963 no. 163 z.l.g. bij S.B. 2011 no. 71 (Labour Code G.B. 1963 no. 163 as amended by S.B. 2011 no.71)	The Arbeidswet G.B. 1963 no. 163 z.l.g. bij S.B. 2011 no. 71 (Labour Code G.B. 1963 no. 163 as amended by S.B. 2011 no.71) regulates different aspects of labor such as working hours, shift work, night work, breaks, rest days, hazardous work, payment, labor inspection, etc.
Veiligheidswet 1947 G.B. 1947 no. 142, z.l.g. bij SB. 1980 no.116 (Occupational Safety and Health Act 1947 G.B. 1947 no. 142, as amended by SB. 1980 no.116)	The Occupational Safety and Health Act 1947 G.B. 1947 no. 142 as amended by S.B. 1980 no. 116 which is a framework act on safety and hygiene in enterprises. Detailed rules are laid down in subsidiary legislation. At present, there are 9 Safety regulations pursuant to the Occupational Safety and Health Act. The Act and the regulations aim to decrease the chances of employment injuries and occupational diseases. They provide specific rules regarding safety on the work floor.
Veiligheidsvoorschrift nr. 1, G.B. 1972 no. 95 (Safety regulation nr. 1, G.B. 1972 no. 95)	This regulation aims to prevent or diminish the risk of injuries in all enterprises. Article 40: Workers should have the appropriate protective equipment. For this, suitable storage places should be made available at their place of work.
Veiligheidsvoorschrift nr. 2, G.B. 1948 no. 104 (Safety regulation nr. 2, G.B. 1948 no. 104)	This regulation aims to promote hygiene (order and prevention of dust) in all enterprises. The regulation provides requirements for hygiene related to cleaning, drainage and washstands and requirements for washing facilities for employees.
Veiligheidsvoorschrift nr. 3, G.B. 1948 no. 183 (Safety regulation nr. 3, G.B. 1948 no. 183)	This regulation prescribes some measures regarding first aid. These include the availability of an emergency compartment kit at site, certified persons entrusted with first aid and where the work involves the risk of drowning, efficient and visible means for rescue (swimming jackets, etc.) should be readily available.
Veiligheidsvoorschrift nr. 7, S.B. 1981 no 72 (Safety regulation nr. 7, S.B. 1981 no. 72).	This regulation promotes safe and comfortable working conditions related to inter alia hazardous or disturbing noises and vibrations. The regulation provides guidelines for lighting, temperature, and fresh air in workspaces, excessively strenuous labor hazardous to an employee's physical and mental well-being, and avoidance of excessive time in front of screens, which could cause mental or physical strain.
Ongevallenwet G.B. 1947 z.l.g. bij S.B. 2007 no.26 (Industrial Accidents Act G.B. 1947 as amended by S.B. 2007 no.26)	To indemnify the worker and his/her family against financial consequences of industrial accidents and occupational diseases. These accidents related to or in the course of employment include fatal injuries, but also the more gradual development of sickness because of the performed labour.

Waste management

Standard on Waste (developed by Surinaams Standaarden Bureau, SSB)

In the absence of legislation on waste management and awaiting the approval of the Draft Laws, the Ministry of Public Works, has requested the Surinaams Standaarden Bureau (Surinamese Standards Bureau; SSB) to develop a Standard on Waste. In response, the SSB initiated the process to set up the standard which contains (i) garbage collection and (ii) processing. Part 1 of the Standard has been finalized and was published on 23 January 2019.3 It covers household, medical, industrial, and bulky waste and provides a procedure for packaging, offer and pickup, including frequency of pickup. It is recommended that this standard is followed for waste management activities related to the project

International Conventions:
Suriname has become a signatory to various international agreements and conventions that focus on environmental management and occupational health and safety. These conventions typically necessitate governmental involvement in implementing legal and administrative measures. Below is a comprehensive compilation of the relevant Conventions pertinent to the proposed 3D seismic acquisition survey.

- ***United Nations Framework Convention on Climate Change (UNFCCC)*** - On 14 October 1997, Suriname ratified the United Nations Framework Convention on Climate Change (UNFCCC). The primary objective of the UNFCCC is to stabilize greenhouse gas emissions in the atmosphere at a level that ensures dangerous human-induced interference with the climate system is avoided. This target must be achieved within a specific timeframe to allow ecosystems to naturally adapt to climate changes, safeguard food production, and promote sustainable economic development. The UNFCCC establishes international guidelines to limit greenhouse gas emissions and combat climate change. Equipment during execution of works will use fuel for operations. Combustion of fuel will contribute to greenhouse gases, so minimising use of fuel is recommended.

- ***Paris Agreement -*** In 2016, Suriname acceded to the Paris Agreement, an international accord linked to the UNFCCC (United Nations Framework Convention on Climate Change). The agreement commits its participating countries to promote the mitigation of greenhouse gas emissions while fostering sustainable development. Under the Paris Agreement, Suriname is obligated to regulate and control greenhouse gas emissions within its territory.

1.3.2 Policy

Development Plan of Suriname 2022 – 2026 (MOPS): The general objective of the development plan is to build and maintain a national economy that is free from foreign domination with the participation of the citizens, and from which citizens benefit. The MOP acknowledges that Climate Change can be a serious threat for Suriname. Extreme drought and flooding events can adversely impact the environment, human being and national economy. The MOP addresses the need to build up financial and social resilience, as well as risk and disaster management.
Some relevant Strategic Actions listed in the MOP are:

- Set up of Environmental Authority (NMA)
- Sea level monitoring stations
- Execution plans for specific projects identified in the NDC (National Determined Contribution)
- Systematic and proper rehabilitation and maintenance of pumping stations and drainage systems
- Set up regulations and norms for future drainage systems
- Enhance nature based solutions for coastal areas

Environmental Policy Note - Ministry of Spatial Planning and Environment (ROM): The Ministry of Spatial Planning and Environment was established in 2020. Its mission is to have a leading role in the development and implementation of policies to guarantee an environment that is spatially ordered and where health, well-being and sustainable development are central.

Within the policy note of ROM, emphasis is placed on the environmental reform policy, wherein specific priority areas have been identified. These areas include:

- Waste management
- Regulation of industrial environmental pollution
- Operationalization of the Environmental Framework Act
- Provision of environmental information

Biodiversity Strategy (2006-2020) and National Biodiversity Action Plan (2012-2016): In 2006, the Government of Suriname adopted the Biodiversity Strategy (NBS), which outlines the country's vision and strategic directions for preserving and sustaining its diverse range of biological resources. The NBS aims to achieve the sustainable management of natural resources and promote the fair distribution of benefits derived from biodiversity-related services. Subsequently, in 2012, a National Biodiversity Action Plan (NBAP) was developed in accordance with the NBS. The NBAP seeks to translate the set objectives into tangible actions and assigns responsibility to specific entities for their implementation. In 2022, the Ministry of ROM initiated an evaluation and possible update of Suriname's strategy for the sustainable management and conservation of biodiversity and the associated action plan. It is expected that an updated Strategy 2023-2030 will be finalized in October 2023.

1.3.3 Institutional Framework

Several institutional stakeholders play a role in the context of this project. In this section, only the primary institutions and their relevance to the project are presented.

Relevant Stakeholder	Role/ Relevance to project
Ministry of Public Works	• Ministry responsible for public infrastructure in general and more specific for urban water management, in close cooperation with District Commissioners • Responsible for maintenance of pumping stations, sluices, ship locks and main drainage systems, including any rehabilitation works • Responsible for coastal and river flood protection • Responsible for long term management plans for infrastructure • The nodal ministry for implementation of the works considered under this ESIA
Ministry of Spatial Planning and Environment	• The Ministry of Spatial Planning and Environment is responsible for proper spatial planning and must do this in consultation with relevant ministries and institutes and coordinate national policy for spatial planning. • In addition, the ministry is also charged with ensuring compliance with statutory regulations regarding spatial planning and the environment, if necessary, in an interdepartmental context. • In accordance with its mission statement, the Ministry of Spatial planning and Environment is also responsible for coordinating and monitoring the implementation of national environmental policy, in collaboration with relevant ministries and agencies.

National Institute for Environment and Development in Suriname (NIMOS) in transition to become NMA	• With the promulgation of the Milieu Raamwet S.B. 2020 no. 97 (Environmental Framework Act S.B. 2020 no. 97) the National Institute for Environment and Development (NIMOS) will be transformed into the National Environmental Authority (NMA). • The NMA will be responsible for administering the Environmental Impact Assessment process and Pollution Control.
Ministry of Labor, Employment and Youth Affairs	• Development and safeguarding of the labor market. • Regulatory responsibility for specifying safety conditions for projects of this nature and for receiving and investigating safety-related incidents as necessary. • Regulation of permits required for labor or work by foreigners. • The Project will be accomplished in accordance with all applicable Surinamese health and safety regulations.
Ministry of Public Health	• Responsible for environmental health management, such as control of infectious disease, food and drinking water quality, sanitation, prevention of ship and aviation pollution, and disposal of industrial waste in collaboration with other relevant institutions.
Maritime Authority Suriname (MAS)	• Management of maritime traffic. • Supervision of compliance with laws and regulations concerning shipping, shipping traffic, and ensuring that calamities such as ship accidents, oil spills or the discharge of ballast water do not occur or are handled correctly. • Vessels involved in the project can affect marine traffic and there will be a need to issue Notices to Mariners and communicate with MAS. • MAS is the authority responsible for the issuance of Safety Certificates
National Coordination Centre for Disaster Management (NCCR)	• A division of the Ministry of Defense that develops national policies on disaster management through coordination and prevention of potential threats and disasters. • Can become a key stakeholder in situations involving accidental spills or other project-related emergencies.

1.4 Consultants' Team of experts

The ESIA has been undertaken by a team of experts with ample national and international experience and under conditions similar to the assignment. The team of key experts is presented below.

ESIA Team of key experts	
Ravindra Patandin	Project Manager

Eric Brasser	Project Manager (lead firm)/QA/QC
Margriet Hartman	Sr. Environmental Specialist
Marieke Heemskerk	Social Specialist
Shareen Koenjbiharie	Environmental Specialist
Dirk Noordam	Soil specialist
Support experts/ staff (several)	Field measurements, data collection, communication, logistics, etc.

1.5 Report structure

The report is structured as follows:

- This Chapter 1: outlines the purpose and objectives of the ESIA and ESMP for the Project. Chapter 1 also included an overview of the legal, policy and institutional framework.
- Chapter 2: provides a brief project description with the relevant technical details.
- Chapter 3: presents an update of the environmental and social baseline of the study area.
- Chapter 4: presents the expected environmental and social impacts related to the maintenance of the Saramacca Canal and the rehabilitation of Doorsteek sluice and ship lock and the Uitkijk ship lock. Chapter 5: presents the environmental and social management and monitoring plan for all identified impacts and risks throughout all the phases of the Project. Separate tables are presented for the Canal maintenance works, the rehabilitation of Doorsteek sluice and ship lock and the Uitkijk ship lock.
- Chapter 6: outlines the roles and responsibilities for the different Project parties in different stages of project implementation and monitoring.
- Chapter 7: described the minimum ESHS requirements that the contractor should comply with. It proposes the contents of the CESMP and the compliance monitoring and reporting requirements.
- Chapter 8: summarizes the key aspects of stakeholder engagement & communication, including grievance redress, which are described in detail in the SECP for the Project.
- Chapter 9: contains a budget estimate for ESMP implementation and monitoring.
- Chapter 10: lists the references.
- Background data and supporting materials are compiled in the Annexes.

The structure of this report is slightly different than the structure as required by NIMOS. For easy reference purposes, the table below presents the location of each subject as per NIMOS structure.

Cross reference table for Report Structure	
NIMOS EIA structure	**This Report**
Executive Summary	Executive Summary (Page x)
Table of Contents	Table of Content (Page iii)
List of Tables, List of Figures, List of Photos	List of Tables/Figures (Page iv, vi)
List of Acronyms and Abbreviations	Glossary (Page vii), Acronyms (page ix)
Chapter 1 Introduction	Chapter 1: Introduction
Chapter 2 Legal and Institutional Framework (i.e., why is the EIA being done)	Section 1.3
Chapter 3 Description of the Project (including location plans and site plans)	Chapter 2 Project Description

Chapter 4 Evaluation of Alternatives to the Project	Chapter 2 Project Description
Chapter 5 Description of the Existing Environment	Chapter 3 Environmental and Social Baseline
Chapter 6 Environmental impacts (positive and negative) and Mitigation Measures	Chapter 4 Expected Environmental and Social Impacts Tables 9 until 20 Appendix A10 Impact tables with ranking of impacts before and after mitigation and optimization
Chapter 7 Management Plan	Chapter 5 Environmental and Social Management and Monitoring Plans
Chapter 8 Public Consultation	Chapter 8 Stakeholder Engagement and Communication Plan
Chapter 9 References	Chapter 10 References
Annex 1 Project Impact Management Summary Table Project Actions Potential Impacts Proposed Mitigation Measures Proposed Monitoring Plan Additional Recommendations	Tables 9 until 20 Appendix A10 Impact tables with ranking of impacts before and after mitigation and optimization
Other	Chapter 7 Contractor ESHS requirements Appendix 11: Grievance Redress Mechanism

2 Project description

2.1 Overview

Suriname is one of the countries in the world that is most vulnerable to the impact of flooding. Around 30 percent of Suriname is within a few meters above mean sea level, and therefore it is particularly susceptible to coastal flooding and erosion. The country is also prone to periodic flooding due to heavy rainfall, especially when combined with spring tides. Flooding is exacerbated by poor drainage in the relatively highly populated urban areas on the coast such as the capital city of Paramaribo.

Approximately 87 percent of Suriname's population lives along the 386 km long coastal plain (around 67 percent in Paramaribo), and therefore, flooding affects most of the population and an estimated 90 percent of human activities. The majority of Greater Paramaribo relies on an extensive network of canals for storm water drainage. These canals drain the central and southern parts of the city toward the Saramacca Canal, while the northern part has a series of canals draining storm water directly to the ocean.

The GoS intends to use WB funding to reduce flood risk for the people living in the Greater Paramaribo area and improve the operation of the Saramacca Canal System for flood risk management and navigation. The Project area that will benefit from reduced flood risk or the 'Greater Paramaribo area' comprises the Saramacca Canal drainage area, including some areas of the Paramaribo, Wanica, and Saramacca Districts. The expected results of the Project include an improved capacity of the Saramacca Canal to discharge water efficiently into the Suriname and Saramacca Rivers, and the establishment of a functioning monitoring, forecasting, and operational management system for the overall Saramacca drainage system.

The Project has been categorized as Category B according to the NIMOS guidelines and WB criteria which means that activities are not expected to produce significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented. A preliminary ESIA with management plan was developed in 2018, to identify all the positive and negative effects of the Project in compliance to applicable safeguards policies. The preliminary ESIA (2018) has been updated in the present ESIA and ESMP.

2.2 Description of planned activities

The structural measures under the proposed Project were designed to:

- Improve the discharging capacity of the Saramacca Canal to reduce pluvial flooding and
- Improve navigation between the Suriname and Saramacca Rivers and the industrial zones around Saramacca Canal.

The structural measures under the Project are divided into two separate parts, respectively, urgent (or so called no-regret) rehabilitation works and other improvement measures.

No-regret measures include (a) Maintenance of the Saramacca Canal, including removal of aquatic weeds/floating vegetation, trimming of bank vegetation, sediment removal at the connection of the side canals Spoorsloot, Kasabaholokreek and Magenta Canal with the Saramacca Canal (see Figure 2) and embankment reprofiling and backfilling with the excavated sediments from these three locations and b) Rehabilitation of the Doorsteek sluice and ship lock.

This version of the document (ESIA +ESMP) covers the scope of the urgent / no-regret measures., which include the Canal Maintenance works and the rehabilitation of the Doorsteek sluices and ship lock, as well as the rehabilitation of the Uitkijk ship lock. Figure 1 presents the Project area.

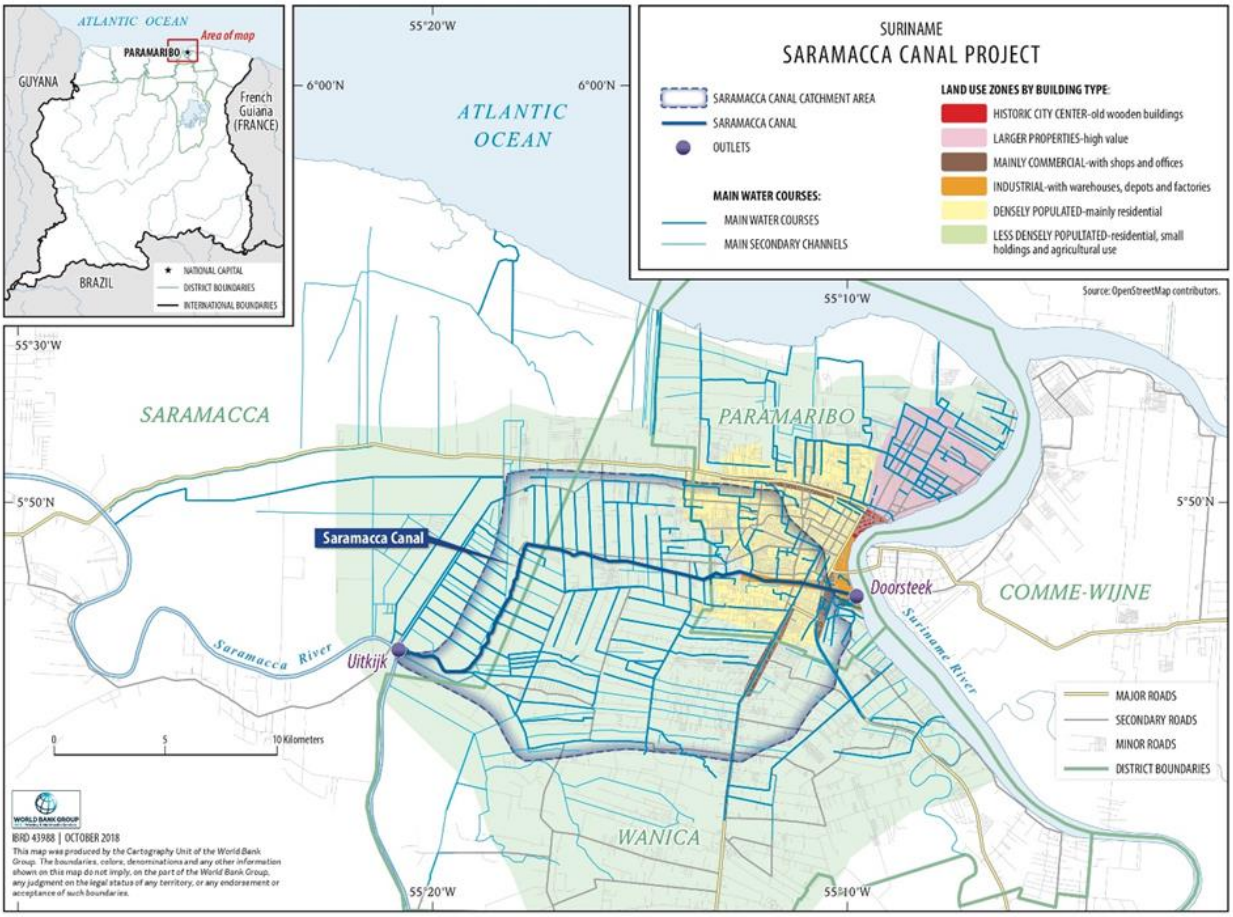


Figure 1 Location Project

Figure 2 presents the measures for this ESIA/ESMP.

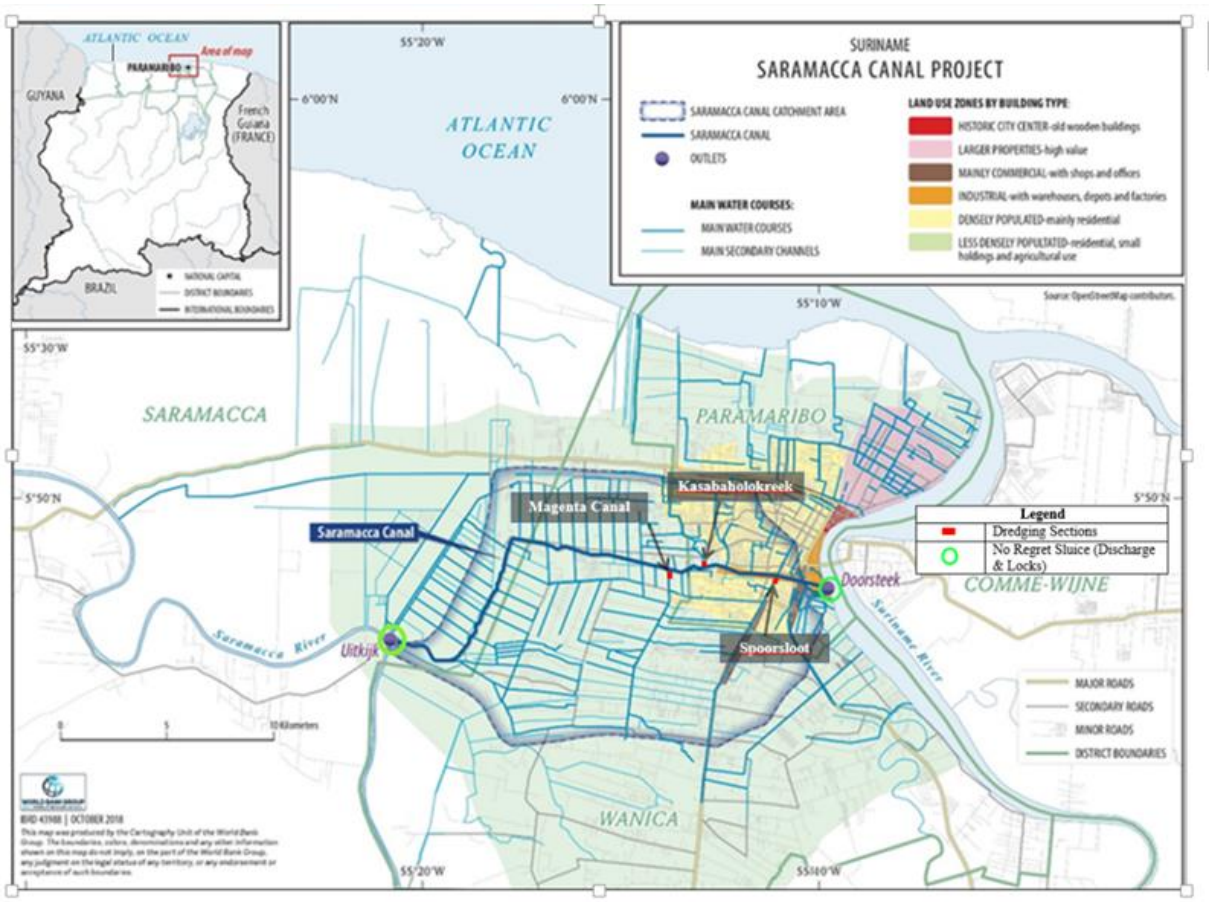


Figure 2 Measures for this ESIA/ESMP

Canal Maintenance works:

The Canal Maintenance works will be carried out over a period of 6 months and is expected to commence in October 2023 after procurement of works are completed.

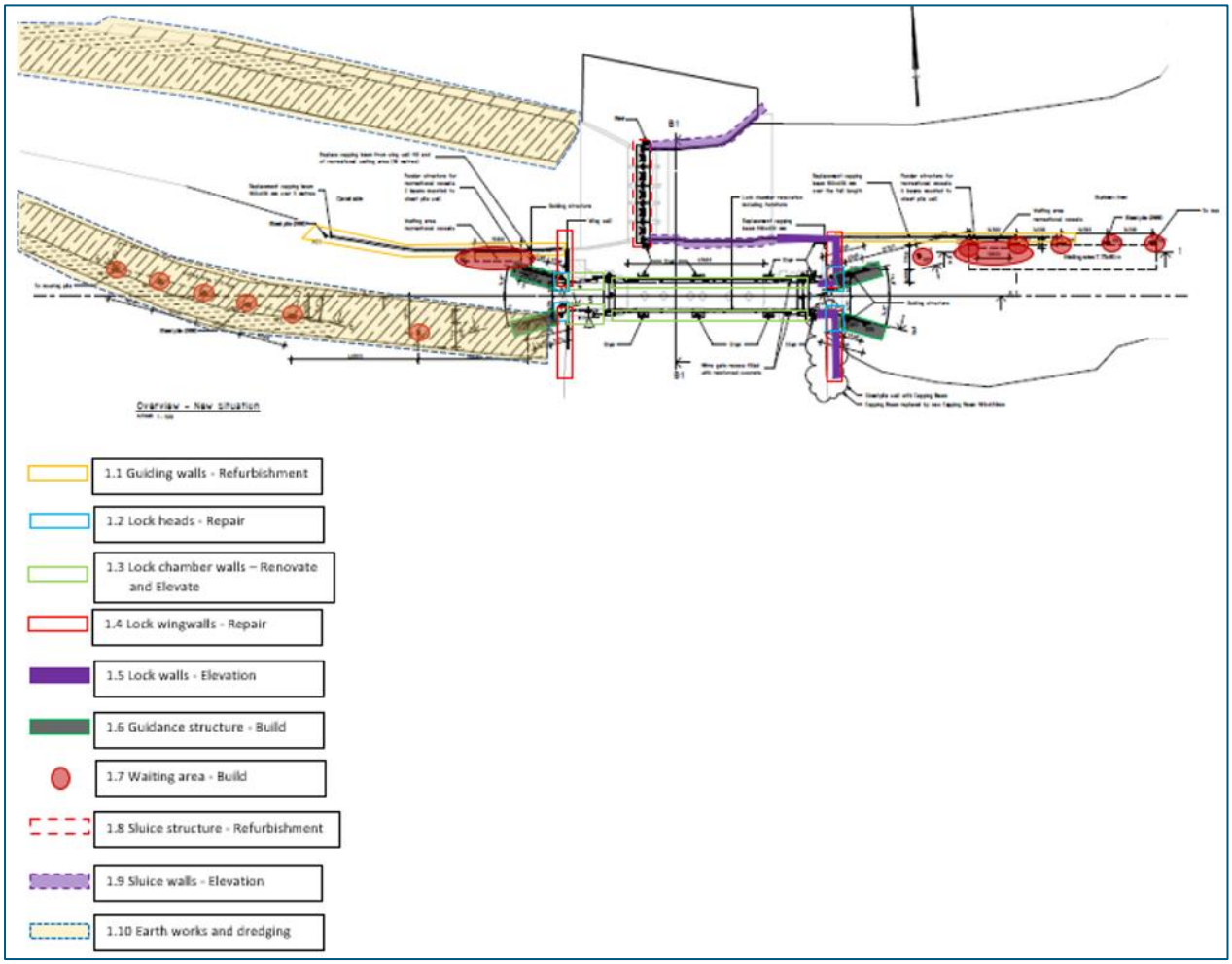
The maintenance works will be done in and along the Saramacca Canal and at the first 50 meters of three Secondary canals (Spoorsloot, Magenta Canal and Kasabaholo Creek) to the Saramacca Canal.

- Removal of aquatic weeds/floating vegetation from the canal and outlets of the side canals, including processing and disposal
- Trimming of vegetation from the canal slopes and embankment, including processing and disposal
- Sediment removal at three selected Secondary canals and backfilling of excavated sediments on the side embankments

The majority of the works are expected to be carried out with floating equipment (pontoons), long arm excavators and shredders. Trucks, mowers and other equipment may be used for on land activities.

