Government of Sint Maarten

NRPB
National Recovery Program Bureau

NATIONAL RECOVERY PROGRAM BUREAU

GOVERNMENT OF SINT MAARTEN

WASTEWATER MANAGEMENT PROJECT (SWMP)

PROJECT NO.: P179067

DESIGN AND SUPERVISION OF WASTEWATER NETWORK AND WWTP

CONTRACT NO.: SX-NRPB-367262-CS-QCBS

INCEPTION REPORT

FINAL VERSION

JULY 2025

A project financed by:

THE WORLD BANK
IBRD • IDA

Implemented by:

ENGIDRO engineering solutions

PROCESL

With collaboration as subconsultant of:

Subsurface

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Revision Registry		
Version	**Date**	**Description**
V0	12-06-2025	Draft version
V0	08-07-2025	Final version

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ACRONYMS AND ABBREVIATIONS

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CSMP	Country Sint Maarten Sewerage Master Plan 2020-2030
ESA	Environmental and Social Assessment
ESMP	Environmental and Social Management Plan
ESHS	Environmental and Social Health and Safety
E&S	Environmental and Social
GIS	Geographic Information System
JV	Joint-Venture
MSW	Municipal Solid Waste
NGO	Non-Governmental Organizations
OHS	Occupational Health and Safety
N-tot	Total Nitrogen
PAP	Project Affected People
P-tot	Total Phosphorous
RIVM	Dutch National Institute for Public Health and Environment
SEP	Stakeholder Engagement Plan
ToR	Terms of Reference
VROMI	Ministry of Public Housing, Spatial Planning, Environment and Infrastructure
VSA	Ministry of Public Health, Social Development and Labor
WB	The World Bank
WWTP	Wastewater Treatment Plant

1. INTRODUCTION, FRAMEWORK AND OBJECTIVES OF THE CONSULTANCY

1.1 INTRODUCTION AND FRAMEWORK

Sint Maarten is especially susceptible to natural disasters and extreme weather events due to its location in the hurricane belt. Over the past several decades, the country has experienced numerous hurricanes and strong winds. Given the country's small size, a single storm can directly impact the entire population. The primary risks include high winds, heavy rainfall, and flooding, with the country also being susceptible to earthquakes. Coastal regions face additional flood risks from sea level rise, storm surges, and potential tsunamis. Factors such as increased urbanization, climate change, and limited capacity to build resilience further exacerbate Sint Maarten's vulnerability to natural hazards.

In response to Hurricane Irma, the Sint Maarten Recovery, Reconstruction, and Resilience Trust Fund (SXM TF) was established in 2018. The SXM TF is managed by a Steering Committee composed of representatives from the Government of Sint Maarten, the Government of the Netherlands, and the World Bank. Investments in wastewater infrastructure are among the initiatives proposed to be financed through the SXM Trust Fund.

To support the implementation of the Trust Fund, the Government of Sint Maarten set up the National Recovery Program Bureau (NRPB), which serves as the Project Implementation Unit (PIU) for the government. The NRPB's mission is to facilitate Sint Maarten's recovery and long-term resilience through the effective execution of development projects. In collaboration with its partners, the NRPB is committed to delivering the Sint Maarten Wastewater Management Project successfully, ensuring that the local population can enjoy the long-term benefits of this crucial infrastructure improvement.

Sint Maarten sewerage network coverage is very limited, covering only some districts and neighborhoods. There is only one public biological treatment plant currently in operation whose treatment capacity is approximately 4,500 m³ of sewage and septage per day. However, due to the incomplete sewerage network across Sint Maarten, the wastewater treatment plant is currently operating at about 65% of its hydraulic capacity and 80% of its pollution load capacity.

The Government of Sint Maarten has received financing from the International Bank for Reconstruction and Development (IBRD / World Bank) toward the cost of the Wastewater Management Project and intends to apply part of the proceeds for consulting services, namely the "**Design and Supervision of Wastewater network and Wastewater Treatment Plant**". The consulting services have been awarded to **ENGIDRO /PROCESL** Joint-Venture, together with **SUBSURFACE** (as subconsultant). The date for Commencement of Services is May 12, 2025. The Inception Phase followed the kick-off meeting held on May 07, 2025.

This document presents the **D0 - Inception Report**, aiming to provide a comprehensive overview of the initial activities, the methodology of work, tasks to be performed, the expert team's participation, and the updated schedule of services. The Report reflects not only these activities but also the initial findings regarding the sanitation systems, based on the information provided in the Terms of Reference and other additional data shared by NRPB and on bibliographic research.

1.2 OBJECTIVES

The consultancy aims to identify a viable, feasible, and responsible plan for upgrading the wastewater treatment plant (WWTP) and expanding the sewer network in the Greater Cul de Sac area (**Figure 1.1**), with potential extensions to other areas if funds allow. It will assess the environmental and social conditions, risks, and impacts of the WWTP and evaluate the capacity of water bodies to handle effluent discharge. The consultancy will also supervise the construction work related to the sewer network and WWTP improvements but will not include environmental and social assessments for the sewer network expansion.

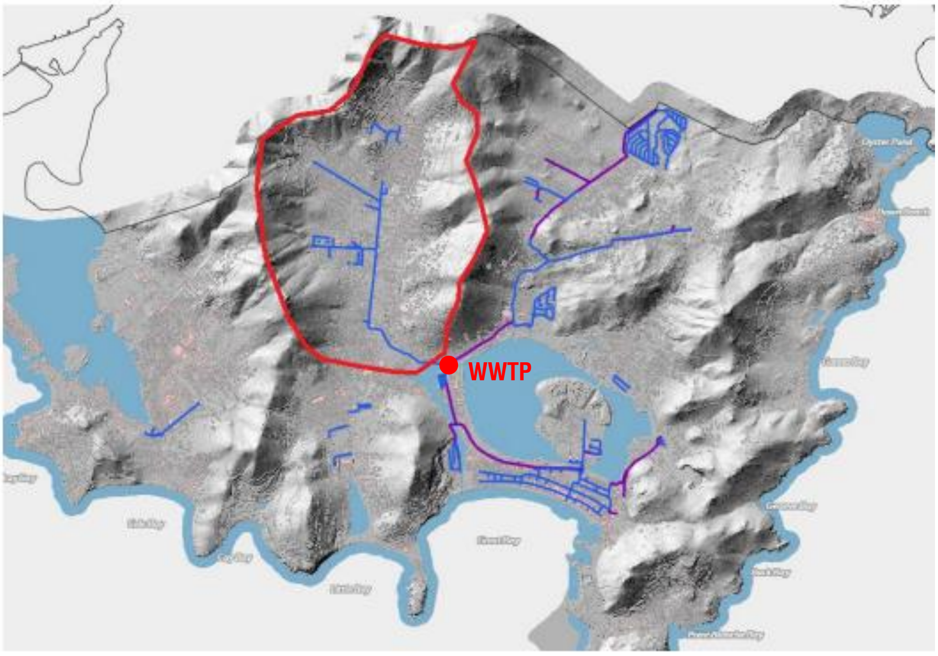

Figure 1.1 – Project location: Cul de sac network expansion area (in red) and WWTP (Source: Adapted from the ToR)

The consultancy will evaluate the following:

- The environmental and social baseline conditions within the WWTP’s area of impact;
- The environmental and social (E&S) risks and impacts associated with the WWTP's current operations, planned upgrades, and future activities;
- The capacity of the receiving water bodies to handle the effluent discharge.

In addition, the consultancy will oversee the construction site during civil works related to the installation of the sewer network and the enhancement of the existing WWTP.

1.3 DOCUMENT ORGANIZATION

The content of the present report is organized into 5 distinct chapters.

After the first introductory chapter, were the framework and objectives of the assignment are presented, chapter 2 outlines the Work Methodology and Work Plan, focused on methodological aspects and the submission of deliverables.

Chapter 3 presents the aspects related to the logistical and operational preparation for the consultancy providing insights into the team structure, mobilization of experts, logistic facilities, contacts matrix, and the overall organizational framework, for effective project implementation.

Chapter 4 covers essential aspects of the assignment's progress, such as the description of the study area, stakeholder identification, data collection and initial findings.

Finally, in chapter 5, the critical points of the project, and corresponding mitigation measurements are presented.

2. METHODOLOGY AND WORKPLAN

2.1 INTRODUCTION

The consultancy services will be implemented in two phases:

- Phase 1: Design and Environmental and Social assessment.
- Phase 2: Construction site supervision.

A key phase of the consultancy will involve knowledge transfer and capacity building, ensuring long-term impact by equipping stakeholders with the skills and expertise needed to sustain the results.

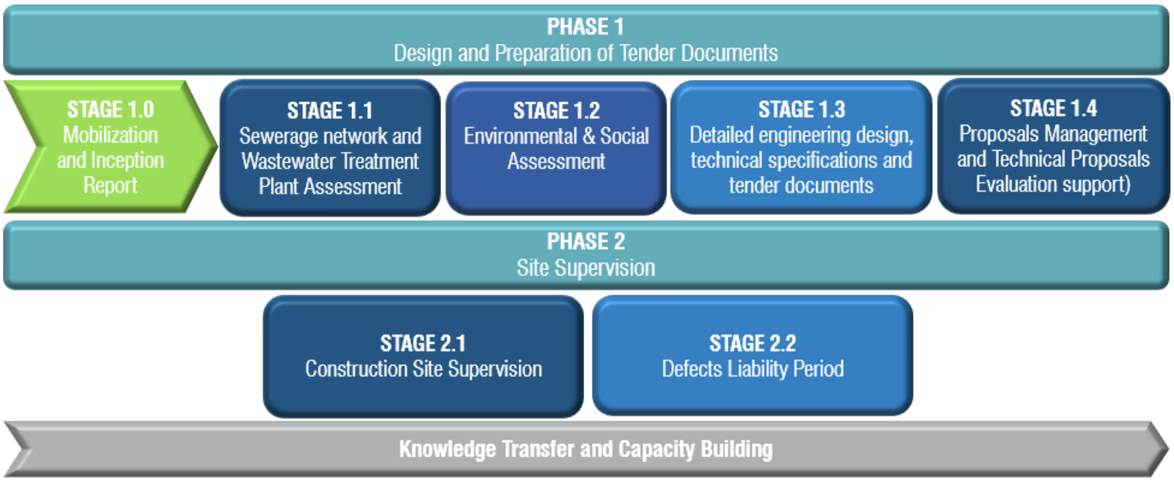

Figure 2.1 – Phases of consultancy services

2.2 METHODOLOGY FOR PHASE 1

2.2.1 Stage 1.0 - Mobilization and Inception Report

The first stage corresponds to the technical team mobilization and includes the activities that have been developed in the beginning of this study for the preparation of next stages, resulting in the current Inception Report. These activities also involved all necessary logistical preparations for the beginning of work tasks, to ensure that services were initiated and that deadlines are met.

During this period, the consulting team was mobilized and necessary corrections and changes to the work plan have been made. The main output of this stage is the **D0 - Inception Report**.

- **Deliverable D0 - Inception Report**

The main activities included in this phase are the following:

- Team Mobilization;
- Preliminary Assessment of the Information to Collect and Initial Findings;
- Stakeholder Identification;
- Methodology and Work Plan Redefinition;

- o Preparation of Deliverable D1 - Inception Report;
- o Preparation and Presentation of Findings.

Following the initial meetings, the **team mobilization** activities were launched, aiming to assemble and organize the technical team for this project, as well as all necessary logistical preparations for the beginning of work, particularly in terms of ensuring the operability of on-site activities, office and administrative support, transport, communication systems and other essential logistics.

Further details concerning team composition and logistic facilities are presented in section 3 of this Inception Report.

The preliminary assessment of the **information to be collected** included identifying existing documents and data relevant to the current assignment, including projects and studies that contain information regarding the following areas: sanitation and sewerage, water supply, urban planning, hydrology and water resources, socio-demographics, legal and institutional framework, environment and climate change.

A general data list was prepared by the Consultant, identifying the preliminary documentation to be collected. Further details concerning data collection activities are presented in section 4 of this Inception Report.

Stakeholder identification had two main objectives, as described below.

- Identify and initiate communication framework with key stakeholder organizations and entities;
- Establish a Steering Committee to monitor the development of all stages of the project.
- The **Stakeholders Engagement Plan (SEP)** prepared for the Sint Maarten Wastewater Management Project will be followed.

The identification of all potential and interesting stakeholders to the project is a key activity to the success of all activities ahead and of the project itself. The basic associated objective is to identify and establish communication framework with key stakeholder organizations and entities whose aim is to identify the key actors, entities and agencies that must be consulted and participate in the development of the study.

In a preliminary proposal, figure below presents the main stakeholders that may be related to the project, along with their categorization (beneficiary/interested) and influence/importance for the project:

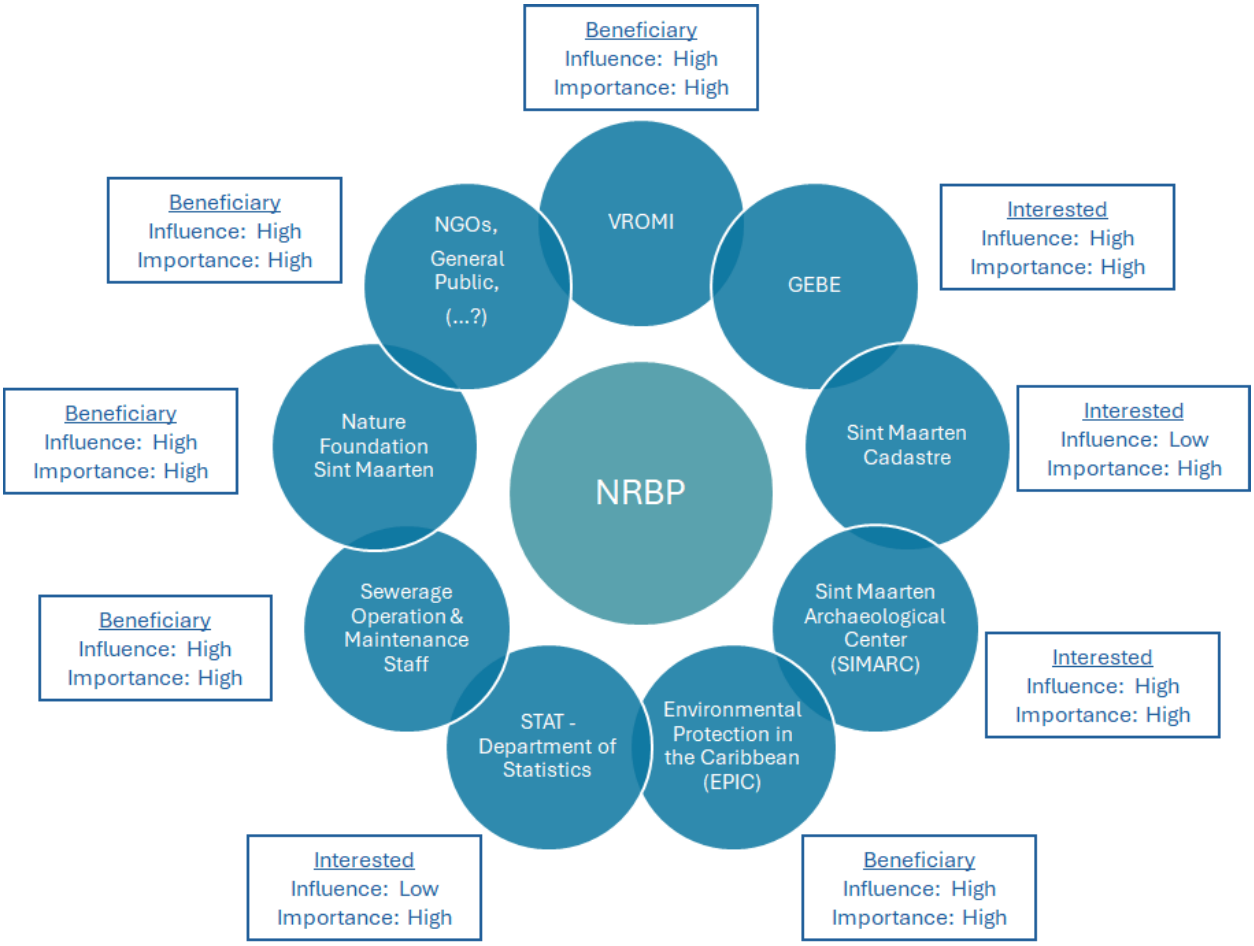

Figure 2.2 – Preliminary Stakeholders Identification, Categorization and Involvement in the Project

The following table also describes the stakeholders:

Table 2.1 – Main Interested Parties of the Project

(a) INTERESTED PARTIES who may be directly or indirectly affected by the project	**(b) OTHER INTERESTED PARTIES**	**(c) VULNERABLE INDIVIDUALS OR GROUPS**
- Community residents of the affected neighborhoods and neighbors of the project implementation areas	- VROMI - Community councils of Cul de Sac district, - GEBE - Kadaster - STAT - NGOs (EPIC, Nature Foundation) - General Public	- Women, heads of household - People with disabilities - People with chronic illnesses - Elderly - Children - Migrants

Based on the project update design and the collected baseline information, specific enquiries and consultations may be performed with local residents and the methodologies for these approaches will be prior discussed with NRBP, including those for any vulnerable group identified in the project area.

It is already proposed that, in order to reduce and even eliminate the barriers to participation faced by vulnerable groups, specific methods and techniques will be implemented to facilitate the collection of views and concerns from these stakeholders. These include: translating promotional materials into the local language/dialect, printing posters and other informational materials on a larger scale, choosing accessible venues for events, and organising gender-segregated meetings to provide a more comfortable environment for everyone to ask questions and express their concerns.

Further details concerning the communication matrix and the establishment of a steering committee are presented in section 3 of this Inception Report.

Methodology and Work Plan Redefinition resulted from the first meetings and the best knowledge from the National Recovery Program Bureau and its expectations for all activities, namely in data collection and field surveys. In this context, some adjustments have been made to the methodology and planning approach, as presented in this document, considering the experience of the Joint-venture companies in similar projects, assuring, together with the NRPB, the link between the present project and other sanitation and water supply strategies in Sint Maarten.

All the key findings from this phase will be presented to **key stakeholders**, to gather their inputs and feedback and reach a consensus on the methodological aspects and work planning of the assignment.

The changes to the coaching staff were also addressed in this phase as described in section 3.

2.2.2 Stage 1.1 – Sewerage network and Wastewater Treatment Plant Assessment

During this phase, the Consultant will collect, analyze, and complement basic information related to the different subjects of study, establish a diagnosis of the current situation in the provision of water and sanitation and develop the criteria to estimate future service needs. In case of information gaps, the Consultant will be responsible for filling those gaps. The main output of this stage will be the deliverable **D1 - Sewerage network and Wastewater Treatment Plant Assessment**, with the final version expected for delivery five (5) months after the beginning of the contract.