Rehabilitation of Doorsteek sluices and shiplock and Uitkijk shiplock:
The rehabilitation of the Doorsteek sluices and shiplock will be over a period of approx.. 18-24 months. The works execution is expected to start in the first quarter of 2024, after completion of the procurement procedure.
The rehabilitation works include amongst others:

- Rehabilitation of concrete works of the sluices and shiplock
- Rehabilitation and renewal of steel sheet piles
- Replacement of 5 sluice gates
- Rehabilitate / extend existing shiplock gates
- Mooring facilities, including piles
- Excavation works in canal at inlet and outlet side of gates
- Renewal of electrical and mechanical installations
- Repair on buildings



Overview of works at Doorsteek

The works will be carried out with floating equipment (pontoons), cranes, excavators, pile driving equipment and concrete pouring equipment. Furthermore, trucks, jack hammer, mowing, grading and other equipment will be used on land.

The commencement of the Uitkijk ship lock rehabilitation works are yet to be scheduled. The Ministry of Public Works is currently assessing the schedule and related budget for this work. If deemed appropriate, these works may be scheduled for 2024/2025. The duration of the execution of works may be 12-16 months.
The works at Uitkijk are more of less the same as for the Doorsteel shiplock, though of a lesser scale. There are no sluice gates included in the Uitkijk works.

2.3 Analysis of Alternatives

The 2001 Master Plan for the Drainage of Greater Paramaribo and the 2010 Integrated Coastal Zone Management (ICZM) plan recommended various physical interventions and institutional and regulatory actions to reduce flood risk. These identified coastal erosion and protection, destruction of mangroves, unplanned or inappropriate spatial development, and inadequate drainage of residential areas as the most urgent problems to tackle along the coast. Recommendations included developing a national disaster risk management (DRM) policy to address climate change adaptation, developing an early warning system, carrying out a flood risk reduction assessment, and instituting an emergency response plan. However, neither plan has yet been systematically or fully implemented due in part to lack of funding.
Between 2016 and 2017, a World Bank TA, supported by the African, Caribbean, and Pacific-European Union (ACP-EU) National Disaster Risk Reduction Program, in partnership with the Global Facility for Disaster Reduction and Recovery (GFDRR) and the GoS, conducted a Strategic Flood Risk Assessment (FRA) for the greater Paramaribo area and a Coastal Resilience Assessment.
The FRA supported the GoS to prioritize targeted flood risk reduction interventions. Strategic flood hazard modelling was carried out to assess flood depth and extent for a range of rainfall and tidal scenarios in the greater Paramaribo area, and a high-level options appraisal was undertaken for evaluating mitigation proposals. Exposure and vulnerability were quantified using annual average damages and a cost-benefit analysis was then used to determine viable flood mitigation options. The studies led to the development of a prioritized list of targeted flood reduction investments comprising 14 structural and non-structural flood risk interventions to reduce pluvial flooding in the greater Paramaribo area.

The preliminary cost-benefit analysis found that the most beneficial, strategic, and sustainable flood mitigation options included improvements to the Saramacca Canal, a key element of the drainage system for the central and western areas of Paramaribo. To directly address these challenges and following the recommendations of the FRA, this project will upgrade specific critical drainage infrastructure, improve drainage in the Saramacca Canal and targeted secondary systems.

3 Environmental and Social Baseline

3.1 Environmental Baseline

3.1.1 Climate

Most of Northern Suriname has a Tropical Rainforest Climate (Af climate in Köppen's classification; Amatali & Naipal, 1999). The average annual rainfall in the central part of northern Suriname predominantly ranges between 2,000 and 2,500 mm. Like in most parts of Suriname, consistently high temperatures and a high humidity characterize the study area with the main variation being rainfall and the associated cloud cover. The mean annual air temperature at Paramaribo (Cultuurtuin) is 27.8 ºC, with a daily range of 9-13 ºC and an annual range of about 2 ºC.

The weather of Suriname is dictated mainly by the northeast and southeast trade wind system called the Inter-Tropical Convergence Zone ("ITCZ" zone also known as the "Equatorial Trough").
The ITCZ follows the sun in its movement to the north to about 15º latitude and to the south to about 10º latitude south of the Equator. The ITCZ passes over Suriname two times per year bringing heavy rainfall when it is overhead. This results in four seasons based upon rainfall distribution (Scherpenzeel, 1977).

- Long Rainy Season End April - Mid August
- Long Dry Season Mid-August - Early December
- Short Rainy Season Early December - Early February
- Short Dry Season Early February - End April

The mean monthly rainfall for station Zorg en Hoop near the Project area has an average annual total of 2,186 mm (1991-2020). Highest average monthly rainfall is recorded during the months May, June and July, which are in the Long Rainy Season, and minimum values are found during the months September to November, which are in the Long Dry Season.

Northern Suriname has a general northeast (NE) to southeast (SE) wind direction, with the first dominating in the February-April and the latter during the July-September period. The other months show directions mostly ranging between NE and SE. However, closer to the coast north-eastern to eastern winds tend to dominate throughout the year. Calm winds, i.e. winds with hourly average speeds less than 0.5 m/s, are very frequent. During the night and early morning, it is usually calm. During the day, the wind speed may increase to about 5 m/s, and in some seasons to 5-8 m/s, in particular in the February-April and the September-October periods.
In the coastal zone, wind speeds are usually higher than further inland (Scherpenzeel, 1977). Wind speeds of 20-30 m/s have been occasionally recorded during thunderstorms, but only for a very short period (locally known as 'sibibusi'). Suriname is free of hurricanes.

3.1.2 Air Quality

Suriname does not have air quality monitoring stations and, apart from some incidental measurements, no ambient air quality data are available. For the current study, a qualitative description and assessment of ambient air quality is made, based on sources of air pollution and climatological conditions in the Project area.

The rural area, including roads with ribbon building, does not have significant air quality issues, because much of the landscape outside the roads is not, or not intensively, used. An important source of emissions in the rural area is traffic along the roads, in particular the Commissaris Weytinghweg, the Magentakanaalweg, the Bomaweg, the Nieuw Weergevondenweg and the road from Uitkijk to Koewarasan. The roads being at some distance from the Saramacca Canal, it is expected that emissions from road traffic at the Project area

(Saramacca Canal + 200 m at both sides) are low, due to dispersion by the NE-SE winds. The main roads are paved, but also unpaved side roads are found. Traffic along the latter roads will generate dust during dry periods. However, traffic intensity along these roads is usually low and dust is quickly settling in the surrounding vegetation. Locally there are emissions from vehicles and equipment working in the area, e.g. at agricultural land or small sawmills. Emissions from these sources are expected to be minor, given the small scale and the scattered character of such activities. Furthermore, there is incidental and local generation of airborne particles and smoke as a result of burning of vegetation debris as part of (illegal) vegetation clearing. Such burning is usually done during the Long Dry Season. In conclusion, it can be stated that there are no major anthropogenic influences on air quality in the rural area and that air quality here is relatively good.

Except from vegetation burning, similar emission sources are present in the urban area. But due to the presence of small industries and a higher activity level, in particular from traffic, it is to be expected that the air quality in the wider urban area will be less good than in the rural area. However, along the Saramacca Canal project area within Paramaribo, away from most traffic and industries, the air quality will be at least acceptable.

3.1.3 Noise

Existing noise records for environments similar to the ones in the study area show that daytime average noise levels (LAeq) may range between 43 and 72 decibels (dBA) (see Table 1). Highest levels are found within Paramaribo and along the main roads outside the city, predominantly due to traffic. The variation in these LAeq levels is mostly the result of traffic intensity and type of vehicle, but also speed and road type will play a role. Overall, it can be concluded that all LAeq levels along busy roads surpass the WHO/IFC daytime standard of 55 dBA for residential sites (IFC, 2007). It should, however, be noted that measurements were typically done at a distance of 8-10 meter from the road, while most houses are farther away. These will thus be exposed to lower noise levels, depending upon their distance from the road. Far lower noise levels are experienced in rural areas, without busy roads, and small communities outside Paramaribo. Here the levels are usually below the above-mentioned daytime standard.

The Project area along the Saramacca Canal outside Paramaribo is rural, mostly without main roads nearby. Representative noise levels will be 43-56 dBA, except for the area where bridges cross the canal. Elevated dBA levels are only expected in the direct neighbourhood of these bridges. Given the higher activity level, the section of the canal within Paramaribo is expected to have higher daytime background noise levels. However, most roads here are too far from the canal to generate a noise impact from traffic at the canal site, except near bridges. Some noise will originate from the local industry that is found along the canal section from the Suriname River towards the mouth of the Mattonshoop Canal. Overall, it is expected that the daytime noise levels in this canal section will only slightly surpass those of the sections through rural areas, with the exception of some of the industries that locally and/or incidentally could produce higher noise levels, e.g. sawmills.

Table 1: Results of noise measurements along main roads in Suriname

Area	Daytime LAeq level (dBA)	# of measurements	Source
Rural areas and communities, no main roads (e.g. Prins Park, Rens Project)	43-56	12	ILACO, 2015
Rural, along main roads (Wanica Medical Center and surroundings)	56-70	15	ILACO, 2016; 2019
Urban Paramaribo (City Centre, Martin Luther Kingweg, Sir Winston Churchillweg)	60-72	12	ILACO, 2019

3.1.4 Geology

The geology of the study area is shown in Figure 3, which is part of the 1:500 000 Geological Map of Suriname (Bosma et al., 1977). All deposits in the wider area belong to the Coronie Formation, which has been deposited during the Late Holocene (6000 years BP – present). The Formation is dominated by marine deposits, but fluvio-marine deposits are found near the Saramacca River. The area through which the Saramacca Canal runs has been deposited by the sea during the Wanica phase (6,000-3,000 years ago; Brinkman & Pons, 1968).

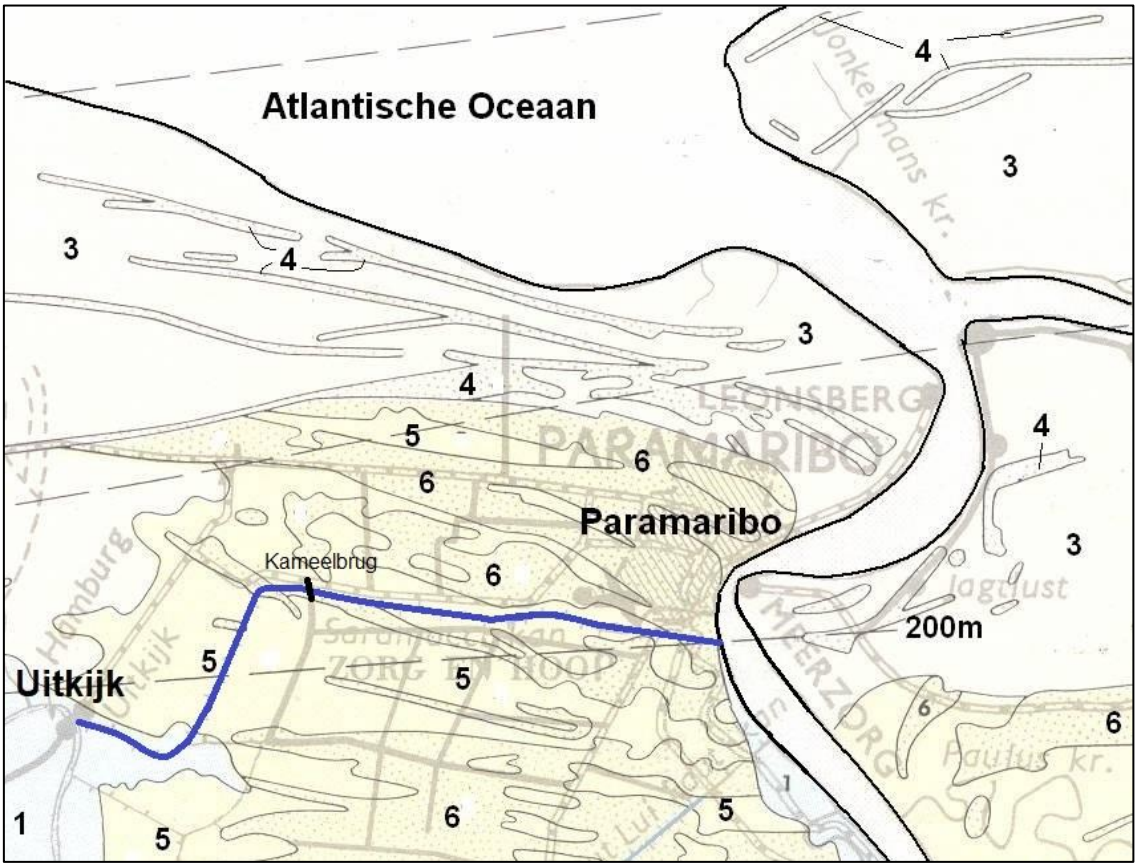


Figure 3: Geology of the study area

Table 2: Floodplain and natural levee deposits (Figure 3)

QUATERNARY	
	Holocene
	Floodplain and levee deposits
1	Alluvial clay and sands– Coronie Formation
	Tidal flat and beach ridge deposits
3	Bluish clay – Comowine and Moleson members of the Coronie Formation
4	Sand and shells - Comowine and Moleson members of the Coronie Formation
5	Bluish grey clay – Wanica member of the Coronie Formation
6	Sand with some shells – Wanica member of the Coronie Formation
---	Depth contour of the Precambrian basement rock

Table 2 indicates floodplain and natural levee deposits (unit 1) at the western end of the canal near the Saramacca River. These are described as alluvial clays and sands. But at this location the sediments are mostly formed by fluvio-marine silty clays; sands are not present at the surface. However, for most of its length, the Saramacca Canal runs through tidal flat deposits of unit 5 with heavy marine clays. These deep clays have low pyrite and carbonaceous content. The clay soils are characterized by a rather low, locally medium, base saturation. They are desalinized to at least 2.5 m, showing initial soil formation (firm consistence, yellowish or/with yellowish red mottling) to depths of 1-1.5m (Brinkman & Pons, 1968).
At two locations, the canal cuts through beach ridge deposits of unit 6, namely at the western section of the east-west stretch near the Kameelbrug/Leiding 7/7A and at the eastern end near the Suriname River. This unit comprises sand and shell beach-ridge and offshore bar deposits from the Wanica period. In Suriname such deposits are known as ridges. Ridges have been deposited on top of clay and are embedded in clay to the north and the south. However, near the Suriname River, the fluviatile and tidal environment has resulted in some degree of mixing of sand and clay. The sands are fine to very fine with scarce shells or shell fragments. Individual sand ridges are up to 4 meters thick.

A deep borehole for construction of the Kameelbrug (1963) shows stiff (“stijve”) clay and sandy clay till 3-meter depth, soft (“slappe”) clay and sandy clay till 9 meter and stiff and tough to very tough (“taaie”) clay and silty clay till 20 meters. The latter entails the Pleistocene deposits (in this case the Para clay), which underlie the Holocene deposits throughout the Young Coastal Plain. From deep boreholes it can be concluded that these Pleistocene deposits are generally found at depths between 8-10 meters in the Saramacca Canal area.

3.1.5 Land and Soil

The Saramacca Canal runs through the Young Coastal Plain, which is characterized as very low, flat land. Elevation is typically at about 1 m +NSP (± 0.5 m), with slightly higher figures for riverine land (up to 2-2.5 m +NSP) and ridges (1-3 meter above the surrounding clay flats).

The most recent soil map of the area is the Reconnaissance soil map of Northern Suriname (Soil Survey Department 1977; Figure 4). This map is based upon aerial photographs from 1971-1973 and additional field checks.

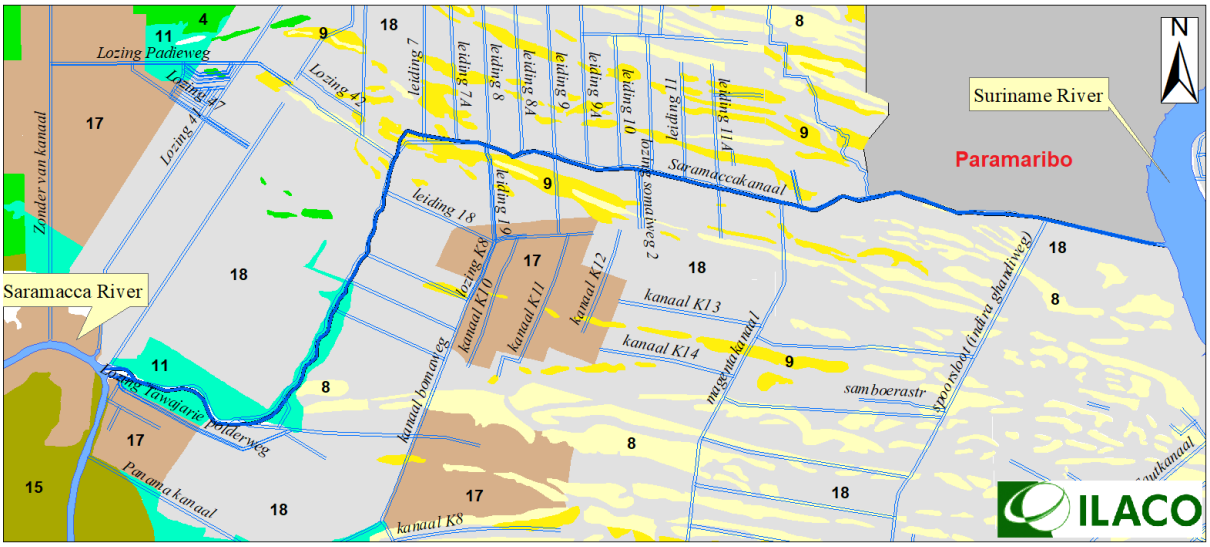


Figure 4: The most recent soil map of the area

Table 3: Legend of the soil map (Figure 4)

FLAT AND UNDULATING VERY LOW LAND (steepest slope < 8%; 0-4m + NSP)	
YOUNG COASTAL PLAIN	
CORONIE LANDSCAPE	
MOLESON PHASE	
	SWAMP AND MARSH SOILS
4	Poorly drained half-ripe and ripe clay with brown and yellow mottles, locally over peat
WANICA PHASE	
	RIDGE SOILS
8	(Moderately) well drained medium and fine sand
9	Imperfectly drained medium and fine sand to sandy loam, locally sandy clay on medium and fine sand
	SWAMP AND MARSH SOILS
11	Poorly and very poorly drained nearly ripe clay with yellow and/or red mottles, locally over sand or sandy loam *(in areas with later polder development: imperfectly drained ripe clay)*
UNCORRELATED (Moleson and Wanica phases)	
	RIVER AND ESTUARY FLAT SOILS
15	Imperfectly and poorly drained ripe clay with brown, yellow and/or red mottles; locally silty clay and silt loam
	POLDER SOILS
17	(Formerly) artificially drained ripe clay with yellow, brown and/or red mottles; locally clay over loamy sand, and/or sandy clay loam in the subsoil (plantations)
18	*(Formerly)* very poorly drained half-ripe clay (rice fields); *now turned into dryland polders of unit 17, with polder drainage system*

The soil map shows basically the same pattern as the geological map, but more detailed information is presented on the soil units. It should be noted that there have been considerable changes in the area since the 1977 map was produced. At that time the area had been recently developed from swamps into polder land. Improved drainage has significantly promoted further ripening of the clay soils since those days. Furthermore, rice fields are no longer present since around 1980, and the former rice soils are now generally under dryland conditions. Therefore, most clay soils are now ripe (firm) till at least 1-1.5 m below the surface. Soft clay may be present from 3-meter depth, with nearly ripe to half ripe clay in-between the ripe top layer and the soft deeper layer.

Soil properties

Clay soils

The (silty) clay soils comprise soils with 50-70 % clay particles (<2mu) and usually less than 2% sand. The remainder of the soil is made up by silt particles. Clay mineralogy is made up by 20% quartz, 40% kaolinite, 20% illite and 20% smectite. The clays exhibit moderate swelling and shrinking upon wetting and drying. In dry periods significant cracking may be found till 50-60 cm depth. Permeability of the soils is moderate to slow, with “by-pass” flow through cracks in drier periods and slow to very slow vertical flow during wet periods when cracks have closed. The groundwater level in most soils ranges between near ground level in the rainy season to below 100 cm depth in the dry season. At some locations inundation occurs during the rainy season, with shallow groundwater (<50 cm) during the dry season. Soil pH is low (usually <5), but soils are rich in nutrients (P, K, Ca, Mg, S and trace minerals) and have a high adsorption capacity (> 20-25 meq/100g). Organic matter content in the topsoil is moderate to low.

Sandy soils

Sandy soils are found at a number of locations along the Saramacca Canal. The sandy soils in the area are predominantly fine to very fine sandy (50-250 micron), but they also contain some clay (5-10%). Dominant minerals are quartz, with minor fractions of feldspar. The soils have a low to medium fertility and a relatively low adsorption capacity (< 10 meq/100g). Permeability is moderate due to the high percentage of very fine sand

and some clay. Groundwater levels in the deeper sandy soils usually range from 40-60 cm in the rainy season to more than100 cm in the dry season.

3.1.6 Hydrology

The Saramacca Canal is approximately 25 km in length, and its width ranges from around 50 m at the eastern end to less than 30 m toward the more rural western end. There are large sluice gates with navigation locks at both ends of the canal to allow shipping access from the Suriname and Saramacca Rivers; however, vessel traffic is minimal at present. Figure 5 shows the drainage areas of the Saramacca Canal, divided into a northern and a southern part with further subdivision into (predominantly) urban areas and (predominantly) rural areas.

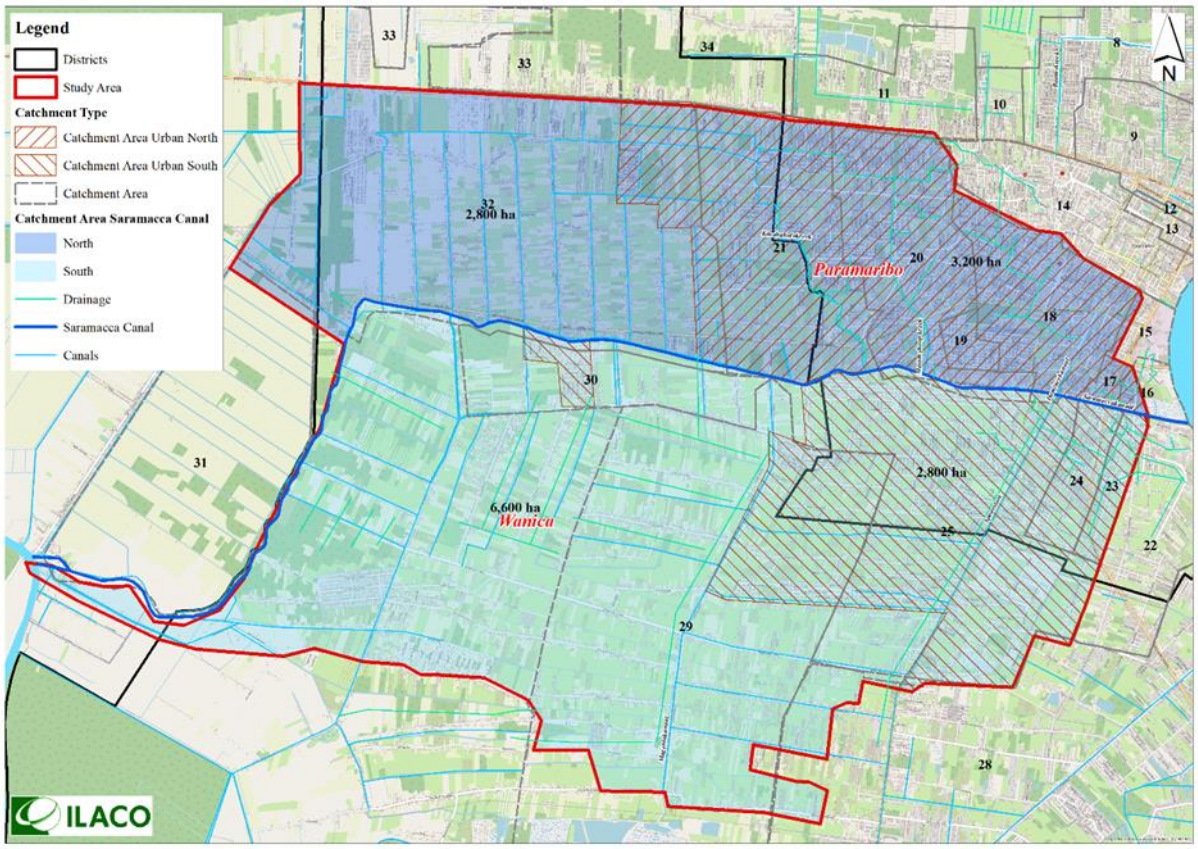


Figure 5: Drainage areas of the Saramacca Canal

The distinction between the urban and rural areas is sometimes arbitrary, due to the irregular occupation pattern in some areas. The boundaries between the Saramacca Canal drainage areas and the surrounding catchments is based upon the drainage areas as distinguished by the 2000 Masterplan for Greater Paramaribo[1]. The total drainage area of the Saramacca Canal amounts about 15,400 ha, of which 6,000 ha is from heavily populated areas. The area relies on an extensive network of gravity canals for stormwater drainage. As the city has grown over the last century, the role of the Saramacca Canal has become more important in the drainage of rainwater from the city of Paramaribo.

The Uitkijk Polder area to the west of the Project area is a separate catchment that drains toward the Saramacca River and is discharged through a pumping station.

[1] *The numbers in Figure 5 refer to the original numbers in the 2000 Masterplan.*

Canal water level data near Uitkijk collected between 1962 and 1987 show that the mean annual level ranged mostly between 30 and 55 cm +NSP. For the section near Doorsteek, similar figures have been recorded throughout the year, as illustrated in Figure 6 for 1976, which was a wet year (2,723 mm at station Zorg & Hoop). Only occasionally water levels outside this range can be observed with minima till 15-20 cm +NSP and peaks till 68 cm +NSP. Most of the year, the water level is between 40 and 60 cm +NSP, but in some periods in the months of May and June, levels are frequently between 30 and 45 cm +NSP. At Doorsteek water level can drop below NSP 0.0, when the sluice is open.

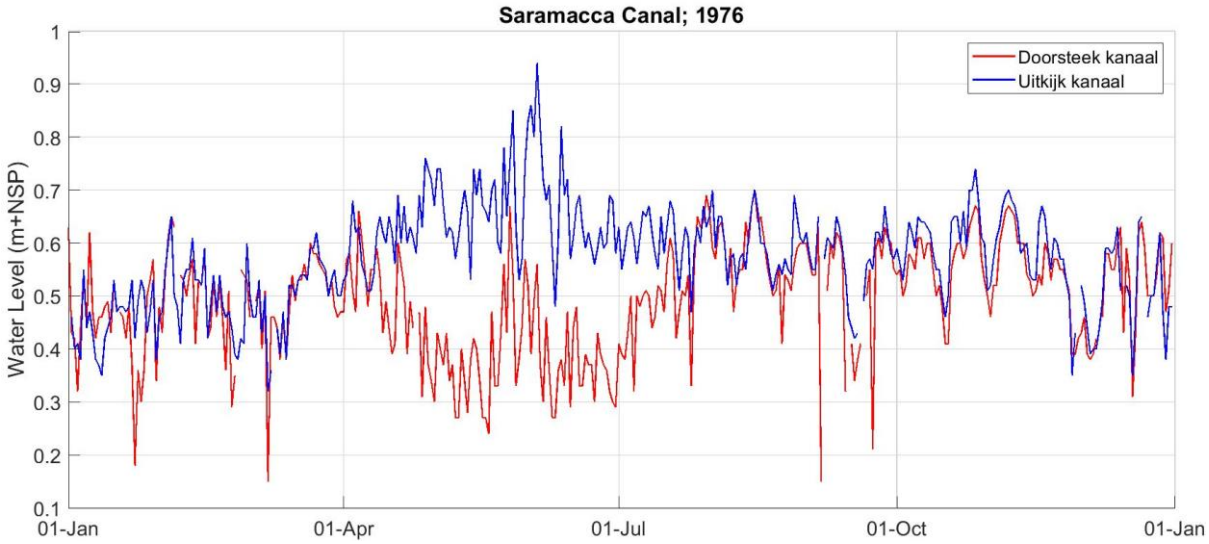


Figure 6: Daily water levels of the Saramacca Canal 1976

The canal water levels at Uitkijk, however, showed an opposite trend during the May-June period, namely an increase with levels mostly between 55 and 75 cm +NSP. This is the result of the fact that drainage from the Saramacca Canal at Uitkijk during the Long Rainy Season is frequently restricted due to high water levels in the Saramacca River.
Water levels measured in the past 2 years show similar average water levels and trends.

The average water levels of the Suriname River at Doorsteek and Saramacca River at Uitkijk over the period 1960-1990 are shown in the tables below. Water level measurements in 2021 at Doorsteek and Uitkijk show that the high water levels in Suriname River can reach NSP +1.87 m and in Saramacca River NSP +1.92 m. The water level in Saramacca River appeared to be higher than average in the wet season April-June 2021, which also experienced a higher than average rainfall.

Table 4: Water levels Suriname River and Saramacca River (1960-1990)

percentiles	(Doorsteek) Suriname River
1%	-0.98
5%	-0.84
10%	-0.74
25%	-0.47
50%	0.17
75%	0.79

90%	1.14
95%	1.30
99%	1.54

percentiles	(Uitkijk) Saramacca River
1%	-0.43
5%	-0.30
10%	-0.21
25%	0.05
50%	0.46
75%	0.85
90%	1.10
95%	1.21
99%	1.40

3.1.7 Water Quality

Two water quality surveys have been undertaken as part of the preparation for the Project execution (ILACO, 2018 and ILACO, 2022). The field data are summarized in Table 5.

Table 5: Results of water quality measurements in the Saramacca Canal

	June 2018	January 2022
pH	6.1-6.7	6.7-7.3
Electrical Conductivity (EC; µS per cm)	163-643	103-430
Clarity	Very slightly turbid to turbid	Almost clear to turbid
Secchi (cm)	18-49	15-55
Dissolved Oxygen (mg/L)	1.5-4.7	0.21-7.16
Faecal coliforms and E. Coli	Very high	No data, however expected to be more or less the same
Oil stains and sheen	L3, L9	L1, L5, L6
Fishes	Observed everywhere	Observed everywhere

There is a rather good agreement between the results of the two rounds. The pH is circumneutral and the Electrical Conductivity (EC) points to freshwater. In 2022, EC was measured along the full length of the canal. The highest EC was measured in the section near the Doorsteek due to intruding floodwater from the Suriname River. A value of 430 µS/cm was measured at km 1.9 and from there the EC gradually dropped till 103 µS/cm at km 23.5 near Uitkijk.

Turbid water was only encountered close to the Doorsteek sluice. In the section from the Doorsteek sluice till Leiding 22 (km 6 from Doorsteek), which runs through urban/industrial area, the water is almost clear to slightly turbid. In the remainder of the canal the water is almost clear to very slightly turbid (2022 survey). Dissolved Oxygen (DO) is lowest from Doorsteek till Sunny Point with most DO below 1 mg/L. This section is mostly running through urban area, where organic loading of the water is highest. An exception is formed by the water near the Doorsteek sluice with DO of 4.9 mg/L, probably due to the water flow at this location. In the remainder of the canal till Uitkijk the DO is much higher with figures mostly above 3 mg/L (2022 survey). ‘

The concentration of both faecal coliform bacteria and E. Coli were very high, as can be expected from surface water in which untreated sewage from a large urban area is discharged. The presence of faecal contamination is an indicator that a potential health risk exists for individuals exposed to this water.

During both surveys, oil sheens and stains were encountered in the sections with industry (till km 5.3 from the Suriname River), but not in the other canal sections. No exceedance of WB oil and grease standards was reported in 2018. A water sample taken the industry section in 2022, showed a Total Petroleum Hydrocarbon (TPH) of 1,100 µg/L, the hydrocarbons mainly originating from (marine) diesel and motor oil. TPH and all other analysed components were well below the USEPA (2016) Aquatic Life Criteria for Freshwater.

In the urban/industrial sections of the canal, various types of waste are reported scattered in the water and at certain spots at the banks.

3.1.8 Ecology

A rapid biological survey has been undertaken as part of the Preliminary ESIA (2018), in order to gather baseline information on the existing plant and animal species and their distribution for the Project area (Jairam-Doerga, 2018). The 2018 survey entails fishes, amphibians, reptiles and invertebrates (Jairam-Doerga, 2018). The 2018 survey report documented a number of amphibians, reptiles, fishes and invertebrates during the survey. A potential impact from project activities that is identified in the Preliminary Environmental and Social Impact Assessment (2018), is injury to manatee and dolphins. For the manatees no records of them seen in the Saramacca Canal were found, nor were feeding traces observed during the survey (Jairam-Doerga, 2018). Dolphins are restricted to the brackish waters of the Suriname River estuary (Mol, 2007) and thus not present in the Saramacca Canal. Terrestrial mammals and birds are not included in the survey, because the activities will only take place on the canal and the immediately adjacent bank. However, it cannot be completely ruled out that disturbance of wildlife in neighbouring vegetation will take place as a result of the Project activities, therefore general remarks are made about this group of animals. The terrestrial and aquatic fauna and birds in the Project area are expected to be typical for man-made and man-affected habitats, with animal species that are adapted to/tolerating, or able to cope with the presence of men in general, forest clearing, bush fires (habitat destruction), noise, road kills, hunting and fishing pressure, and trapping. Wildlife numbers and diversity is anticipated to be higher in the larger contiguous sections with high vegetation. Terrestrial fauna species that are commonly associated with human presence and may therefore occur in the vegetated parts of the Project area include mammal species such as certain opossums, bats, monkeys, edentates, carnivores, rodents; and reptiles (snakes and lizards). The 2018 report concludes: “Although the data mentioned in this report is based on a single survey, we are quite confident to say that the diversity in and along the canal presents no unique (endangered and/or threatened) species and as such can be found in other locations in Suriname”. With regard to the terrestrial wildlife, no vegetation clearing in the larger forested areas along the canal are foreseen, so that the only potential impact is noise from project activities. If affected, wildlife has the possibility to move to quieter areas of the forest during activities near such forests, but they are already accustomed to outside noise.

Habitats

The Saramacca Canal runs through the freshwater zone of the Young Coastal Plain. Swamp forest used to cover most of the clay soils in the extensive back swamps, while marsh forest was found at the slightly higher and better drained clay soils along rivers and creeks. At the sandy ridges, dryland forest occurred on the higher parts and marsh forest on the slopes towards the clay flats. But nowadays the wider project area basically entails a man-made polder land, with locally smaller or larger patches of vegetation, which typically will be

secondary. This low to high secondary growth usually has a marsh character due to a certain degree of water stagnation during rainy periods on the imperfectly to poorly drained clay soils.

Figure 7 shows the ecosystems map of the wider Saramacca Canal area (Teunissen, 1978), indicating that the Project area and its surroundings is covered with unit 66, which comprises build-up land, agricultural land and abandoned land. Natural vegetation communities are still encountered further away. Higher vegetation of trees and shrubs is encountered along the Uitkijk Polder and in-between the Bomaweg and Leiding 20. The two larger contiguous secondary forest and shrub areas are also indicated in Figure 7. These may have some importance as local “refugia” for wildlife.

Within the canal Mokomoko (Montrichardia arborescens) is found along the canal border while free floating mats and rooted floating mats are seen at the water surface. For plant species, reference is made to 2018 survey (Jairam-Doerga, 2018). No unique or rare plant species were reported for the 2018 survey.
The identified vegetation types in the Project area are quite abundant in other parts of Suriname with anthropogenic disturbances.

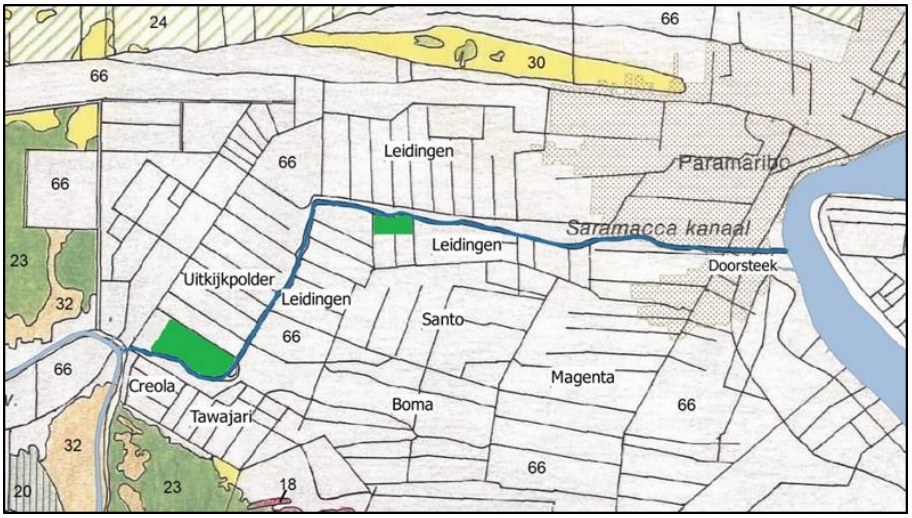


Figure 7: Part of sheet 3 of the Reconnaissance Map of the Surinam Lowland Ecosystems, scale 1:200.000 (adapted from Teunissen, 1978). Two larger secondary forest areas are shown in green (Google Earth, 2021)

Table 6: Legend of the Ecosystems Map (Figure 7).

ECOSYSTEMS OF THE COASTAL PLAIN	
Ecosystems of Fresh-Water Areas	
Ecosystems of Young Ridges	
18	Predominantly mixed mesophytic dryland- and marsh forest, locally xerophytic forest
Ecosystems of Young Swamps	
20	Hydrophytic swamp forest with *Virola surinamensis*, *Symphonia globulifera* and *Euterpe oleracea*
23	Hydrophytic swamp wood, dominated by *Pterocarpus officinalis*
24	Scattered *Pterocarpus*-bushes in herbaceous swamps
30	Herbaceous open swamps
Ecosystems of Younger Riverbanks	
32	Predominantly mixed mesophytic dryland- and marsh forest
Other Lowland Ecosystems	
66	Ecosystems of urban areas, farmland, livestock meadows, forest plantations, mining areas and abandoned land

Conservation
There are no protected areas in or near the Project area.

3.1.9 Sediment quality

Sediment samples of the Saramacca Canal were taken in June 2018 and in January 2022. They were analysed by Eurofins Analytico, the Netherlands, using the TerrAttesT ®, which includes some 200-common industrial and other contaminants. The results of both rounds reflect the same situation. (See Annex A9)

The large majority of determinants had outcomes below the reporting limit, while much of the results of the remaining determinants were below the Dutch Background Value. The Dutch Limits have been used to assess the contaminant concentrations in the dredging sludge. These limits are presented in the Soil Quality Regulation of 2007 ("*Regeling van 13 december 2007, nr. DJZ2007124397, houdende regels voor de uitvoering van de kwaliteit van de bodem*"; VROM. 2007).

Overall, most contamination is found in the section with industry (Doorsteek, first 6-7 km from the Suriname River) and residential areas, including Sunny Point (6-11.6 km). Most common contaminants are zinc and hydrocarbons, which appear in most of the samples here. High levels of hydrocarbons (levels above the Dutch background value, the maximum value for residential and industrial soil function) are found in 5 out of 12 samples, while another 7 have moderate levels. The most common fractions point to contamination with (marine) diesel and motor oil. Also, some contamination with grease is observed. Zinc levels are low to moderate. Other contaminants found in more than one sample are phenols (phenol and cresols) with moderate to high levels in 4 samples. Striking is the occurrence of high Arsenic levels and moderate mercury levels near Sunny Point. Arsenic may occur naturally in soils and sediments. Other potential sources of Arsenic are wood preservatives, pesticides and metal alloys. There is no clear explanation for the elevated presence of this compound at this specific location. No contamination of sediments was found in the rural section beyond Sunny Point to Uitkijk.

3.2 Social Baseline

3.2.1 Project Stakeholders

There is an assortment of GoS institutions, businesses, and residents located within the canal area of influence. This section provides an overview across these stakeholders.

Government
The Project will be implemented by the Ministry of PW. Within the Ministry of PW, a Unit has been established to manage daily project activities, monitor project progress, communicate with stakeholders, and address grievances (See SECP): the Saramacca Canal Unit (SCU)
Other government ministries with an interest in the Project are listed in Table 7 below.

Table 7: Other government ministries with an interest in the Project

Name	Dutch name & Abbreviation	Task in this Project
Finance	Ministerie van Financiën	Manages finance
Agriculture, Animal Husbandry and Fisheries	Landbouw, Veeteelt en Visserij - LVV	- First point for contact for farmers who have problems with water management - Communicates with the Ministry of PW, which operates the sluices and manages water regulation in the canals
Regional Development and Sport	Regionale Ontwikkeling en Sport, ROS	Supervises the various district governments
Natural Resources	Natuurlijke Hulpbronnen – NH	Provides licenses for mining of resources such as gravel and river sand, which are sold by firms along the canal
Spatial Planning and Environment	Ruimtelijke Ordening en Milieu - ROM	Environmental regulation and monitoring
Land Policy and Forest Management	Grondbeleid en Bosbeheer - GB	Land allocation and land titling
National Institute for Environment and Development in Suriname	Nationaal Instituut voor Milieu en Ontwikkeling in Suriname (NIMOS)	Manages the ESIA process and monitors compliance, including stakeholder engagement. Developed National ESIA Guidelines. The ESIA/ESMP is to be reviewed by NIMOS before its final completion.
Maritime Authoritiy Suriname	Maritieme Autoriteit Suriname (MAS)	Vessel traffic and navigation at sea and on inland waters, including the Saramacca Canal. Water traffic must comply with regulations of the MAS
District Governments, with District Commissioner	Commissariaat / Districts Commissaris - DC	Intermediaries between the central government and the population in the various districts. The Project covers three districts: Paramaribo (southeast), Wanica (northwest), and Saramacca
Suriname Water Supply Company	Surinaamse Waterleiding Maatschappij - SWM	Piping from the SWM runs along the canal and, at one point, underneath the canal. Maps of the exact locations have been acquired and will be considered in project design. During Project activities, near SWM waterworks, close collaboration with this company is advisable.
Suriname Energy Company	Energie Bedrijven Suriname -EBS	Electricity wiring from the EBS runs along the canal and crosses the canal at some locations
Bureau Public Health	Bureau Openbare Gezondheidszorg, BOG	Responsible for public health measures. During Project preparation, the BOG laboratory worked on measurements of water quality
Telesur (National telephone company, provider of land lines and internet)	Telesur	Telesur cables are present in the area of impact (200 m on both sides of the canal) and cross the canal at some locations (at the bridges)
National Coordination Center for Disaster Relief	Nationaal Coördinatie Centrum voor Rampenbeheersing	Must be involved in case of large-scale projects and be prepared for possible disasters that could result from such projects

Businesses

A significant number and variety of businesses is situated immediately bordering the canal. The Ministry of PW characterized the 130 businesses and other non-residential structures in the 200 m zone along the canal as follows: 56 industrial firms; 50 small and medium enterprises; 11 government buildings (for example, power stations, water companies, schools, health centres, and ministry buildings); 10 cultural sites (including places of worship); two pumping stations; and one sports facility (soccer field).

Residents

Four main residential neighbourhoods were identified along the Saramacca Canal (Figure 8).
South of the canal:

- Wit Boiti (Goede Verwachting), Ressort Latour, District of Paramaribo
- Sunny Point 2/Leiding 20, Ressort Koewarasan, District of Wanica

North of the canal:

- Magnesiumstraat/Titaniumstraat, Ressort Flora, District of Paramaribo
- Metropoolweg/Indrawatiweg, Ressort Saramaccapolder, Wanica District

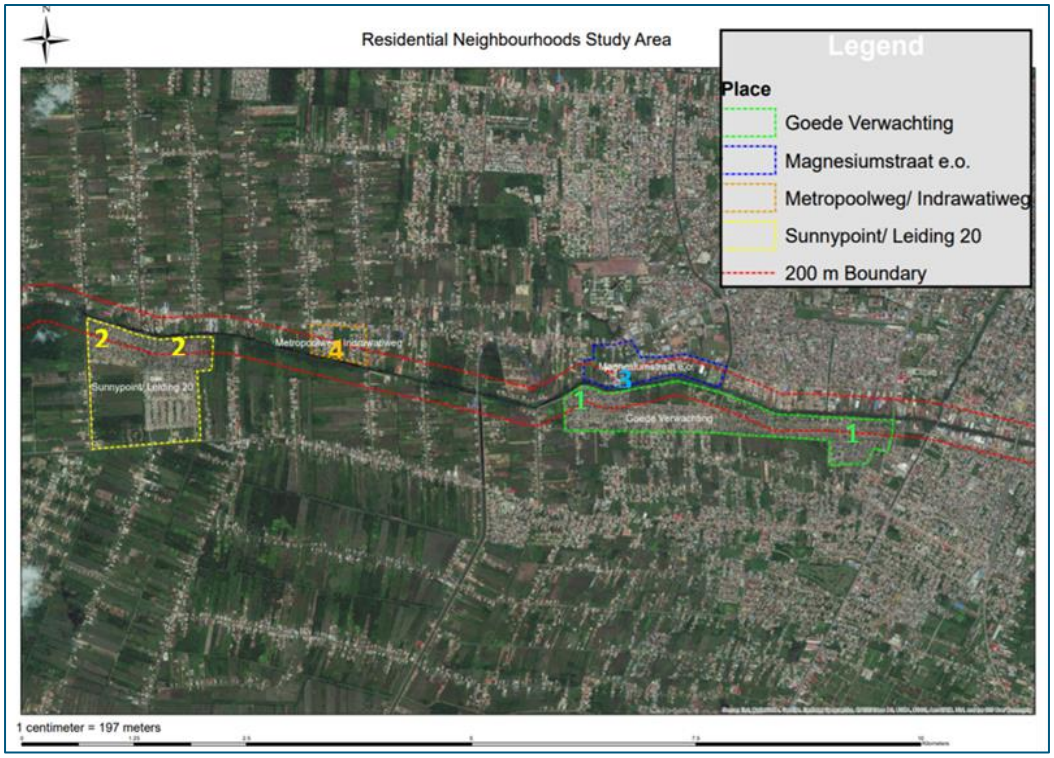


Figure 8: Residential areas along the canal

A more detailed demographic and socioeconomic description of these different neighbourhoods is presented below.

Wit Boiti/Goede Verwachting

The residential area along the Saramacca Canal that is popularly known as ‘Wit Boiti’ or “Goede Verwachting” is situated on both sides of the Goede Verwachtingweg, along the Saramacca Canal between roughly 2.7 km and 6.7 km from the Suriname River. The area is not subdivided into different segments. Nevertheless, one can distinguish the small cluster of households east of the Coesewijne Bridge, the households along the paved part of the Goede Verwachtingweg west of the Coesewijne Bridge, and the households along the unpaved part of

the Goede Verwachtingweg. A small number of houses are built immediately bordering the canal, on the government maintenance strip. In addition, several persons built larger and smaller docks along the canal.

Goede Verwachting is largely inhabited by low-income families, and characterized by associated social problems. The heads of the households typically have poorly paid and/or informal jobs. Ethnically, the majority (>50%) of neighbourhood inhabitants are of Maroon ethnic descent. The remaining (non-Maroon) population consists of Hindustani (people of East Indian descent), Creoles (people of African descent), and people of mixed ethnic heritage.

House counts on aerial photographs suggest that there may be about 750–800 houses in the Goede Verwachting section that is situated within the 200 m boundary along the Saramacca Canal. Houses in this neighbourhood are typically small and very basic, yet of varying quality, ranging from brick houses with decent zinc roofing to makeshift huts built of zinc plates and wood. Along the paved parts of area of influence in the Wit Boiti neighbourhood (Goede Verwachtingweg, Goede Zorgweg, and side roads), housing structures appear to be of relatively better quality. In this section, residents are connected to the public water network of the SWM. They often have a water tap on their plot outside the home. Along the unpaved part of this neighbourhood, people are not connected to the public water network. For drinking and other household uses, these households primarily collect rainwater from rooftops. In the dry season, they buy drinking water at the SWM, which fills the water storage tanks next to their homes.

During the long rainy season (end of April through mid-August) the neighbourhood gets flooded and rainwater runs into peoples' homes. A primary reason for flooding is that the secondary and tertiary canals in the neighbourhood are grown over with weeds and culverts are clogged, preventing the diversion of water. The resort council is looking into options to clean up these canals, but they do not have the necessary machinery.

There is no school in Goede Verwachting; children mostly go to school on the other side of the canal in the Latour, Flora, and Ephraimzegen neighbourhoods. There also are no sports facilities and there is no clinic. There is one church along the waterfront, and two churches along the main road, within the area of influence. All churches are evangelical churches; there are no prayer houses of other religions.

Sunny Point 2/Leiding 20

The residential area along the Saramacca Canal that is popularly known as 'Sunny Point' borders the Saramacca Canal on the south, roughly between 10.5 km and 11.8 km measured from where the Saramacca Canal meets the Suriname River, as the crow flies. This neighbourhood is subdivided into a section with public housing structures, Sunny Point 1 and Sunny Point 2; the latter area also is referred to as Leiding 20. Only Sunny Point 2 is located within the 200 m boundary. An estimated 350–400 households populate this area.

Sunny Point 2/Leiding 20 can be characterized as a marginalized neighbourhood: streets are unpaved; houses are typically very basic, self-fabricated structures. Many households are not connected to the public water network (SWM); and there is no decent sewer system. For drinking water, households in the Leiding 20 section rely mostly on rainwater and three public taps that are placed along main crossroads. In the Sunny Point 2 section, people also rely on rainwater or on self-constructed water pots. In addition, households may buy water from households in the Sunny Point 1 section, which is connected to the public water network. Most houses in this neighbourhood have outhouses outside their home, as a toilet facility. Very few, if any of the houses, have a flush toilet and a septic tank. Many of the open gutters along the street are clogged so that the water does not run, creating a public health risk. This situation is exacerbated by the fact that the sluices at Leiding 20, which are meant to divert the water from the Goede Verwachting and Sunny Point neighbourhoods to the Saramacca Canal, are clogged. Despite the poor conditions of the secondary and tertiary canals, the neighbourhood is not prone to flooding during heavy rainfall.

This part of the Sunny Point neighbourhood is not connected to the EBS, but some households have requested an electricity source for building purposes (bouwstroom) and others have constructed their own wiring to these points. Loose hanging power lines create a public hazard. Children attend school in the Sunny Point 1 section. Sunny Point 1, which is mostly paved, also features a neighbourhood centre of the neighbourhood association Stichting Du Leti.
The Sunny Point 2/Leiding 20 area is inhabited by low-income families. People typically have low-income and/or informal jobs. Similar to the Goede Verwachting neighbourhood, teen pregnancy, single mothers with many children, and school dropouts are common problems. Ethnically, the grand majority (>80%) of neighbourhood inhabitants are of Maroon ethnic descent. Other inhabitants are ethnically Chinese, Hindustani, Creoles, people of mixed African heritage and others.

Magnesiumstraat/Titaniumstraat
The houses along the Magnesiumweg and Titaniumweg form a small, middle-class/upper-middle-class residential area on the north side of the Saramacca Canal, at roughly 6.4 km from the Suriname River (as the crow flies), in District Paramaribo. Within the 200 m boundary along the canal, there are approximately 50–60 houses. Along the unpaved part of the Magnesiumweg, parallel to the canal, there are a couple of houses and a hotel 'Comfort Tulip Inn' overlooking the canal. There are no houses on the public maintenance strip, but the hotel built a terrace with lounging chairs on this strip.

This area can be characterized as middle and upper middle class. Ethnically the neighbourhood inhabitants are mostly of Hindustani ethnic descent. Most streets are paved and the area is connected to the public water network (SWM) and the public electricity net.

Metropoolweg/Indrawatiweg
The area surrounding the Metropoolweg/Indrawatiweg is a residential area on the north side of the Saramacca Canal, at roughly 8.8 km from the Suriname River (as the crow flies), in Wanica District. This residential area is bordered by the Commissaris Weytinghweg in the north, the Saramacca Canal in the south, the Indrawatiweg in the west, and the Mireilleweg in the east. Within the 200 m boundary along the canal, there are approximately 80–100 houses. This area can be characterized as middle class.

Vulnerable groups
A significant factor in achieving inclusiveness of the engagement process is safeguarding the participation of vulnerable individuals in public consultations and other engagement forums established by the Project. Vulnerable status may stem from an individual's or group's national, ethnic or social origin, colour, gender, language, religion, political or other opinion, property, age, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources. Engagement with the vulnerable groups and individuals often requires the application of specific measures and assistance aimed at the facilitation of their participation in the project-related decision making so that their awareness of and input to the overall process are commensurate to those of the other stakeholders.

Within the Project area, particularly vulnerable are the inhabitants of the low-income neighbourhoods Goede Verwachting and Sunny Point who live directly along the Canal. Many of these households are female-headed, poor, and of Maroon ethnic descent. Particularly in Sunny Point, the household members often have limited educational attainment, some are illiterate, and many are not fluent in Dutch, the national language. Within the scope of this Project, special effort will be made to ensure that during all Project stages, these households are well informed in the language they are most comfortable with, and are given adequate opportunities to ask questions and voice concerns.

Another vulnerable group consists of the school children and commuters from the Goede Verwachting neighbourhood (south of the Canal) who need the ferry to go to respectively school and work. From the north side of the Canal, they either walk to school or work, or they take a bus to go further. Closing the ferry during school and work days is problematic. Besides the expenses in seeking alternative transportation, it would take a lot of time to reach the other side of the Canal across the nearest bridge, especially in rush hour.

Near the Uitkijk sluices there are receptors that need to be taken into account. North of the sluices there is an elementary school (O.S. Uitkijk). Loud noise during school hours may disturb the school children. Also, possible bridge closure will affect access to the school. Also north of the sluices there are two churches, a Seven-Days Adventist Church, which has services on Saturdays, and an Evangelical Church (EBG), which holds services on Sundays. A local government office is also located north of the sluices (see Figure 9).

Figure 9 Location Government office

3.2.2 Uses of the Canal

Businesses

Businesses along the canal use the canal to bring in production inputs (for example, sand, lumber), to discharge wastewater, and to dispose of waste. The following types of vessels use the canal:

- Motorized deck barges (Motordekschuiten) a deck barge for freight transport that is powered by a combustion engine
- Push boats (duwboten): Vessels that do not transport a load on their decks, but serve to drive two, four, or six large, almost square steel barges (duwbakken) with freight
- Fishing vessels

In the years 2016-2020, an average number of 490 vessels/yr used the Doorsteek sluices. Numbers in the earlier years were relatively higher (2016: ca. 500; 2017: ca. 700; 2018: ca. 550). Due to the poor navigability of the canal and relative low road transportation costs, fewer vessels use the Doorsteek sluices today.

In the years 2018-2020, on average approximately 300 vessels passed the Uitkijk sluices. These numbers have been dwindling as particularly the westerns half of the canal has become unnavigable. In the first five months of 2021 (Jan-May), the sluice log book counted 73 passages (in and out), an average of 15 vessels per month.

Currently, the sluices at Uitkijk are hardly used. Due to excessive plant growth in the canal, vessels are unable to enter the canal (Figure 10). As a result, fishing boats are laying idle, and several vessels that made an effort to get through have had to return (Figure 11).

Information about the vessels using the Saramacca Canal in the first half of 2021 is listed in Table 8.

Figure 10 Vessel coming from Coppename Punt, waiting at the lock (20-11-2022)

With fewer ships passing the sluices, the main function of the sluices has become flushing water from the Saramacca Canal to the rivers, to drain the surrounding land. Plant growth is severely inhibiting this function as well (Figure 11).