- **Deliverable D1 - Sewerage network and Wastewater Treatment Plant Assessment**

The main activities included in this phase are the following:

- Site Visits Plan
- Site Visits Inspections
- Stakeholder Interviews
- Inventory of Operations
- Review of Past and Current Operational Models
- Review historic engineering project design

- Study of the wastewater inflow in the last 2 years
- Conduct wastewater survey during 4-week period
- Analysis of current status of WWTP
- Diagnosis of actual O&M practices
- Prepare a Rehabilitation proposal
- Provide a comprehensive proposal to sludge disposal options.
- Preparation of cost estimate for the proposed works and installations.
- Drafting and submission of Sewerage network and Wastewater Treatment Plant Assessment report: D1 - Sewerage network and Wastewater Treatment Plant Assessment
- Preparation and Presentation of Findings to NRPB and stakeholders

Two separate **site visit plans** will be prepared, one for the sewerage network and another for the Wastewater Treatment Plant (WWTP). The assessment of the network will begin with identifying the main contributing catchments and dividing them into sub-catchments. The aim is to collect all relevant information about each sub-catchment and prepare a detailed site visit plan to verify whether the available data matches actual site conditions. The site visit plan for the sewer network will involve reviewing operation and maintenance (O&M) plans and historical records as well as the available inventories and any existing CCTV surveys to aid in evaluating the network's condition. This will include assessing the current operational capacity, technical condition, and potential weaknesses across the network. For the WWTP, the site visit plan will be structured around different treatment lines (e.g., primary treatment, secondary treatment, sludge management). The aim will be to gather key data, including preventive maintenance plans, corrective maintenance records, water laboratory test results, energy consumption data, and sludge production records, to support the evaluation of WWTP's performance.

Key experts from the consulting team will conduct **on-site inspections** of all critical infrastructure components in accordance with the Site Visit Plans.

Inspections will cover house connections, sewers, pumping stations, overflows, and other relevant assets to evaluate the system's technical and operational conditions. The focus will be on identifying infrastructure deficiencies and assessing whether the system's components are performing as intended. We will record all the assets found on site and not connected to any dwelling. In addition, the current extent of the sewage network will be mapped.

The inspection of the WWTP will focus on evaluating the condition of treatment facilities, pumps, tanks, sludge processing units, and ancillary equipment with the aim to detect technical and operational deficiencies that may hinder performance. <u>This assessment of existing conditions is crucial to define the methodology for the Wastewater 4-week period survey, in which both the influent and effluent volumes and quality at the WWTP will be measured.</u>

All findings will be meticulously documented, including photographic evidence, mapping, and technical notes. This documentation will serve as a foundation for the subsequent stages of analysis and decision-making.

Interviews will be conducted, notably with individuals who are directly responsible for the operation and management of both the sewerage network and the WWTP (system operators, maintenance staff, and management teams). The interviews aim to gather insights into current operational practices, challenges faced, and potential areas for improvement. Additionally, the interviews will capture informal knowledge and undocumented practices that are essential for the effective management and operation of the sewerage network and WWTP.

All available **data related to the wastewater network and WWTP operations will be collected**, including (but not limited to) development plans, demographic data, industrial and commercial wastewater contributions, septage delivery records, energy consumption data, operation and maintenance plans and records, sludge production statistics, etc. Further details on the data to be collected are provided in section 4. The available real-time operational data from the WWTP's control instruments and GIS systems managed will be analyzed. Also will be performed a comprehensive study on the system's management, in order to assess the system's current operational performance and any trends over time.

During this stage, the consulting team will perform an in-depth **analysis of past and current operational models**, assessing both centralized and decentralized approaches to wastewater management. This will include a comparative analysis of wastewater management systems in other Caribbean nations to extract best practices and lessons learned. A feasibility study will be conducted to explore the potential of concessioning wastewater system operations to a private operator. This analysis will consider the legal, financial, and operational implications, drawing on examples from both local and regional wastewater operations.

Considering the current legal requirement and performance gaps, **historic engineering project design** will be reviewed, to assess if the designs are still valid.

In this stage, the **study of the wastewater inflow in the last 2 years will be developed.** Through this retrospective analysis a comprehensive understanding of the wastewater streams entering the WWTP in Sint Maarten over the past two years will be provided, helping identify trends, challenges, and opportunities for future improvements. For this achievement, the team will be focused on collecting the data from 3 different sources:

1. <u>Septic sludge hauled by trucks:</u> the consultant team will approach local authorities and private septic service providers to retrieve records from the last two years regarding the volume of septic sludge transported to the WWTP. This includes obtaining data from companies responsible for septic tank emptying, which are often regulated and required to report to local agencies. Additionally, any available historical records on the quality of the sludge, such as its organic content, solids concentration, and pollutant levels from laboratory tests conducted at the WWTP,

will be reviewed. If specific data is missing, it may be necessary to estimate typical sludge quality based on previous studies or regional standards. Finally, trends in the volume and quality of septic sludge hauled monthly or seasonally over the two-year period should be calculated to assess fluctuations.

2. Domestic, institutional, and industrial/commercial wastewater flows via sewage systems: the historical flow data from the sewage collection systems maintained by the utility company will be analysed. It comprises data detailing the daily and/or monthly wastewater volumes reaching the WWTP, accounting for contributions from domestic, institutional, and commercial sources. Given that Sint Maarten experiences tropical rainfall, weather and hydrological data from local meteorological services over the past two years will be reviewed and compared with WWTP inflow data to identify periods of rainwater intrusion or groundwater infiltration that could have influenced the volume of wastewater treated. If available, lab reports from the WWTP on wastewater quality parameters, such as biological oxygen demand (BOD), chemical oxygen demand (COD), nutrient levels, and potential contaminants from different sources (domestic, institutional, industrial), will also be reviewed. Additionally, infiltration trends will be evaluated to assess how these factors, particularly during heavy rainfall or flooding, impacted WWTP performance in terms of both volume and quality.
3. Wastewater and septic sludge from ships and hotels: historical records from the Port of Sint Maarten regarding wastewater or septic sludge discharges from cruise ships and other maritime vessels will be retrieved. Given Sint Maarten's popularity as a cruise destination, port authorities are likely to have logs of discharges into the WWTP. Similarly, large hotels and resorts will be contacted to obtain historical data on their wastewater contributions, which are likely monitored for environmental compliance. Finally, an analysis should be conducted to examine how fluctuations in tourism, such as variations in cruise ship traffic due to events like COVID-19 or seasonal peaks, influenced both the volume and quality of wastewater.

The Consultant team will organize all existing data into a clear and systematic format, grouping it by source—such as trucked sludge, sewage, ship and hotels—and arranging it by month or by quarter across the two-year timeframe. Any missing or incomplete data will be highlighted, and where necessary, the team will consult with regulatory bodies or apply reasonable assumptions based on common trends (for example, average sludge properties or typical sewage flow rates). To uncover patterns, a retrospective statistical analysis will be conducted, which may reveal seasonal shifts in wastewater volume or source-related differences in composition, such as elevated chemical content from industrial contributors or increased flows during rainy periods.

As part of this Stage, and according to the Terms of Reference, a **Wastewater survey during a 4-week period** should be developed. Field data should be collected and analyzed for both the influent and effluent volumes and quality at the WWTP. This analysis should cover key parameters and should be carried out over a continuous 4-week period (28 days) through an onsite survey. The following elements should be included for the analysis.

1. WWTP Flow Monitoring and Hydraulic Flow Rates: hydraulic flow rates should be measured and documented. Groundwater and rainwater intrusion should be estimated through a water balance analysis. Key actions include:
    a. Install flow meters at the WWTP inlet and outlet to measure wastewater flow every hour for 4 weeks.
    b. Set up online monitoring systems for real-time flow data collection to ensure continuous measurement.
    c. Gather precipitation data from local meteorological stations to identify spikes in inflow after rain events, indicating rainwater intrusion.
    d. Analyze night flows to estimate groundwater infiltration, as significant flow at night may suggest groundwater entry.

   A water balance should then compare inflow and outflow to detect discrepancies caused by rainwater or groundwater.

2. Pollutant Concentration Measurements and Pollution Load Analysis should also be performed, in the WWTP influent, effluent, and septic sludge delivered by trucks. The process includes:
    a. Setting up automatic samplers at the WWTP inlet and outlet to collect 24-hour composite samples over 28 days.
    b. Performing daily grab sampling of sludge delivered by trucks.
    c. Sending samples to a certified lab to analyze for various pollutants (e.g., BOD_5, COD, nutrients, heavy metals).
    d. Calculating daily pollution loads by multiplying pollutant concentrations by daily flow rates to determine the mass of pollutants entering, leaving, and brought by sludge.

3. Sludge Analysis comprising the characteristics of wet and dried sludge produced by the WWTP:
    a. Wet sludge sampling: Once per week, collect samples of wet sludge that is pumped to the drying beds at the WWTP. This sludge should be tested for TSS, VSS, and heavy metals (Cr, Zn, Cu, Cd, Ni, Hg).
    b. Dried sludge sampling: Similarly, once per week, collect samples of dried sludge before it is transported to the landfill. The same parameters should be analyzed (TSS, VSS, and heavy metals).

c. Laboratory testing: Send the wet and dried sludge samples to a certified laboratory for analysis. These results would provide information on the quality and pollution levels in the sludge and help assess the treatment efficiency.

d. Compare results of wet and dried sludge to understand the WWTP's sludge reduction and treatment effectiveness over the 4-week period.

4. Seasonal Variability Analysis to Forecast, analysing seasonal variations in hydraulic and pollution loads, considering weather, tourism, and commercial activity. The following steps would be undertaken.

    a. Gather historical data on tourism and weather conditions (precipitation, temperature) for the catchment area of the WWTP from local tourism authorities and meteorological agencies. This will include information about high tourist seasons and climate events (e.g., storms, hurricanes) over the past two years.

    b. Analyze the flow and pollutant data collected during the 4-week survey, comparing it with historical patterns to forecast how the WWTP performs under different seasonal conditions.

    c. Simulate the impact of extreme weather events based on the collected data, estimating how much rainwater intrusion and increased hydraulic load the WWTP can handle during these periods.

    d. Estimate the WWTP's maximum hydraulic load and pollutant capacity during these peak periods, defining the system's operating limits and potential challenges under varying seasonal conditions.

Under the first Mission to St. Maarten (16 to 20 June, 25) the Consultant Team has received minute-by-minute readings of the treated effluent between August 2024 and June 2025, extracted from the Parshall flume data logger. Additionally, and as part of the WWTP operation procedures, the Consultant Team has also received weekly sampling/analysis results of raw sewerage and treated effluent for the following parameters:

- Raw sewerage: Total nitrogen, NH4, COD, Total phosphorous, TSS, conductivity, pH
- Treated effluent: Total nitrogen, COD, Total phosphorous, NH4-N, NO3-N, NO2-N, TSS, pH, conductivity
- Sludge: no data
- Process data (aeration): MLSS, MLVSS, SVI
- Process data (RAS): MLSS

In this context, discussions with NRPB are still ongoing to determine whether, and which, additional measurements will be carried out by the Consultant Team.

The Consultant Team will analyze all collected data and present findings including a compilation of all the data from the flow meters, sample analyses, sludge tests, and seasonal factors. Through the use of statistical software, will identify trends and correlations between rain events, groundwater infiltration, tourist seasons, and variations in pollutant loads.

As part of this stage, the consultant team will assess the **current status of the WWTP**, focusing on its physical condition, performance capacities, and potential improvements. The assessment of the Civil Works and Equipment will be done as part of the Site Visits Inspections where all the observations will be recorded and analyzed. It will be created a static model to simulate WWTP's operation representing the physical and operational characteristics of WWTP. This model will include key components such as inflow rates, treatment processes, and effluent quality. Software tools (e.g., MATLAB, Excel) for modeling will be used to ensure accuracy and ease of adjustments. It will be required to validate the model by comparing model outputs against actual historical performance data. The evaluation of the current and future capacities of the WWTP regarding hydraulic flow rates and pollution loads, will include the following activities:

- Analyze the historical design capacity of WWTP as planned in 2013, taking into account the intended hydraulic flow rates and pollution load limits.
- Assess the actual capacity of the existing infrastructure, identifying any deviations from the design specifications.
- Evaluate the potential capacity of a proposed upgraded or rehabilitated WWTP based on recommendations made by the Consultant.

For each scenario (historical design, current state, and proposed upgrades) it will be identified and documented critical capacity bottlenecks where the infrastructure may not meet demand or regulatory standards. Additionally, the consultant team will engage in forecasting to consider future scenarios, including factors such as population growth, changes in land use, tourism activity and increased industrial activity, which could impact the capacity requirements of the WWTP.

A Treated Effluent Quality Analysis also will be performed to determine the expected quality of the treated effluent from an upgraded WWTP while ensuring compliance with legal requirements. To achieve this, baseline standards will first be established for effluent quality in accordance with local regulations and environmental requirements. Next, the static model will be utilized to simulate the performance of the upgraded WWTP, focusing on how the proposed improvements will influence effluent quality. This analysis will involve assessing the removal efficiencies of key pollutants, such as BOD, TSS, nitrogen, and phosphorus, under various operational scenarios. Finally, compliance will be verified by ensuring that the projected effluent quality meets or exceeds all relevant legal and environmental standards, thoroughly documenting compliance levels for regulatory review.

In terms of Energy Performance and Efficiency Analysis, the objective is to evaluate the energy usage of the WWTP and identify opportunities for energy savings. To achieve this, it will first conducted a comprehensive energy consumption review by collecting data on the current energy use of the WWTP, which includes electricity usage for pumps, aeration, and other operational processes. Following this, it will be performed an efficiency assessment that analyses the efficiency of major energy-consuming equipment and processes, pinpointing areas of excessive energy use, and benchmarking the WWTP's energy performance against industry standards. Lastly, it will be conducted a savings potential analysis to identify feasible energy-saving measures, such as equipment upgrades and process optimizations, and quantify potential energy savings in kilowatt-hours per year (kWh/year), calculating the corresponding monetary savings in U.S. dollars per year (USD/year).

To **diagnose the current operation and maintenance practices of the wastewater treatment plant** (WWTP), the consultant team will leverage the data obtained from the wastewater survey conducted, which provides a comprehensive overview of the quantity and quality of influent flow. Additionally, it will be incorporated findings from site visits inspections to enhance the analysis.

The assessment will begin with an evaluation of the sizing and operational efficiency of the mechanical pre-treatment stages of the WWTP, which include screening, grit removal, and fat removal. It will be analyzed the outcomes from site visits inspections and compare the sizing of the pre-treatment equipment against the influent flow rates and load characteristics to determine whether they are appropriately sized to meet both current and anticipated demands. Furthermore, it will be reviewed maintenance logs to ensure adherence to manufacturer recommendations and industry standards. Next, the consultant team will focus on the biological treatment stage, evaluating its sizing and operational efficiency. This evaluation will include calculating mass and volume loads from combined wastewater and septic sludge deliveries, along with measuring biomass concentration (MLSS and MLVSS) through sampling and laboratory analysis. It will be calculated the sludge age to assess its suitability for achieving optimal treatment efficiency, taking into account settleability characteristics, oxygen requirements, and sludge properties. Additionally, it will be reviewed the existing process design for nitrogen and phosphorus removal and disinfection to verify compliance with design targets. The analysis will encompass calculating the Mohlman Sludge Volume Index (SVI) to assess sludge settleability, evaluating the oxygen requirements of the biological treatment process, and analyzing the aeration capacity of current mechanical aerators. Lastly, it will be examined the hydraulic and solids loading of the secondary clarifier, the intervals and volumes of sludge removal, and the sizing and operational practices associated with sludge treatment.

The evaluation will also cover sludge management practices and the performance of drying beds. The consultant team will assess current sludge management strategies, including handling, storage, and disposal methods, while inspecting the conditions and effectiveness of drying beds in reducing moisture content. Additionally, the characteristics of the final dried sludge will be analysed to ensure compliance with disposal regulations for municipal landfills.

An essential component of our diagnosis will be the comparison of operational outputs against regulatory requirements. We will evaluate the treated discharge levels achieved by the WWTP and assess compliance with local and national regulations concerning effluent quality, noise levels, and odour emissions. This will involve documenting any discrepancies and compiling a compliance report that highlights areas requiring improvement.

Finally, the consultant team will analyze the WWTP's current operational costs and benchmark them against typical expenditures for similar treatment plants. This analysis will involve collecting data on various operational costs, such as energy, labor, maintenance, and materials, and comparing these figures to industry standards. The findings will be compiled into a comprehensive report that outlines current costs versus benchmarks while identifying potential opportunities for enhancing operational efficiency and cost management.

In this Stage, the consultant team will prepare a **Rehabilitation proposal.** Based on all the data gathered in the previous activities, it will be developed a population forecast for the next 30 years for the sewer system catchment area and a 15-year forecast for the WWTP, utilizing official census data, urban planning documents, and regional growth strategies to inform these projections.

It will be conducted a needs assessment for the sewer collection system by evaluating its existing capacity to accommodate projected population growth and increased flow rates. This will include identifying necessary upgrades and modifications, such as new connections, pipe replacements, and potential new treatment points. In conjunction with this, it will be analyzed the modifications needed at the WWTP to ensure it meets treatment quality objectives following the sewer network expansion. Key considerations will include operational costs, energy consumption, and environmental targets, along with enhancing the infrastructure's resilience to flooding, heavy winds, strong rainfall, and power outages. Additionally, it will be modelled the expected decrease in septic sludge generation due to increased sewer connections and adjust WWTP capacity calculations accordingly.

To ensure efficient operations, the existing Standard Operating Procedures (SOPs) for both the sewer system and the WWTP will be reviewed, modifying or developing new SOPs as necessary for the upgraded facilities. A comprehensive work plan will be created to prioritize the construction of new sewer connections, outlining a phased approach to ensure that increased connections do not compromise the capacity of the WWTP. It also will be assessed the potential impacts of expected population growth, considering social changes such as shifts in the number of individuals per household and the implications for sewer connections and treatment capacity.

In addition, we will conduct an operational cost analysis of the WWTP and sewer collection network to identify areas where running costs can be improved, which will involve proposing energy-efficient technologies and operational practices to achieve cost savings while maintaining or enhancing service levels. Furthermore, we will develop an Occupational Health and Safety (OHS) Plan that identifies key occupational hazards associated with the construction and operation of the WWTP and sewer system, along with strategies to mitigate risks related to noise, odor, chemical exposure, and pollution. The team will also define an emergency response plan to address potential incidents.

A detailed implementation timeline will be developed for the rehabilitation and expansion works, including resource allocation and budget considerations, along with monitoring protocols to evaluate the effectiveness of the upgrades and modifications post-implementation, ensuring compliance with established objectives and standards.

As part of this Stage, a **comprehensive proposal to sludge disposal options** will be provided. The objective is to identify the most viable sludge management solution for Sint Maarten, considering its unique socioeconomic and environmental conditions. The process involves assessing sludge from the wastewater treatment plant and evaluating four disposal options: agricultural application, composting, incineration, and landfilling. Each option is analyzed for feasibility, cost, and environmental impact.

1. Agricultural Application: Offers soil benefits but is limited by land availability and risks from pathogens and heavy metals.
2. Composting: Converts sludge into a soil amendment, but space and odor management are challenges.
3. Incineration: Reduces sludge volume and eliminates pathogens but is costly and requires strict emission controls.
4. Landfilling: A low-cost option but poses significant environmental risks and space constraints.

Economic and environmental analyses will be conducted, considering regulatory compliance checks, and stakeholder engagement. A risk assessment will guide decision-making using a multi-criteria framework. The final recommendation will include a phased implementation plan that balances economic, environmental, and social factors for long-term sustainability.

At the end of this Stage, the preparation of cost estimate for the proposed works and installations will be conducted. It will be performed a comprehensive cost breakdown for each project component. It includes itemizing costs for materials, labor, equipment, and overhead for both the sewer collection system (e.g., excavation, pipe installation, pumping stations) and the WWTP (e.g., treatment processes, sludge management). Accurate quantity take-offs will be prepared from engineering drawings, and local suppliers will be contacted to obtain current pricing information. A contingency percentage will also be included to account for unforeseen circumstances and risks.