Figure 11 Plant growth in canal

Table 8: Number of businesses that use the Saramacca Canal sluices, based on sluice operator log books

	Doorsteek	Uitkijk
Number of businesses that use the sluices	10	4
Names of businesses that use the sluices	Vabi, Soebratie, Haukes, Dienie, Paladsingh, Taurus, Arsap, Ome Tome, Rocco Palass, Akash	Samagroup, Victoria, Boyke (Individual) Fisherman (no name)
Number of uses (in and out) between January and May 2021	138	73
Average number of passages/months	28	15

Main complaints of businesses about the canal included:

- The canal is poorly navigable; obstructions in the canal include wood, drifting vegetation, and waste
- Land loss/erosion
- Waiting time at the locks
- Limiting dimensions of the canal and related public infrastructure, such as vertical clearance, dimensions of the lock chambers, depth of the canal, and depth of the lock entrance

Household uses
In Sunny point and, to a lesser extent Goede Verwachting, several households have built clay stairs or jetties into the canal. They use the canal water for bathing and washing clothes and dishes- especially in the dry season.

Wastewater of the low-income households along the canal typically flows directly into the canal. These households may or may not have a septic tank. Observations suggest that where the houses are built on the public maintenance strip, outhouses often are built immediately along the canal, with the sewer pipes draining into the canal.

Livelihood Activities in and along the Saramacca Canal
One individual depends solely on access to the canal for his livelihood. This person manually operates a small ferry boat to bring passengers across the canal near the offices of Staatsolie Suriname NV (approximately 4.8 km from the Suriname River).

People occasionally fish in the canal, using both nets and fishing rods. Fishing is primarily undertaken by members of low-income households who live along the canal for own consumption, while small surpluses may be sold. However, many residents are aware of the possible pollution of the water, and they do not consume fish from this source. People can catch all kinds of fish in the canal. People set out the nets along the shoreline in the evening, and collect the fish in the morning.

Fishers who fish at Coppename Punt, at the confluence of the Saramacca River and the Coppename River, used to use the canal, going through both the Uitkijk and the Doorsteek locks, to bring the fish they catch at Coppename punt to the market in Paramaribo. Nowadays, however, they cannot take this route anymore because the canal is overgrown and they cannot get through. For that reason, these fishers now travel over sea, along the shoreline, to reach the Paramaribo market. It is expected that once the canal is cleared and navigable, fishers will use this inland passage way again as it is faster and safer than traveling over sea.

Hardly anyone plants commercial food crops along the canals, and even planting for subsistence use is rare. In some locations, people may have some fruit trees (for example, banana and coconut). The harvested fruits are for own consumption, while the surplus may be sold. In the area between Leiding 11 and Uitkijk, farmers use the secondary and tertiary canals that run into the Saramacca Canal for irrigation.

Transportation
A selected number of firms use the canal to bring in raw materials for their production process, yet not all firms located along the canal use it for transportation. These firms typically use the Doorsteek locks to bring their products outside. In the year of the cut-off date (15 November 2021), ten firms were still using the locks at Doorsteek, including Vabi, Soebratie, Haukes, Dienie , Paladsingh, Taurus, Arsap, Ome tome, Rocco Palass and Akash. The sluice manager log books show that vessels from these firms passed the locks, on average, 14 times each month. This figure indicates that travel through the locks is not very frequent, and that there are many days without any travel.

A small ferry boat in the Wit Boiti area provides an important connection for work and school commuters.

Leisure
Occasionally children swim in the canal, but this is discouraged by parents as already several children have drowned.

Some persons drive small boats in the canal for leisure. Persons from outside the Project area also use the boat landings along the canal to launch their boats. In this context, the canal is sometimes used as a passage way to the Saramacca River or the Suriname River. Along the Magnesiumweg, one of the households constructed a jetty to launch its leisure boat and a water scooter. However, the people have not used it for a while and the jetty is overgrown with weeds.

In the Metropoolweg area, people have used the public maintenance strip to build small docks and simple wooden jetties along the water. In this same general area, there are at least two cement boat ramps that are used both by the families who have tenure rights to the land and by others who wish to bring their boat to the water. Leisure boats enter at this location to access the Suriname River or the Saramacca River.

3.2.3 Land tenure

With regards to land tenure of the Project area of influence of the canal (200m on each side), it was not possible to obtain a map with land tenure titles, or quantitative figures on the percentage of land under different land tenure titles. Nevertheless, based on land tenure information from the Management Institute for Land Registration and Land Information System (MI-GLIS), the land tenure situation can be summarized as described below.

South of the canal, in the residential area along the Goede Verwachtingweg, residents predominantly have land lease (grondhuur) titles to the land. In addition, part of the land in this neighbourhood is occupied government land (vrije domein). Also, south of the canal, in Sunny Point 2/Leiding 20, the land has been allocated as private ownership, but this land has (largely) been occupied by poor households without legal tenure rights. A small number of houses are built immediately bordering the canal, on the government maintenance strip.

Land in the residential area of the Magnesiumstraat and Titaniumstraat, north of the canal, has been allocated as governmental land lease (grondhuur). In the other residential area north of the Saramacca canal, around the Metropoolweg/Indrawatiweg, residents hold property titles (eigendom). Land of the industrial area bordered by the Suriname River in the east, the Coesewijne Bridge in the west, Industrieweg Noord in the north, and Industrieweg Zuid in the south, has been allocated as governmental land lease (grondhuur) and leasehold (erfpacht). The rural areas between roughly 12 km from where the canal meets the Suriname River, until the point where it meets the Saramacca River, have been allocated as land lease/lease hold.

4 Expected Environmental and Social Impacts

4.1 Purpose of the Environmental and Social Impact Assessment

The Project is categorized as a Category B - Partial Assessment, assigned to projects that are likely to have localized, limited, and reversible environmental impacts. Overall, the Project will have largely positive social and environmental (health and safety) impacts through its role in reducing vulnerability to flooding and improved navigational capacities to enhance commercial trade. Physical interventions resulting from the implementation of the Project activities could have low to moderate negative environmental impacts. The most significant impacts will result from canal maintenance works and rehabilitation works of the sluice and ship lock. Impacts on the biophysical and socioeconomic environments are expected to be limited in nature.

The purpose of the ESIA is to characterize and identify project risks and impacts and mitigation measures based on current information, including an accurate description and delineation of the Project and any associated aspects, and environmental and social baseline data. The ESIA must allow the Borrower to identify ways to mitigate adverse environmental and social impacts and seek opportunities to enhance the positive impacts of the Project. More specifically, the purpose of the ESIA is to:

- Identify and assess environmental and social impacts and risks;
- Determine measures to mitigate these impacts and risks through an ESMP;
- Implement stakeholder consultation and have valid communication process with these stakeholders:
- Specify the inter-institutional arrangements for the preparation of time-bound action plans for managing and mitigating impacts and risks;
- Ensure that there are appropriate avenues for grievance redress across the Project activities;
- Provide ample information for the Project Contractor to submit an appropriate Construction ESMP to effectively and appropriately implement the Project components; and
- Establish a monitoring and verification program to report to all parties on the progress and status of safeguards actions.

Projected social and environmental impacts without mitigation and enhancement measures, are presented in the tables below. Possible impacts are categorized as environmental, health & safety, and socioeconomic impacts. We distinguish canal maintenance works and rehabilitation of the sluices and ship lock.

4.2 Impacts related to maintenance of the Saramacca Canal

Table 9 Project Environmental, Social Impacts, Issues and Concerns related to Maintenance of the Saramacca Canal

Item	Description
General Performance	• Poor public perception; Stakeholders who feel that the Project negatively affects them, or who feel unheard, may generate protests and negative publicity. Damage of the image of all involved parties
Air quality	• Emissions from construction vehicles and equipment. Poor maintenance of equipment and transportation means, and unnecessary idling of construction equipment or delivery trucks when not in use increases emissions. • Dust pollution during transportation of waste.
Fuel use	• Risk of spills • Risk of poor management of fuel waste, e.g., empty containers. • Potential pollution of soils and water.

Item	Description
Waste	• Canal cleaning and maintenance will produce large volumes of vegetation waste. • Clearing of the Canal embankment will produce waste such as trees and shrub bushes plastic material etc. that need to be removed and transported and disposed of adequately. • Excavated materials may contain waste.
Soil/Sediment	• Excavated material may contain waste debris and /or contaminants. • Backfill materials could flow back into Canal after placement on Canal banks (erosion). Sediment removal works and clearing vegetation disturbs the soil and can cause increase of turbidity in the Canal. Soil pollution as a result of improper transportation of excavated material and other waste via public roads (if applicable).
Surface water quality	• Excavated sediment materials may contain contaminants. This excavated material can only be reused for re-profiling and/or backfilling, if the sediment quality at targeted location is acceptable. • Increase in turbidity due to Canal maintenance activities may affect aquatic flora and fauna in selected areas. • Waste (vegetation, sediments, plastics and other waste) could clog and pollute waterways if ending up in the Canal or trenches and ditches. • Water pollution with spilled and leaked oil and/or grease from boats and equipment during canal maintenance.
Noise	• Noise generated by maintenance equipment and activities may be a nuisance to area inhabitants. • Working in conditions with excessive noise may damage worker's hearing.
Health and Safety	
Collisions	• Collisions or accidents involving other water users. • Collisions with objects on the water
Worker Health and Safety	• Construction workers are exposed to health and safety risks (snakes, bees etc.), especially when working with heavy equipment and/or on water (injuries, drowning). • Navigational hazards and accidents including drowning. • Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.
Fisher health and safety	• Positive: Fishers from Coppename Punt now have to travel over sea to get to the market because they cannot get through the weeds in the canal. Once the canal has been cleared from vegetation, they can use the safer route through the canal.
Community Health and Safety	• Incidents and accidents due to transportation of material and goods on the public road (transportation of waste, excavated material via the public roads) • Area inhabitants, particularly those right along the canal, use the canal water for household uses such as bathing and washing dishes and clothing. Increased turbidity of the canal during maintenance will affect these activities. • Some children use the canal for swimming. This will create a safety hazard and must be discontinued during maintenance. .
Risk Force Majeure (environmental emergency)	• Danger of the workers and public from fire, flooding, extreme weather events etc.

Item	Description
Socioeconomic impacts	
Livelihood impacts	• Positive: Project will enable fishers from Coppename to reach the Paramaribo market through the Canal, which now is impossible as the Canal cannot be navigated. • Positive: Provision of construction jobs to Suriname companies and materials sourced from the Suriname economy generate income for Suriname workers and small businesses
Disruption of household uses of Canal	• Temporary presence of clearing and vessels, and increased turbidity, affect households that use Canal for household uses such as washing clothes and dishes. Especially in the dry season.
Risk of damage to assets of residents	• Risk of damage to business and household structures on or near embankment • Risk of damage to other private property in and along Saramacca Canal, including jetties.
Flood risk reduction	• Positive: Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding • Lower risk of health problems after heavy rainfall and flooding

4.3 Impacts related to rehabilitation of the Doorsteek sluice and ship lock

Table 10 Project Environmental and Social Impacts, Issues and Concerns related to rehabilitation Doorsteek sluice and ship lock

Item	Description
General performance	• Poor public perception; Stakeholders who feel that the project negatively affects them, or who feel unheard, may generate protests and negative publicity • Damage of the image of all parties involved
Air quality	• Emissions from construction vehicles and equipment. Poor maintenance of equipment and transportation means, and unnecessary idling of construction equipment or delivery trucks when not in use increases emissions. • Dust pollution from construction site • Dust pollution during transportation of waste
Waste	• Solid household and construction waste is generated during works on sluice and lock.
Noise	• Noise generated by construction equipment and activities may be a nuisance to area inhabitants, especially those immediately bordering the area of the sluice and locks • Working in conditions with excessive noise may damage worker's hearing.
Material and resources	• Introduction of foreign material (metals, cement) in an aquatic environment
Water quality	• Spills during construction works (raw material, oil, fuel, paint) • Local increase in turbidity
Health and Safety	
Worker Health and Safety	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water. • Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.
Risk Force Majeure (Environmental emergency)	• Danger of the workers and public from fire, flood, extreme weather events etc.
Socioeconomic impacts	
Livelihood impacts	Disruption of business, loss of income or increased expenses for businesses using the locks for transport of goods, as will be detailed in an LRP as needed, in line with World Bank standards. • Positive: Provision of construction jobs to local companies and materials sourced from the local economy generate income for local workers and small businesses • Positive: Better functioning ship lock will make passage for vessels more efficient
Flood risk reduction	• Positive: Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding • Lower risk of health problems after heavy rainfall and flooding

4.4 Impacts related to rehabilitation of the Uitkijk ship lock

Table 11 Project Environmental and Social Impacts, Issues and Concerns related to rehabilitation Uitkijk ship lock

Item	Description
General performance	• Poor public perception; Stakeholders who feel that the project negatively affects them, or who feel unheard, may generate protests and negative publicity • Damage of the image of all involved parties
Air quality	• Emissions from construction vehicles and equipment. Poor maintenance of equipment and transportation means, and unnecessary idling of construction equipment or delivery trucks when not in use increases emissions. • Dust pollution from construction site • Dust pollution during transportation of waste and materials
Waste	• Solid household and construction waste is generated during works on ship lock.
Noise	• Noise generated by construction equipment and activities may be a nuisance to area inhabitants, especially those immediately bordering the area of the Uitkijk ship lock • Working in conditions with excessive noise may damage worker's hearing. • There is an elementary school at an approx. distance of 220m from the Uitkijk ship lock. Excessive noise during school hours may impact learning. • There are two churches in a circle of 500 m. from the Uitkijk ship lock. Excessive noise on Saturdays (Adventist) or Sundays (Protestant) may impact the services.
Material and resources	• Introduction of foreign material (metals, cement) in an aquatic environment
Water quality	• Spills during construction works (raw material, oil, fuel, paint) • Local increase in turbidity
Flooding risks	• Flooding risks if works prevent opening of the sluices during high water levels in the canal
Health and Safety	
Worker Health and Safety	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water. • Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.
Improved Fishers health and Safety	• Positive: Fishers from Coppename who can use the locks and enter the Saramacca Canal to get to the Paramaribo market, thus preventing having to undertake the more dangerous travel over sea.
Risk Force Majeure (Environmental emergency)	• Danger of the workers and public from fire, flood, extreme weather events etc.
Socioeconomic impacts	
Livelihood impacts	• Negative: Vessels from fishers and businesses that wish to use the Uitkijk sluices to enter the canal once it has been cleared, may be hindered. It is expected that this negative impact will be minimal as the Uitkijk Lock is hardly used by fishers and businesses due to excessive vegetation. • Positive: Provision of construction jobs to local companies and materials sourced from the local economy generate income for local workers and small businesses

Item	Description
	• Positive: Better functioning ship lock will make passage for vessels more efficient
Flood risk reduction	• Positive: Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding • Lower risk of health problems after heavy rainfall and flooding
Flood risk	• Risk of flooding during construction period if works prevent opening of the Uitkijk sluices to drain during high water (e.g. after heavy rainfall).

Tables rank these impacts prior to, and after mitigation of negative impacts and maximizing of positive benefits, are provided in ANNEX A10.

4.5 Involuntary Resettlement and Livelihood Restoration

World Bank OP 4.12 on involuntary resettlement covers direct economic and social impacts that result from Bank-assisted investment projects and are caused by
(1) the involuntary taking of land resulting in
relocation or loss of shelter;
loss of assets or access to assets; or
loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

(2) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

All persons losing assets or use of resources as a direct result of a Bank-supported project are considered "Project Affected People" (PAPs) entitled to compensation and/or other forms of assistance.

The works subject to this ESIA/ESMP will not cause involuntary resettlement under OP 4.12. Also, in the context of canal maintenance, no livelihood impacts are foreseen. It is extremely unlikely that canal maintenance activities damage houses, jetties, or other structures in or along the Saramacca canal. With proper stakeholder communication, canal maintenance will not affect ferry traffic.

Livelihood impacts may be experienced due to work on the Doorsteek sluices and locks. Companies that are restricted in their use of the sluices and thereby forego income are entitled to compensation or other forms of assistance, for example in the form of help with transportation of their products, so that they will not experience any loss of income or assets.

Involuntary resettlement and livelihood impacts are not foreseen as a result of work on the Uitkijk ship lock rehabilitation.

In those cases where potential livelihood impacts are evident and proven, a Livelihood Restoration Plan (LRP) will need to be developed, in accordance with WB guidelines.

4.6 Natural Disaster and Risk Prevention

4.6.1 Natural Hazards

Paramaribo is prone to natural hazards, including flooding and extreme weather events (rainfall and wind), further discussed below. Climate Change may increase both the frequency and severity of such hazards, and aggravate the impacts. Other extreme events such as hurricanes and earthquakes are not applicable for Paramaribo.

- **Construction Phase**: Flooding and extreme weather events could impact construction activities and could result in damage to project components (e.g., damage to construction sites and equipment). Some delays may be experienced, but generally extreme weather events and flooding are for a short period and these periods are covered within the overall construction periods.
- **Operations Phase:** Natural events could also damage infrastructure or disruption of operation.

Flooding
Suriname experiences frequent floods in its coastal plain and rivers. Inland and coastal flooding in urban areas of Paramaribo is produced from the high volume of precipitation, poor drainage due to the outdated and insufficient drainage system, and rising sea and river water levels, particularly during the rainy season. Due to excessive plant and shrub growth in the Saramacca Canal, rainwater is not properly transported to the rivers and the Canal fails at its drainage function. Canal maintenance and rehabilitation of the sluices will have a positive impact on flood risk as it will improve water flow in the Canal and drainage into the rivers.

It is possible that during Project activities, excessive rainfall will cause flooding and thus impact the construction activities and/or result in damage of project components or delays. The Contractor is expected to take protective and preventive measures to avoid / reduce damages or delays as much as possible.

Storms and other extreme weather events
Paramaribo has recently experienced severe weather conditions including high intensity wind. These extreme winds occur during heavy rains and can present wind speeds between 20 meters per second (m/s) and 30 m/s. It is expected that with the projected increase in temperature, the energy in the atmosphere will increase as well as the maximum wind velocity. Extreme weather events such as high winds may impact the construction activities and/or damage project components.
It is not foreseen that the project will affect storm risk or the risk on other extreme weather events, nor will it affect people's ability to respond to such events.

4.6.2 Social hazards

Public revolts
Suriname occasionally experiences (peaceful) demonstrations and strikes, but public revolts are extremely rare. It is not foreseen that the Project will have any impact on public revolts.

5 Environmental and Social Management and Monitoring Plan

5.1 Purpose of the Environmental and Social Management and Monitoring Plan

An ESMP is essential for successfully implementing the Project's social and environmental performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental and social risks are identified, minimised and managed. The ESMP will be a living document and will continue to develop during the design and construction phases to enable continuous improvement of the Project's social and environmental performance.

The overall objective of the ESMP is to bring the project into compliance with national environmental and social requirements and environmental and social policies of the Bank. In particular, the objectives of the ESMP are to:

- Promote environmental and social management and communicate the aims and goals of the ESMP;
- Ensure that all workers, subcontractors and others involved in the Project meet legal and best practice requirements with regard to environmental and social management;
- Incorporate environmental and social management into project design, construction and operating procedures;
- Address concerns and issues raised in the stakeholder consultation process and those that will likely continue to arise during the Project's lifetime;
- Provide a framework for implementing project environmental and social commitments; and
- Prepare and maintain records of project environmental and social performance (i.e., monitoring, audits and non-compliance tracking). The Contractor should monitor their own performance and submit monitoring reports to the Ministry of PW - SCU.

This Project ESMP outlines management commitment for the sustainable implementation of the proposed project at large and will be included in the bidding documents. All parties involved in the Project, especially the Contractor, will have to detail this general ESMP into its Construction Environmental and Social Management Plan (CESMP). The Contractor will be asked to submit a draft CESMP with their tender. This draft budgeted CESMP should outline the Contractor's method statement and management procedures to ensure that all construction, maintenance and excavation activities are implemented in an efficient, safe and sustainable manner. In this way, the Ministry of PW-SCU can assess the proposed approach of the Contractor and include that in the selection of the preferred bidder.

The tables below give an overview of the ESMP for the preparation, construction and operational phases of the selected measures of the Project. The Canal maintenance works and the rehabilitation of the sluices and ship lock are presented in separate sub-chapters.

Note: PW is mentioned as responsible entity, but for most activities under this Project PW is supported by SCU and as such SCU is also assumed to be part of the responsible entity.

5.2

5.3 Saramacca Canal Maintenance

Table 12 Environmental and Social management measures Preparation phase - Maintenance Canal

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
General Performance	Poor public perception/ Damage of the image of all involved parties	• Inform local population, local business, fishers, sluice managers and other users of the canal and related stakeholders about progress of the project, activities planned, and job and economic opportunities.	PW/ Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances	Review of records	Minutes of meetings Monthly progress reports Grievances records and analysis
		• Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the project throughout all phases. • Include the ESMP as part of the tender documents	PW			
E&S	All E&S risks	• Include E&S requirements in contract conditions and work together with the contractor	PW	Tender documents have a E&S section	During contractor selection (bidding process): E&S requirements included in the Bids	Contractor BID/Draft CESMP

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		to incorporate ESMP requirements fully				
		• Develop and share ESIA and ESMP	Consultant/PW	ESIA and ESMP accurately describe relevant social and environmental baseline, impacts and mitigation measures	Review of ESIA and ESMP by WB and SCU	ESIA and ESMP accepted by WB and SCU
		• Contractor shall prepare a CESMP which is part of the tender • Contractor shall have an ESHS representative included in their team • Contractor shall ensure that all personnel, subcontractors etc. Are sensitized on E&S aspects and performance	Contractor	CESMP covers all E&S impacts (see Chapter 4) Number of trainings and percentage of attendance (training records)	CESMP documentation and compliance audits and checks	Draft CESMP submitted as part of the bidding process Compliance audit reports Training records

Table 13 Environmental and Social management measures Construction Phase Maintenance Canal

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Air quality	• Emissions from construction vehicles and equipment due to poor maintenance and idling • Dust pollution from construction site and during transportation of material and waste	• Proper maintenance of all vehicles and equipment. • No unnecessary idling of construction equipment or delivery trucks • Limit land transportation and enforce speed limits to minimize dust release (e.g. in unpaved areas). • All trucks need to be properly covered (e.g. with canvas) or use closed truck containers when transporting material and/or waste.	Contractor	Number of Complaints Visual observations	Field inspection	Complaints register ESMP checklist (non-compliance records) Monthly progress reports
Fuel use	• Risk of spills • Risk of poor management of fuel waste, e.g. empty containers. • Potential pollution of soil and water	• Use of well-maintained equipment and vehicles • Proper management of fuel to be part of the CESMP (incl. for storage and supply) • Have spill response included in the Emergency Response Plan • Maintenance, fuelling and cleaning of vehicles and	Contractor	Visual observations (e.g. oil sheen)	Field inspection	ESMP checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		equipment, to take place with adequate leakage prevention measures				
Waste (different type of waste will be produced during Canal maintenance	• Canal cleaning and maintenance will produce large volumes of floating vegetation. • Clearing of the Canal embankment will produce waste such as trees and shrub bushes but also plastic material etc. that need to be removed and transported adequately. • Excavated materials may contain waste.	• Have a waste management plan in place: all waste shall be managed in accordance with applicable guidelines and only on approved disposal sites or treatment facilities (disposal of any type of waste in the Canal is strictly forbidden) • Floating vegetation needs to be dewatered prior to disposal. • Trees and shrub bushes need to be chopped into smaller pieces to reduce volume, prior to disposal. • Organic waste needs to be separated from all other waste such as plastic. • The contractor may propose a yard nearby the project area for temporary storage/processing of vegetation/organic waste,	Contractor	Number of housekeeping incidents Visual observations Number of complaints	Field inspection	ESMP checklist (non-compliance records) Waste chain of custody (in annexes) Complaints register

Construction Phase						
Component	Impact	Mitigation Measure	Responsibility	Monitoring & Performance Evaluation		Compliance Reporting
				Performance Indicator	Method of Monitoring	
		however this is subject to approval of PW/Supervision Consultant. • Encourage beneficial use of vegetation/organic waste for composting • Properly and timely collect all types of waste from the work sites and transport these wastes to the approved disposal / waste treatment sites. • Keep records of waste transported off-site • Encourage workers to waste segregation. • Have waste bins/bags available for workers • No waste littering on the Project site • No burning of non-vegetative wastes at construction sites or at the temporary storage site. • Keep waste records and compliance reports for submission to the project supervisor				

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Soil/ Sediment	• Excavated material may contain contaminants • Backfill of sediment materials could flow back into Canal after placement on Canal banks (erosion). • Excavation works and clearing vegetation disturbs the soil and can cause increase of turbidity in the Canal. • Soil pollution as a result of improper transportation of excavated material and other waste via public roads (if applicable)	• Have a management plan for excavated material in place as part of the CESMP • All excavations to be conducted in an efficient manner to avoid spills and limit increase in turbidity of the water. • All excavated sediments to be processed/applied directly along the embankments of the selected canals. Storage of excavated material is not foreseen, however if circumstances require such, PW will designate a suitable location. • During excavation activities, continuous visual observation should be conducted to limit increase of turbidity in the canal. • All sediment material needs to be removed carefully and can only be applied at the same location (backfilling on the canal embankment)	Contractor	Visual observations Number of complaints Number of spills Number of media announcements	Field inspection	ESMP checklist (non-compliance records) Complaint register

Construction Phase						
Component	Impact	Mitigation Measure	Responsibility	Monitoring & Performance Evaluation		Compliance Reporting
				Performance Indicator	Method of Monitoring	
		• Backfilling with excavated material is only possible within sections of the equivalent sediment quality (e.g. sediment from the industrial section can only be reused within the same section). • Proper placing of excavated material on selected slopes to prevent discharge/erosion into the canal • In case of road transportation of excavated material (exceptional case, if application from the canal side is not possible due to obstacles or shallow water depth etc.): all trucks need to properly close off (no leakages) and covered and/or use closed truck containers. • All sites should be left in proper/clean state after completion. • Have a communication plan in place as such to timely inform the local communities and				

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		business about maintenance activities and the location and duration of these activities				
Surface water quality	• Excavated materials may contain contaminants to impact water quality. • Increase in turbidity due to maintenance and excavation activities may affect aquatic flora and fauna in selected areas. • Waste (vegetation, sediments, plastics and other waste) could clog and pollute waterways if ending up in the Canal or trenches and ditches. • Water pollution with spilled and leaked oil and/or grease during canal maintenance.	• All maintenance activity to be conducted in such a way to minimize impacts on water quality (turbidity) • Limit any unnecessary spilling of material near and on the water • Proper waste management according to the waste management plan. Disposal of any type of waste into the Canal is strictly forbidden • Have a plan in place to clean up spills • Use leak proof containers and storage tanks for fuel	Contractor	Visual observations (turbidity, waste material, oil sheen etc.) Number of complaints Number of spills	Field inspection	ESMP checklist (non-compliance records) Complaint register
Noise	• Noise nuisance due to construction equipment and activities especially to residents immediately	• Proper maintenance of all vehicles and construction equipment. • Have a communication plan in place as such to timely inform	Contractor	Number of media announcements Number of complaints	Field inspection Review of records	ESMP checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	bordering the area of the sluices. • Occupational nuisance: workers exposed to excessive noise	the local communities and business about noisiest activities and the duration of these activities • Works to be conducted during daylight hours as much as possible. Work outside daylight hours is only possible with permission from the PW-SCU • Provide necessary PPE to workers (earplugs)		Number of PPE provided to workers		Complaints register PPE distribution records
Collisions	• Collisions or accidents involving other water users. • Collisions with objects on the water	• Have a communication plan in place as such to timely inform the local communities and business about all activities and the duration of these activities • Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S aspects and performance • Contractor shall conduct Job Safety Analysis (JSA) as part of the method statement • Contractor shall conduct toolbox meetings (weekly)	Contractor	Number of media announcements Number of incidents/accidents Number of trainings and percentage of attendance Number of drills performed Number of complaints	Review of records	ESMP Checklist (non-compliance records) Incident/accident reports Training records Monthly progress reports