After that, the cost estimates will undergo a thorough validation process. This includes cross-verifying estimates against industry standards and historical data from similar projects, as well as consulting experienced professionals and conducting a peer review. Feedback from external experts will be sought to ensure the reliability and accuracy of the cost estimates.

With completion of the described activities, the Consulting Team will prepare **Deliverable D1 - Sewerage network and Wastewater Treatment Plant Assessment** (draft and final versions), to be submitted to the Client.

This activity will provide a comprehensive evaluation of Sint Maarten's existing sewer infrastructure and WWTP performance. It will assess the condition and capacity of the sewer network, including pipelines and pumping stations, and analyze the WWTP's treatment processes, sludge management, and environmental compliance. The report will identify operational challenges, highlight opportunities for improvement, and offer both short-term and long-term recommendations for optimizing the system's efficiency and sustainability. Financial, environmental, and regulatory factors will be considered, ensuring a well-rounded strategy for future upgrades.

2.2.3 Stage 1.2 - Environmental & Social Assessment

The main output of this assessment will be the deliverable **D2 - Environmental & Social Assessment of the WWTP current and planned operation**, with the final version expected for delivery five (5) months after the beginning of the contract.

As from the start of the consultancy services, the Engineering and Environmental and Social Teams shall work in close collaboration, with a preliminary assessment of the critical issues, with the definition of the most environmental-friendly solutions and the proposal of mitigation measures to be incorporated in the project design.

In fact, the choice of the most environmental and socially advantageous technical solution corresponds to an important mitigation measure for each project/sub-project, as the alternatives with greater impacts will be abandoned.

The ESA report will include the following volumes:

- **Executive Summary**
- **Synthesis Report**, which includes the description of the solutions to be evaluated, the Project justification, the characterization of the current environmental and social situation, the evaluation of impacts, the mitigation and compensation measures and the monitoring plans. It will also include all the necessary cartography for the various subjects covered.
- **Appendices**, as required for full comprehension of the Project.

The ESA will be organized as follows:

1) General project background – Description of the overall situation of the Project, its causes and purposes (including an overview of the energy sector), background of the project definition; and ESA context, including the description of the works and technical team.
2) Project Description, including:

- General data from the project, including its nature, location and background;
- Project description, comprising information on the site, design, size and other relevant features of the project as project solutions and construction procedures/methods, raw materials, emissions / waste and data of the products / goods);

- Project proposals, alternatives studied, construction methods and the reasons for the chosen solutions, Inclusion of associated investments;
- Project schedule and preliminary cost estimates;
- Other existing or planned projects in the same area.

3) Technical evaluation of each pertinent environmental factor for the project, including:

- Applicable laws and regulations;
- Scope of the evaluation (Study area);
- Environmental and social baseline characterization - current situation of the different environmental factors in the area/region that could be affected by the project and its overall environmental quality, according to the most recent bibliographic data and field surveys (which include measurements and analysis when needed). In addition to the physical and biotic factors, the social aspects and uses and the economic activities will also be considered, whether existing or planned in the area;
- Evaluation method to be used to predict and evaluate the environmental and social impacts, namely the qualitative and quantitative assessment for the civil works at the construction phase and the operation phase (calculation methods, models or software, hypothesis and criteria);
- Potential Environmental and Social Impacts – Description of possible impacts of the construction and operation phases of the project and, where applicable its quantitative determination using proper calculation models and/or software, indication of the severity, distribution, duration of the possible environmental impacts and cumulative effects. Evaluation and Comparative analysis of project alternatives and "Without Project" Alternative. Synthesis of the assessment;
- Compensation and mitigation measures, which can increase potential positive impacts and opportunities to improve the life quality and income for the populations;

4) Environmental and Social Management Plan, which will plan out the implementation of the mitigation measures, with inclusion of the environmental guidelines for the construction and operation phases and also the monitoring program. This will also include the definition of the capacity building and training programs associated to the implementation of the ESMP, as well as the capital and recurrent costs associated;
5) Public Consultation, with a review of major comments, conclusions and recommendations resulting from public consultations;
6) Identification of Gaps of knowledge and Conclusions.

The first activity to start the ESA will be to define the objectives, scope, and key deliverables of the ESA. In addition, the relevant stakeholders will be identified and a timeline for the assessment established.

A comprehensive technical description of the current WWTP design and proposed upgrades will be presented, as described above.

Regarding diagnosis of the baseline situation, recent studies related to the project area will be analysed to ensure that the ESA is informed by the most relevant and current information. If needed, field surveys will be conducted, along with interviews to gather additional data to fill gaps, identified during the assessment. The following main issues will be addressed:

- Description of the WWTP's location and surrounding area, size, environment, land uses, future development, sensitive receptors, communities, demography, land ownership, structures of historical or cultural significance, past use, etc, and analyse the Fresh Pond catchment area, including water recharge sources and interconnections with Great Salt Pond and Great Bay will be documented;
- Collection of scientific data (literature and brief field surveys) on the ecosystems of the Fresh Pond and Great Salt Pond in Sint Maarten, focusing on flora, fauna, and particularly migratory and threatened bird populations;
- Location of the point of effluent discharge into the Fresh Pond and assess its characteristics;
- Collection of water samples and analysis for wastewater parameters to establish baseline data. The analysis will assess factors such as pollutants, nutrients, and other indicators of water quality, providing a reference point for future monitoring and environmental management efforts;
- Assessment regarding the presence of impermeable layers regarding soil, ground water and hazardous materials;
- Based on the available literature and stakeholders meetings, updated noise level data may be required. Viability of field measurements (at least two sites) in the surroundings of the WWTP will be assessed;
- Identification of onsite odor sources from WWTP operation and sludge disposal, with visual assessment and enquiries to local residents.

As desktop studies, in a close articulation with the Client and Engineering Team, specific information will be assessed, namely (amongst others):

- The capacity of the Fresh Pond to handle additional effluent discharges;
- Type and quantities of chemicals used at the WWTP, describing their storage conditions and assessing final disposal methods;
- Current sludge disposal practices;
- Identification of occupational hazards, review of existing OHS plans, and assessment of the public health risks related to sludge management;

- Evaluation of the current emergency preparedness plan to verify its effectiveness on covering various potential incidents, including flooding and chemical spills.
- Collection of data on the WWTP workforce (operator personnel), including demographics, roles, and compliance with labour regulations. These assessments will be conducted in line with national data protection laws and international best practices for data protection.

All this information will be, whenever possible, integrated in a Geographic Information System (GIS) for a quantitative and qualitative assessment of impacts.

For impact assessment, the JV will assess both direct impacts of the WWTP operation, focusing on effluent discharge, noise, traffic, and odor, as well as indirect impacts associated with discharged effluent connecting into other water bodies and sludge transport and disposal.

The impact assessment will allow the identification and evaluation of the effects that the selected Alternatives of the Project will have on the environment and the community. This consists of the identification of negative and positive impacts, their evaluation and prioritization, in each of the Project phases:

- The Construction Phase, covering all Project construction works, circulation of vehicles and people, as well as operation of the construction site and temporary site offices and laydown areas;
- The Operation Phase with the physical presence of the infrastructures and its operation;
- The Decommissioning Phase, evaluating the impacts associated to this occurrence.
- Specifically, the subjects below will be assessed (amongst others):
- Evaluation of the capacity of the Fresh Pond to handle additional effluent discharge and its implications for the biological environment;
- Potential impacts on soil and groundwater from the WWTP construction and operation;
- The management and disposal of construction and demolition waste, including the decommissioning of drying beds and aging electromechanical equipment;
- The management and disposal of sludge and solid waste;
- Management of chemicals and other hazardous materials;
- Quality and quantity of noise emissions related to the WWTP's operation post-upgrade. Simulations will be performed (CADNA) if available data are robust;
- Potential odour impacts. Simulations will be performed (AERMOD software);
- Health and Safety aspects;

In order to grade the significance of the impacts, a classification scale will be used, based on a set of parameters that defines their significance. The identified and classified impacts include all the project solutions, as well as all measures associated with good environmental practices. All the impacts that cannot be mitigated will be justified, along with the residual impacts.

The parameters to achieve the Significance of Impact will be classified with specific values (corresponding to low, medium and high impact), in which the total sum will correspond to three classes of significance (Significant, Moderately significant and Non significant). In the Impact Synthesis, the final classification of the impacts for each Project phase is systematized.

Cumulative impacts between projects and other existing or planned projects will also be evaluated.

Mitigation measures will be proposed, with the purpose of developing realistic and feasible mitigation measures based on the findings of the ESA, focusing on local context and conditions. Some mitigation measures may be related to the project design and others may be applied during the subsequent phases. These measures will be included in the Environmental and Social Management Plan, as one chapter of the EAS. These measures will be presented for the construction and operation phases, including cartography (whenever possible), responsibilities of implementation, cost estimates and financial support.

A comparison between several alternatives for design, construction, and operation phases will be performed, quantifying their environmental and social impacts.

Throughout the ESA development, the JV will conduct stakeholder consultations to gather input and assess the effectiveness of current engagement practices. During this activity, the team will organize one workshop to present the ongoing works and to receive feedback from stakeholders.

The JV will review existing grievance procedures and assess their effectiveness in addressing community complaints.

The Environmental and Social Assessment (ESA) Draft Report will provide a comprehensive evaluation of the potential environmental and social impacts of the sewerage and wastewater treatment project in Sint Maarten. It will assess the project's effects on natural resources, including air and water quality, soil, and local ecosystems, while also examining social factors such as community health, safety, and livelihood impacts.

The report will be concise, focused, and limited to a maximum of 200 pages for the main body, excluding annexes and maps.

2.2.4 Stage 1.3 - Detailed engineering design, technical specifications and tender documents

The main output of the detailed design will be deliverables:

D3.1 – Detailed Engineering Design,

D3.2 – Technical Specifications,

D3.3 – Tender Documents,

with the final versions expected for delivery seven (7) months after the beginning of the contract.

The Detailed Engineering Design will be based on the findings of Stage 1.1 (network and WWTP assessment), topographical and geotechnical surveys.

With the information gathered in the previous activity, it will be developed the **hydraulic model of the existing sewer network**, supported on a specialized sewer network analysis software, such as OpenFlows Sewer. The model will be used to evaluate hydraulic performance, detect bottlenecks, and identify capacity limitations or areas prone to overflows and backups. To ensure the accuracy of the model, it will be **calibrated** using actual wastewater flow data collected through on-site flow monitoring. The results of these real-time measurements will be compared with theoretical flow calculations (based on factors such as population, water usage, and rainfall data) to adjust the model parameters. Once calibrated, simulations will be conducted to **validate the model's performance** under different operating conditions. The validated model will serve as a reliable tool for further analysis and future projections.

With the calibrated model in place, various operational conditions will be simulated, both current and future, to assess the system's resilience and capacity to handle projected increases in wastewater flows. These scenarios may include population growth, infrastructure deterioration, changes in rainfall patterns, or new development projects. The model will identify which sections of the network require upgrades, pinpoint necessary works, and help prioritize these improvements in terms of urgency and cost-effectiveness. The result will be a clear action plan for expanding and upgrading the wastewater network.

The calibrated digital model will be handed over to the National Regulatory Program Body (NRPB), along with full documentation and guidelines for its future use. This will ensure the client can continue to monitor and manage the wastewater network effectively.

Also, during this stage, the **designing and specifying of all necessary components for the WWTP** will be developed. This includes both existing components that will remain in use and any new elements required to improve or expand the plant's capacity. The design process will ensure that the WWTP can handle both current and future wastewater volumes, meet regulatory standards for effluent quality, and optimize energy efficiency. Components to be designed may include primary and secondary treatment systems, sludge handling, filtration, and disinfection units.

This methodology ensures that both the sewer network and WWTP are thoroughly analyzed, simulated, and designed to handle current and future wastewater treatment challenges efficiently and sustainably.

During this stage, the assessment of **Resilience of Sanitation Infrastructure and Green Economy Principles** will be developed. The first step of this assessment relies in the identification of all components of the sanitation infrastructure, such as lift stations, pumping stations, and wastewater treatment plants (WWTP), and gather data on their operational status, design, and vulnerability to environmental hazards like flooding, drought, and wind. This is followed by an analysis of the potential risks using geographical and climatic data to assess their impact on the infrastructure. Next, a failure modes analysis to evaluate possible failures and rate associated risks based on their likelihood and impact will be developed, resulting in mitigation measures recommendations, including structural reinforcements, improved drainage systems, backup power, and early warning systems.

Green economy principles will be integrated by proposing decarbonization strategies and low-emission technologies, such as renewable energy for pumping stations and energy-efficient WWTP processes. Lastly, the findings will be compiled into a report, outlining hazards, risks, mitigation measures, and the integration of sustainable solutions for review by stakeholders. This structured approach ensures long-term resilience and sustainability of the sanitation infrastructure.

Once these activities have been completed, the **D3.1 – Detailed Engineering Design** of all interventions required for the wastewater collection network and at the WWTP, including refurbishment and expansion works will be drawn.

The detailed engineering design of the wastewater treatment rehabilitation and expansion works include:

- Detailed descriptions and calculations of all recommended interventions at the WWTP, including rehabilitation of existing structures and equipment, as well as expansion works.
- Layout plans and flow scheme of the recommended technology.
- Hydraulic profile through WWTP and recipient water.
- Detailed drawings with definition of all interventions proposed.

The necessary topographical and geotechnical surveys to be carried out during this stage will, if possible, be anticipated to the previous Stage 1.1, as soon as the scope of works is well defined and approved.

In this stage, also the following activities will be developed, to prepare the **D3.2 – Technical Specifications**:

- Preparation of the Environmental, Social, Health & Safety (ESHS) requirements for the tender Package, based on a detailed review of applicable environmental, social, health, and safety regulations.
- Draft Operations guidelines for the extended network, after the reviewing of the existing operational guidelines to maintain consistency with the new network expansion. The guidelines will include detailed maintenance protocols, outlining regular inspection, cleaning, and repair schedules to avoid system failures. In addition, an emergency response plan will be developed, providing clear steps to manage potential breakdowns or overflows to minimize service disruptions. Finally, staffing and training requirements will be defined to ensure that personnel have the necessary skills to safely and efficiently manage the extended network.
- Draft Operations guidelines for the WWTP, comprising an overview of the plant's key elements, such as the primary and secondary treatment units, sludge handling, and filtration systems. Each phase of operation, from start-up to shutdown, will be described in detail, with an emphasis on monitoring key performance indicators like chemical dosing and water quality. Preventive maintenance schedules will be outlined for all critical equipment, including pumps and aeration

systems, to ensure the facility operates reliably. Additionally, health and safety protocols will be incorporated to protect workers, particularly regarding chemical handling and sludge management. Lastly, the guidelines will specify the monitoring requirements to ensure that treated effluent meets national and international environmental standards before discharge into water bodies.

- Draft Proposal for contract for operation of wastewater system, clearly defining the operator's responsibilities and performance standards. The contract will specify the scope of services, detailing the operation, maintenance, and repair duties for both the wastewater network and WWTP. It will also establish performance metrics for essential aspects such as effluent quality, system uptime, and compliance with environmental and safety regulations. In addition to these operational responsibilities, the contract will incorporate ESHS obligations, ensuring the operator complies with all relevant environmental, social, health, and safety requirements. The contract will also include the financial terms, including payment schedules, penalties for non-performance, and mechanisms for resolving disputes. Finally, requirements for regular reporting on performance, compliance, and financial management will be included to ensure transparency and accountability throughout the contract term.
- Draft Proposal for preparation of sewerage operation framework, with operational protocols developed for all system components, including the collection network, pumping stations, and treatment facilities. These will cover standards such as flow capacities, maintenance routines, equipment monitoring, and effluent quality control. Protocols will be customized to meet the system's specific needs and ensure efficient operation now and in the future. Maintenance strategies will include both preventive and corrective actions, aiming to minimize failures and downtime. These will be based on component criticality and historical data. Emergency response procedures will also be established to handle overflows, blockages, and breakdowns efficiently. Health, safety, and environmental standards will be integrated to protect workers and reduce environmental impacts, including hygiene practices and odor control. Staffing and training plans will define roles, required qualifications, and continuous skill development to align with evolving system demands and safety requirements. A performance monitoring and reporting system will track KPIs such as network utilization, pumping efficiency, and effluent quality. Additional KPIs will be introduced as needed to support continuous improvement.
- Draft technical specifications and submission to the client
- Preparation of Deliverable D3.2 – Technical Specifications

At the end of this stage, the consultant team will prepare the deliverable **D3.3 – Tender Documents**, comprising the following components: General Specifications and Particular Specifications; Bill of Quantities; Engineer's Cost Estimates; Priced Bills of Quantities; Construction Plant and Equipment; and Recommended list of reports, data, topographical, geotechnical and other information to accompany the RFP document, including the ESHS specifications/requirements.

2.2.5 Stage 1.4 - Proposals Management and Technical Proposals Evaluation support

The main output of this stage will be the deliverable **D4 – Technical Proposal Evaluation Report.** The tendering process will start after submission and approval of deliverable D3.1, D3.2 and D3.3 (tender package). The duration of the assignment for the deliverable D4 is expected to be 2 months (18 months after the commencement of the Contract).

The team will collaborate with the NRPB to conduct **pre-proposal meetings** aimed at providing potential bidders with essential project information and clarifying any uncertainties regarding the Request for Proposals (RFP). During these meetings, the Consultant team will address questions raised by bidders to ensure they have a comprehensive understanding of the project requirements. If any necessary changes arise from these discussions, RFP amendments and/or addendums will be developed to update the proposal documentation accordingly. Furthermore, circular letters will be prepared, including reports summarizing the key points and outcomes of the pre-proposal meetings, which will be distributed to all proposers to keep them informed of the latest project developments.

Following the pre-proposal meetings, the consultant team will **oversee the proposal opening process** and gather **all proposers' offers and relevant data into a single document**. The Consultant will support the Technical Proposal Evaluation (for both REOI and RFP processes) by providing technical advice to the official Technical Proposal Evaluation (TPE) panel members, while not being part of the panel itself. A report will be submitted to the TPE panel containing an organized technical evaluation and examination of each proposer's technical proposal documents:

- All proposers' offers, summarized data, and relevant information will be compiled into one comprehensive document (such as an Excel sheet);
- All technical queries submitted by proposers will be attached along with our responses, justification letters, deviations, and clarification lists;
- Each proposer's deviations will be identified, described, and quantified in terms of their impact on the project's timeframe, budget, and scope.
- A complete list of requirements derived from the REOI, RFP, and Specifications will be included to facilitate thorough evaluation and compliance checks.

A **Comprehensive Evaluation of Proposals** will then be developed, following a structured approach comprising several key steps:

1. a technical evaluation based on the established technical specifications list, scoring each proposal against predetermined criteria to ensure objectivity.
2. an Environmental and Social (E&S) evaluation to assess the compliance of each proposal with E&S requirements, ensuring sustainability and community impact considerations are addressed.

After these evaluations, the consultant team will analyze the proposed timeframe for project completion, identifying potential risks or conflicts. Based on the outcomes of the technical and E&S assessments, the **technical acceptance or rejection of each proposer** will be determined, documenting the rationale for each decision. Finally, a Letter of Notification for the successful proposer, confirming their selection and outlining the next steps. This comprehensive process will ensure a transparent and fair assessment, leading to the selection of the most qualified contractor for the project.

After client review, the final version of **D4 – Technical Proposal Evaluation Report** will be prepared.

At the end of this process, the consultant team will assist in the **preparation of the contract(s) with the selected Contractor(s)** by ensuring that all necessary documentation is complete and accurate.

2.3 METHODOLOGY FOR PHASE 2

Phase 2 of the assignment comprises the construction works supervision of the sewerage network and the WWTP, in close coordination with the NRPB Project Manager. The Consultant will participate in all preconstruction surveys, oversee site inspections and the ESHS compliance during the works implementation, monitoring the contractor's program of works.

This phase is organised in two stages:

- Stage 2.1- Site Supervision
- Stage 2.2 - Defects Liability Period

2.3.1 Stage 2.1- Site Supervision

The main outputs of this stage will be the following deliverables: **D5.1 - Site Assessment Report**, with the final version expected for delivery approximately 40 days after the commencement of Phase 2; **weekly D5.2 - Progress Monitoring Reports**; and monthly **D5.3 - ESHS & ESMP Reports** and **D5.4 - SEA/SH Reports**.

The key activities required to produce the Deliverables of this stage are:

- Site visits and preconstruction surveys, reported in the Site Assessment Report
- Preparation of a monitoring Report template to be approved by the Client
- Comprehensive Monitoring of Construction Progress and Financial Disbursements
- Quality and Compliance Monitoring of Construction Works, ensuring that the construction works meet specified quality standards and adhere to national health and safety regulations
- Review payment requests from contractors and ensure quality control over substantial completion certificates
- Progress Monitoring Report and submission to the client
- Assist in ensuring project completion, in line with the project specifications and requirement
- ESHS Training and Audits
- Conducting safety inspections of the construction site, ensuring compliance with OSHA's General Industry Standards (29 CFR 1910) and Construction Standards (29 CFR 1926)
- C-ESMP Oversight, comprising reviewing, providing feedback on, and recommending approval of the Contractor's Environmental & Social Management Plan (C-ESMP), including any revisions
- Assessment of the compliance of the contractor with Labour Management Procedures (LMP)

- ESHS & ESMP and SEA/SH Compliance Monitoring and Reporting

2.3.2 Stage 2.2 - Defects Liability Period

The main output of this stage will be the deliverable **HR – Handover Report**, with the final version expected for delivery upon completion of the contract.

During this Stage, the Consultant Team will maintain close communication with the operators to swiftly identify and address any defects that may emerge. This involves fostering a collaborative relationship with the contractor to resolve issues effectively. The consultant team will meticulously document any defects, assist in implementing remedial actions, and ensure that all corrections are in accordance with the project specifications. Additionally, will provide valuable feedback and recommendations to the client regarding the contractor's performance, which will aid in making informed decisions about retention and future contracts.

2.4 WORKPLAN

The Work Plan is designed to elucidate the different stages and activities encompassed within the scope of services. Each organizational unit in the work plan delineates its duration, content, final products, and pertinent characteristics. The partial and total durations for each unit are specified, along with the various contributions from experts, interlinks, reports, consultations, and follow-up meetings.

For the stakeholder engagement/communication, the plan will be as follows:

- **Deliverable D1 - Sewerage network and Wastewater Treatment Plant Assessment**
- **Deliverable D2 - Environmental & Social Assessment of the WWTP current and planned operation**

As some of the activities for both deliverables run in parallel, is predicted to have consultations in an initial phase with the main stakeholders (beneficiary and interested parties) for information gathering and critical analysis of the collected information.
It is planned, at the end of both deliverables, the preparation of a workshop, where the main conclusions of the Preliminary/Conceptual Projects, as well as the ESA findings, will be presented to the main stakeholders in a Workshop, in order to gather their contributions and feedback and reach a consensus on the best technical solution for the Project Area.

2.4.1 Phase 1 - Design and Environmental and Social assessment

This chapter presents the reviewed Work Plan for the development of the "**Design and Supervision of Wastewater network and Wastewater Treatment Plant**". The sewerage network and WWTP assessment consultancy and pre-design studies shall be completed in a period of seven (7) months.

Figure **2.3** presents a summary calendar with the planned stages of the proposed workplan. The following figures (Figure 2.4 to Figure 2.11) present the proposed workplan, detailing activities to be developed for each Deliverable.

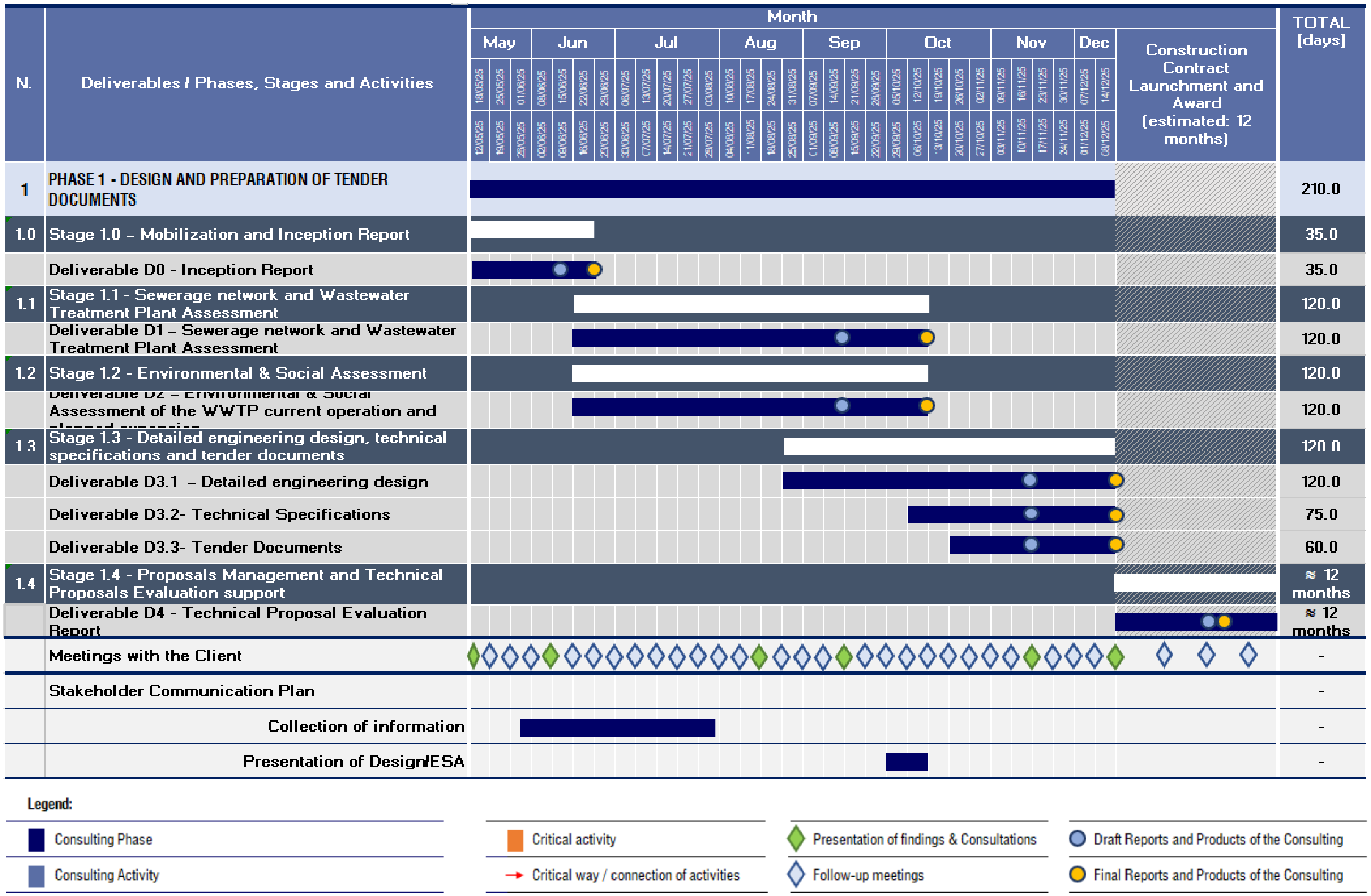

Figure 2.3 – Sequence and duration of work stages - Phase 1

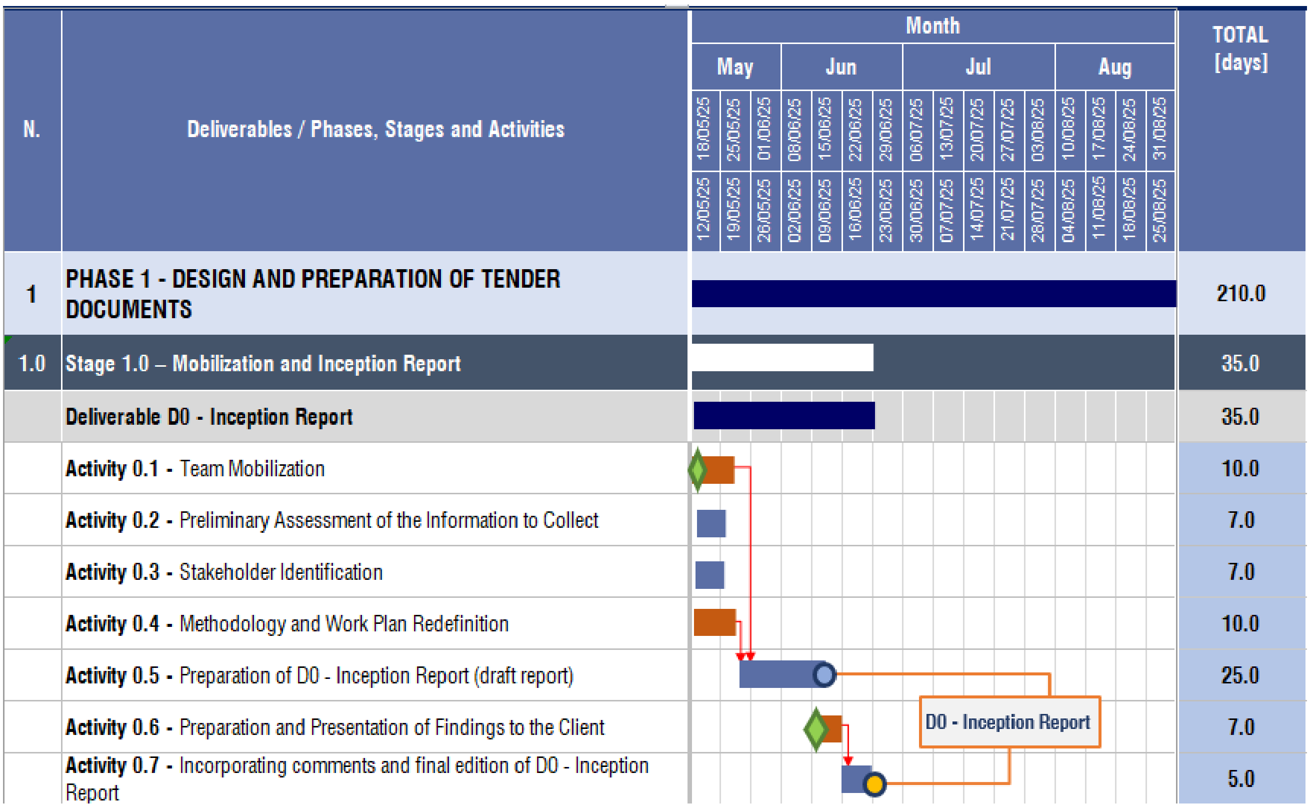

Figure 2.4 – Proposed Workplan for Stage 1.0 - Deliverable D0

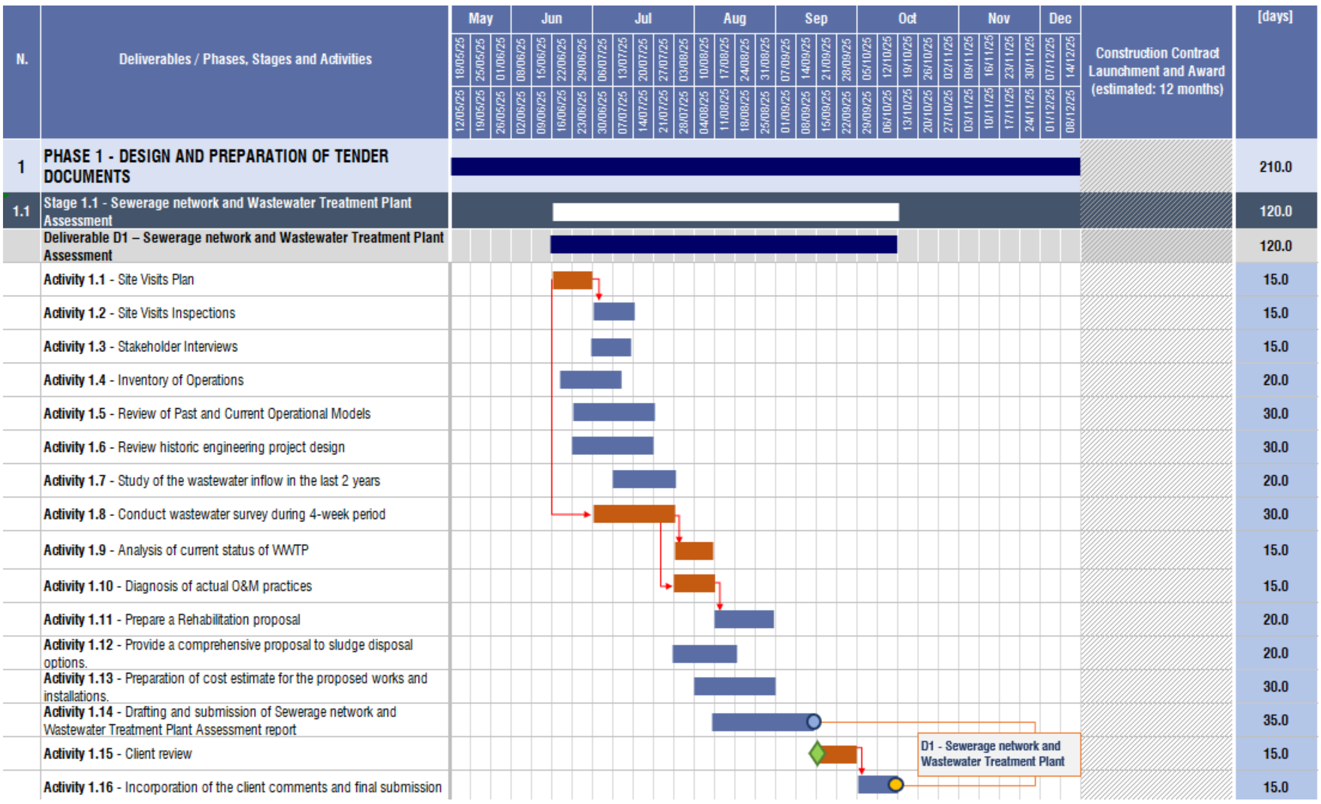

Figure 2.5 – Proposed Workplan for Stage 1.1 - Deliverable D1

N.	Deliverables / Phases, Stages and Activities	TOTAL [days]
1	**PHASE 1 - DESIGN AND PREPARATION OF TENDER DOCUMENTS**	210.0
1.2	**Stage 1.2 - Environmental & Social Assessment**	120.0
	Deliverable D2 – Environmental & Social Assessment of the WWTP current operation and planned expansion	120.0
	Activity 1.17 - Project Scoping and Planning	15.0
	Activity 1.18 - Review of Previous Studies	20.0
	Activity 1.19 - Field Surveys	15.0
	Activity 1.20 - Site Description and Catchment Analysis	15.0
	Activity 1.21 - Direct and Indirect Impact Analysis	15.0
	Activity 1.22 - Effluent Discharge Location and Capacity Assessment	20.0
	Activity 1.23 - Soil, Groundwater, and Hazardous Material Impact Assessment	15.0
	Activity 1.24 - Construction and Demolition Waste Management	15.0
	Activity 1.25 - Alternative Analysis and Scientific Data Gathering	15.0
	Activity 1.26 - Gather scientific information about the Fresh Pond and Great Salt Pond	20.0
	Activity 1.27 - Water Sampling: Identify groundwater resources near Fresh Pond	20.0
	Activity 1.28 - Sludge Management Review	15.0
	Activity 1.29 - Noise Emission Assessment	15.0
	Activity 1.30 - Hazardous Material Analysis	15.0

Figure 2.6 – Proposed Workplan for Stage 1.2 - Deliverable D2 (activity 1.17 – activity 1.30)

N.	Deliverables / Phases, Stages and Activities	[days]
1	**PHASE 1 - DESIGN AND PREPARATION OF TENDER DOCUMENTS**	210.0
1.2	**Stage 1.2 - Environmental & Social Assessment**	120.0
	Deliverable D2 – Environmental & Social Assessment of the WWTP current operation and planned expansion	120.0
	Activity 1.31 - Occupational Health and Safety Assessment	15.0
	Activity 1.32 - Emergency Preparedness Assessment	15.0
	Activity 1.33 - Technical Description of Upgrades	20.0
	Activity 1.34 - Odor Source and Impact Assessment	15.0
	Activity 1.35 - Mitigation Measure Development	20.0
	Activity 1.36 - Stakeholder Engagement / Consultations	15.0
	Activity 1.37 - Grievance Redress Mechanism Evaluation	15.0
	Activity 1.38 - Labour Protection Assessment	15.0
	Activity 1.39 - Preparation of ESA draft report and submission to the client	35.0
	Activity 1.40 - Client review	15.0
	Activity 1.41 - Incorporation of the client comments and final submission	15.0

Figure 2.7 – Proposed Workplan for Stage 1.2 - Deliverable D2 (activity 1.31 – activity 1.41)

N.	Deliverables / Phases, Stages and Activities	TOTAL [days]
1	**PHASE 1 - DESIGN AND PREPARATION OF TENDER DOCUMENTS**	210.0
1.3	Stage 1.3 - Detailed engineering design, technical specifications and tender documents	120.0
	Deliverable D3.1 – Detailed engineering design	120.0
	Activity 1.42 - Performance of the Topographical Survey	30.0
	Activity 1.43 - Performance of the Geotechnical Survey	30.0
	Activity 1.44 - Collection and Analysis of Existing Information	20.0
	Activity 1.45 - Hydraulic network analysis, calculation validation and calibration of the network model	20.0
	Activity 1.46 - WWTP process design	30.0
	Activity 1.47 - Analysis of Resilience of Sanitation Infrastructure and Green Economy Principles	15.0
	Activity 1.48 - Draft detail engineering design and submission to the client.	45.0
	Activity 1.49 - Client review	15.0
	Activity 1.50 - Incorporation of the client´s comments and final submission	15.0

Figure 2.8 – Proposed Workplan for Stage 1.3 - Deliverable D3.1

N.	Deliverables / Phases, Stages and Activities	TOTAL [days]
1	**PHASE 1 - DESIGN AND PREPARATION OF TENDER DOCUMENTS**	210.0
1.3	Stage 1.3 - Detailed engineering design, technical specifications and tender documents	120.0
	Deliverable D3.2- Technical Specifications	75.0
	Activity 1.51 - Preparation of the Environmental, Social, Health & Safety (ESHS) requirements for the tender Package	15.0
	Activity 1.52 - Draft Operations guidelines for the extended network	30.0
	Activity 1.53 - Draft Operations guidelines WWTP	30.0
	Activity 1.54 - Draft Proposal for contract for operation of wastewater system	20.0
	Activity 1.55 - Draft Proposal for preparation of sewerage operation framework	20.0
	Activity 1.56 - Draft technical specifications and submission to the client	20.0
	Activity 1.57 - Client review	15.0
	Activity 1.58 - Incorporation of the client´s comments and final submission	15.0