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		and daily safety talks. Topics to be related to the works (e.g. safety driving etc.) • Develop an ERP as part of the CESMP • Have an incident/accident procedure in place as part of the CESMP				
Worker Health and Safety	• Construction workers are exposed to health and safety risks (snakes, bees etc.) and especially when working with heavy equipment and/or on water (injuries, drowning).	• Develop an Occupational Health and Safety Plan as part of the CESMP • Conduct JSA and include as part of the work method statement. Topics to be related to the works (e.g. safety driving etc.) • Conduct weekly toolbox meetings and daily safety talks • Ensure workers competence for the specific jobs • Select subcontractors and suppliers with good H&S record. • Ensure workers competence for the specific jobs	Contractor	Occupational H&S plan submitted Number of incidents/accidents Number of sick leave Number of complaints Number of training conducted/100% attendance in training Number of PPE provided	Inspections Review of records	ESMP Checklist (non-compliance records) Incident/accident reports HR records Complaint register Training records PPE distribution records Monthly progress reports

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S risks (training) • Supply workers with required Personal Protective Equipment (PPE: life vest is mandatory for works on water and there should be emergency rescue equipment for accidental falling into the water) • Have proper availability of drinking water and sanitation facilities at construction sites • Provide construction first aid kit				
	• Navigational hazards	• Contractor shall ensure that all staff on the vessels is properly trained in OHS. Work with vessel operators with a zero-accident record	Contractor	Training records Number of incidents and accidents	Review of records by PW	Training records Incident/accident reports
	• Female workers are disproportionally at risk of sexual harassment and discrimination, including	• Make gender equity and involvement of women in skilled and unskilled positions and explicit part of the tender	PW	Percentage of female workers included in the workforce.	Documentation and compliance audits by PW	Tender documents

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	unequal payment conditions.	process, documents, and selection criteria. • Have a code of conduct in place		Number of harassment complaints.		
		• Prepare HR Policy and procedures, including Code of Conduct for workers, • Follow the Code of Conduct as outlined by PW in the bidding documents • Management of labour to be included as part of the CESMP (compliance with applicable national laws and regulation as well as per International Labour Organization (ILO) requirements • Have a complaint procedure for workers included in the CESMP • Provide gender-friendly work conditions and facilities	Contractor	Percentage of female workers included in the workforce Visual observations Number of complaints (especially on Gender based violence)	Documentation and compliance audits by PW GBV related complaints to be handled by PTWC	ESMP checklist (non-compliance records) HR records Complaint register Monthly progress reports
Community Health and Safety	• Incidents and accidents as a result of transportation of material and goods on the	• Develop a Community Health and Safety Plan as part of the CESMP	Contractor & SCU	Presence of a good quality CESMP.	Field inspections	ESMP Checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	public road (transportation of waste, excavated material via the public roads) • Risk to children who use the canal for swimming.	• Have a communication plan in place as such to timely inform the local communities and business about all activities and the duration of these activities • Timely announcement of canal maintenance schedule. • No Swimming signs along the canal during construction phase.		Number of media announcements Number of incidents/accidents Number of complaints		Incident/accident reports Complaint register Monthly progress report
Risk Force Majeure (Environmental emergency)	Danger of the workers and public from fire, flood, extreme weather events etc.	• Develop an Emergency Response Plan (ERP) as part of the CESMP and ensure update of the ERP and implementation with hazard assessment, measures to prevent, respond, contain, communicate, train and exercise, contact with public emergency services • All necessary steps will be taken for prompt first aid treatment of all injuries.	Contractor	Number of drills performed	Documentation and inspections	ESMP checklist (non-compliance records) Records of drills held Monthly progress reports

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Livelihood impacts	• •			.		
Disruption of household uses of Canal	Presence of maintenance vessels/equipment, and increased turbidity, affect households that use Canal for household uses such as washing clothes and dishes. Especially in the dry season.	• Have a communication plan in place as such to timely inform the local communities and business about all activities and the duration of these activities • Timely announcement of temporary restriction of use of the Canal water during maintenance activities • Make an inventory of area inhabitants who depend on Saramacca Canal water for household uses • Organise water supply with water trucks for affected households, for duration of increased turbidity in canal.	Contractor	Number of media announcements Number of complaints Number of area inhabitants supplied with clean water.	Field inspections Documentation and compliance audits by PW	ESMP Checklist (non-compliance records) Complaint register
Disruption of school and commuter transport across Canal.	• Disruption of school and work commuting if ferry service is interrupted for households in the Goede Verwachting community	• Ensure continuation of ferry service as much as possible, possibly by conducting part of maintenance works on Sundays.	Contractor	Number of days Ferry service has been hindered or discontinued due to Project activities.	Field inspections	ESMP Checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	• Decreased access to critical facilities, shopping, bus stops etc. for households in the Goede Verwachting community	• Have a communication plan in place as such to timely inform the local communities and business about all activities and the duration of these activities • If ferry service must be interrupted, hold consultations with ferry operator and local commuters to determine best period. • If ferry service must be interrupted; timely announcement of temporary restrictions. • Have traffic management plan in place as part of the CESMP. Traffic arrangements to be such that day to day business can continue. Provide alternative transportation in case ferry service is disrupted.		Notes of meetings with ferry operator and ferry users. Existence of effective Communication plan. Number of media announcements Number of complaints		Complaint register
Risk of damage to assets of residents	• Damage to business and household structures on or near embankment	The contractor needs to conduct a detailed survey in the field to identify any potential effect to assets of residents or businesses	Contractor and PW/SCU	Inventory of objects Number of incidents/accidents	Field inspections	ESMP Checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	• Damage to other private property in and along Saramacca Canal, including jetties.	and prepare detailed plan to avoid affect as much as possible and agree with owner/user of the asset to replace after cleaning work is performed, the schedule and possible nuisance during the works. • Have an incident/accident procedure in place as part of the CESMP		Number of complaints		Complaint register
Public perception	Stakeholders who feel that the Project negatively affects them, or who feel unheard, may generate protests and negative publicity.	• Inform the Suriname public as large, and specifically the local population, local business and other users of the canal, about progress of the Project, activities planned, and job and economic opportunities (contractor's communication plan). • Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the	PW/Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances/complaints	Documentation/ review of records	Minutes of meetings Monthly progress reports Grievances records and analysis (PW)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		Project throughout all phases (project SECP).				Complaint register (contractor)

Table 14 Environmental and Social management measures table: Operational phase – Saramacca Canal Maintenance

Operational phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Flood risk reduction	Positive: • Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding. • Fewer days that people miss days	• Develop long term Maintenance plan with all relevant ministries and departments, including their roles and responsibilities. • Allocate budget for maintenance plan • Work with district government; Ministry of Land Policy and Forest Management; Ministry of LVV; and other relevant government departments to develop jointly endorsed plan • Ensure regular maintenance and cleaning of trenches and ditches running into the Saramacca Canal (\ Project component 1.2), • Follow recommendations from Drainage Master Plan	PW	Maintenance plan in place Awareness activities conducted Annual number of maintenance activities, with dates and specifications.	Field inspections Compliance audits	Maintenance reports

Operational phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	of work or school due to flooding. • Lower risk of health problems after heavy rainfall and flooding.	• Development Flood Early Warning System (FEWS), as part of Contingent Emergency Response system (Project component 3) • Prevent further encroachment and illegal building on the maintenance zones along the Saramacca Canal. • Generate awareness in Suriname population of link between throwing/dumping waste in public waterways, and flooding. • Involve local communities in keeping the neighbourhood clean • Include stakeholder engagement in the maintenance plan. Include waste management, resource use and pollution prevention in maintenance plan.				
Health and Safety Coppename Punt fishers	Fishers will regain access to the Canal to get to the market, thus limiting dangerous travel over sea	• Ensure that Coppename Punt fishers are informed about maintenance works	PW	Number of outreach activities with Coppename Punt fishers	Keep records of meetings and other	Meeting and outreach records

5.4 Rehabilitation Doorsteek Sluice and Lock

Table 15 Environmental and Social management measures Preparation stage Rehabilitation Doorsteek lock and sluice

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
General Performance	Poor public perception/Damage of the image of all involved parties	• Inform local and national population, local business and other users of the canal about progress of the Project, activities planned, and job and economic opportunities.	PW/Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances	Review of records	Minutes of meetings Monthly progress reports Grievances records and analysis
		• Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the Project throughout all phases.	PW		Review of records	
E&S	All E&S risks	• Develop and share ESIA and ESMP	Consultant/PW	ESIA and ESMP accurately describe relevant social and environmental baseline, impacts and mitigation measures	Review of ESIA and ESMP by WB and SCU	ESIA and ESMP accepted by WB and SCU

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
E&S	All impacts (also see Chapter 4)	• Include E&S requirements such as this ESMP in contract conditions and work together with Contractor to incorporate ESMP requirements fully.	PW	Tender documents have an E&S section	During contractor selection (bidding process): E&S requirements included in Bids	Contractors Bid/Draft CESMP
		• Contractor shall prepare a CESMP which is part of the tender. • Contractor shall have an Environmental, Social, Health and Safety (ESHS) representative included in their team • Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S aspects and performance.	Contractor	CESMP covers all E&S impacts (see Chapter 4) Number of trainings and percentage of attendance (training records)	CESMP documentation and compliance audits and checks	Draft CESMP submitted as part of the bidding process Compliance audit reports Training records

Table 16 Environmental and Social management measures Construction phase Rehabilitation Doorsteek sluice and lock

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Air quality	• Emissions from construction vehicles and equipment due to poor maintenance and idling • Dust pollution from construction site and during transportation of material and waste	• Proper maintenance of all vehicles and equipment. • No unnecessary idling of construction equipment or delivery trucks • Take appropriate measures to suppress dust generation, especially in unpaved areas and during operations that may create a lot of dust, such as cutting or sawing silica-containing materials, jack hammering, impact drilling, using heavy equipment, and demolishing structures and during the dryer seasons. • Limit land transportation and enforce speed limits to minimize dust release. • All trucks need to be properly covered (e.g. with canvas) or use closed truck containers when transporting material and/or waste.	Contractor	Number of complaints Visual observations	Field inspections	Complaints register ESMP checklist (non-compliance records) Monthly progress reports
Waste	• Different types of waste generated during works on sluices and locks.	• Have a waste management plan in place: all waste shall be managed in accordance with applicable guidelines and only on approved disposal sites • Have procedures in place to properly separate hazardous waste from non-hazardous waste.	Contractor	Number of housekeeping incidents Visual observations Number of complaints	Field inspection	ESMP checklist (non-compliance records) Waste chain of custody (in annexes)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Properly and timely collect all types of waste from the work sites and transport these wastes to the approved disposal / waste treatment sites. • Keep records of waste transported off-site • Encourage workers to waste segregation. • Have waste bins/bags available for workers • No waste littering on the Project site • No burning of non-vegetative wastes at construction sites • Keep waste records and compliance reports for submission to the project supervisor				Complaints register
Noise	• Noise nuisance due to construction equipment and activities especially to residents immediately bordering the area of the sluices. • Occupational nuisance: workers exposed to excessive noise	• Proper maintenance of all vehicles and construction equipment. • Have a communication plan in place as such to timely inform the local communities and business about noisiest activities and the duration of these activities • Works to be conducted during daylight hours as much as possible. Work outside daylight hours is only possible for activities with limited noise nuisance and with permission from the PW-SCU. Also the public should timely be informed of night-time activities. • Provide necessary Personal Protective Equipment (PPE) to workers (earplugs)	Contractor	Number of media announcements Number of complaints Number of PPE provided to workers	Field inspection Review of records	ESMP checklist (non-compliance) Complaints register PPE distribution records

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Material and resources	• Introduction of foreign material (metals, fuel cement) may impact the aquatic environment	• Limit piling of material and resources on or near the water • Cover loose material to avoid wind drifting • Limit any unnecessary spilling of material • Have a plan in place to clean up spills	Contractor	Number of complaints Visual observations Number of spills	Field inspections	ESMP checklist (non-compliance records) Complaint register
Water quality	• The Project activities may impact the local water quality (increase in turbidity)	• Limit piling of material and resources on or near the water • Cover loose material to avoid wind drifting • Limit any unnecessary spilling of material • Have a plan in place to clean up spills	Contractor	Number of complaints Visual observations (of turbidity, oil sheen, waste etc.) Number of spills	Field inspections	ESMP checklist (non-compliance records) Complaint register
Worker Health and Safety (H&S)	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water.	• Develop an Occupational Health and Safety Plan as part of the CESMP • Conduct Job Safety Analysis (JSA) and include as part of the work method statement • Conduct weekly toolbox meetings and daily safety talks. Topics to be related to the works (e.g. safety driving etc.) • Ensure workers competence for the specific jobs • Select subcontractors and suppliers with good H&S record.	Contractor	Occupational H&S plan submitted Number of incidents/accidents Number of sick leave Number of complaints Number of training conducted/100% attendance in training	Inspections Review of records	ESMP Checklist (non-compliance records) Incident/accident reports Human Resource (HR) records Complaint register Training records

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S risks (training) • Supply workers with required Personal Protective Equipment (PPE: life vest is mandatory for works on water and there should be emergency rescue equipment for accidental falling into the water) • Have proper availability of drinking water and sanitation facilities at construction sites • Provide construction first aid kit		Number of PPE provided		PPE distribution records Monthly progress reports
	• Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.	• Make gender equity and involvement of women in skilled and unskilled positions an explicit part of the tender process, documents, and selection criteria. • Have a code of conduct in place	PW	Percentage of female workers included in the workforce	Documentation/ Review of records	Tender documents
		• Prepare HR Policy and procedures, including Code of Conduct for workers. • Follow the Code of Conduct as outlined by PW in the bidding documents. • Management of labour to be included as part of the CESMP (compliance with applicable national Suriname laws and regulation as well	Contractor	Percentage of female workers included in the workforce Visual observations Number of complaints (especially on Gender based violence etc.)	Documentation and compliance audits by PW Gender Based Violence (GBV) related complaints to be handled by PW	ESMP checklist (non-compliance records) HR records Complaint register

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		as per International Labour Organization (ILO) requirements • Have a Complaint Procedure for workers included in the CESMP • Provide gender-friendly work conditions and facilities				Monthly progress reports
Risk Force Majeure (Environmental emergency)	Danger of the workers and public from fire, flood, extreme weather events, etc.	• Develop an Emergency Response Plan (ERP) as part of the CESMP and ensure update of the ERP and implementation with hazard assessment, measures to prevent, respond, contain, communicate, train and exercise, contact with public emergency services. • All necessary steps will be taken for prompt first aid treatment of all injuries.	Contractor	Number of drills performed	Documentation and inspections	ESMP checklist (non-compliance records) Records of drills held Monthly progress reports.
Livelihood impacts – Businesses along the canal	Disruption of business, loss of income or increased expenses for businesses using canal for transport of goods.	• Develop work plan for construction works at lock that minimizes time that passage through particularly the Doorsteek lock is not possible. • Plan intervals in work schedule to allow for lock use. • Have a communication plan in place to inform users of the canal for transportation in a timely and adequate fashion. • Discuss alternatives with stakeholders and assist stakeholders with accessing alternatives.	PW	Number of stakeholder meetings held Number of complaints	Compliance audits	Complaints register Monthly planning and progress (work method statements) Monthly progress report

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Where necessary, develop LRP in line with World Bank guidelines. • Have Grievance Redress mechanism in place.as part of the CESMP				
Livelihood impacts- Local employment	Employment opportunities.	• Widely advertise job-opportunities for Suriname subcontractors. • Provide (on-the-job) training for Suriname subcontractors if required to meet all tender criteria. • When sourcing small supplies, source these from Suriname sellers, when possible.	Contractor	Percentage of local (canal surroundings) and Surinamese suppliers in the workforce Number of trainings conducted (percentage attendance) Number of complaints Number of media announcements	Documentation and inspections	HR records Training records Complaints register Monthly planning and progress (work method statements) Monthly progress report

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Public perception	Stakeholders who feel that the Project negatively affects them, or who feel unheard, may generate protests and negative publicity.	• Inform local population, local businesses and other users of the canal about progress of the Project, activities planned, and job and economic opportunities (contractor's communication plan). • Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the Project throughout all phases (project SECP) • Adhere to code of conduct, work ethics	PW/ Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances/complaints Number of workers that have signed the code of conduct Number of trainings conducted	Documentation/ review of records	Minutes of meetings Monthly progress reports Grievances records and analysis (PW) Complaint register (contractor) HR records

Construction Phase							
Component	**Impact**	**Mitigation Measure**		**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
					Performance Indicator	**Method of Monitoring**	
Cultural resources	Damage or loss of cultural heritage site, religious shrine due to the Project implementation	• Follow IFC performance standard 8 on cultural heritage. • Follow the chance find procedures in Annex A7 of this ESMP.	Contractor	Number of chance finds that have been properly handled according to chance find procedure (Annex A7)	Documentation and inspection	Chance find procedure forms Recovered artifacts	

Table 17 Environmental and Social management measures table: Operation and Maintenance- Rehabilitation Doorsteek Sluice and Lock

Operation and Maintenance						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Hydrology	Flooding	• Long term planning for maintenance of sluice and lock, needs to be developed. Development of maintenance plan with all relevant ministries and departments. Plan should include roles and responsibilities, and budget must be allocated within these responsible government entities. • Include stakeholder engagement and waste management, resource use and pollution prevention in the maintenance plan.	PW	Number of flooding events during operation and maintenance	Compliance audits	Maintenance plan
Livelihood	Job opportunities	• In operation and maintenance plans, enhance job opportunities for local and Surinamese residents.	PW	Percentage of local and Surinamese workers as part of the workforce	Documentation/review of records	HR records
Sustainability	Preventing damage to sluices	• Training for boat drivers, including fishers, who use the locks to minimize chances that they will damage the locks during use. • Use a camera vigilance system to record use of the lock and identify misuse. • Introduce a system of sanctions for damage due to misuse of the locks.	MAS, PW	Number of boat owners trained. Number of recorded incidents of misuse of locks	Compliance audits	Training record Camara installed Documentation system of sanctions

5.5 Rehabilitation Uitkijk Ship Lock

Table 18 Environmental and Social measures Preparation stage Rehabilitation Uitkijk ship lock

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
General Performance	Poor public perception/Damage of the image of all involved parties	• Inform local area inhabitants, sluice workers and users of the sluices about progress of the Project, activities planned, and job and economic opportunities.	PW/Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances	Review of records	Minutes of meetings Monthly progress reports Grievances records and analysis
		• Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the Project throughout all phases.	PW		Review of records	
E&S	All E&S risks	• Include E&S requirements from this ESMP in contract conditions and work together with Contractor to incorporate ESMP requirements fully.	PW	Tender documents have an E&S section	During contractor selection (bidding process): E&S requirements included in Bids	Contractors Bid/Draft CESMP
		Develop and share ESIA and ESMP	Consultant/PW	ESIA and ESMP accurately describe relevant social and	Review of ESIA and ESMP by WB and SCU	ESIA and ESMP accepted by WB and SCU

Preparation Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
				environmental baseline, impacts and mitigation		
		• Contractor shall prepare a CESMP which is part of the tender. • Contractor shall have an Environmental, Social, Health and Safety (ESHS) representative included in their team • Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S aspects and performance.	Contractor	CESMP covers all E&S impacts (see Chapter 4) Number of trainings and percentage of attendance (training records)	CESMP documentation and compliance audits and checks	Draft CESMP submitted as part of the bidding process Compliance audit reports Training records

Table 19 Environmental and Social management measures Construction phase Rehabilitation Uitkijk ship lock

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
Air quality	• Emissions from construction vehicles and equipment due to poor maintenance and idling	• Proper maintenance of all vehicles and equipment. • No unnecessary idling of construction equipment or delivery trucks • Take appropriate measures to suppress dust generation,	Contractor	Number of complaints Visual observations	Field inspections	Complaints register ESMP checklist (non-compliance records)

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	• Dust pollution from construction site and during transportation of material and waste	especially in unpaved areas and during operations that may create a lot of dust, such as cutting or sawing silica-containing materials, jack hammering, impact drilling, using heavy equipment, and demolishing structures and during the dryer seasons. • Limit land transportation and enforce speed limits to minimize dust release. • All trucks need to be properly covered (e.g. with canvas) or use closed truck containers when transporting material and/or waste.				Monthly progress reports
Waste	• Different types of waste generated during works on sluices and locks.	• Have a waste management plan in place: all waste shall be managed in accordance with applicable guidelines and only on approved disposal sites • Have procedures in place to properly separate hazardous waste from non-hazardous waste. • Properly and timely collect all types of waste from the work	Contractor	Number of housekeeping incidents Visual observations Number of complaints	Field inspection	ESMP checklist (non-compliance records) Waste chain of custody (in annexes) Complaints register

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		sites and transport these wastes to the approved disposal / waste treatment sites. • Keep records of waste transported off-site • Encourage workers to waste segregation. • Have waste bins/bags available for workers • No waste littering on the Project site • No burning on non-vegetative wastes at construction sites • Keep waste records and compliance reports for submission to the project supervisor				
Noise	• Noise nuisance due to construction equipment and activities especially to residents immediately bordering the area of the ship lock.	• Proper maintenance of all vehicles and construction equipment. • Minimize activities that produce excessive noise to outside school hours. • Have a communication plan in place as such to timely inform the local communities, school, churches and business about	Contractor	Number of media announcements Number of complaints Number of PPE provided to workers	Field inspection Review of records	ESMP checklist (non-compliance) Complaints register PPE distribution records

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
	• Occupational nuisance: workers exposed to excessive noise	noisiest activities and the duration of these activities • Works to be conducted during daylight hours as much as possible. Work outside daylight hours is only possible for activities with limited noise nuisance and with permission from the PW-SCU. Also the public should timely be informed of night-time activities. • Provide necessary Personal Protective Equipment (PPE) to workers (earplugs)				
Material and resources	• Introduction of foreign material (metals, fuel cement) may impact the aquatic environment	• Limit piling of material and resources on or near the water • Cover loose material to avoid wind drifting • Limit any unnecessary spilling of material • Have a plan in place to clean up spills	Contractor	Number of complaints Visual observations Number of spills	Field inspections	ESMP checklist (non-compliance records) Complaint register
Water quality	• The Project activities may impact the local water quality (increase in turbidity)	• Limit piling of material and resources on or near the water • Cover loose material to avoid wind drifting • Limit any unnecessary spilling of material	Contractor	Number of complaints Visual observations (of turbidity, oil sheen, waste etc.)	Field inspections	ESMP checklist (non-compliance records) Complaint register

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Have a plan in place to clean up spills		Number of spills		
Hydrology	• Flooding risk if works prevent opening sluices during high water levels in the canal.	• Use temporary mobile pumps • Ensure rehabilitation of Havelaar Sluice prior to start of lock works	Contractor PW	Included in bidding document for contractor Urgent repairs Havelaar sluice completed	Review Bidding Document Repair report	Approved Bidding Document Repair report
Worker Health and Safety (H&S)	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water.	• Develop an Occupational Health and Safety Plan as part of the CESMP • Conduct Job Safety Analysis (JSA) and include as part of the work method statement • Conduct weekly toolbox meetings and daily safety talks. Topics to be related to the works (e.g. safety driving etc.) • Ensure workers competence for the specific jobs • Select subcontractors and suppliers with good H&S record. • Contractor shall ensure that all personnel, subcontractors etc. are sensitized on E&S risks (training)	Contractor	Occupational H&S plan submitted Number of incidents/accidents Number of sick leave Number of complaints Number of training conducted/100% attendance in training Number of PPE provided	Inspections Review of records	ESMP Checklist (non-compliance records) Incident/accident reports Human Resource (HR) records Complaint register Training records PPE distribution records Monthly progress reports

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Supply workers with required Personal Protective Equipment (PPE: life vest is mandatory for works on water and there should be emergency rescue equipment for accidental falling into the water) • Have proper availability of drinking water and sanitation facilities at construction sites • Provide first aid kit				
	• Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.	• Make gender equity and involvement of women in skilled and unskilled positions an explicit part of the tender process, documents, and selection criteria. • Have a code of conduct in place	PW	Percentage of female workers included in the workforce	Documentation/ Review of records	Tender documents
		• Prepare HR Policy and procedures, including Code of Conduct for workers, • Follow the Code of Conduct as outlined by PW in the bidding documents	Contractor	Percentage of female workers included in the workforce Visual observations	Documentation and compliance audits by PW Gender Based Violence (GBV) related	ESMP checklist (non-compliance records) HR records Complaint register

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Management of labour to be included as part of the CESMP (compliance with applicable national Suriname laws and regulation as well as per International Labour Organization (ILO) requirements • Have a complaint procedure for workers included in the CESMP • Provide gender-friendly work conditions and facilities		Number of complaints (especially on Gender based violence etc.)	complaints to be handled by PW	Monthly progress reports
Improved health and safety of Coppename Punt fishers	• Due to ability to use sluices to access Paramaribo market no need to travel over sea	• Include fishers from Coppename Punt in stakeholder communication	PW, Contractor	Number of outreach activities with Coppename punt fishers	Records of meeting or other outreach activities are kept.	Meeting records
Risk Force Majeure (Environmental emergency)	• Danger of the workers and public from fire, flood, and extreme weather events, etc.	• Develop an Emergency Response Plan (ERP) as part of the CESMP and ensure update of the ERP and implementation with hazard assessment, measures to prevent, respond, contain, communicate, train and	Contractor	Number of drills performed	Documentation and inspections	ESMP checklist (non-compliance records) Records of drills held Monthly progress reports.