Figure 2.9 – Proposed Workplan for Stage 1.3 - Deliverable D3.2

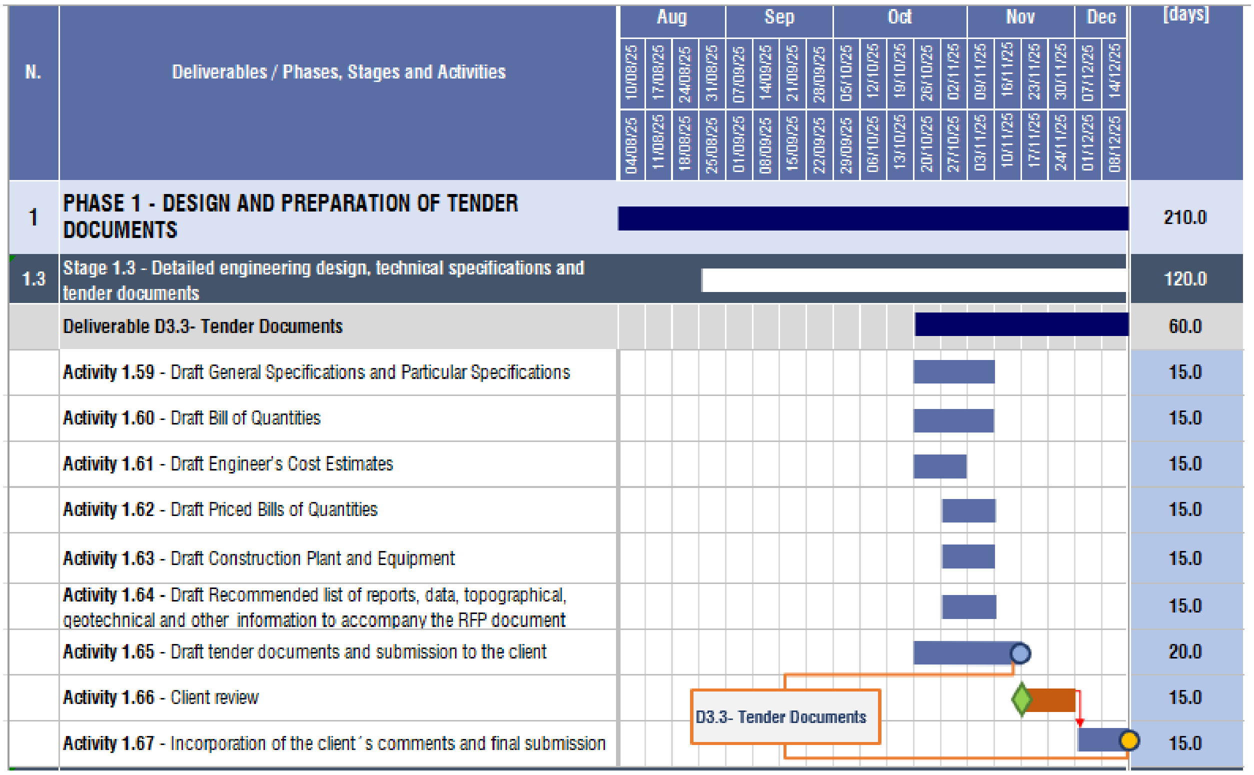

Figure 2.10 – Proposed Workplan for Stage 1.3 - Deliverable D3.3

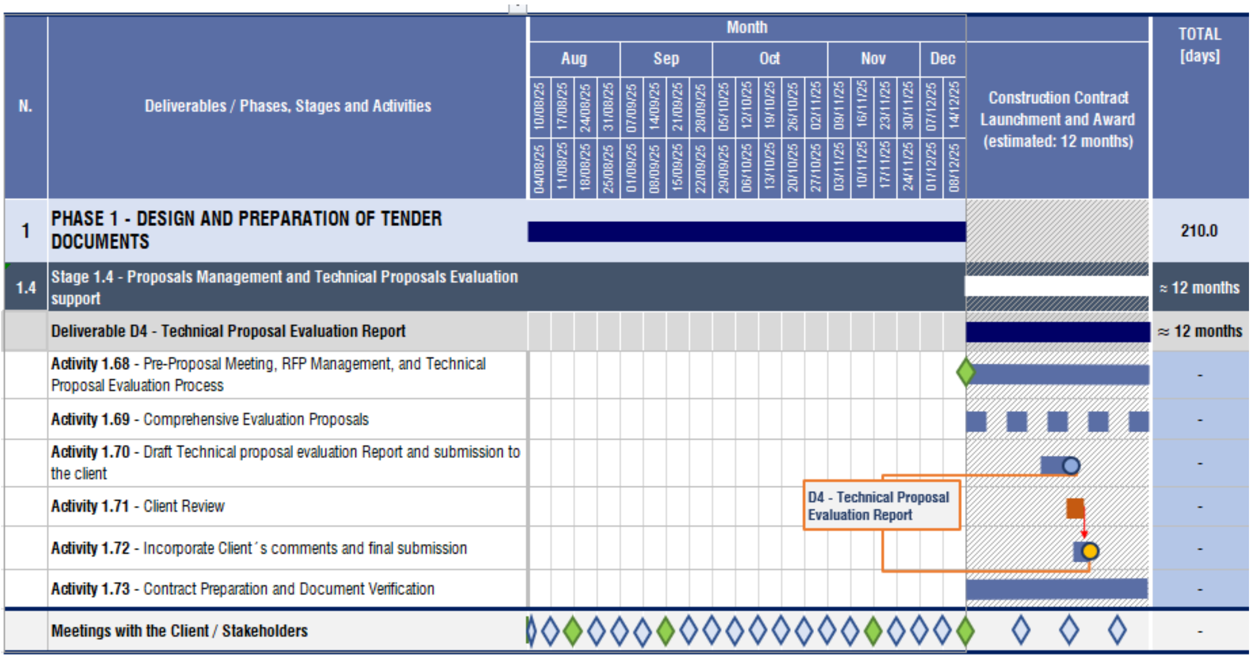

Figure 2.11 – Proposed Workplan for Stage 1.4 - Deliverable D4

2.4.2 Phase 2 - Construction site supervision

Phase 2 is organized in two stages: Stage 2.1- Site Supervision and Stage 2.2 - Defects Liability Period. Figure 2.12 and Figure 2.13 present the proposed workplan, detailing activities to be developed in each phase.

N.	Deliverables / Phases, Stages and Activities	Month (Jan 27 – Jun 28)	Defects Liability Period	TOTAL [days]
2	PHASE 2 – CONSTRUCTION WORKS SUPERVISION			730.0
2.1	Stage 2.1 – Site Supervision			540.0
	D5.1 – Site Assessment Report	D5.1 - Site Assessment Report		40.0
	Activity 2.1 – Site visits and preconstruction surveys			15.0
	Activity 2.2 – Draft Site Assessment Report and submission to the client			15.0
	Activity 2.3 – Client Review			10.0
	Activity 2.4 – Incorporate Client's comments and final submission			10.0
	D5.2 – Progress Monitoring Report			540.0
	Activity 2.5 – Preparation of a monitoring Report template to be approved by the Client			15.0
	Activity 2.6 – Comprehensive Monitoring and Reporting of Construction Progress and Financial Disbursements			540.0
	Activity 2.7 – Quality and Compliance Monitoring of Construction Works			540.0
	Activity 2.8 – Review payment requests from contractors and ensure quality control over substantial completion certificates			540.0
	Activity 2.9 – Progress Monitoring Report and submission to the client	D5.2 - Progress Monitoring Reports (weekly periodicity)		540.0
	Activity 2.10 – Assist in ensuring project completion			25.0
	D5.3 – ESHS & ESMP Reports			540.0
	Activity 2.11 – ESHS Training and Audits			540.0
	Activity 2.12 – Conduct safety inspections of the construction site			540.0
	Activity 2.13 – C-ESMP Oversight			540.0
	Activity 2.14 – Labour Management and Grievance Mechanism			540.0
	Activity 2.15 – ESHS & ESMP Compliance Monitoring and Reporting	D5.3 - ESHS & ESMP Reports (monthly periodicity)		540.0
	D5.4 – SEA/SH Reports			540.0
	Activity 2.16 – SEA/SH Plan Monitoring and Reporting	D5.4 - SEA/SH Reports (monthly periodicity)		540.0

Figure 2.12 – Proposed Workplan for Phase 2 – Site supervision

N.	Deliverables / Phases, Stages and Activities	Month (Jan 27 – Jun 28)	Defects Liability Period (6 months)	TOTAL [days]
2.2	Stage 2.2 - Defects Liability Period			180.0
	HR - Handover Report	HR- Handover Report		180.0
	Activity 2.17 – Assistance during the Defects Liability Period			180.0
	Activity 2.18 – Draft and submission of Handover report			20.0
	Activity 2.19– Client Review			15.0
	Activity 2.20 – Incorporate Client's comments and final submission of the Handover report			15.0
	Activity 2.21 – Issuance of the works completion certificate			-
	Training sessions			-
	Regular Meetings with the Client			-

Figure 2.13 – Proposed Workplan for Phase 2 – Defects Liability Period

2.5 DELIVERABLES

The assignment considers the production of seven (7) main deliverables in phase 1. In phase 2, in addition to the Assessment Report (Deliverable D5.1), the assignment comprises regular weekly and monthly reports, as presented below.

Table 2.2 –Deliverables

Phase	Stage	Deliverable	Proposed delivery dates	
			Draft Version	Final Version
1	**1.0**	D0 - Inception Report	12.06.2025	23.06.2025
	1.1	D1 - Sewerage network and Wastewater Treatment Plant Assessment	14.09.2025	12.10.2025
	1.2	D2– Environmental & Social Assessment of the WWTP current operation and planned expansion	14.09.2025	12.10.2025
	1.3	D3.1– Detailed engineering design	12.01.2025	12.02.2026
	1.3	D3.2- Technical Specifications	12.01.2025	12.02.2026
	1.3	D3.3- Tender Documents	12.01.2025	12.02.2026
	1.4	D4 - Technical Proposal Evaluation Report	2 months after the start of tendering process	
2	**2.1**	D5.1 – Assessment Report	3 weeks after construction starts	6 weeks after construction starts
	2.1	D5.2 - Progress Monitoring Report	Weekly during construction phase	-
	2.1	D5.3 – ESHS & ESMP Report	Monthly during construction phase	-
	2.1	D5.4 – SEA/SH Report	Monthly during construction phase	-
	2.2	Handover Report	-	-

3. MOBILISATION

3.1 TEAM MOBILISATION OF EXPERTS

The proposed technical team for the Sint Maarten assignment is composed of Key Experts and a Support Team (Non-Key Experts), structured according to the technical requirements of each project component and deliverable.

During the mobilization phase, the team was adjusted and completed with the inclusion of additional non-key staff to optimize the operational resources and technical coverage of the consortium partners. These reinforcements aim to strengthen project coordination, ensure thematic integration, and increase field-level responsiveness.

The newly mobilized team members include:

- K-8.14 – Victoria d'Orey (PROCESL)
- K-8.15 – Celeste Cunha (ENGIDRO)
- K-8.16 – Catarina Lopes (ENGIDRO)

Celeste Cunha – Sanitation Expert

Celeste Cunha is an Environmental Engineer and a Senior Member of the Portuguese Engineers Association with over 20 years of solid experience in studies and detailed design projects within the water supply and sanitation sectors. She also holds Geographic Information Systems (GIS) expert qualification course and a Postgraduate Certificate in Occupational Health and Safety Management. As Engidro team member she has participated and coordinated a wide range of planning studies and detail design assignments in sanitation and water supply sector, with references in Portugal, Cape Verde, Angola, Barbados and Mozambique. Her core expertise includes hydraulic modeling, infrastructure sizing and design, and the technical and economic evaluation of engineering solutions. Skilled in financial analysis of projects, ensuring both feasibility and long-term sustainability, with focus on technical accuracy and resource optimization. Known for strong technical leadership, collaborative work in multidisciplinary teams, and a results-driven approach. In this assignment, she acts as Sanitation Expert and Lead of the ENGIDRO Technical Team, coordinating technical contributions and ensuring alignment across all water and wastewater components.

Victoria d'Orey – Wastewater Process Expert

Victoria d'Orey has over 30 years of experience in infrastructure and urban development projects, with a strong focus on water and wastewater engineering and water quality. She has participated in major national and international assignments across Portugal, Angola, Mozambique, Tanzania, and the Middle East. Since joining PROCESL in 2024 as Project Manager, she has led multidisciplinary teams in the planning and implementation of large-scale infrastructure projects. Her background also includes senior roles in consulting engineering firms, with responsibility for hydraulic and process design, as well as project management of wastewater systems for both municipal and industrial clients. She was notably involved in urban requalification programs in Tomar and Setúbal and has also contributed to the design of treatment solutions for leachates from solid waste landfills. In this project, Victoria acts as Technical Coordinator for PROCESL, ensuring the integration of the Lisbon-based team and alignment of technical contributions with project requirements.

Catarina Lopes – Project Management Officer (PMO)

Catarina Lopes is an Environmental Engineer with a professional background in hydraulic engineering and project management. She has led multidisciplinary teams and coordinated large-scale infrastructure projects in Portugal and internationally, including studies for ANA Aeroportos, AdA, and AIAS. As PMO for this assignment, she is responsible for planning, reporting, coordination of specialists, risk monitoring, and communication with both the Client and the backstopping unit. She plays a key role in ensuring internal coherence and alignment with contractual requirements.

In this initial phase of the assignment, given the unavailability of Alexandra Cardoso to fill the position of K3 - Hydraulic Engineer, originally planned, authorization was requested for her replacement by João Guimaraes, who underwent an interview with NRPB to assess his experience. **João Guimarães** has 31 years of professional experience in design and modelling of hydraulic systems, highlighting the participation in various Portuguese and international works, as specialist and as technical director. For more than 15 years, he has coordinated studies and projects for the planning of hydraulic systems and also collaborated in the preparation of measurement and budgeting of solutions, Technical Specifications and Tender Documents. His experience in African countries includes coordination and participation in various studies and projects in Mozambique, Cape Verde and Angola.

The figure below presents the final composition of the technical team.

Table 3.1 – Technical Team: Participation of the experts by deliverable

ID	Position	Name	Phase 1					Phase 2	
			D0	D1	D2	D3	D4	D5	HR
K-1	Team Leader	António Jorge Monteiro	●	●	●	●	●	●	●
K-2	Wastewater Process Engineer	Pedro Póvoa	●	●	·	●	·	·	·
K-3	Hydraulic Engineer	João Guimarães	●	●	·	●	●	·	·
K-4	ESHS Specialist (Phase 1)	Susana Baptista	●	·	●	·	·	·	·
K-5	General Supervision Engineer	Kelvin Emilien	·	·	·	·	·	●	●
K-6.1	Site Supervisor	Nelson Nhambir	·	·	·	·	·	●	·
K-6.2	Site Supervisor	Gilberto Muzemane	·	·	·	·	·	●	·
K-7	ESHS Specialist (Phase 2)	Rui Alves	·	·	·	·	·	●	·
K-8.1	Operation & Maintenance Specialist	Andy O. Phillip	·	●	·	●	·	●	·
K-8.2	Social, Community Development and Gender Specialist	Aline Afonso	·	·	●	·	·	·	·

ID	Position	Name	Phase 1					Phase 2	
			D0	D1	D2	D3	D4	D5	HR
K-8.3	Sanitation Specialist	Mark W Barnett	·	●	·	●	●	·	·
K-8.4	Financial/Institutional Specialist	Filipe Vasconcelos	·	●	·	·	·	·	·
K-8.5	Hydrologist / Water Resource Expert	Abílio Castro	·	●	·	·	·	·	·
K-8.6	Civil/Structural Engineer	Omar Allahar	·	·	·	●	·	●	●
K-8.7	Mechanical Engineer	Pedro Almeida	·	·	·	●	·	●	●
K-8.8	Electrical Engineer	Célia Tenente	·	·	·	●	·	●	●
K-8.9	Geotechnical Expert	Kevin Seale	·	●	·	●	·	●	·
K-8.11	Biologist	David G. Lee	·	●	●	·	·	·	·
K-8.12	Environmental Specialist	Luísa Leiria	·	●	●	·	·	·	·
K-8.13	Occupation Health and Safety Specialist	Esmeralde Rommy	·	●	·	·	·	●	·
K-8.14	Wastewater Process Expert	Victoria d'Orey	●	●	●	●	●		
K-8.15	Sanitation Expert	Celeste Cunha	●	●	●	●	●		
K-8.16	Project Management Officer	Catarina Lopes	●	●	●	●	●	●	●

The figure below presents the organization chart of the definitive technical team composition, distributed and organized for each phase, including the participation of the experts in each deliverable.

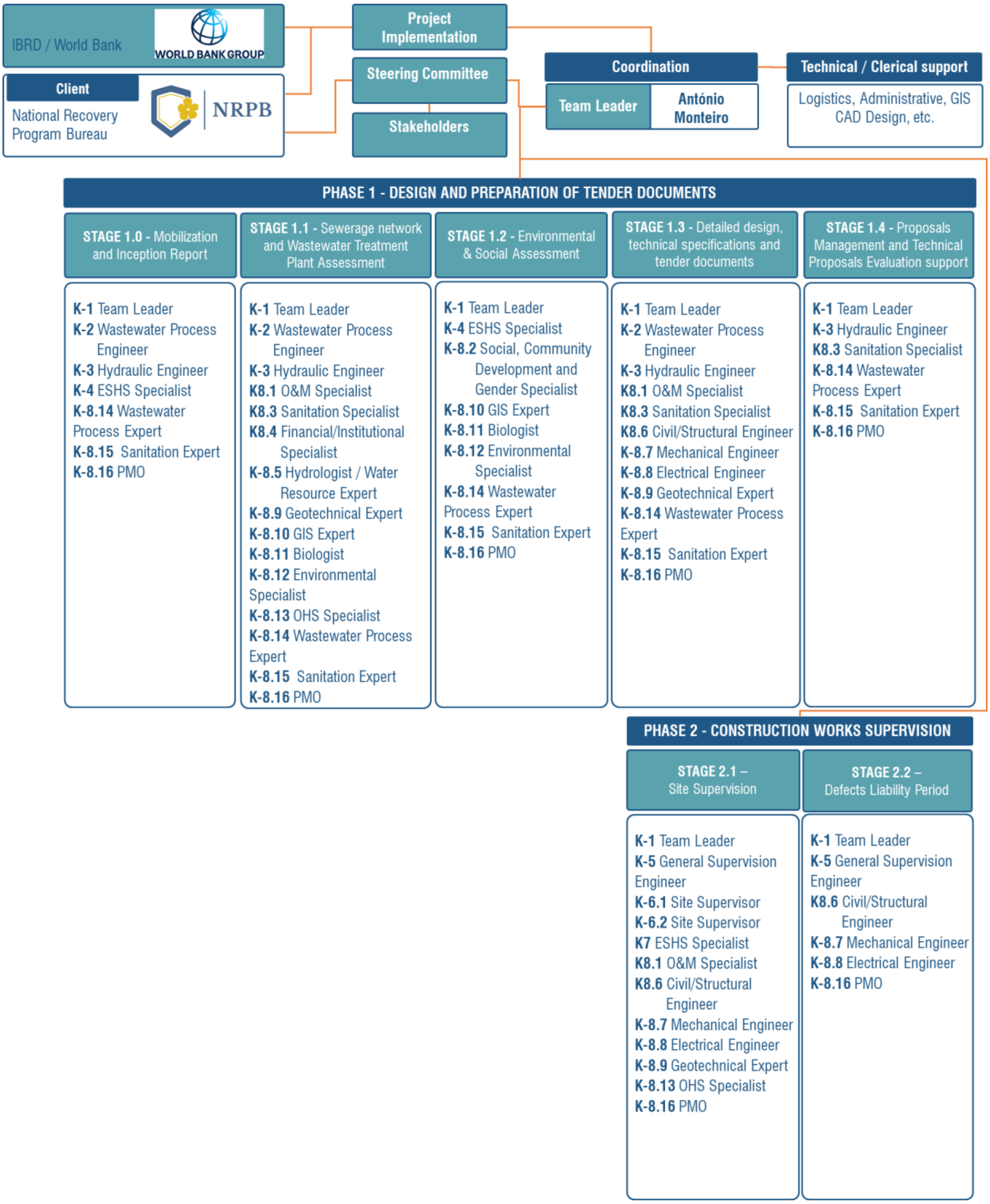

Figure 3.1 – Organization chart of the definitive Technical Team

3.2 LOGISTICS FACILITIES

The successful implementation of this assignment relies on an effective combination of local logistical support, remote technical coordination, and institutional cooperation with the Client. The Joint Venture has put in place a comprehensive logistics framework to ensure efficient field operations, secure data exchange, and smooth interaction with stakeholders.