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		exercise, contact with public emergency services. • All necessary steps will be taken for prompt first aid treatment of all injuries				
Livelihood impacts – local fishers and businesses	• When sluices cannot be used: disruption of access to the canal or the river negatively affects income.	• Inform sluice guards and users of the sluices timely of sluice closure through signs at the sluices, stakeholder meetings and media announcements. • Minimize days that sluices cannot be passed. • If period of disruption lasts more than a week, allow for rest days when traffic can pass through sluices.	Contractor/PW	Complaints about works on sluices received by GRM and/or local government office. Number of week days and weekend days of Uitkijk sluice closure. Number of vessels arriving at the sluices/locks while these cannot open.	Uitkijk sluices related complaints voiced by vessel owners to be handled by the SCU. Log book of sluices Communication with Bestuursopzichter (BO)	Report of stakeholder communication and engagement. Complaints register
Livelihood impacts- Local employment	• Employment opportunities.	• Widely advertise job-opportunities for Suriname subcontractors. • Provide (on-the-job) training for Suriname subcontractors if required to meet all tender criteria.	Contractor	Percentage of local (canal surroundings) and Surinamese suppliers in the workforce Number of trainings conducted	Documentation and inspections	HR records Training records Complaints register

Construction Phase						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• When sourcing small supplies, source these from Suriname sellers, when possible.		(percentage attendance) Number of complaints Number of media announcements		Monthly planning and progress (work method statements) Monthly progress report
Public perception	• Stakeholders who feel that the Project negatively affects them, or who feel unheard, may generate protests and negative publicity.	• Inform local population, local businesses and other users of the canal about progress of the Project, activities planned, and job and economic opportunities (contractor's communication plan). • Continue Stakeholder Engagement and Communication Plan and adjust the existing Grievance Redress Mechanism for the Project throughout all phases (project SECP) • Adhere to code of conduct, work ethics	PW/ Contractor	Number of executed stakeholder engagement activities Number of announcement and advertisement (e.g. newspaper, radio, tv, social media advertisements) about project activities Number of grievances/complaints Number of workers that have signed the code of conduct Number of trainings conducted	Documentation/ review of records Communication with Bestuursopzichter (BO)	Minutes of meetings Monthly progress reports Grievances records and analysis (PW) Complaint register (contractor) HR records

Construction Phase						
Component	Impact	Mitigation Measure	Responsibility	Monitoring & Performance Evaluation		Compliance Reporting
				Performance Indicator	Method of Monitoring	
Cultural resources	• Damage or loss of cultural heritage site, religious shrine due to the Project implementation	• Follow IFC performance standard 8 on cultural heritage. • Follow the chance find procedures in Annex A7 of this ESMP.	Contractor	Number of chance finds that have been properly handled according to chance find procedure (Annex A7)	Documentation and inspection	Chance find procedure forms (Annex A7) Recovered artifacts

Table 20 Environmental and Social management measures phase Operation and Maintenance Rehabilitation Uitkijk ship lock

Operation and Maintenance						
Component	Impact	Mitigation Measure	Responsibility	Monitoring & Performance Evaluation		Compliance Reporting
				Performance Indicator	Method of Monitoring	
Hydrology	Flooding	• Long term planning for maintenance of sluice and lock, needs to be developed. Development of maintenance plan with all relevant ministries and departments. Plan should include roles and responsibilities, and budget must be allocated within these responsible government entities.	PW	Number of flooding events during operation and maintenance	Compliance audits	Maintenance plan

Operation and Maintenance						
Component	**Impact**	**Mitigation Measure**	**Responsibility**	**Monitoring & Performance Evaluation**		**Compliance Reporting**
				Performance Indicator	**Method of Monitoring**	
		• Include stakeholder engagement and waste management, resource use and pollution prevention in the maintenance plan.				
Livelihood	Job opportunities	• In operation and maintenance plans, enhance job opportunities for local and Surinamese residents.	PW	Percentage of local and Surinamese workers as part of the workforce	Documentation/review of records	HR records
Sustainability	Preventing damage to sluices	• Training for boat drivers, including fishers, who use the locks to minimize chances that they will damage the locks during use. • Use a camera vigilance system to record use of the lock, and identify misuse. • Introduce a system of sanctions for damage due to misuse of the locks.	MAS, PW	Number of boat owners trained. Number of recorded incidents of misuse of locks	Compliance audits	Camera views Training records Documentation system of sanctions

6 ESHS Roles and Responsibilities

As per the 2020 Environmental Framework Act (Milieu Raamwet [2]), the to-be-established National Environmental Authority (Nationale Milieu Autoriteit -NMA) will obtain legal responsibility for managing the ESIA process and reviewing the reports. Once this institute has been established, a project for which an ESIA is required may only start after clearance of the Environmental Impact Report (milieu effecten rapport -MER) by the NMA. Until establishment of the NMA, managing of the ESIA process and review of the reports are done by NIMOS.

The Ministry of PW, in accordance with the legal obligations tied with the WB financing agreements, is responsible for ensuring that the Project implementation will be carried out in compliance with the provisions set by this ESMP. The Ministry of PW is supported by an SCU, which has the direct responsibility for the implementation of instruments and procedures associated with management of social and environmental matters and impacts.

CESMPs will be the responsibility of the Contractors. Contractor compliance with the CESMP will be overseen by a Supervisory Consultant (Supervisor) on behalf of the PW/SCU. It is anticipated that the SCU will also coordinate environmental and social due diligence for the Project across all donor lending and sponsor agencies.

Stakeholder Consultation around the ESMP will be conducted according to national norms and the WB policies. This process is intended to inform stakeholders about the Project, its potential impacts and mitigation, and to involve them in a partnership in developing and implementing the Project solutions and mitigation measures. The process of consultation will be conducted in a manner that provides the Project Affected Persons (PAPs) and broader stakeholders with opportunities to express their views on project risks, impacts and mitigation measures. More details about stakeholder consultation are specified in the Stakeholder Engagement and Communication Plan for this Project.

The Ministry of PW is responsible for disclosure of the ESMP and executing the stakeholder consultation process and general awareness of environmental and social issues of the Project. The ESMP will also be transmitted to the WB for approval. The ESMP will be disclosed on the WB website and the website of the ministry of PW and NIMOS.

Specific roles and responsibilities with regard to this ESMP are summarized in Table 21 below.

Table 21: Roles and responsibilities with regard to the Saramacca Canal System Rehabilitation Project ESMP

Responsible party	Tasks	Phase
PW	Ensure that all project activities are well-managed, coordinated and implemented and the financial obligations provided. Execution of all procurement activities, works and goods, including preparation of bidding and contract documents, tender	Throughout the Project implementation

[2] *Law of 14 mei 2020, publ. in State Gazet 2020, no.97, as "WET van 07 mei 2020, houdende regels voor duurzaam milieumanagement (Milieu Raamwet)."*

Responsible party	Tasks	Phase
	procedures and contractor selection, execution, management and supervision. Support with the necessary and required permits from government authorities. Monitoring of the implementation of ESMP. Together with the Supervision Consultant drafting the Environmental, Social, Health and Safety requirements in the bidding and contract documents in accordance with the ESMP; integrating the ESMP in to contract documents. Obtain approval of ESMP by the WB. Review and approve of the various documents prepared by the Contractor such as CESMP, code of conduct, labor procedures, job hazard analysis, monitoring reports, and so on. Provide recommendations for implementation of corrective actions for any noncompliance's and suggest improvements for contractor's performance. Investigate, with Supervisor's support, and report all incidents related to environmental, social and health aspects. Carry out root cause analysis for all major incidents, and recommended actions to be taken to rectify the failure that led to these incidents. Conduct regular consultations with the stakeholders; Stakeholder Engagement and communication Plan (December 2021 implementation). Provide guidance in addressing community grievances and complaints (operation of GRM) Prepare quarterly progress reports on the implementation of the ESMP for transmission to the WB Prepare and implement operation and maintenance plan	
Supervision Consultant	Perform role of on behalf of the PW in the works contract; Ensure that adequate ESHS staff are appointed for the Project. Inform their own personnel through environmental awareness training of their roles and responsibilities in terms of the ESMP during operations Supervision of the implementation of the CESMP and its related sub-plans by the Contractor	During construction

Responsible party	Tasks	Phase
	Supervise works, ensuring compliance with all design parameters including quality requirements and ESMP implementation. Ensure that the ESMP is properly implemented and that all its staff and personnel have signed the Code of Conduct under this Project. Provide guidance to the Contractor on implementation of ESHS aspects and provide training to the Contractor's staff if necessary. Prepare monthly progress reports with ESHS performance and monitoring components included, to submit to SCU. Support with the investigation and reporting of all incidents related to environmental, social and health aspects. Carry out root cause analysis for all major incidents, and recommended actions to be taken to rectify the failure that led to these incidents Support PW with consultations with the stakeholders. Review and advise PW on compliance, of the various documents prepared by the contractor such as CESMP, code of conduct, labour procedures, job hazard analysis, monitoring reports, and so on. Inform the SCU of any incidents and accidents immediately upon learning of such incidents	
Contractor	Obtain all necessary licenses/permits from relevant Ministries. Prepare construction environmental and social action plans with site-specific mitigation measures/management plans, and contractor environmental and social management plan Implement all the measures as identified in this ESMP and as instructed by PW. Implement all mitigation measures to address potential environmental and social risks and impacts as described in the ESMP and CESMP. Review the CESMP periodically, at least quarterly, and update in a timely manner. Implement the environmental monitoring plan of the ESMP. Carry out a job hazard assessment for each worksite to assess the potential hazards and implement mitigation measures to minimize risks.	During construction

Responsible party	Tasks	Phase
	Conduct toolbox training to the laborers on health and safety risks of the Project works. Report all accidents and incidents within 24hrs to the supervision consultant and SCU and facilitate incidents investigation. Make sure that all workers have signed the Code of Conduct under this Project prior to the start of works and have followed training in Gender Based Violence sensitization. Nominate an ESHS staff who will be responsible for implementing the Contractors' environmental, social, health and safety responsibilities, and liaising with government agencies. Inform staff through environmental awareness training of their roles and responsibilities in terms of the ESMP during operations; Have a complaint and communication procedure in place and operate it accordingly. Report where necessary, as described in this ESMP. Prepare monthly ESHS reports on ESMP implementation.	
NIMOS	Approve ESIA/ESMP Oversee the ESIA and ESMP development and implementation process	Prior to construction phase Throughout project timeline

7 Contractor ESHS Requirements

7.1 General

The tender documents are being developed by the consultancy team and will be reviewed by the Ministry of PW. This ESMP will be an integral part of the tender documents. Though there will be no impacts during the bidding phase of the Project, the effective implementation of mitigation measures in this ESMP will start from the pre-construction stage risks and impacts and their management. To ensure that during project implementation, the expected environmental and social risks and impacts are addressed, PW and the consultancy team will include the ESHS mitigation measures as listed in Chapter 5 in the respective bidding documents and to ensure that the following guidance is incorporated accordingly:

- The tender procedure should include minimum requirements for the contractors to adhere to. These minimum requirements should come back in the contract, so they can be enforced and sanctions can be set, in case of non-compliance.
- All sections of bidding documents are to be reviewed in detail and cross-reference will need to be made to the environmental and social safeguards policies and instruments relevant to the specific sub-projects which have been prepared as per the requirements of this ESMP.
- Inclusion of ESHS Requirements as technical specifications, including the need for the contractors ESHS staff and Code of Conduct.
- The bidder shall submit a draft CESMP to manage the key ESHS risks described in the ESMP. The Contractor shall be subsequently required to submit, before mobilization, and implement this CESMP.
- The bidder shall propose an ESHS personnel as the Contractor's key personnel. The exact qualifications for ESHS personnel shall be outlined in the bidding documents.
- In the selection of the Contractor for canal maintenance and the Contractor responsible for reparation of the sluice and lock, environmental and social performance should be promoted. Preference should be given to bidders who provide improved methods statements and management procedures, therewith reaching a higher level of efficiency and sustainability of the Project.

7.2 Requirements of the CESMP

As a requirement under the bidding documents, the contractors for all both the Canal Maintenance Project as well as the Rehabilitation of Sluice and Lock Project will need to submit a CESMP prior to their mobilization for approval. This plan will include the following site-specific management sub-plans/chapters that will be prepared in compliance with the requirements of the bidding documents, the WB Environmental, Health, and Safety (EHS) guidelines and this stand-alone ESMP:

- Description of the Project
- ESHS roles and responsibilities
- Management of environmental and social impacts and risks as identified in this ESMP
- Code of conduct for the workers
- Communication plan/procedure
- Complaint procedure (grievance mechanism of the contractor)
- Waste management incl. solid waste/debris management, pollution prevention etc.)
- Traffic management (on land and on water)
- Community and occupational health and safety plan
- Labour management
- Management of cultural resources

- Emergency response plan
- Workers training plan

Selected contractors will need to submit a method statement where the works will be implemented, addressing the measures associated with various hazards at the work sites. These reports will be reviewed and approved by PW after ensuring the mitigation measures proposed in the analysis are in place at the work sites.

Specific requirements are outlines in the Table 22 below.

Table 22 Environmental and social requirements to be included in contracts for (1) Canal maintenance and (2) rehabilitation of Doorsteek sluice and lock and the rehabilitation of Uitkijk ship lock

No.	Item	Environmental/social clause
1	Environmental and social management	Prepare CESMP for all activities and locations (including transportation routes over water and land) to implement all measures as mentioned in this ESMP into practical rules, responsibilities, timelines, training and awareness raising, communication, monitoring, costs and supervision. Plan needs approval from the Client. As part of the CESMP, there must be an environmental and social performance manager on-site.
2	Labor management	A labour procedure shall be developed for the Construction Phase, and include, at the minimum: - Recruitment procedure in line with laws and policy of the Government of Suriname. - Code of conduct - Worker's grievance mechanism. - Health and safety procedures. - Strategy to ensure non-discrimination based on gender, ethnicity or other grounds. - Clause ensuring no recruitment at the gate. - Adherence to national and international labor legislation and conventions. - Clause affirming that no child or forced labor will be used. - Statement confirming that no work will be performed at night. - No labor camp will be allowed.
3	Community and occupational health and safety	Prepare a community and occupational health and safety plan, based on a risk assessment of all activities performed during the construction period. Include also communication and behavioural rules for staff with communities. Special focus should be on labour accommodation, which special facilities for women. This Plan needs approval from the Client.
4	Communication	Develop a communication plan specifically for the construction phase. This construction-specific plan should include, at the minimum: - Communication plan for the communities, detailing who will be targeted, about what topics, in what phase. - Code of conduct for the workers for their relationship with nearby community members (including sexual harassment and abuse). - Complaint mechanism where the community and the workers can file their complaints and organize proper handling of the complaints.
5	Avoid displacement, damage to property and livelihood impacts	In line with the RPF, the selected contractors shall avoid adverse resettlement impacts, including displacement and livelihood impacts, and if not possible then minimize and mitigate. Among others, the contractor will follow the below principles:

No.	Item	Environmental/social clause
		- Do not affect or remove any existing structures, regardless of whether they were or were not previously identified or constructed after the census related to the cut-off date. Important to note is that no works will be conducted within 10m from all objects - In case any action is expected on private structures and properties, this will be coordinated with the Ministry of PW-SCU.
6	Physical cultural resources	'Chance find' procedures, when physical cultural resources are found during the works, need will be included in the construction contract and implemented by the Contractor (included in Annexes).
7	Waste Management	Include in the CESMP procedures on solid and liquid waste prevention and management.
8	Supply chain management	Minimize the risks of environmental and social impacts in the supply chain with subcontractors and main suppliers. Audit subcontractors and main suppliers on labour conditions, environmental impact, child labour and health & safety.
9	Emergency Response Plan	An emergency response plan must be prepared in line with local requirements and include the following basic elements. - Roles and responsibilities; - Communication systems; - Emergency response procedures; - Emergency resources; - Training and updating; - Checklists (role and action list and equipment checklist); Important hazards identified at this stage are: ▪ Flooding of the handling sites, resulting in flooded facilities and potentially excavated material that floats away. ▪ Fire in the equipment and/or solid waste storage. ▪ Worker accidents involving equipment during construction activities or transportation. ▪ Risk of protests and vandalism in case people feel not satisfied with compensation provided in case they are affected, job opportunities or management of the impacts from the works.
10	Sediment management	Develop procedure for management of and to prevent spills of excavated sediment material on public space.

7.3 Compliance monitoring and reporting

Monitoring and compliance reporting on the environmental and social mitigation provisions is an essential part of an environmental and social management procedure. Corrective actions are required in the case of non-compliance, and non-conformance. During construction it is also useful to also identify actions that can improve performance.

The contractor will keep the PW/Supervision Consultant and if necessary other relevant authorities informed of the Project performance with respect to environmental and social matters and implementation of the ESMP by submission of relevant records, weekly written status reports and/or face-to-face meetings etc as per requirements outlined in Chapter 5.

In addition, compliance monitoring comprises of on-site inspection of the activities to verify that measures identified in the ESMP and that are included in the clauses for contractors are being implemented. This type of monitoring is similar to the normal technical quality assurance management tasks ensuring that the Contractor is achieving the required standards and quality of work. The following reports will be prepared on the implementation of ESMP:

- Monthly environmental and social monitoring reports by the Contractor on the status of implementation of environmental, social, health and safety aspects;
- Incident/accident reports

Table 23 ESMP Monitoring and Compliance Reporting

#	Title of the Report	Contents of the Report	Frequency of Report Preparation	Report to be prepared by
1	ESHS Monitoring Report	Compliance status of the Project with the environmental and social mitigation and monitoring measures. Besides, the report also covers: • ESMP daily checklist (non-compliance reporting) • environmental incidents; • health and safety incidents, • health and safety supervision; • usage of PPEs by workers; • highlights of inspection; • training conducted and workers participated; • workers complaints; • community complaints and • chance find (if any) • other monitoring metrics such as results of visual monitoring of water quality, waste records, HR records etc.)	Monthly	Contractor
2	Incident reports	• Incident investigation reports for all incidents/accidents covering details of the incident, root cause analysis and actions taken to address the future recurrence of this event	Initial investigation report within 24hours (all parties to be informed within 24 hours); Detailed Investigation Report within 10 days.	Contractor

8 Stakeholder Engagement & Communication Plan

8.1 Stakeholder engagement

The WB and the Ministry of PW recognize the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Therefore, an SECP, including guidelines for a GRM was developed in December 2021. The aforementioned SECP for the Saramacca Canal Rehabilitation Project was designed to establish objectives and principles, and organizational arrangements for stakeholder communication, information disclosure and grievance redress, in line with the WB OP on Environmental Assessment (OP 4.01). More specifically, the objectives of stakeholder engagement are to:

- Promote the development of respectful and open relationships between stakeholders and the Project proponent and other relevant parties in the pre-construction and future phases;
- Identify Project stakeholders and understand their interests, concerns and influence in relation to Project activities, particularly during the construction phase;
- Provide stakeholders with timely information about the Project, in ways that are appropriate to their interests and needs, and also appropriate to the level of expected risk and potential adverse impacts;
- Support alignment with financing standards and guidelines for stakeholder engagement, as necessary in the pre-construction phase; and
- Record and resolve any grievances that may arise from Project-related activities through a grievance mechanism.

This SECP seeks to strengthen stakeholder participation of the sectors involved or stakeholders throughout the Project life cycle, commencing such engagement as early as possible in the Project development process. This is achieved through public and targeted consultation meetings, social assessment activities, and individual meetings with specific target groups, such as PAPs who are part of resettlement measures. Specifically, the SECP sets guidelines for meaningful consultation with stakeholders on the proposed project design, anticipated environmental and social risks and impacts, mitigation measures, environmental and social risk management instruments, and any other emerging issues. It identifies the main stakeholder groups, outlines the proposed consultation approach and methods, and suggests a structure for grievance redress.

In the context of environmental and social management, each contractor will need to develop its own Communication Plan, including a complaint mechanism, based on the guidelines laid out in this EMSP, the Project SECP, and in WB OP 4.01. .
A list of main project stakeholders is presented in Annex A4.
The Table below presents the Stakeholder Engagement Plan, Communication Plan and Grievance Redress Mechanism (Stakeholder Engagement and Communication Plan, SECP) for the “Saramacca Canal Rehabilitation Project”.

The Project foresees in three rounds of stakeholder engagement. The first round of stakeholder engagement had been concluded in 2021. During this round, five stakeholder meetings were held, representing both government and industry, as well as inhabitants along the Saramacca Canal (Table below).

The principle goals of these stakeholder meetings were:

- Inform PAPs and other project stakeholders about Project goals, activities, timeline and safeguard instruments.

- Inform PAPs and other stakeholders of the social and environmental assessment activities in their neighbourhoods.
- Establish a Cut-off date for Resettlement assistance at 15 November 2021.

The second round of stakeholder meetings is underway. During this round of meetings, different stakeholder groups will be informed about the technical designs, and about the ESMP for the no regret works (Canal Maintenance and Doorsteek sluices and locks). On December 8, 2022, a targeted meeting was held with firms who are users of the Doorsteek locks. There will be follow-up meetings with this stakeholder group as the actual construction activities come nearer. Once the dates of maintenance works are known, meetings will be health with inhabitants of the communities along the canal, as well as with local government. The principle goals of this second round of stakeholder meetings are to:

- Inform PAPs and other project stakeholders about the project activities, possible impacts and mitigation measures.
- Elicit feedback on ESMP, especially mitigation measures to reduce negative impacts and optimize Project benefits.

The third round of stakeholder meetings will focus on the regret measures, including rehabilitation of the Uitkijk lock, beautification measures, and possibly other works.

Table 24 Stakeholder Engagement Plan (shaded rows indicated activities already completed)

Project phase	Engagement activity	Objective	Targeted stakeholders	Time Frame
1. Inception	National level (virtual) stakeholder meeting.	Present and collect views on Project details, environmental and social risks, RPF and mitigation measures.	Representatives of government Ministries and departments; Industry along the Canal.	October 2021
	Meetings for local government representatives	Present and collect views on Project details, environmental and social risks, and mitigation measures.	Resort (Municipality) council members of the resorts along the Canal.	October/November 2021
	Community meetings	Present and collect views on general project activities and potential impacts; Explain RPF; establish cut-off date	Residents of low-income neighbourhoods Goede Verwachting and Sunny Point, specifically people living directly along the Canal	October-November 2021
2. No Regret: (Preliminary) Design Phase- Doorsteek and Canal Maintenance	Stakeholder meeting with stakeholders of Doorsteek sluices and locks	Present and elicit feedback on preliminary design and ESMP, GRM; Obtain more detailed information about use of the locks (frequency, types of transport, alternative routes used)	Businesses, fishers, and other boat owners using the locks, sluice managers, MAS, relevant government Ministries and departments incl. PW	December 2022, with follow-up January/February 2023 and 9 May 2023, 2 June 2023
	Selected stakeholder meeting, prior to onset physical work on Doorsteek locks (planned 2024)	Share projected work schedule, discuss mitigation measures for duration of sluice closure. Present possible LRP.	Businesses, fishers and other bat owners along the canal that use the Doorsteek locks for transport of materials/goods.	TBD
	Community meetings	Present and elicit feedback on preliminary design, ESIA,	Residents of low-income neighbourhoods Goede	February 2023; or when dates

Project phase	Engagement activity	Objective	Targeted stakeholders	Time Frame
		ESMP, RPF and GRM. Presentation modified to non-technical language and will be given in Sranantongo.	Verwachting and Sunny Point, specifically people living directly along the Canal, incl. local government representatives.	of maintenance works are known. 2 June 2023
	Social Assessment Activities, incl. drafting ESMP, and possible LRP for businesses that use the locks.	Identify and characterize targeted communities, organizations, and persons and assess social issues and potential social impacts	Representatives of government Ministries, businesses, local area inhabitants.	2 June 2023
	Meetings with local contractors	Explain bidding and tender procedures, to maximize opportunities for local businesses	Suriname contractor firms	14 December 2022
3. Regret measures: (Preliminary) design Uitkijk, Beautification and other	Stakeholder meeting with stakeholders of Uitkijk sluices and locks	Present and elicit feedback on preliminary design and ESMP, GRM; Obtain more detailed information about use of the locks (frequency, types of transport, alternative routes used)	Businesses, fishers and other boat owners using the Uitkijk locks, sluice managers, MAS, relevant government Ministries and departments incl. PW	9 May 2023 and 2 June 2023
	Selected stakeholder meeting, prior to onset work on Uitkijk locks	Share projected work schedule, discus mitigation measures for duration of sluice closure.	Businesses , fishers and other boat owners who use the Uitkijk locks for transport of materials.	TBD
	Stakeholder meeting about beautification measures Goede Verwachting	Present proposal for beautification, solicit input and ideas for improvement. Inform people about possible impacts and mitigation measures; ESIA, ESMP, GRM.	Residents of Goede Verwachting, specifically people living directly along the Canal, incl. local government representatives, church leaders, and other community leaders..	TBD 2023
	National level meeting	Present and collect views on regret measures, present ESIA, ESMP, GRM	National government representatives, media, District commissioners from relevant districts.	TBD 2023
	Meetings with local contractors	Explain bidding and tender procedures, to maximize opportunities for local businesses	Suriname contractor firms	TBD 2023
4. Procurement support	No engagement activities			

The contractors should prepare, as part of their CESMP, their own communication plan for their part of the works and their engagement with residents and businesses in the area.

8.2 Grievance Redress

The WB requires the Project to provide a grievance mechanism, process, or procedure to receive and facilitate resolution of concerns and grievances of project-affected parties arising in connection with the Project, in

particular about the Project's environmental and social performance. The SCU developed a Grievance Redress Mechanism, which was approved by the World Bank. This approved GRM is attached as ANNEX A11.

The purpose of the GRM is to ensure that any person that feels affected by the activities supported by the Project can convey her/his complaint. It is legally required that the GRM will be of easy access and that prompt responses to the complaints will be made available. Specifically, the GRM will:

- Provide affected people with tools and means for making a complaint or resolving any dispute that may arise during the course of the Project.
- Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants; and
- Provide an avenue to resort to judicial proceedings.

9 Budget

Mitigation measures are to be covered under the Contract for Rehabilitation of Doorsteek Sluice and Ship Lock, Rehabilitation of Uitkijk Ship Lock and Canal Maintenance . These measures are good practice for contractors and are therefore not considered additional costs.

Other measures (see Table below) are part of the ESMP budget.

Table 25 provides an overview of budget items that are additional to the Contractor's costs. It is assumed that these costs are included in the overall Financing agreement for the Project, managed by/through the SCU.

Table 25:Budget for execution of the ESMP for the SCU/PW

Item	Cost in USD
Stakeholder consultation meetings; local communities, government, others by PW/SCU	USD 10,000
Communication measures (radio, newspapers, bill boards) by PW/SCU	USD 5,000
Training workshop on environmental, social and labour performance for all parties involved in the Project	USD 15,000
Mitigitation to avoid loss or impact on assets or livelihood	USD 75,000
Monitoring expenses e.g. 1x per week (Supervision Consultant on behalf of PW/SCU)	USD 10,000
TOTAL	USD 115,000

Notes:

1) The budget is based on the information known at this stage. The amounts may change as the project details continue to be developed and finalised.
2) If required for the Doorsteek and Uitkijk ship lock rehabilitation works, a separate Livelihood Restoration Plan will be developed and, if applicable, compensation related to potential livelihood impacts will be included separately in the specific LRP.

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A1 ESMP Checklist for Rehabilitation of Sluices and Ship Locks

Location:
Date:
Inspection by:
Reviewed by:

Mitigation measure	Compliance (Yes/ No)	Responsible	Remarks
Corporate wide involvement and social cooperation All involved parties have been timely informed about the project (progress, planned activities, economic opportunities, etc.) All persons (personnel, sub-contractors) involved are trained and aware of the CESMP, including HR policy, Occupational H&S plan and ERP.			Date and information medium:

Workers Health & Safety Occupational H&S plan is in place. Work method statement including JSA have been approved Weekly toolbox meeting and daily safety talks have been conducted. All personnel and subcontractors sensitized on E&S risks (training). Required PPE supplied to workers. Have any ERP drills been conducted? Complaint procedure for worker in place. No complaints have been reported (e.g. Gender-based violence etc.)			Provide topics and list of attendance of toolbox meetings
Air Quality Control All equipment and vehicles are properly maintained and operated. Speed limits have been implemented to minimize dust. Visual observations on dust clouds have been conducted. Measures for supressing dust implemented.			

All trucks are covered during transport of material and/or waste.			
Noise control All vehicles and construction equipment are properly maintained. Work on sluices and lock carried out during daylight hours. Works in evening allowed for activities with low noise nuisance and with prior approval from PW. Local communities and business are timely informed about noisiest activities and their duration. Required PPE provided and used by the workers at locations required.			
Waste Management All waste is managed according to the waste management plan. Procedures are in place for separation of hazardous and non-hazardous waste. Waste is being collected in proper waste bins. No waste littering on project site.			

All type of waste is properly and timely collected for final disposal at an approved disposal site. Waste records are being kept including waste type, volume and disposal location.			
Water Quality (visual observations) Materials and resources are properly stored; limited piling on or near the water. Plan is in place for clean-up of spills.			

Completed by: Date: Sign:	Received and checked by: Date: Sign:

A2 ESMP Checklist for Saramacca Canal Maintenance

Location:
Date:
Inspection by:
Reviewed by:

Mitigation measure	Compliance (Yes/ No)	Responsible	Remarks
Corporate wide involvement and social cooperation All involved parties have been timely informed about the project (progress, planned activities, economic opportunities, etc.) All persons (personnel, sub-contractors) involved are trained and aware of the CESMP, including HR policy, Occupational H&S plan, ERP and traffic management plan.			Date and information medium:

Workers Health & Safety Occupational H&S plan in place. Work method statement including JSA have been approved. Weekly toolbox meeting and daily safety talks have been conducted. All personnel and subcontractors are sensitized on E&S risks (training). Required PPE supplied to workers. Have any ERP drills been conducted? Complaint procedure for workers is in place. No complaints have been reported (e.g. Gender-based violence etc.)			Provide topics and list of attendance of toolbox meetings
Community Health and Safety Community Health and Safety Plan in place. No incidents or accidents reported (on land or water) Announcements for temporary restriction of use of the canal water during maintenance activities have been communicated timely (according to communication plan).			Date and information medium:

Speed limits have been implemented. Water has been supplied to affected households.			
Air Quality Control All equipment and vehicles are properly maintained and operated. Land transport is minimized as much possible. Visual observations on dust clouds have been conducted. Speed limits have been implemented to minimize dust. All trucks are covered during transport of material and/or waste.			
Fuel management All vehicles and construction equipment are properly maintained. Spill response procedure, spill response equipment and materials are in place. Maintenance, fuelling and cleaning of equipment only executed at off-site workshop.			

No oil spill has been observed at project site.			
Noise control All vehicles and construction equipment are properly maintained. Local communities and business are timely informed about noisiest activities and their duration. Works only conducted during daylight hours Required PPE provided and used by the workers at locations required.			
Waste Management All waste is managed according to the waste management plan. Organic waste is separated from other waste (plastic). Waste is being collected in proper waste bins. No waste is observed in the water around the project site. Floating vegetation has been dewatered prior to disposal.			

Trees and shrub bushes have been chopped into smaller pieces prior to disposal. All type of waste is properly and timely collected for final disposal at an approved disposal site. Waste records are being kept including waste type, volume and disposal location.			
Water Quality (visual observations) Materials and resources are properly stored; limited piling on or near the water. Plan is in place for clean-up spills. There is no sign of oil pollution observed in the surrounding water (visual observation (e.g. oil spills, waste etc.) Continuous visual observation of turbidity during excavation has been conducted daily at excavation area			Describe measures in case of increased turbidity.
Soil/ sedimentation/ erosion Continuous visual observation of turbidity during excavation have been conducted daily			Describe measures in case of increased turbidity.

Excavated sediment material only used for re-profiling and backfilling within section of same sediment quality. No discharge/ erosion of backfilled sediment into the canal has been occurred. All trucks are properly closed off during transport of excavated material.			
Socio-economic A Traffic management plan is in place and implemented. Traffic arrangements don't stop the day-to-day business activities. Announcements for temporary restriction of use of the canal water during maintenance activities have been communicated timely (according to communication plan). Water has been supplied to affected households for duration of increased turbidity in the canal. Ferry service interrupted in consultation with ferry operator and local commuters.			Consultation date with ferry operator and local commuters.
Resettlement Detailed survey in the field has been conducted.			

Plan to avoid effect on assets of residents or businesses have been prepared.			

Completed by: Date: Sign	Received and checked by: Date: Sign:

A3 Waste Chain of Custody Form- Rehabilitation Sluices and Ship Locks

Contractor's name:
Project:
Location:
Period:
Reported by:

Waste type	Quantity	Unit (m^3 or kg)	Disposal destination
General waste (food, etc.)			
Packing material			
PET/HDPE			
Construction waste			
Waste oil			
Oil contaminated sorbets			

A4 Waste Chain of Custody Form- Saramacca Canal Maintenance

Contractor's name:
Project:
Location:
Period:
Reported by:

Waste type	Quantity	Unit (m^3 or kg)	Disposal destination
General waste (food, etc.)			
Packing material			
PET/HDPE			
Waste oil			
Oil contaminated sorbets			
Organic waste (dewatered floating vegetation)			
Organic waste (chopped trees, shrubs bushes)			
Excavated materials (sediment)			

A5 Stakeholder identification

Stakeholders for Project Component 1a: Improving Drainage Infrastructure; Structural flood management measures in the Saramacca Canal

Project Activities		Project Stakeholders	
Activity	Description	National	District, local, and community
Canal maintenance	Maintenance of Saramacca Canal and outlets of the secondary canals, to remove vegetation and water plants and to increase the navigation capacity of the canal and eliminate hydraulic restrictions.	Government Ministries and departments responsible for drainage infrastructure and canal management, including: ▪ Ministry of Public Works (OW) ▪ Ministry of Spatial Planning and Environment (ROM). ▪ Ministry of Transport, Communication and Tourism (TCT). ▪ Ministry of Agriculture, Animal husbandry and Fishing(LVV) ▪ Maritime Authorities Suriname (MAS) ▪ Suriname Water Company (SWM) ▪ National Institute for Environment and Development Suriname (NIMOS) ▪ Meteorologische Dienst Suriname Large industry along the Canal, specifically: ▪ Companies with jetties in the Canal ▪ Companies that uses the Canal for transport of bulk goods and/or waste (water) disposal ▪ Population of greater Paramaribo (incl. Wanica and Saramacca) who experience flooding.	▪ Residents of neighbourhoods along the canal. ▪ Households and small businesses that built houses and other structures on the edge of, or in the Canal. ▪ People with private jetties in the Canal ▪ Ferry service owner (Foundation) ▪ School children and commuters who use the ferry to get to school/work. ▪ People using the Canal for (subsistence) fishing. ▪ Farmers using the canal for irrigation. ▪ District Government of Paramaribo (South-West and North-East), Wanica North-West and Saramacca. ▪ District Councils ▪ Ressort Councils ▪ (Anticipated) providers of tourism activities in the Saramacca Canal

Project Activities		Project Stakeholders	
Activity	Description	National	District, Local and Community
		▪	▪
Rehabilitation of sluices and locks	Rehabilitation of: (a) two ship locks at the outlets of the Saramacca and Suriname Rivers, (b) the five-door sluice gate at the outlet to the Suriname River and (c) the four-door sluice gate at the outlet to the Saramacca River.	▪ Ministry of OW ▪ Ministry of TCT/MAS ▪ Industry that uses the Canal for transport of bulk goods	▪ Farmers along the Canal whose land gets flooded during heavy rainfall. ▪ Tour operators wanting to use the sluices during tourist activities. ▪ District Government of Paramaribo (South-West and North-East), Wanica North-West and Saramacca.
Localized intervention and/or pilot projects.	Upgrading of selected secondary and tertiary 'hot-spots' drainage systems and/or piloting of green flood management solutions. No specific sites for these activities have been selected as of yet.	*To be determined when projects get selected.*	*To be determined when projects get selected.*

A6 Stakeholder Engagement Plan

This Annex presents the Stakeholder Engagement Plan, Communication Plan and Grievance Redress Mechanism (Stakeholder Engagement and Communication Plan, SECP) for the "Saramacca Canal Rehabilitation Project" (hereafter: the Project).

The Project foresees in three rounds of stakeholder engagement. The first round of stakeholder engagement had been concluded. During this round, five stakeholder meetings were held, representing both government and industry, as well as inhabitants along the Saramacca Canal (Table below).

The principle goals of these stakeholder meetings were:

- Inform PAPs and other project stakeholders about Project goals, activities, timeline and safeguard instruments.
- Inform PAPs and other stakeholders of the social and environmental assessment activities in their neighbourhoods.
- Establish a Cut-off date for Resettlement assistance at 15 November 2021.

The second round of stakeholder meetings is underway. A targeted meetings were held with firms who are users of the sluices. After approval of the ESMP, a national level stakeholder meeting will be held. Once the dates of maintenance works are known, meetings will be health with inhabitants of the communities along the canal.

Table: Three phases of stakeholder consultation

Project phase	Engagement activity	Objective	Targeted stakeholders	Time Frame
1. Inception	National level (virtual) stakeholder meeting.	Present and collect views on Project details, environmental and social risks, RPF and mitigation measures.	Representatives of government Ministries and departments; Industry along the Canal.	October 2021
	Meetings for local government representatives	Present and collect views on Project details, environmental and social risks, and mitigation measures.	Resort (Municipality) council members of the resorts along the Canal.	October/November 2021
	Community meetings	Present and collect views on general project activities and potential impacts; Explain RPF; establish cut-off date	Residents of low-income neighbourhoods Goede Verwachting and Sunny Point, specifically people living directly along the Canal	November 2021
2. Detailed Design and Bidding documents No Regret activities	National level (virtual) stakeholder meeting.	Present and elicit feedback on preliminary design, ESIA, ESMP, RPF and GRM.	Representatives of government Ministries and departments; Industry along the Canal.	February 2023
	Meetings for local government representatives	Present and elicit feedback on preliminary	Resort (Municipality) council members of	February 2023

		design, ESIA, ESMP, RPF and GRM.	the resorts along the Canal.	
	Community meetings	Present and elicit feedback on preliminary design, ESIA, ESMP, RPF and GRM. Presentation modified to non-technical language and will be given in Sranantongo.	Residents of low-income neighbourhoods Goede Verwachting and Sunny Point, specifically people living directly along the Canal	/February 2023
	Inform users of locks about Technical Design Doorsteek sluices.	Present technical details about works on Doorsteek sluices. Discuss impacts and mitigation measures. Explain compensation under the RPF.	Boat owners and firms that transport goods through the locks	8 December, 2022. Follow up communication by e-mail
	Individual meetings	Explain WB resettlement safeguard to possibly affected persons; collect detailed data on potential resettlement issues; discuss ways to avoid resettlement; discuss how to annihilate negative impact and enhance positive Project contribution.	People affected by resettlement issues	Start within 60 days after prelim. design shows what objects could be at risk.
3. Detailed design and bidding documents Regret activities	National level (virtual) stakeholder meeting.	Present and elicit feedback on detailed design, showing where earlier feedback has been incorporated.	Representatives of government Ministries and departments; Industry along the Canal.	TBD 2023
	Meetings for local government representatives	Present and elicit feedback on detailed design, showing where earlier feedback has been incorporated.	Resort (Municipality) council members of the resorts along the Canal.	TBD 2023
	Community meetings	Present and elicit feedback on detailed design. Obtain stakeholder views on functioning and results – if any- of the GRM, RPF .	Residents of low-income neighbourhoods Goede Verwachting and Sunny Point, specifically people living directly along the Canal	TBD 2023
4. Procurement support	No engagement activities			

A7 Chance Find Procedure and Form

Introduction

This Chance Finds Procedure (CFP) is developed in compliance with the ESMP established for the Saramacca Canal System Rehabilitation Project and describes necessary measures to be taken in response to the chance discovery of (a) physical cultural resource(s) due to project associated (e.g. maintenance) activities.

National legislation of relevance to the development of the CFP is the Monuments Act 2002, S.B. 2002 no. 72) that aims to preserve historical monuments and architecture in Suriname, since archaeological or historical items may be encountered during maintenance. International best practice standards, such as the guidelines of the World Bank Group also provided guidance for the writing of the CFP document.

Objective and scope

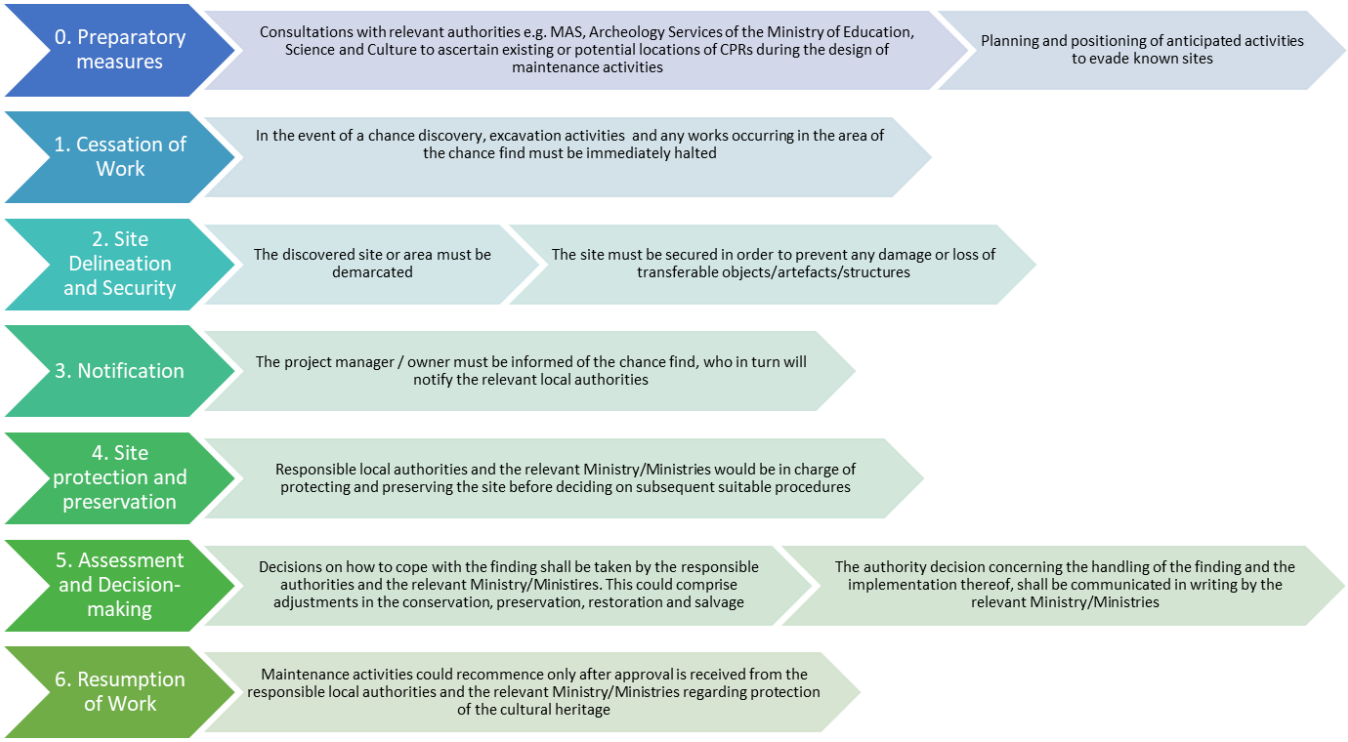
The chance finds procedure serves to monitor how chance finds of Physical Cultural Resources (PCRs) are managed in order to ensure their protection from adverse impacts of project activities (e.g. damage) and to support their preservation.

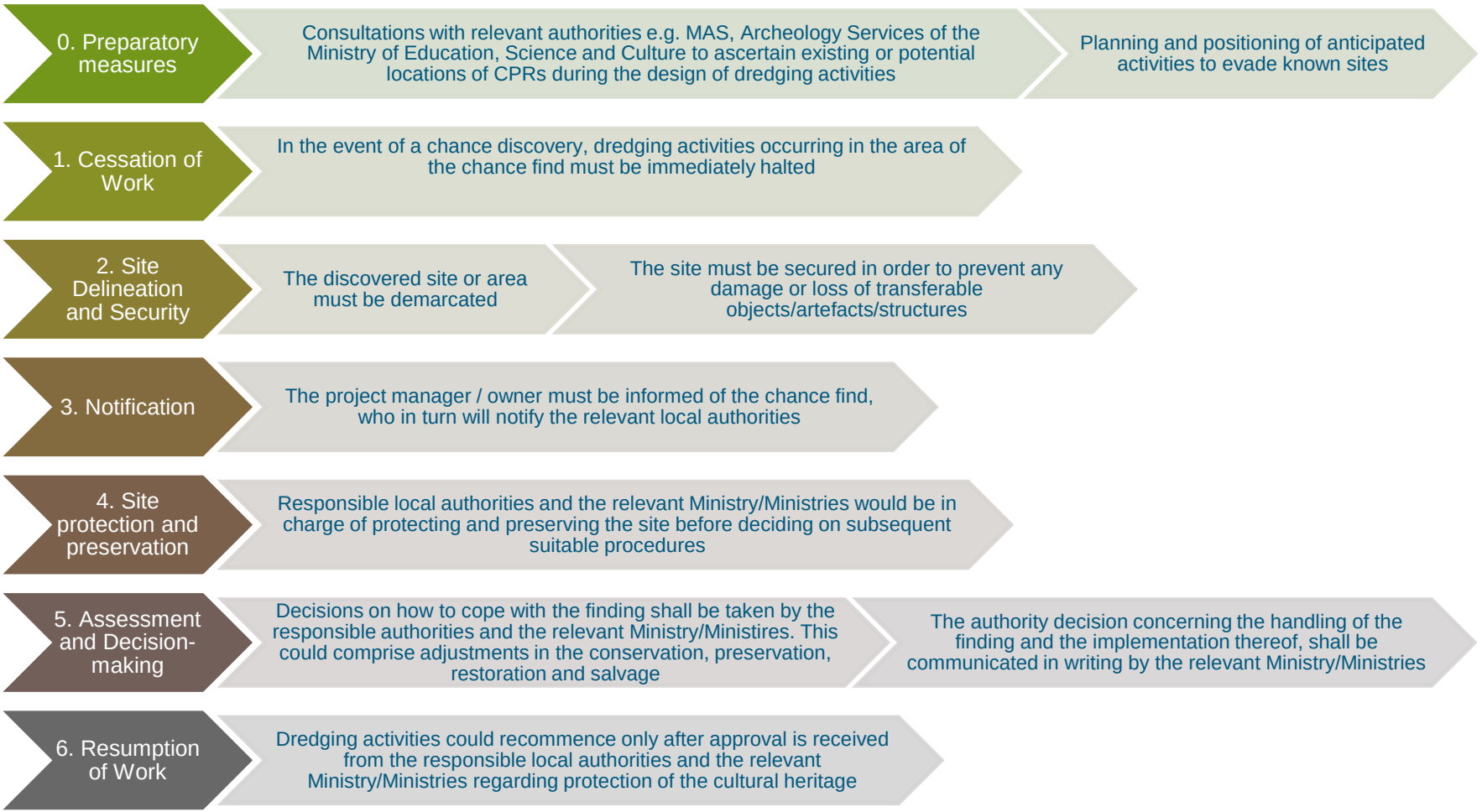
The CFP contains actions for avoiding and/or mitigating unsolicited impacts on possible PCRs, including:

- Consultations with relevant authorities and local residents/communities to ascertain existing or potential locations of PCRs during the design of maintenance activities;
- Planning and positioning of anticipated activities to evade known sites (including protected areas and zones);
- The interruption/stoppage of work until the importance of a ‘find’ has been assessed by appropriate authorities or relevant experts; and
- Measures for managing and alleviating undesirable impacts (for example establishment of buffer zones).

This CFP pertains to physical cultural resources located under water, that may include movable or immovable objects, (groups of) structures, and sites and natural features/landscapes having archaeological, historical, religious, or other cultural significance or value.

Schematic overview Chance Finds Procedure




0. Preparatory measures
Consultations with relevant authorities e.g. MAS, Archeology Services of the Ministry of Education, Science and Culture to ascertain existing or potential locations of CPRs during the design of dredging activities
Planning and positioning of anticipated activities to evade known sites
1. Cessation of Work
In the event of a chance discovery, dredging activities occurring in the area of the chance find must be immediately halted
2. Site Delineation and Security
The discovered site or area must be demarcated
The site must be secured in order to prevent any damage or loss of transferable objects/artefacts/structures
3. Notification
The project manager / owner must be informed of the chance find, who in turn will notify the relevant local authorities
4. Site protection and preservation
Responsible local authorities and the relevant Ministry/Ministries would be in charge of protecting and preserving the site before deciding on subsequent suitable procedures
5. Assessment and Decision-making
Decisions on how to cope with the finding shall be taken by the responsible authorities and the relevant Ministry/Ministires. This could comprise adjustments in the conservation, preservation, restoration and salvage
The authority decision concerning the handling of the finding and the implementation thereof, shall be communicated in writing by the relevant Ministry/Ministries
6. Resumption of Work
Dredging activities could recommence only after approval is received from the responsible local authorities and the relevant Ministry/Ministries regarding protection of the cultural heritage

Roles and responsibilities

Roles and responsibilities attributed to the following actors under the CFP are:

Actor	Role(s) and/or responsibility/(ties)
Contractor	• Consultations with relevant authorities to ascertain existing or potential locations of PCRs, during the planning of maintenance activities • Planning and positioning of anticipated activities to evade known sites • Empower staff to stop works on (chance) discovery of artefacts • In the event of a chance discovery, maintenance activities occurring in the area of the chance find must be immediately halted • The discovered site or area must be demarcated and secured in order to prevent any damage or loss of transferable objects / artefacts / structures; no archaeological or historical object may be removed from the seabed without prior authorization issued by the Government • The project manager / owner must be informed of the chance find • Permission must be sought of the Project owner, before maintenance work can be resumed • Monitoring of community issues
Supervision Consultant on behalf of PW	Will notify the responsible local authorities e.g. Archaeology Services of the Ministry of Education, Science and Culture
Maritime Authority Suriname (MAS)	• Advisory role to the other government entities and the contractor with regard to the location of shipwrecks within the project area and the planning of maintenance activities • Supporting role to the GoS with regard to the protection and preservation of the site where the chance find occurred
Ministry of Public Works	Responsible for: • Protecting and preserving the site before deciding on subsequent suitable procedures in consultation with other relevant local authorities • Assessment and decision-making on how to cope with the finding in relation to conservation, preservation, restoration and salvage of the find • Communicating the outcome of the assessment in writing to the contractor • Providing permission to the contractor for resumption of work
Ministry of Education, Science and Culture; Archaeology Services	Supporting/advisory role to the other government entities in particular concerning the conservation, preservation, restoration and salvage of the find
Stichting Surinaams Museum	Supporting/advisory role to the other government entities in particular concerning the conservation, preservation, restoration and salvage of the find

A8 Incident and Accident Reporting Procedure

Introduction

Despite significant efforts to manage environmental and social risks associated with project activities, incidents and/or accidents may occur. These may include but are not limited to:

- Environmental and social incidents (major environmental pollution, spills, damage to public or private property, vehicle accident, encroachment on private property, burglary or theft of assets)
- Inspection, investigation by, or warning or official order from, government regarding a (possible) violated policy, permit or legislation or permit conditions.
- Near miss events that are legally required to be reported by the Contractor to the Ministry of Labor, Employment Opportunity and Youth Affairs immediately, no later than three days.
- Health and safety incidents, accidents, injuries and all fatalities that require medical treatment, hospitalization, medical leave and in case of permanent complete or partial invalidity of an employee, fractured or cracked bones or teeth, punctured eardrums or hearing loss;
- Community and workers grievances
- Any allegation of gender-based violence (GBV), sexual exploitation or abuse, sexual harassment or sexual misbehaviour, rape, sexual assault, child abuse, or defilement, or other violations involving children (child labor).
- Suspected Code of Conduct violations in regard to human rights, discrimination against workers, drugs or other illegal activities, fraud & corruption, and conflict of interest;
- Damage to cultural heritage, artefacts, monuments, sacred grounds etc.

Roles and Responsibilities

Contractor's roles and responsibilities

The Contractor must have a written/documented procedure for the managing of incidents and accidents related to the project. The incident management and reporting process may comprise below steps.

The contractor shall report any accidents/incidents to the Supervisor/Client in writing **within 24 hours** after the incident, and immediately after the occurrence via email. The initial report from Contractor shall address the following questions.

- What happened to what or to whom?
- Where and when did the incident occur?
- How did it happen? What were the conditions or circumstances under which the incident occurred?
- How serious was the incident?
- What is the information source? Are the basic facts of the incident clear and uncontested, or are there conflicting versions?
- Is the incident still ongoing or is it contained? How is it being addressed and what is the status?

After the initial written reporting, the Contractor shall undertake a root cause analysis and propose appropriate measures to avoid future incidents. A detailed report shall be submitted in writing, for the Supervisor/Client approval, **within three days**. After the Contractor's initial reporting on the root cause analysis and corrective actions, the Contactor should also report the completion of corrective actions and possible preventive actions. In case of a GBV incident, the Contractor shall follow the instructions from the PW-SCU.

PW-SCU responsibilities

PW-SCU will as soon as reasonably practicable, preferably within **48hrs, but not later than five (5) calendar days** after the occurrence of a significant incident (which has, or is likely to have a significant adverse effect on the environment, the affected communities, the public or workers, including, explosions, spills, and any workplace accidents that result in death, serious or multiple injury, pollution, or any violent labor unrest or dispute, any case of gender-based violence and violence against minors), inform the World Bank by any

electronic means of the nature of the incident, accident, or circumstance and any effect or impact (whether on-site or off-site) resulting or likely to result there from. Furthermore, a summary report with a description of the incident, the measures and implementation will be provided to the Bank no later than thirty (30) days after occurrence. PW-SCU, supported by the Supervisor will monitor the Contractor for implementation of corrective actions and formulation of preventive actions in order to avoid occurrence of such incidents in the future. PW-SCU will keep the Bank informed of the on-going implementation of the said measures and plans.

A9 Overview sediment quality data 2018-2022

Sediment Sampling (2018)

Table 1: Overview of sediment and surface water sampling locations

Code	GPS#	Location Description
L1	21 N 702942 641091	Near the discharge pipe of a fish factory
L2	21 N 702548 641192	3m away from the quay of Van Alen Concrete Industries (VABI- Van Alen Beton Industrie)
L3	21 N 701699 641378	At the outlet of a secondary channel, nearby the Sluice (Suriname River)
L4	21 N 701563 641411	3m away from the Consolidated Industries Corporation (CIC) site
L5	21 N 700510 641586	3m away from a household dumpsite
L6	21 N 699851 641627	Sand storage site, in front of a moored boat
L7	21 N 699139 641715	Prison of Duisburglaan, as close as possible to land
L8	21 N 694741 642111	Residential area, at the outlet of a secondary channel
L9	21 N 692381 642476	Ship building site, in front of the mooring location
L10	21 N 686217 637815	Reference site, natural vegetation, in the center of the Saramacca Canal

Table 2: Abridged soil and sediment Risk-Based Guidelines and testing of parameters with results above the reporting limit.