Local Support and Facilities

As part of the Joint Venture, SUBSURFACE will provide dedicated logistical support to the Consultant team. With regional operations based in the Caribbean, SUBSURFACE will assist with:

- Collection and validation of baseline data.
- Scheduling and coordination of field missions and stakeholder consultations.
- Travel and accommodation arrangements.
- Rental of vehicles, field equipment and other operational needs.

SUBSURFACE has fully equipped offices in Nursery Park Estate, Saint Philip, Barbados, and access to private offices and meeting spaces at Regus Business Centre, One Welches, St. Thomas, allowing for flexible workspace when required. Administrative and technical staff from SUBSURFACE will be available to support back-office tasks, local liaison, and logistics-related problem-solving throughout the assignment.

3.3 CONTACTS MATRIX

During the coordination meeting held on May 12, 2024, the need to establish a formal contact structure for all project-related communication was raised. It was agreed that the contracts would be organized under two main categories:

- Contractual Issues – for formal correspondence, and
- Technical and Other Issues – for operational coordination and day-to-day communication.

This contact structure facilitates traceability, ensures clear communication flows, and promotes accountability across all parties. The following matrix presents the initial list of main contacts, which remains subject to updates and validation by the Client.

Table 3.2 – Contacts Matrix

From	To	CC
CONTRACTUAL ISSUES - LETTERS SUBMITTED BY E-MAIL		
CONSULTANT	CLIENT (NRPB)	
	a.vadillo@nrpbsxm.org (**Álvaro Vadillo**) s.ghosh@nrpbsxm.org (**Sumon Ghosh)**	a.j.monteiro@engidro.pt **(António Monteiro)** catarina.lopes@engidro.pt (**Catarina Lopes)**
CLIENT (NRPB)	CONSULTANT	
	catarina.lopes@engidro.pt (**Catarina Lopes)**	a.j.monteiro@engidro.pt **(António Monteiro)**
TECHNICAL AND OTHER ISSUES - DAILY E-MAIL COMMUNICATIONS & SHAREPOINT		
CONSULTANT	CLIENT (NRPB)	
	a.vadillo@nrpbsxm.org (**Álvaro Vadillo**) s.ghosh@nrpbsxm.org (**Sumon Ghosh)** j.george@nrpbsxm.org (**Jo-Ann George**) r.thompson@nrpbsxm.org (**Rueben Thompson**) y.roussos@nrpbsxm.org (**Yiannis Roussos**)	a.j.monteiro@engidro.pt (**António Monteiro**) celeste.cunha@engidro.pt **(Celeste Cunha)** vdorey@quadranteglobal.com (**Victoria d'Orey**) ppovoa@ext.quadranteglobal.com (**Pedro Póvoa**) sbaptista@agriproambiente.pt (**Susana Batista**)
CONSULTANT	INDEPENDENT CONSULTANT	
	hkw@hkwinkler.com (**Harald Winkler**)	a.vadillo@nrpbsxm.org (**Álvaro Vadillo)** s.ghosh@nrpbsxm.org (**Sumon Ghosh**) a.j.monteiro@engidro.pt (**António Monteiro**) celeste.cunha@engidro.pt (**Celeste Cunha**) vdorey@quadranteglobal.com (**Victoria d'Orey**) ppovoa@ext.quadranteglobal.com (**Pedro Póvoa**) sbaptista@agriproambiente.pt (**Susana Batista**) j.george@nrpbsxm.org (**Jo-Ann George**) r.thompson@nrpbsxm.org (**Rueben Thompson**) y.roussos@nrpbsxm.org (**Yiannis Roussos**)
CLIENT (NRPB)	CONSULTANT	
	a.j.monteiro@engidro.pt **(António Monteiro)**	celeste.cunha@engidro.pt **(Celeste Cunha)** vdorey@quadranteglobal.com (**Victoria d'Orey**) ppovoa@ext.quadranteglobal.com (**Pedro Póvoa**) sbaptista@agriproambiente.pt (**Susana Batista**)

3.4 PROJECT ORGANIZATION

3.4.1 General Structure

The implementation of this project in Sint Maarten is supported by a robust organizational structure designed to ensure operational efficiency, technical rigor, and continuous alignment with the project's objectives and contractual requirements. The proposed setup reflects the Joint Venture's extensive experience in managing complex, multidisciplinary assignments in the water and sanitation sector, particularly in developing and island contexts.

The project is led by a Joint Venture between ENGIDRO and PROCESL, with ENGIDRO acting as the lead partner and contractual representative. The two firms operate as an integrated team under a unified management structure, with clearly defined roles, responsibilities, and communication lines. This organization ensures technical complementarity and the full mobilization of resources and expertise from both partners.

The team is structured around a core technical coordination unit, supported by thematic specialists and reinforced by a backstopping team based at the headquarters of both partner firms.

3.4.2 Key Functions

To ensure effective implementation, the project team is organised around clearly defined functional roles. Each key function contributes to the overall coordination, technical quality, and responsiveness of the project, ensuring that all contractual obligations are met in a timely and structured manner. The table below summarises the main functions and respective responsibilities.

Table 3.3 – Organizational Functions and Key Responsibilities

Function	Description
Team Leader	Provides strategic and technical oversight across all project components. Ensures compliance with the ToR, leads coordination with the Client, manages the team and deliverables, and chairs formal meetings. Acts as the primary point of contact for the Client.
Project Management Officer (PMO)	Supports the Team Leader in planning, scheduling, reporting, and document control. Manages communication flows with the Client and backstopping team, ensures internal coordination, and oversees risk and quality management tools.
Experts	Senior specialists in wastewater treatment, hydraulic design, environmental and social management, procurement, and supervision. Ensure full technical coverage of all project components.
Local Interface & Field Support	Local partners and technicians will be progressively mobilized to support site surveys, field logistics, stakeholder engagement, and supervision/DLP activities, considering the island's geographical and logistical context

3.4.3 Communication and Decision-Making

3.4.3.1 Communication with the Client

All official communication with the Client will be managed under a formal protocol, with the Team Leader acting as the primary point of contact. This ensures a centralized and coherent exchange of information, where strategic decisions, clarifications, deliverable submissions, and feedback responses are consolidated through a single communication channel. This approach helps prevent fragmented or duplicated communication and promotes a unified position from the Consultant team.

The PMO plays a critical role in supporting the day-to-day communication flow. The PMO is responsible for:

- Monitoring and documenting correspondence.
- Ensuring timely follow-up on action points and requests.
- Keeping the communication archive up to date.
- Maintaining consistency in formats and templates used across communications.

All formal deliverables, including reports, technical notes, and official responses to comments, will be submitted through the Team Leader, with prior internal validation and backstopping review. Any correspondence involving contractual or procedural matters will also be coordinated with the backstopping team and shared with the Joint-Venture headquarters.

Internally, the Consultant team operates under clear coordination and decision-making structure, supported by regular meetings and shared planning tools. Key components include:

- **Weekly Coordination Meetings**
  Held between the Team Leader, PMO, and key experts to review project progress, identify potential risks or delays, and align on the week's priorities.

- **Thematic Working Sessions**
  Organized as needed among specialists (e.g. wastewater, hydraulics, environmental and social supervision), these sessions are used to align technical content, clarify methodology, and ensure integration across deliverables.

- **Review and Validation Process**
  All draft deliverables undergo internal review before submission. This ensures technical quality, consistency with the methodology, and compliance with the ToR.

- **Decision-Making**
  Strategic and technical decisions are made by the Team Leader, with input from the PMO and thematic leads. Where necessary, the backstopping team provides additional technical validation or alternative recommendations.

The following figure summarizes the internal and external communication and decision-making flow established for the project:

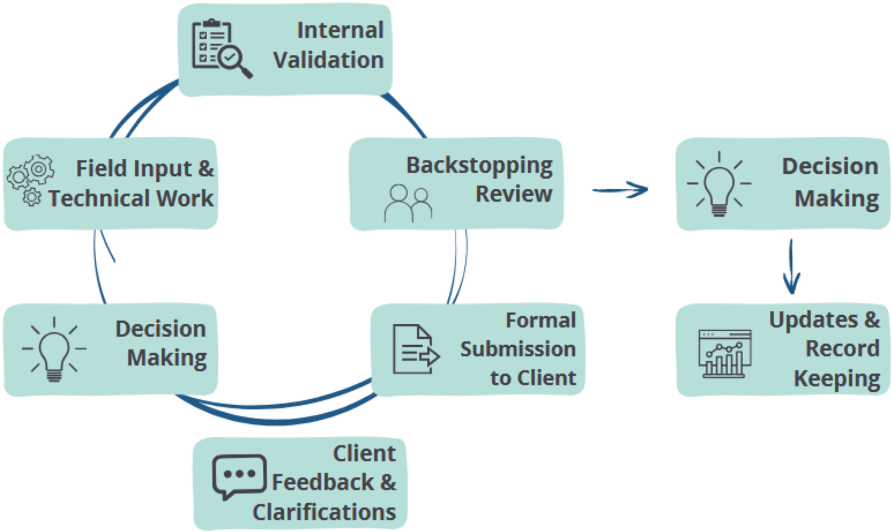

Figure 3.2 –Communication and Decision-Making Flow

3.4.3.2 Document Management and Collaboration Tools

To support all communication and coordination processes, a SharePoint platform has been set up by the Client as the central document management tool. This platform will be used to:

- Store project documentation and deliverables.
- Share technical data and field information.
- Archive meeting minutes and communication records.
- Facilitate collaborative drafting and feedback cycles.

The SharePoint includes dedicated folders for the Consultant team and for the independent expert (HKW), allowing controlled sharing of outputs and ensuring clarity in document ownership and updates. Internal access rights will be managed by the Consultant to ensure confidentiality and proper version control.

This structure guarantees transparency, accessibility, and real-time collaboration between the Consultant, the Client, and external stakeholders.

3.4.4 Quality Assurance and Backstopping

To ensure the quality, consistency, and integrity of all project outputs, the Consultant has established a dedicated backstopping unit, based at the headquarters of both Joint Venture partners. This team plays a central role in reinforcing the project's internal quality assurance framework by providing an independent and systematic review of all deliverables, as well as ongoing support to the field team.

The backstopping team operates as an extension of the core technical coordination unit, with responsibilities that span across planning, technical validation, and risk mitigation. Its main functions are summarised in the table below.

Table 3.4 – Backstopping Functions and Quality Assurance Roles

Function	Purpose	Associated Quality Objective
Review of all deliverables	Independent validation before submission	Technical consistency and compliance with ToR
Participation in planning & evaluation	Early-stage input in methodologies and workplans	Alignment with project objectives and scope
Support in responding to Client feedback	Ensure coherent and traceable responses to Client comments	Responsiveness and traceability
Methodological oversight and harmonization	Promote consistency across disciplines and workstreams	Integration and internal coherence
Internal knowledge-sharing	Dissemination of best practices and lessons learned	Continuous improvement and team alignment
Risk monitoring and early issue detection	Identify and flag potential technical or procedural deviations	Risk mitigation and quality control

In addition to these functions, the backstopping mechanism supports the internal review and validation cycle applied to all formal project deliverables. This cycle ensures that reports and outputs meet the highest quality standards before submission to the Client.

This structured review and validation process reinforces the project's risk management strategy, allowing for the early identification and correction of potential deviations — whether technical, administrative, or procedural. By maintaining this additional layer of independent oversight, the Joint Venture ensures full compliance with contractual obligations, consistency with the approved methodology, and continuous alignment with performance targets.

3.4.5 Compliance and Governance Principles

The Joint Venture is fully committed to upholding the highest standards of ethical conduct, transparency, inclusiveness, and accountability throughout the implementation of the assignment. These governance principles are not only embedded in the internal policies of both ENGIDRO and PROCESL but also aligned with international development standards and the expectations of the Client and funding institutions.

The following principles guide the behavior of all team members, both at headquarters and in the field:

3.4.5.1 Ethical Conduct and Integrity

All team members operate under a strict code of professional ethics, which includes:

- Full compliance with anti-corruption policies and procedures, in line with World Bank and EU guidelines.
- Transparent and honest communication with all stakeholders.
- Zero tolerance for fraudulent practices, collusion, or abuse of power.
- Obligation to report any suspected misconduct through internal reporting channels.
- Respect for institutional hierarchies and coordination structures defined in the project.

These standards are reinforced during internal briefings and throughout the assignment, particularly during key phases of fieldwork and stakeholder interaction.

3.4.5.2 Data Protection and Confidentiality

The Consultant team recognizes that much of the information accessed during the project may be sensitive in nature. Accordingly, the following safeguards are enforced:

- All personal and institutional data are handled in accordance with applicable data protection regulations, including the General Data Protection Regulation (GDPR) where relevant.
- Confidential information is not shared outside the team unless formally authorized.
- All project documentation is stored on secured servers, with access managed through role-based permissions.
- Hard copy materials and field notes are collected, digitized, and securely archived.

In all instances, the use of data is strictly limited to the purposes of this assignment.

3.4.5.3 Gender Equality and Non-Discrimination

The Joint Venture is firmly committed to gender equality and to promoting a working environment — both internally and with stakeholders — that is free of discrimination, harassment, or bias. Key measures include:

- Balanced gender representation within the project team whenever possible.
- Active efforts to ensure that women and underrepresented groups participate in consultation processes.
- Sensitization of team members to issues of power asymmetry and cultural sensitivity.
- Integration of gender-responsive approaches into technical and stakeholder-related workstreams.

These commitments are in line with the principles set out in the Client's Gender and Inclusion policies and those of the World Bank.

3.4.5.4 Stakeholder Participation and Accountability

The project adopts a participatory and inclusive approach at all levels of implementation. This includes:

- Structured stakeholder mapping and engagement planning.
- Proper engagement plan for vulnerable groups
- Open and respectful dialogue with institutional actors, communities, and civil society groups.
- Use of participatory tools such as interviews, focus groups, and validation sessions.
- Systematic documentation of feedback received and transparent incorporation of justified inputs into project outputs.

Through this approach, the Consultant aims to ensure that proposed technical solutions are context-sensitive, locally owned, and institutionally anchored.

3.4.5.5 Organizational Structure and Reporting Flow

The governance of the project is underpinned by a clear organizational structure, defined reporting lines, and systematic quality control mechanisms such as outlines:

- The roles and relationships among the technical team, Project Management Officer (PMO), Team Leader, and backstopping unit.
- The hierarchical flow of information, coordination, and decision-making.
- The interfaces with the Client, including focal points for technical, contractual, and administrative matters.
- The role of local partners in field logistics, community engagement, and institutional support.

This structure supports not only efficient project delivery, but also full compliance with contractual and institutional governance requirements.

4. PROGRESS OF THE ASSIGNMENT

4.1 PROJECT AREA

Sint Maarten is an autonomous country within the Kingdom of the Netherlands. It occupies the southern part of the island of Saint Martin in the Leeward Islands - the northern half is the French territory of Saint Martin.

Figure 4.1 – Location of Sint Maarten

Together with Aruba, Curacao and the Netherlands, they constitute the Kingdom of the Netherlands since October 10, 2010. On that date, Sint Maarten acquired the status of country within the Kingdom. As a result, St. Maarten has its own Governor as of that day.

The total population of Sint Maarten is 42 577 inhabitants, according to the census in 2022, in an area of around 34 Km^2. The territory of Sint Maarten is organized into 8 districts, with Philipsburg as the main town and capital:

Figure 4.2 – Districts of Sint Maarten

4.2 IDENTIFICATION OF STAKEHOLDERS

The identification of all stakeholders with potential interest to the project is a key activity for the success of all activities, ahead and of the project itself. The basic associated objective is to identify and establish a communication framework with key stakeholder organizations and entities identifying the key actors that must be consulted and participate in the development of the study.

The Wastewater Management Project has already a **Stakeholder Engagement Plan (SEP)** which "*serves to support the implementation of relevant Stakeholder engagement requirements and guides the outreach and information disclosure of the Sint Maarten Wastewater Management Project (SWAMP) as it moves through critical milestones*."

During Project Implementation, and according to the SEP, the main stakeholders consist of the Government entities related to the project (VROMI, VSA, etc), the general public, NGOs and interest groups. The consultation will be conducted as soon as the ESA is prepared by the JV and before finalized and approved by the WB.

The JV will support NRPB in conducting stakeholder consultations and update the Environmental and Social Assessment (ESA) based on the consultations.

The ESHS Specialist for the Site Supervision is expected to monitor the works contractor's implementation of their SEP. Periodic reports with information relevant to the SEP will be described in these reports. Key stakeholders identified up to this point include:

- NRPB
- VROMI
- GEBE's - Common Electricity Company Windward Islands
- Nature Foundation Sint Maarten
- Sewerage Operation & Maintenance Staff
- STAT - Department of Statistics
- Environmental Protection in the Caribbean (EPIC)
- Sint Maarten Archaeological Center (SIMARC)
- Sint Maarten Cadaster

NGOs and general public will be assessed during baseline data gathering. Categorization of these stakeholders was provided in Figure 2.2 and Table 2.1, and if vulnerable groups shall be identified with the project area, any engagement plans will be prior discussed with NRPB.

It is predicted that the consultations will be divided in two steps. The first one (individual meetings) to collect baseline information for the project and for the ESA, and the second one (workshop) to present the updated project design and the ESA findings based on that new design.

4.3 DATA COLLECTION

Base data for the development of the design has been downloaded onto a SharePoint by NRPB and VROMI, which include:

- GIS data regarding the existing sewage network,
- CSMP – The Sint Maarten Sewerage Master Plan 2020-2030, Ministry of VROMI, Sint Maarten, November 2019
- Design Standards Sewerage 2020, Ministry of VROMI, Sint Maarten, (focuses on sewer transport and flow calculations)
- Design Standards Drainage 2020, Ministry of VROMI, Sint Maarten, April 2020
- Storm water and Drainage 2022, Ministry of VROMI, Sint Maarten
- Hard surfaced gutter and trench standards
- Country Sint Maarten Policy Document – Sewerage 2020, Ministry of VROMI, Sint Maarten, December 2021
- Extracts of the Saint Peters Upgrading and Beautification Project, 2006
- Draft zoning plans for Simpson Bay, Bily Folly – Cay Hill, Cole Bay
- Hidrance Permit for the WWTP Illidge Road
- Relevant legislation and policy documents
- VROMI Function Book

- WWTP Operation Sheets (GEBE electricity bills, operations and wastewater quality testing – it is presumed these refer to the Illidge Road WWTP)
- Terms of Reference – Consultancy for reviewing and advising on the Sludge Management Strategy
- Technical Assessment and Capex analysis of the WWTP at Illidge Road
- GEBE water supply: island schematics, storage tank and pumping station data, plans of water consumption area and average flows
- Sint Maarten Citywide Inclusive Sanitation & Marine Ecosystems Workshop, 2025
- Environmental data: Biodiversity, CORENA Project, Historic Reports, Instruments, Water Sampling
- Data on the WWTP Illidge Road
  - plans of hydraulic connections, and drawings, 2010
  - 2012-2013 monthly reports monthly septic truck movements summary, WWTP equipment – hours of operation, pumping stations – hours readings
  - P&IDs
  - Influent Characterization of the WWTP Illidge Road, Final Report, UNESCO-IHE, January 2008
- Resolution Sewage Water Treatment Plant_F_20130506.pdf
- Regulations Sewage Water Treatment Plant_Gouvernment_F_20130506
- Advice Governmental Wastewater treatment plant and Laboratory

Analysis of the first data collected is ongoing and some additional information has already been requested:

Cartography

- Existing topographical surveys
- Existing Digital Terrain Models

Geological and Geotechnical

- Existing geological and geotechnical studies

Population and Development Planning

- 2022 population census for St. Maarten (results broken down by administrative structure)
- Population projections – based on latest census
- Existing development planning studies

GoSM requirements

- Water Act
- Surface Water Pollution Act
- Soil Protection Act
- Building Code

- National Safety Ordinance (SO, AB 2013 GT no 438) and Safety Decrees I-III (AB 2013 GT no. 348; no.280; no. 350)

Engineering project designs

- Existing design standards and guidelines regarding wastewater treatment
- Existing technical specifications of equipment, materials, procedures, etc

Water supply

- Water costumers georeferenced data: location, costumer type, water consumption
- Water supply network coverage: existing and planned
- Water supply tariffs and water supply bills

Pumping Stations

- Available flow data (or electricity records)
- Detailed design or "as built" drawings

Waste water Treatment Plant

Following the first data collection, the following **data gaps** remain, and were already requested:

- historical data of inlet flow meter,
- historical data of inlet and outlet sampling,
- previous WWTP operation contract, procedures, sampling, process control, number of persons,
- previous WWTP maintenance contract, preventive and reactive procedures, number of persons,
- Detailed design (process and hydraulics) of the WWTP or "as built" drawings.

To address the remaining data gaps, additional data collection will be conducted through on-site inspections, surveys, and stakeholder meetings (as described in section 2.2.2). Moreover, field data will be collected and analyzed for both the influent and effluent volumes and quality at the WWTP. This analysis will cover key parameters and will be carried out over a continuous 4-week period (28 days) through an onsite survey, as described in section 2.2.2

Hydrology e hydrogeology

- Available rainfall data
- Available data concerning groundwater resources and boring wells

Environmental and social

- Existing water quality surveys at the receiving waterbodies, to identify major pollution sources
- Cartography data (shapefiles) of:
    - Administrative division
    - Roads
    - Hydrography
    - Land Use / Vegetation
    - Fauna distribution maps
    - Terrestrial and Marine Protected Areas

- Industry and Extraction Areas
- Noise, Air Quality and Water Quality Monitoring Stations

- Coastal and Inland Water Quality Data (especially for Fresh Pond)
- Noise Maps or similar studies for the WWTP municipality
- Air Quality data or similar studies for the WWTP municipality
- Records of complaints for the current WWTP

4.4 INITIAL FINDINGS

4.4.1 Population

Sint Maarten holds the distinction of having the highest population density in the Caribbean. Due to significant economic growth, the island's population has seen a steady rise over the past several decades.

Regarding Population, three main sources were used in this preliminary analysis, namely:

- Official data from STAT - Department of Statistics of Sint Maarten (available in the institution's website);
- Data of the World Development Indicators (World Bank) [1]
- Data from Barbados Sewerage Plan (BRP 2012)

Next chart represents Sint Maarten total population growth and projections, according to the sources previous mentioned.

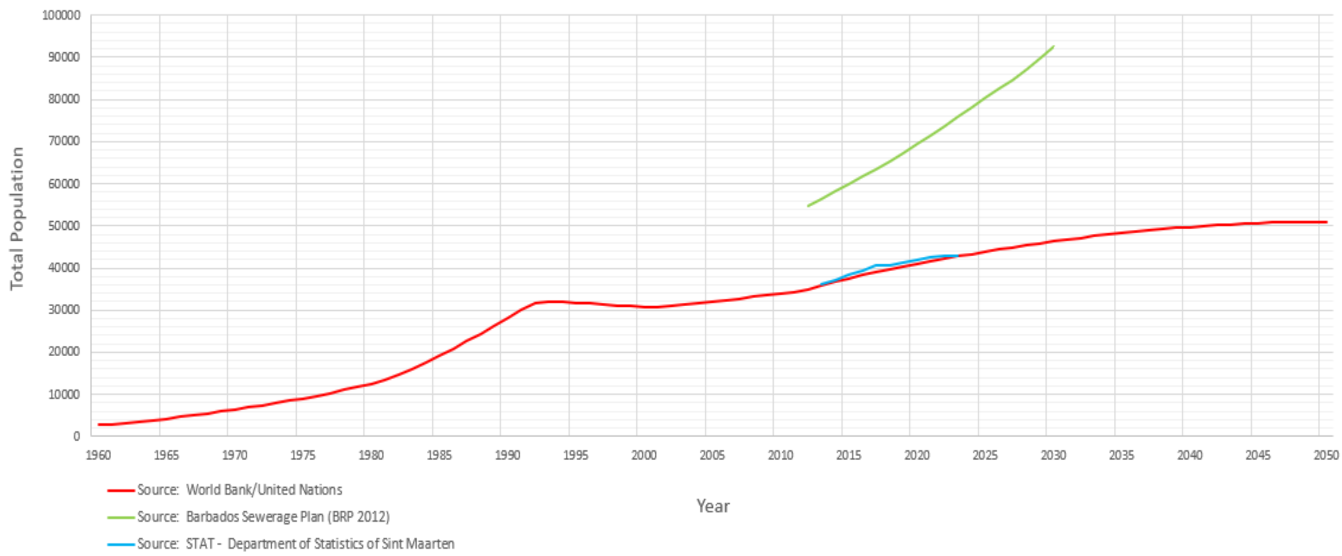

Figure 4.3 – Districts of Sint Maarten

The population estimates presented in Barbados Sewerage Plan (BRP 2012) is supported by the following:

[1] World Bank -World Development Indicators: https://databank.worldbank.org/source/world-development-indicators#

"Because the growth of the population during the years 2008, 2009 and 2010 could not be determined, an average relative growth was taken. The relatively large growth figure from 2011 can mainly be attributed to the Brooks Tower agreement, in which 5065 people previously illegally living on St. Maarten were legalized. The total population in 2012 is based on figures from the Census Office. For population growth up to 2025, the average population growth from 1992 to 2012 is therefore assumed. This realistic average growth amounts 2.98%."

As part of the technical team's first mission to Sint Maarten, scheduled for June 16–20, 2025, meetings with STAT - Department of Statistics of Sint Maarten are planned to discuss the population projections in Sint Maarten.

According to World Development Indicators, from 1960 to 2022, the population surged from just 2 715 to over 42 139, marking an astonishing increase of more around 1 450%, which positions Sint Maarten as one of the most densely populated areas in the Caribbean. The total population of Sint Maarten is 42 577 inhabitants, according to the STAT 2022 population estimate, in an area of 34 Km^2. In 2022, people over 65 years of age accounted for 12.8% of the total population, an increase of around 327% compared to the year 2001.

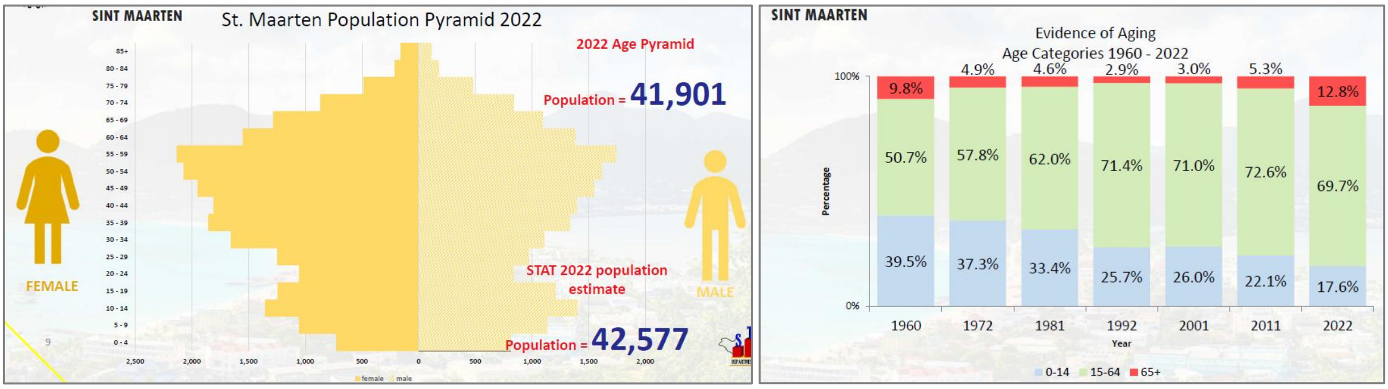

Figure 4.4 – St. Maarten Population Pyramid (2022) and Age Categories 1960-2022 (Source: STAT[2])

In 2023, there were 87.1 women per 100 men and 112.2 older people (65 years or older) per 100 children under 15 years of age. The population density is approximately 1 232 inhabitants per km^2.[3]

There is **immigration** from all over the world, predominantly from Dominican Republic, Haiti and Jamaica.

4.4.2 Environmental and Social Baseline

As previously mentioned, Sint Maarten covers an area approximately 34 km^2, to the southern part of the Caribbean Island of Saint Martin.

Geology and Geomorphology

[2] Sint Maarten Population 2022 Report - STAT
[3] https://www.cia.gov/the-world-factbook/about/archives/2023/countries/sint-maarten/

The bedrocks of Sint Maarten consist primarily of andesite tuff and tuff breccia from Eocene volcanic events. These have been intruded by basalt, quartz diorite, and andesite. Later volcanic activity caused intrusions which metamorphosed the rock and caused the tuff to tilt and fold. Limestone and marl were deposited on the eroded surfaces of these materials. There are limestone caverns on Sint Maarten/St. Martin where the softer limestone was exposed.

At the end of the Pleistocene glaciation, ice melted and the sea level rose. The large, single island flooded and only the highest parts remained above sea level – forming the islands of St. Martin/St. Maarten, Anguilla and St. Barthélemy as they are known today. The tuffs form the Pointe Blanche formation, which is most visible at the southern end of the island. The Simpson Bay Lagoon, Great Salt Pond, Great Bay and other bays and lagoons are drowned valleys.

The island has hilly terrains where elevation ranges from near sea level to about 420 m above mean sea level. Based on a publication of ABEBE et al. (2019), the study area of Cul de Sac is limited by two upland areas reaching 360 m.

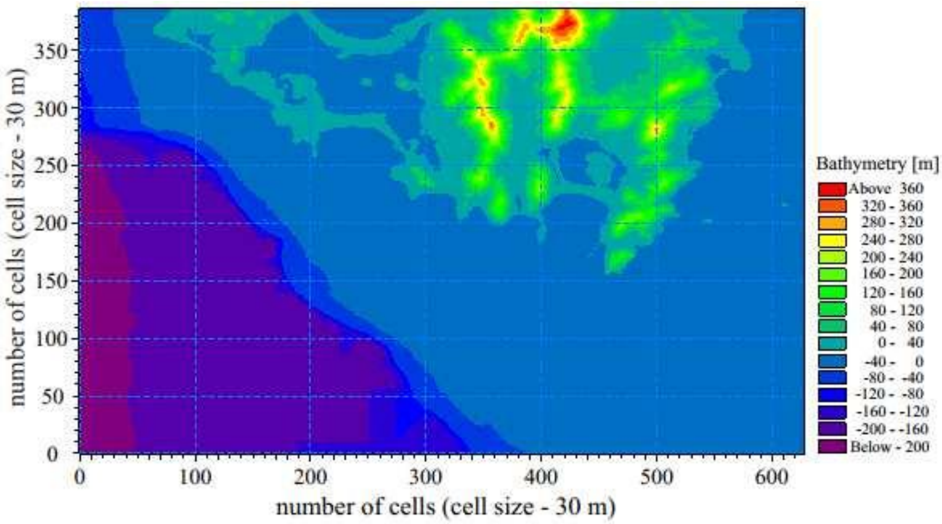

Figure 4-5 – Topography and Bathymetry of Sint Maarten and specifically at the study area (black circle) (ABEBE et al., 2019[4])

The coastline is a series of beaches, coastal lagoons, rocky areas and salt and fresh water (brackish) ponds, and the interior is characterized by many valleys.

The country is vulnerable to earthquakes. The island is located in the Eastern Caribbean, which is an island arc system formed at a convergent plate boundary, more specifically, at a subduction zone where two tectonic plates meet and the denser plate is forced beneath the lighter plate. This phenomenon is the main cause of seismic activity resulting in earthquakes (and volcanoes) in the Eastern Caribbean.28 On

[4] ABEBE, Y.A., A. Ghorbani, I. Nikolic, Z. Vojinovica and A. Sanchez (2019). *Flood risk management in Sint Maarten – A coupled agent-based and flood modelling method*. https://www.elsevier.com/open-access/userlicense/1.0/

November 13, 2020, a magnitude 4.7 earthquake, with a depth of 31km and located 64km north-northwest of St. Kitts and Nevis, was felt in several Caribbean islands, including St. Maarten (although with minimal impacts) (UNDRR, 2022[5]).

Climate and Climate Changes

The **climate** of Sint Maarten is tropical with hot and sunny weather all year around. Daily average temperature ranges from 25 degrees Celsius (°C) in the period from January to March, to 28 °C between June and October. The night temperature rarely drops below 20°C, while sometimes it can reach 35/37 °C during the day, from June to November.

Average annual rainfall is 1045 mm. In the period from June to November (but mostly from August to October), Sint Maarten can be hit by tropical depressions and hurricanes, as happens in general in the Caribbean. Sint Maarten is located within the Atlantic hurricane belt, and hence, subject to frequent hurricanes, being the Hurricane Irma the latest occurring in this area (2017). The damages due to hurricanes are associated with one or a combination of strong wind, storm surge, pluvial flooding and mudslides. The compounding effect of these extreme weather events, storm surges, and sea level rise in the Caribbean would affect – on average for small island tourism economies – an estimated 10 percent of the population and at least 50 percent of tourism resort infrastructures (UNDP, 2010 in [6] PETERSON, 2019).

Wind speed is prevailing from the east to northeast, with consistent monthly average of about 5 m/s at an elevation of 10 m above the ground. In the study area, the winds do not exceed 6.5 m/s. This parameter is important for the odour dispersion.

[5] UNDRR (2022). *Disaster Risk Reduction in Sint Maarten, Situational Analysis 2022*. United Nations Office for Disaster Risk Reduction (UNDRR). 58 pp

[6] PETERSON; R.R. (2019). *Whence the twain shall meet: Weathering overtourism and climate change in small island tourism economies*. The 51st Annual Monetary Studies Conference St. Kitts, November 2019. 68 pp

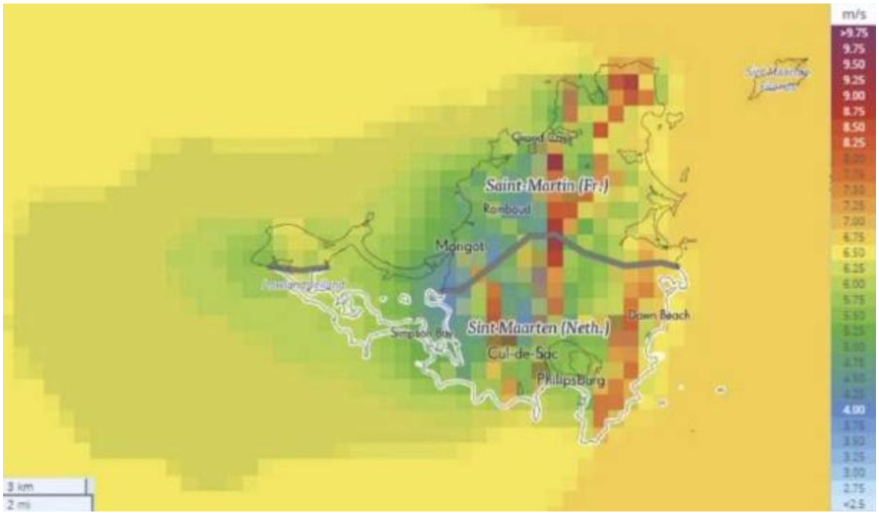

Figure 4-6 – Average wind speed at a height of 50 m above the ground (SMG, 2023[7])

St. Maarten has undertaken various initiatives that contribute to **climate adaptation and mitigation**. The National Development Vision 2020-2030 recognizes climate change as a major challenge and emphasizes the need for sustainable infrastructure and improved disaster resilience. Initiatives in renewable energy and sustainable waste management also exist. For example, the National Energy Policy 2014 states that dependence on fossil fuels must be reduced and the energy infrastructure must be more resilient. In addition, the Wastewater Management Project is working on improving wastewater processing, which indirectly contributes to climate adaptation.

Hydrology

While there are dry **gulches** that may fill temporarily after strong rains, there are no permanent **rivers**.

The water tables of the plains are more or less brackish.

Soils and Land Uses

The soils of St. Maarten are in a young stage of development. This is demonstrated by the shallowness of the soils, the poor development of the subsoils and the presence of shell and rock material in the soils. The soils in the vicinity of Philipsburg fall into the category of the coastal low land soils. These soils are divided into two groups: well drained sandy soils and imperfectly and poorly drained mineral soils.

Regarding **land use**, the lowlands are highly urbanized with predominantly residential buildings, and businesses are located mainly along the coast.

Within the study area (Cul de Sac), the neighbourhoods are mainly residential with commercial activity mainly observed along the main roads. In addition, these areas are characterized by the presence of

[7] SINT MAARTEN GOVERNMENT. *Installation of a Temporary Weighbridge and Reconstruction of the Access road to the MSW Site. Daily Management of the MSW Site Operations including Fire Suppression and Slope Recontouring*. Environmental and Social Impact Assessment (ESIA). 662 pp

facilities such as: (pre) schools, sports and recreational facilities, medical facilities, pharmacies, community centers, hurricane shelters, churches, grocery stores, and other types of stores like salons, restaurants/bars, gas stations and car shops/garages.

The roads in the residential areas are in general narrow and works will hinder traffic, also because most of the parking is done either along the roadside or on the road shoulders (NRPB, 2024[8]).

Biodiversity and Landscapes

At present, Sint Maarten is home to one marine park (Man of War Shoal Marine Park, located in the south coast of Sint Maarten) and one wetland of recognized international importance (RAMSAR Simpson Bay Lagoon, located in the west side of Sint Maarten). However, neither have been established as a nature park through the Nature Ordinance to enable maximum protection. At present there are no terrestrially **protected areas** (nature parks), aside from the protection afforded to Fort Amsterdam through zoning plans which designate the area as a registered historical site and as a nature conservation zone.

St. Maarten pond areas are also important for the biological ecosystems of the island. Together with Fort Amsterdam and Pelican Rock, the ponds of Little Bay Pond, the Great Salt Pond and Fresh Pond form the five Important Bird Areas of St Maarten.