Determinant		Soil/sediment guidelines					Sample results									
		Back-ground level	max value for residen-tial use	max value for indus-trial use	Inter-vention value	Combined guidelines	L-1	L-2	L-3	L-4	L-5	L-6	L-7	L-8	L-9	L-10
Characteristics																
Dry matter	% (w/w)						51.6	86.5	79.9	33.2	51.5	56.4	47.1	35.5	17.1	24.0
Organic matter	% (w/w) dm						6.7	0.6	1.7	5.4	2.7	4.3	4.4	8.9	14.8	15.6
Fraction < 2µm (clay)	% (w/w) dm						19.0	2.3	3.3	32.5	19.6	15.8	13.1	29.7	40.9	42.2
Metals																
Arsenic (As)	mg/kg dm	20	27	76	85		10	-	3.2	8.7	4.5	4.6	4.0	6.3	10.0	9.8
Barium (Ba)	mg/kg dm	190		625			69	18	23	140	48	48	58	67	86	84
Chromium (Cr)	mg/kg dm	55	62	180	380		31	6.8	7.5	35	21	17	15	35	37	34
Cobalt (Co)	mg/kg dm	15	35	190	240		7.5	4.3	2.9	9.6	7.0	6.0	4.7	10	**19**	**18**
Copper (Cu)	mg/kg dm	40	54	190	190		39	4.0	29	26	11	11	16	19	19	18

Mercury (Hg)	mg/kg dm	0.15	0.83	4.8	10		0.076	-	-	0.11	0.054	0.052	-	0.065	0.14	0.10
Lead (Pb)	mg/kg dm	50	210	530	580		19	3.5	20	30	15	15	20	25	24	23
Nickel (Ni)	mg/kg dm	35	39	100	210		16	4.0	3.8	25	12	9.3	8.2	18	24	24
Vanadium (V)	mg/kg dm	80	97	250			31	11	9.5	38	26	21	18	44	50	47
Zinc (Zn)	mg/kg dm	140	200	720	2,000		**170**	32	120	**250**	110	130	**330**	**210**	140	140
Volatile Organic Hydrocarbons																
Toluene	mg/kg dm				32		40	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	mg/kg dm						-	-	-	0.13	-	-	-	-	7.8	-

Determinant		**Background value**	**Max Residential use**	**Max Industrial use**	**Intervention value**	**Combined Guidelines**	**L-1-**	**L-2**	**L-3**	**L-4**	**L-5**	**L-6**	**L-7**	**L-8**	**L-9**	**L-10**
Phenol																
Phenol	mg/kg dm	0.25	0.25	1.25			**3.0**	-	-	-	-	-	-	-	-	-
o-Cresol	mg/kg dm					4100*	0.02	-	-	-	-	-	-	-	-	-
m-Cresol	mg/kg dm					4100*	0.04	-	-	-	-	-	-	-	-	-
p-Cresol	mg/kg dm					8200*	30	0.3	-	0.02	-	-	0.02	-	8.8	-

Cresols (sum)	mg/kg dm				13	8200*	31	0.3	-	0.02	-	-	0.02	-	8.8	-
Polycyclic Aromatic Hydrocarbons																
Naphtalene	mg/kg dm					0.24	-	-	-	0.01	-	-	-	-	-	-
Acenapthene	mg/kg dm					0.055	-	-	-	0.04	-	-	0.02	-	-	-
Fluorene	mg/kg dm					0.19	-	-	-	0.02	-	-	0.01	-	-	-
Phenanthrene	mg/kg dm					0.56	0.02	-	0.02	0.02	0.02	0.02	0.03	-	-	-
Fluoranthene	mg/kg dm					0.75	0.04	-	0.11	0.06	0.06	0.08	0.31	0.02	-	0.01
Pyrene	mg/kg dm					0.49	0.04	0.01	0.10	0.06	0.05	0.07	0.21	0.02	-	-
Benzo (a) anthracene	mg/kg dm					0.22	0.01	-	0.03	-	0.02	0.03	0.03	-	-	-
Chrysene	mg/kg dm					0.34	0.02	-	0.03	0.01	0.02	0.04	0.03	-	-	-
Benzo(b)fluoranthene	mg/kg dm					21*	0.02	-	0.04	-	0.03	0.05	0.04	-	-	-
Benzo(k)fluoranthene	mg/kg dm					0.24	-	-	0.04	-	-	0.01	-	-	-	-
Benzo (a)pyrene	mg/kg dm					0.37	0.08	-	0.04	-	0.02	0.04	0.03	-	-	-
Benzo(ghi)perylene	mg/kg dm					0.17	-	-	0.02	-	0.02	0.03	0.03	-	-	-
Indeno(123cd)pyrene	mg/kg dm					0.2	-	-	0.02	-	0.01	0.02	0.02	-	-	-
PAH 10 VROM (sum)	mg/kg dm	1.5			40		0.17	-	0.30	0.11	0.17	0.28	0.48	0.02	-	0.01

PAH 16 EPA (sum)	mg/kg dm						0.23	0.01	0.43	0.22	0.24	0.40	0.75	0.03	-	0.01
Chlorobenzenes																
Monochlorobenzene	mg/kg dm				2.0		-	-	-	0.05	-	-	-	-	-	-
Chlorophenols																
2,4,6-Trichlorophenol	mg/kg dm					82*	0.002	-	-	-	-	-	-	-	-	-
Trichlorophenols (sum)	mg/kg dm				22		0.002	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg dm						-	-	-	0.004	-	-	-	-	-	-
Poly Chlorinated Biphenyl (PCB)																
PCB 28	mg/kg dm						0.002	-	-	-	-	-	-	-	-	-
PCB 101	mg/kg dm						-	-	-	0.004	-	-	-	-	-	-
PCB 138	mg/kg dm						-	-	-	0.009	-	-	-	-	-	-
PCB 153	mg/kg dm						-	-	-	0.009	-	-	-	-	-	-
PCB 180	mg/kg dm						-	-	-	0.007	-	-	-	-	-	-
PCB (6) (sum)	mg/kg dm						0.002	-	-	0.029	-	-	-	-	-	-
PCB (7) (sum)	mg/kg dm				1.0		0.002	-	-	0.029	-	-	-	-	-	-
Miscellaneous Organic Compounds																

Biphenyl	mg/kg dm						0.007	-	-	-	-	-	-	-	-	-
Phosphor pesticides																
Demeton-S/ demeton-O-ethyl	mg/kg dm					3.3*		-	-	0.03	-	-	-	-	-	-
Phtalates																
Bisethylhexyl phtalate	mg/kg dm						5.1	-	2.4	1.6	0.7	2.1	4.2	0.5	-	-
Phtalates (sum)	mg/kg dm						5.1	-	2.4	1.6	0.7	2.1	4.2	0.5	-	-
Petroleum Hydrocarbons																
EPH (C12-C16)	mg/kg dm						11	12	18	61	12	12	21	9.7	-	-
EPH (C16-C21)	mg/kg dm						28	38	47	170	40	42	74	28	45	-
EPH (C21-C30)	mg/kg dm						84	65	190	320	160	200	290	130	110	50
EPH (C30-C35)	mg/kg dm						39	40	100	160	79	96	120	67	47	36
EPH (C35-C40)	mg/kg dm						14	17	41	59	31	39	40	23	-	-
EPH (sum C10-C40)	mg/kg dm	190	190	500	5,000		180	170	**390**	**770**	**320**	**390**	**540**	**250**	**220**	-

* Combined guidelines EPA (US and Canada)

19 **Bold and underlined figures are above the background level for the determinant, but below maximum value for industry**

540 **Bold and underlined red figures are above the** max value for industrial use, but below the intervention value

40	Above Intervention value

\- Below reporting limit

The bottom sediment of the Saramacca Canal consists of soft clay with humus material at all locations. River sand was only observed on location L2 and L3 and gravel was only observed on location L2. On all locations a typical muddy odor was observed, except on the locations L3 and L4, where a slight oil odor was observed.

From the laboratory results it can be concluded that many compounds of the bottom sediment are absent or present in very low concentrations.
For the results above the reporting limit, as presented in **Table 2**, the majority of determinants is below the background value for all samples.
Above the background, but below the maximum value for industrial use are:

- Cobalt in samples # L9 and L10
- Zinc in samples # L1, L4, L7 and L8
- TPH/EPH in samples # L3, L5, L6, L8 and L9

Of these samples, cobalt and zinc in sample # L1 are also below the maximum value for residential use.

Above the maximum value for industrial use but below the intervention unit are:

- Phenol in sample # L1
- TPH/EPH in samples # L4 and L7

Above the intervention values are:

- Toluene in sample # L1
- Cresol, especially p-cresol, in sample # L1 and L9

Overall most contaminated are samples #L1 and # L9, while the samples #L2 and L10 are the least contaminated.

Given the presence of a number of parameters above the background value and of few parameters above the maximum value for industrial use and some even above the intervention value, it is concluded that dredging material from the bottom sediment cannot be freely applied.

The quality of the majority of samples, however, indicates that the dredging material can be applied in a land zone for industrial use.

The presence of elevated levels for phenol, toluene, cresol and mineral oil in part of the bottom sediment can be accepted in view of the fact that exceedance of the maximum value for industrial use or the intervention value is restricted to a few samples only, so that the arithmetic mean for all samples is (far) below the maximum for industrial use.

Sediment Sampling (2022)

Code	GPS#	Location Description
SA	21 N 702895 641086	In front of a fish factory
SB	21 N 702163 641285	In front of a company (next to Traverco company)
SC	21 N 701590 641377	In front of the discharge points of NV Consolidated Industries Corporation.
SD	21 N 699074 641770	In front of the prison along the Duisburglaan.
SE	21 N 692037 642548	Near the residential part at Sunnypoint.
SF	21 N 687655 640335	Near Leiding 16A

Table 3: Overview of results of Eurofins analyses above the reporting limit and comparison with Dutch background and maximum values for soil and dredging materials (Regeling Bodemkwaliteit 2007) and intervention values of the water bottom in case of disposal in surface water (Circulaire sanering waterbodems 2008 en wijziging 3 april 2009).

Analyses		Bottom sediment						Background value (NL)	Maximum value Residential soil function	Maximum value industrial soil function	Combined guidelines
		SA_1	SB_1	SC_1	SD_1	SE_1	SF_1				
Characteristics											
Dry matter	% (w/w)	38.5	35.7	46.4	65.2	72.6	24.2				
Organic matter	% (w/w) dm	4.3	5.5	3.9	2.3	1.5	12.5				
Fraction <2 mµ	% (w/w) dm	40.4	37.7	23.5	10.4	6.3	47				
Metals											
Arsenic (As)	mg/kg dm	11	9	8	8	**688**	7	20	27	76	
Antimony (Sb)		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.0	15	22	
Barium (Ba)		54	65	116	68	48	46				
Beryllium (Be)		1.1	0.9	1.0	1.8	2.2	0.8				
Cadmium (Cd)		<0.30	<0.30	<0.30	<0.31	<0.32	<0.33	0.60	1.2	4.3	
Chromium (Cr)		28	32	28	25	24	26	55	62	180	
Cobalt (Co)		9	8	9	11	**20**	9	15	35	190	
Copper (Cu)		14	21	26	32	22	13	40	54	190	
Mercury (Hg)		0.053	0.064	0.092	0.063	**1.483**	0.087	0.15	0.83	4.8	
Lead (Pb)		22	31	35	22	38	19	50	210	530	
Molybdenum (Mo)		<1.0	1.2	<1.0	<1.0	<1.0	<1.0	1.5	88	190	
Nickel (Ni)		20	20	20	17	28	15	35	39	100	
Selenium (Se)		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0				
Tin (Sn)		<5.0	<5.0	<5.0	<5.1	<5.2	<5.3	6.5	180	900	
Vanadium (V)		40	38	36	48	37	33	80	97	250	
Zinc (Zn)		95	**147**	**233**	**232**	**144**	93	140	200	720	

Volatile Organic Hydrocarbons											
Benzene	mg/kg dm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	0.20			
Toluene		<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	0.20			
Ethylbenzene		<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	0.20			
Xylene (sum)		<0.3	<0.3	<0.3	<0.3	<0.3	<0.6	<0.3			
Phenols											
Cresols (sum)	mg/kg dm	**0.82**	--	**0.62**	--	0.05	--	0.30	0.30	5	13
Phenol		**5.6**	**3.9**	**0.6**	<0.01	0.13	<0.02	0.25	0.25	1.25	
Polycyclic Aromatic Hydrocarbons											
Acenaphtene	mg/kg dm	<0.01	<0.01	0.26	<0.01	<0.01	<0.02				0.055
Fluorene		<0.01	<0.01	0.13	<0.01	<0.01	<0.02				0.19
Phenanthrene		<0.01	<0.01	0.08	<0.01	<0.01	<0.02				0.56
Anthracene		<0.01	<0.01	0.02	<0.01	<0.01	<0.02				
Fluoranthene		0.02	0.05	0.1	0.02	<0.01	0.03				0.75
Pyrene		0.02	0.07	0.12	0.03	<0.01	0.04				0.49
Benzo(a)anthracene		<0.01	0.02	0.03	<0.01	<0.01	<0.02				0.22
Chrysene		<0.01	0.02	0.05	0.01	<0.01	<0.02				0.34
Benzo(b)fluoranthene		0.01	0.08	0.08	0.02	<0.01	0.04				21
Benzo(k)fluoranthene		<0.01	0.02	0.03	<0.01	<0.01	<0.02				0.24
Benzo(a)pyrene		<0.01	0.06	0.05	0.01	<0.01	0.03				0.37
Dibenzo(ah)anthracene		<0.01	0.02	<0.01	<0.01	<0.01	<0.02				

Benzo(ghi)perylene		<0.01	0.07	0.05	0.02	<0.01	0.04				0.17
Indeno(123cd)pyrene		<0.01	0.05	0.04	0.01	<0.01	0.04				0.20
PAH 10 VROM (sum)		<0.10	0.29	0.45	<0.10	--	<0.20	1.5	6.8	40	
Volatile halogenated Hydrocarbons											
Tetrachloromethane	mg/kg dm	<0.05	0.06	<0.05	<0.05	<0.05	0.10				
Chlorobenzenes											
Monochlorobenzene	mg/kg dm	<0.01	<0.01	0.14	<0.01	<0.01	<0.02	0.20	0.20	5	
1,4-Dichlorobenzene		<0.01	<0.01	0.02	<0.01	<0.01	<0.02				
Poly Chlorinated Biphenyl (PCB)											
PCB (7) (sum)	mg/kg dm	--	--	<0.020	--	--	--	0.020	0.040	0.5	
Phtalates											
Bisethylhexylphtalate	mg/kg dm	0.5	1.9	1.5	0.7	1.2	<0.4				
Total Petroleum Hydrocarbons											
TPH sum (C10-C40)	mg/kg dm	**488**	**4364**	**2333**	**2348**	**433**	112	190	190	500	

Legend	
xx	Values above the background value, the maximum value for residential and industrial soil function.
xx	Values above the background value but below the value for residential and industrial soil function.
xx	Values above the background value and value for residential soil function, but below the value for industrial soil function.
xx	Values above the combined guidelines EPA (US and Canada)

Most components from Eurofins Analytico are below reporting limits. The majority of determinants is below the background value for all samples.

Above the background value, the maximum value for residential and industrial soil function are:

- Arsenic (As) in sample SE_1
- Phenol in samples SA_1 and SB_1
- TPH in samples SB_1, SC_1 and SD_1

Above the background value but below the value for residential and industrial soil function are:

- Cobalt (Co) in sample SE_1
- Zinc (Zn) in samples SB_1 and SE_1
- Phenol in sample SC_1
- TPH in samples SA_1 and SE_1

Above the background value and value for residential soil function, but below the value for industrial soil function.

- Mercury (Hg) in sample SE_1
- Zinc (Zn) in samples SC_1 and SD_1
- Cresols (sum) in samples SA_1 and SC_1

At sample SC_1 a value of 0.26 mg/ kg dm for Acenaphtene is measured, which is above the combined standard of 0.055 mg/ kg dm.

From the sediment analysis, pollution is observed within the urban and peri-urban area. It can be concluded that the most contaminated sample is SE_1 (near Sunny Point), while sample SF_1 is the least contaminated. In 2018, the most contaminated samples were L1 (urban area; near a fish factory) and L9 (peri-urban area, near Sunny point). The current results more or less reflect the situation as it was then in 2018.

Given the presence of a number of parameters above the background value and of few parameters above the maximum value for industrial use and some even above the intervention value, it is concluded that the dredging material cannot be freely applied. The quality of the majority of samples, however, indicates that the dredging material can be applied in a land zone for industrial use.

A10 Impact tables with ranking of impacts before and after mitigation and optimization

1. Introduction

The significance of key potential impacts is based on two key factors: its severity and probability of occurrence. The severity of predicted impacts was determined based upon assessment of the following attributes:

- Magnitude
- Geographical scale
- Duration

Each one of these factors are rated on the basis of the research findings, as depicted in Table 1 below.

Table 26. Rating definition

Rating	Definition of Rating
Magnitude *– severity and reversibility of possible impact*	
Negligible	No or hardly any impact noticeable
Low	Low level, reversible damage to a small number of people
Medium	Significant yet reversible damage to a significant share of persons in the study area, or irreversible impact on lives and livelihoods of small population.
High	Severe irreversible damage to the lives and livelihoods of many people in the study area, or even (inter)nationally.
Duration*– the time frame for which the impact will be experienced*	
Short-term (ST)	Up to 1 month
Medium-term (MT)	1 month-1 year
Long-term (LT)	More than 1 year
Scale*– the area in which the impact will be experienced*	
Small (SS)	Localized spot (e.g. one part of the canal)
Medium (MS)	Study area
Large (LS)	Larger part of the country or beyond

The severity is determined as follows:

Table 27. Magnititude definition

Magnitude	High	Medium	Low	Negligible
Duration and/or Scale				
LT-LS, LT-MS or MT-LS	High	High	Medium	Negligible
LT-SS, MT-MS, MT-SS, ST-MS or ST-LS	High	Medium	Low	Negligible
ST-SS	Medium	Low	Negligible	Negligible

The next step is the determination of the probability.

Table 3 below shows the categorization of probability. In the rating, “probability” refers to two concepts namely: (a) the likelihood that the potential impact will actually occur or has occurred, and (b) the likelihood that a predicted or observed impact is a consequence of the presence of the project.

Table 28. Magnitude, time and scale ratings and their meaning.

Rating	Definition of Rating
Probability *– Likelihood that the impact will occur/has occurred AND can be attributed to the Project*	
Small	Small chance that this will happen/small chance that this happened as a result of Project.
Fair	<50% possibility that this will happen/happened as a result of the Project.
Likely	Quit likely that this will happen, but not (nearly) certain
Certain	Has happened, is happening, or (nearly) certain that this will happen

Subsequently, a graphic was created to quantify the significance of negative project impacts as a function of severity and probability, on a 4-point scale, as displayed in Table 4 below.

Table 29. Rating of negative project impacts

Probability	Negligible	Low	Medium	High
Certain	Moderate	High	Major	Major
Likely	Low	Moderate	High	Major
Fair	Negligible	Low	Moderate	High
Small	Negligible	Negligible	Moderate	Moderate

Likewise, considering that the project also may have positive project benefits, the significance of potential project benefits was rates as in Table 5 below, as the product of gains and probability.

Table 30. Rating of positive project benefits

	Negligible	Low	Medium	High
Certain	Moderate	High	Major	Major
Likely	Low	Moderate	High	Major
Fair	Negligible	Low	Moderate	High
Small	Negligible	Negligible	Moderate	Moderate

As part of the impact assessment methodology, appropriate and practicable management measures to address impacts are recommended. The management measures are classified as mitigation measures intended to avoid, minimize and/or reduce potential negative impacts and optimization measures intended to generate, maximize and/or enhance potential benefits of the project. The significance of each potential impact is rated before and after the application of mitigation/optimization. The expected impact after application of the mitigation measures is referred to as the residual impact.

2. Impacts related to Canal Maintenance

Table 31. Rating Project Environmental, Social Impacts, Issues and Concerns related to Maintenance of the Saramacca Canal

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation / maximizing)	Residual impact (after mitigation / maximizing)
Environmental					
General performance	• Poor public perception • Damage of the image of all parties involved in the project	Small	Long-term, Medium-scale, Magnitude: Low	Moderate	Low
Air quality	• Emissions from vehicles and equipment. • Poor maintenance of equipment and transportation means • Dust pollution	Likely	Short-term, Small-scale. Magnitude: Negligible	Low	Negligible
Fuel use	• Risk of spills • Risk of poor management of fuel waste, e.g., empty containers. • Potential pollution of soils and water.	Small	Medium-term, Small-scale, Magnitude: Low	Low	Negligible
Waste	• Canal cleaning and maintenance will produce large volumes of vegetation waste. • Clearing of the Canal embankment will produce waste such as trees and shrub bushes • Excavated materials may contain waste	Certain	Short-term, Small-scale, Magnitude: Low	Moderate	Low
Soil/Sediment	• Excavated material may contain waste debris and /or contaminants. • Backfill materials could flow back into Canal after placement on Canal banks (erosion). • Sediment removal works and clearing vegetation disturbs the soil and can cause increase of turbidity in the Canal. • Soil pollution as a result of improper transportation of excavated material and other waste via public roads (if applicable)	Likely	Short term Medium-scale Magnitude: Low	Moderate	Low

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation / maximizing)	Residual impact (after mitigation / maximizing)
Surface water quality	• Excavated sediment may contain contaminants. • Increased turbidity may affect aquatic flora and fauna in selected areas. • Waste could clog and pollute waterways if ending up in the Canal or trenches and ditches. • Water pollution with spilled and leaked oil and/or grease from boats and equipment during canal maintenance.	Small	Medium-term Small-scale Magnitude: Medium	Moderate	Low
Noise	• Noise generated by maintenance equipment and activities may be a nuisance to area inhabitants. • Working in conditions with excessive noise may damage worker's hearing.	Likely	Short-term Small-scale Magnitude: Medium	Moderate	Negligible
Health and Safety					
Collisions	• Collisions or accidents involving other water users. • Collisions with objects on the water	Small	Medium-term Small-scale Magnitude: High	Moderate	Negligible
Worker Health and Safety	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water (injuries, drowning). • Navigational hazards and accidents including drowning. • Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.	Likely	Medium-term Small-scale Magnitude: Low	Moderate	Low
Fisher health and safety	• Positive: Safer access to market for Fishers from Coppename Punt	Certain	Long-term Medium-scale Magnitude: High	Major	Major
Community Health and Safety	• Incidents and accidents due to transportation of material and goods on the public road (transportation of waste, dredge material via the public roads) • Increased turbidity of the canal during maintenance might affect household uses of canal water.	Small	Short-term Small-scale Magnitude: Medium	Low	Negligible

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation / maximizing)	Residual impact (after mitigation / maximizing)
	• Health hazard when children use the canal for swimming.				
Risk Force Majeure (environmental emergency)	• Dangers of workers and public due to fire, flooding, extreme weather events etc.	Small	Short-term Medium-scale Magnitude: Medium	Moderate	Low
Socioeconomic					
Livelihood impacts	• Positive: Fishers from Coppename will be able to reach the Paramaribo market through the Canal, • Positive: Provision of construction jobs to Suriname companies and materials sourced from the Suriname economy generate income for Suriname workers and small businesses	Certain	Long-term Medium-scale Magnitude: Medium	Moderate	Major
Disruption of household uses of Canal	• Temporary presence of clearing and vessels, and increased turbidity, affect households that use Canal for household uses such as washing clothes and dishes. Especially in the dry season.	Fair	Short-term Small-scale Magnitude: Medium	Low	Negligible
Risk of damage to assets of residents	• Risk of damage to business and household structures on or near embankment • Risk of damage to other private property in and along Saramacca Canal, including jetties.	Small	Medium term Small-scale Magnitude: Medium	Moderate	Low
Public perception	• Stakeholders who feel that the Project negatively affects them, or who feel unheard, may generate protests and negative publicity.	Fair	Medium-term Medium-scale Magnitude: Medium	Moderate	Negligible
Flood risk reduction	• Positive: Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding • Lower risk of health problems after heavy rainfall and flooding	Likely	Long-term Medium-scale Magnitude: High	High	Major

3. Impacts related to rehabilitation of the Doorsteek sluice and ship lock

Table 32. Rating Project Environmental, Social Impacts, Issues and Concerns related to rehabilitation of Doorsteek sluice and ship lock

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation)	Residual impact (after mitigation)
Environmental					
General performance	• Poor public perception • Damage of the image of all parties involved in the project	Small	Long-term, Medium-scale, Magnitude: Low	Moderate	Low
Air quality	• Emissions from construction vehicles and equipment. • Dust pollution from construction site • Dust pollution during transportation of waste	Certain	Medium-term Small-scale Magnitude: Negligible	Moderate	Negligible
Waste	• Solid household and construction waste is generated during works on sluice and lock.	Certain	Medium-term Small-scale Magnitude: Negligible	Moderate	Negligible
Noise	• Noise generated by construction equipment and activities may be a nuisance to area inhabitants. • Working in conditions with excessive noise may damage worker's hearing.	Certain	Short-term Small-scale Magnitude: Medium	High	Low
Material and resources	• Introduction of foreign material (metals, cement) in an aquatic environment	Small	Medium-term Small-scale Magnitude: Low	Low	Negligible
Water quality	• Spills during construction works (raw material, oil, fuel, paint) • Local increase in turbidity	Likely	Medium-term Small-scale Magnitude: Low	Moderate	Low
Health and Safety					
Worker Health and Safety	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water.	Likely	Long-term Small-scale Magnitude: Medium	High	Low

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation)	Residual impact (after mitigation)
	• Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.				
Risk Force Majeure (Environmental emergency)	• Danger of the workers and public from fire, flood, extreme weather events etc.	Small	Short-term Medium-scale Magnitude: Medium	Moderate	Low
Socioeconomic					
Livelihood impacts	• Disruption of business, loss of income or increased expenses for businesses using the locks for transport of goods, as will be detailed in an LRP as needed, in line with World Bank standards.	Likely	Short-term Small-scale Magnitude: Medium	Moderate	Negligible
	• Positive: Provision of construction jobs to local companies and materials sourced from the local economy generate income for local workers and small businesses • Positive: Better functioning ship lock will make passage for vessels more efficient	Certain	Long-term Medium-scale Magnitude: Medium	Moderate	Major
Public perception	• Stakeholders who feel that the project negatively affects them, or who feel unheard, may generate protests and negative publicity.	Fair	Medium-term Medium-scale Magnitude: Medium	Moderate	Low
Flood risk reduction	• Positive: Better flood management. • Less loss/destruction of items due to flooding. • Fewer times that school bus does not enter area because of flooding • Lower risk of health problems after heavy rainfall and flooding	Likely	Long-term Medium-scale Magnitude: High	High	Major

4. Impacts related to rehabilitation of the Uitkijk ship lock

Table 33. Rating Project Environmental, Social Impacts, Issues and Concerns related to rehabilitation of Uitkijk ship lock

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation)	Residual impact (after mitigation)
Environmental					
General performance	• Poor public perception • Damage of the image of all parties involved in the project	Small	Long-term, Medium-scale, Magnitude: Low	Moderate	Low
Air quality	• Emissions from construction vehicles and equipment. Dust pollution from construction site • Dust pollution during transportation of waste	Certain	Medium-term Small-scale Magnitude: Negligible	Moderate	Negligible
Waste	• Solid household and construction waste is generated during works on ship lock.	Certain	Medium-term Small-scale Magnitude: Negligible	Moderate	Low
Noise	• Noise generated by construction equipment and activities may be a nuisance to area inhabitants, • Working in conditions with excessive noise may damage worker's hearing. • Noise may disturb school and churches	Certain	Medium-term Small-scale Magnitude: Medium	Major	Low
Material and resources	• Introduction of foreign material (metals, cement) in an aquatic environment	Small	Medium-term Small-scale Magnitude: Low	Low	Negligible
Water quality	• Spills during construction works (raw material, oil, fuel, paint) • Local increase in turbidity	Likely	Medium-term Small-scale Magnitude: Low	Moderate	Low
Hydrology	• Flooding risk if works prevent opening of the sluices during high water levels in the canal	Small	Short-term Medium-scale Magnitude: Medium	Moderate	Low
Risk Force Majeure (Environmental emergency)	• Danger of the workers and public from fire, flood, etc.	Small	Short-term Medium-scale Magnitude: Medium	Moderate	Low
Health and Safety					

Impacts	Description	Probability	Characteristics and magnitude	Impact ranking (before mitigation)	Residual impact (after mitigation)
Worker Health and Safety	• Construction workers are exposed to health and safety risks, especially when working with heavy equipment and/or on water. • Female workers are disproportionally at risk of sexual harassment and discrimination, including unequal payment conditions.	Likely	Long-term Small-scale Magnitude: Medium	High	Low
Improved Fishers health and Safety	• Positive: Fishers from Coppename can more easily use the locks and enter the Saramacca Canal to get to the Paramaribo market	Likely	Long-term Medium-scale Magnitude: Low	Moderate	Moderate
Socioeconomic					
Livelihood impacts	• Negative: Vessels from fishers and businesses that wish to use the Uitkijk sluices to enter the canal once it has been cleared, may be hindered.	Fair	Short-term Small-scale Magnitude: Low	Low	Negligible
Livelihood impacts	• Positive: Provision of construction jobs to local companies and materials sourced from the local economy generate income for local workers and small businesses • Positive: Better functioning ship lock will make passage for vessels more efficient	Certain	Long-term Medium-scale Magnitude: Medium	Moderate	Major
Public perception	• Stakeholders who feel that the project negatively affects them, or who feel unheard, may generate protests and negative publicity.	Fair	Medium-term Medium-scale Magnitude: Medium	Moderate	Low
Flood risk reduction	• Positive: Better flood management.	Likely	Long-term Medium-scale Magnitude: High	High	Major

A11 Grievance Redress Mechanism