The major part of Sint Maarten is covered with secondary **vegetation** derived from either seasonal formations or dry evergreen formations. Only on the top of the hills, some more or less original semievergreen seasonal forest (tropical deciduous forest) is found. This type of forest has regionally become extremely rare too. Because of its small area, this forest formation is very vulnerable.

On the higher hills of the two ridges in the middle part of the island, and the hills of the eastern ridge, dense secondary woodland vegetation is growing (mainly acacia), preventing erosion and with a high scenic value. Refers also the patches of savanna dominated by tall grass. Along the coast and inland waterways there are remains of mangrove forests and other types of coastal vegetation survive, which are of high ecological, aesthetic and recreational value.

There are numerous salt ponds on the island, and most are ringed with mangrove wetlands. In coastal areas that are not developed, littoral (seaside) forest or scrub can be found.

[8] NRPB (2024). *Environmental and Social Management Plan (ESMP) For the Expansion of the Sewerage Network*. Sint Maarten Wastewater Management Project. 156 pp

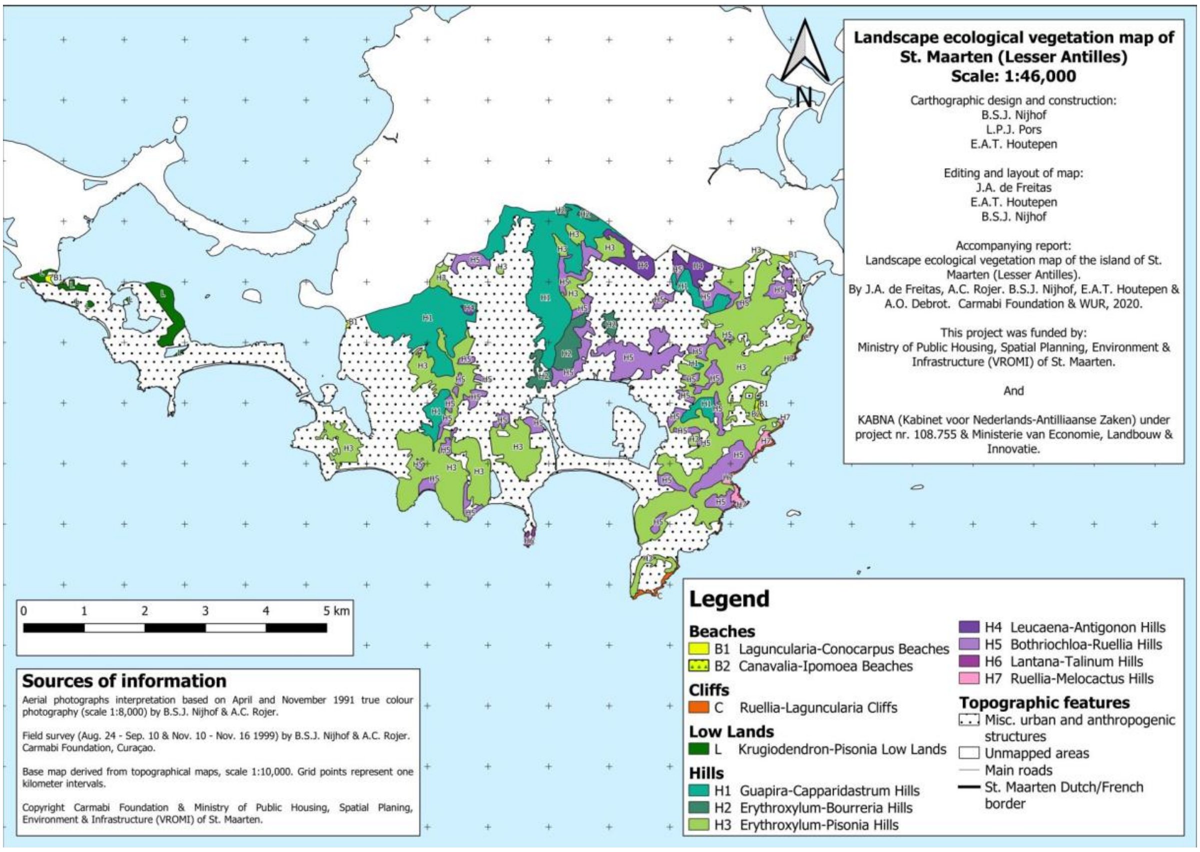

Figure 4-7 – Landscape ecological vegetation map of St. Maarten (1:46,000) (FREITAS et al., 2020[9])

Due to the relatively shallow depths surrounding Sint Maarten, the marine environment is characterized by expansive seagrass beds. Seagrass ecosystems are considered to be amongst the most productive ecosystems in the world. The seagrass beds of Sint Maarten provide a biological filter system for the waters within the bays and lagoons, besides providing a nursery and habitat for certain commercially and recreationally valued species.

The **fauna** is limited, with a relatively low diversity of native fauna, particularly those that cannot fly. The introduction of nonnative animals, both accidental (rats, mice) and deliberate (livestock, mongoose) has also been implicated in the destruction of habitat and the extinction of native species. More recently, development for tourism has resulted in further habitat destruction and degradation of habitats such as the lagoon and the numerous salt ponds on the island.

Mangroves provides the necessary habitat for roosting, nesting and migrating birds, with special emphasis at the Great Salt Pond, located at east of the WWTP. Despite the development of the surrounding area and subsequent stress to the ecosystem, the Great Salt Pond provides important foraging areas for many

[9] De FREITAS, J.A., A.C. Rojer, B.S.J. Nijhof, E.A.T. Houtepen & A.O. Debrot (2020). *Landscape Ecological Vegetation map of St. Maarten (Lesser Antilles).* Caribbean Research and Management of Biodiversity Foundation, Curaçao Wageningen University & Research, Netherlands. 78 pp

birds and the brackish and sometimes hypersaline conditions give rise to a unique wildlife community that includes several fish species, turtles, snails and insects.

As the waters around St. Maarten are relatively shallow, without much exchange between coastal and deep-water currents, corals and other organisms on reefs are exposed to any terrestrial influences including freshwater runoff, sedimentation, nutrients, etc.

Quality of Life

The increase in the elderly adult population and the number of people that develop chronic non-communicable **diseases**, in addition to existing vector-borne diseases is increasing demand for health resources and opportune response.

Health care delivery in Sint Maarten operates through primary and secondary health services, through private health care professionals, NGOs, and governmental health care organizations.

Life expectancy at birth in 2024 was 76.5 years, lower than the average for the Region of Americas and 2.1 higher than in 2000 (74.4y) (PAHO, 2024[10]).

Regarding **air quality**, refers the study developed by the Dutch National Institute for Public Health and the Environment (RIVM) in 2019, with the results presented in the ESIA for the Municipal Solid Waste (MSW) site project (SMG, 2023[11]). Air quality measurements were performed during two weeks in the locations presented in

Sample locations (A-D) are fixed monitoring locations with 24/7 sampling equipment and Sample locations (1-14) are historical and instantaneous locations using other techniques. Within the study area limit (black circle in **Figure 4-8**), there are three measurements sites that will be used as baseline data for the present project.

[10] PAHO (2024). *Sint Maarten. Territory Profile*. https://hia.paho.org/en/country-profiles/sint-maarten

[11] SINT MAARTEN GOVERNMENT. *Installation of a Temporary Weighbridge and Reconstruction of the Access road to the MSW Site. Daily Management of the MSW Site Operations including Fire Suppression and Slope Recontouring*. Environmental and Social Impact Assessment (ESIA). 662 pp

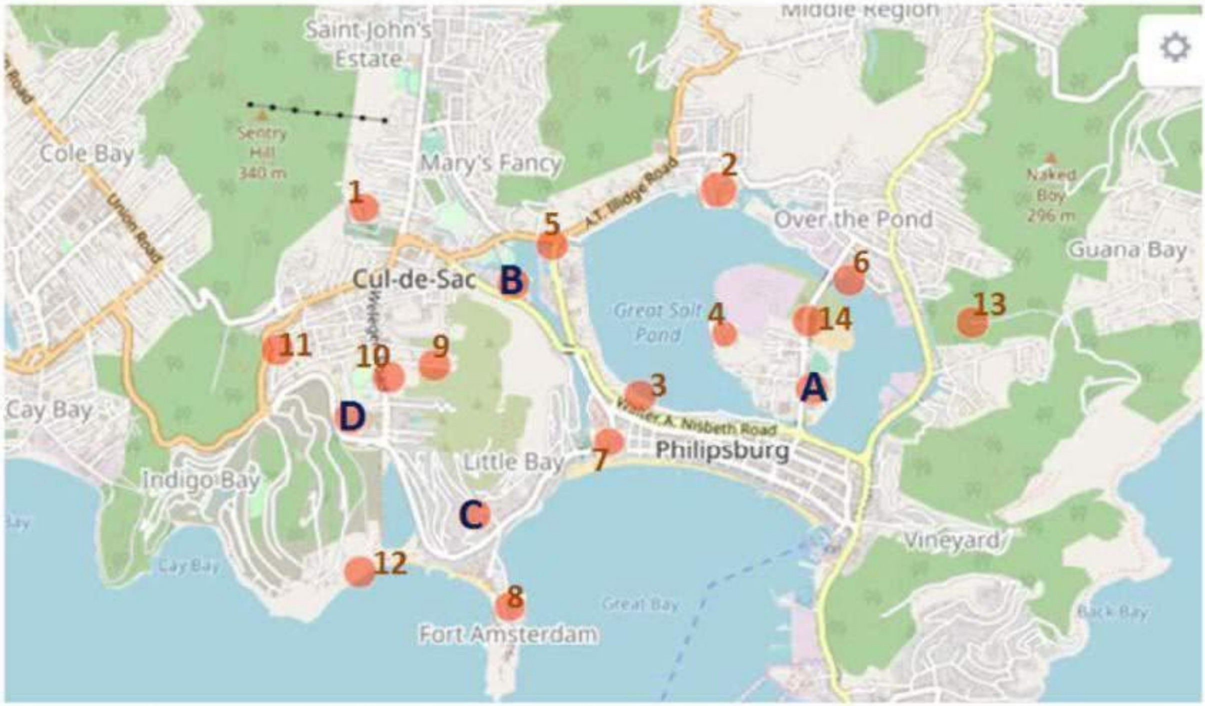

Figure 4-8 – Sampling points by RIVM, 2019 (in SMG, 2023[12])

In terms of main results, some higher concentrations were found, mainly associated with traffic congestion. Odour was detected by the field technicians during the measurement period.

As described in the ToR, in 2019 **water quality** analysis were performed in the Great Salt Pond that indicated high presence of contaminants attributed to influx of sewage and terrestrial run-off from surrounding areas and leachate discharges from the Municipal Solid Waste site(s).

Reference to the existence of plastics and other **waste** items (solid and liquid) in both Fresh Pond and Great Salt Pond was also mentioned in the ToR.

Economy

Tourism and the tourism-related industry is the major source of employment in the country. Only about 10 % of the land is suitable for domestic agricultural production, and over 90% of food products are imported.

Sint Maarten is considered one of most tourism intense, dense, and dependent small island tourism economies, which is related to the overtourism classification. Overtourism refers to the social inequality and the environmental destruction due to excessive tourism consumption and tourism-related infrastructure expansion.

[12] SINT MAARTEN GOVERNMENT. *Installation of a Temporary Weighbridge and Reconstruction of the Access road to the MSW Site. Daily Management of the MSW Site Operations including Fire Suppression and Slope Recontouring*. Environmental and Social Impact Assessment (ESIA). 662 pp

In 2022 the Department of Statistics reported 372,808 stay-over arrivals and 844,090 cruise passenger arrivals, which increase notably the pressure on the country services (water, wastewater, health, etc.)

Communication routes are by sea, with two commercial ports, and by air, with the Princess Juliana/SXM international airport (on the Dutch side) and the Espérance regional aerodrome (on the French side).

The per capita Gross Domestic Product (GDP) of Sint Maarten is USD 25,381. Meanwhile, nearly 30% of the male working population (45% for female workers) earn less than NAf 2,000 (USD 1,200) per month (VROMI, 2021[13]).

4.4.3 Water Supply

According to the information shared by NRPB and VROMI under the weekly meetings with the consultant team, water supply coverage in Sint Maarten is approximately 90%.

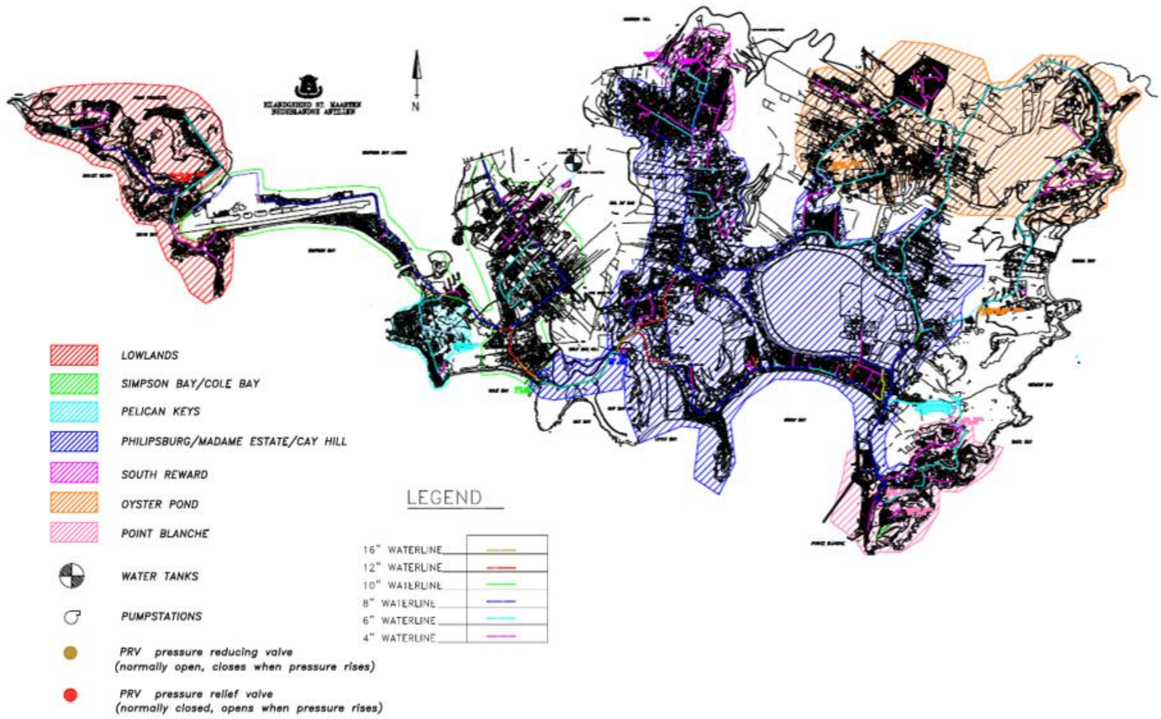

Figure 4-9 – Sint Maarten water consumption network (Source: GEBE - Gemeenschappelijk Electriciteitsbedrijf Bovenwindse Eilanden, 2019)

NV GEBE is responsible for electricity production and water distribution in St. Maarten. According to this entity, the daily water consumption in Sint Maarten, in 2007, achieved 12 950 m^3, distributed by the following consumption areas:

[13] VROMI (2021). *Nature Policy Plan Sint Maarten 2021 – 2025*. 86 pp

Figure 4-10 – Sint Maarten water consumption by consumption area (Source: GEBE - Gemeenschappelijk Electriciteitsbedrijf Bovenwindse Eilanden, 2019)

There are no water springs or rivers on the island. Sint Maarten relies heavily on desalination plants for its water supply, particularly on the Dutch side, where Seven Seas Water Group operates state-of-the-art facilities using reverse osmosis to convert seawater into potable water. These plants, like those at Point Blanche, Cupecoy, and Cay Bay, have a combined production capacity of over 6.4 million gallons per day (23 900 m^3/d).

4.4.4 Sanitation

4.4.4.1 Sewerage

According to The National Recovery Program Bureau (NRPB), in 2024, for about 90% of households on Sint Maarten, wastewater is collected in septic tanks, soak-aways, and cesspits. However, a large portion still finds its way directly into the environment. When these tanks are not emptied regularly, they overflow, causing sewage to spill into streets, public spaces, and eventually ending up in beaches and ponds. This untreated wastewater carries harmful pollutants, chemicals, and diseases, posing serious risks to both human health and ecosystems.

The reason for inadequate sanitation system is, mainly, due to:

- Budget deficits leaving no room for capital expenditures, or budget allocation prioritized for other projects;
- Lack of a wastewater financing model;
- No tariff / billing system for the provision of public wastewater services.

Sint Maarten's sewerage network has limited coverage, with only 10% of households connected to the national system, which conveys wastewater to the Government-operated treatment plant located on A. Th. Illidge Road.

Despite rapid economic development and population growth in recent decades, investment in wastewater infrastructure has not kept pace. Consequently, the existing public sewerage network covers only certain districts and neighborhoods, leaving large areas and a significant portion of the population without proper sewerage connections.

While the Government of Sint Maarten has made several investments, including building a wastewater treatment plant (WWTP) and developing sewerage infrastructure in various areas, it is estimated that only 23% of GEBE’s water customers have sewer connections.

Additionally, less than 11% of properties, approximately 2 000 in total, are connected to the wastewater system.

This has led to inadequate sanitation, impacting both residents and the tourism sector. Current sewerage network is presented on the map below, according to the **GIS data** shared by NRPB.

Figure 4-11 – Sewerage coverage in Sint Maarten (Source: NRPB GIS data)

The approximate length of the existing sewer network is 28Km, mostly in PVC material, with hydraulic capacity of between 110mm and DN500mm.

The pressure pipes are mainly in HDPE, with a range of diameters from 75 to 315 mm, and the total length is about 8 kilometers. The sewage system has a total of 14 pumping stations ranging from 2 to 46 KW.

Table 4.1 – Pumping Stations

Pumping Station Name	District	Size (kW)	Elevation
Jump Up Casino	Great Bay	2	0.7
Harbor View	Great Bay	2	3.3
Philipsburg	Great Bay	20	0.7
Hope Estate	Upper Prince's Quarter	2	2.4
PIT5 Madame Estate	Great Bay	15	0.6
PIT 1	Lower Prince's Quarter	11	8.8
Union Farm	Lower Prince's Quarter	2	46.9
PIT 2 Nazareth	Lower Prince's Quarter	15	22.1
PIT 3 Zorg en Rust	Lower Prince's Quarter	15	29.7
PIT 4 Mount William Hill	Lower Prince's Quarter	46	46.0
SML School	Lower Prince's Quarter	2	72.1
Middle Region	Lower Prince's Quarter	9	68.7
Fort Willem	Great Bay	2	1.8
MLK School	Lower Prince's Quarter	2	47.7
Carnival Village	Great Bay	-	0.4
Soualiga Boulevard	Great Bay	7	-0.2

The Sewerage Master Plan for Sint Maarten 2020-2030 (Version 2019) describes the current situation of the sanitation network at the time it was drawn up. The description comprises the network's coverage, its characteristics, its functional state and the intervention needs. The report is extended to the treatment facilities, identifying and prioritizing required actions, within the framework of the study area's environmental reference. As part of the technical team's first mission to Sint Maarten, to be held from 16 to 20 June 2025, meetings, interviews and fieldwork are planned with the relevant stakeholders, in order to confirm or update the information presented in this document.

For the sanitation solutions to be developed, it is important to know the morphology of the intervention area, in particular the main drainage basins and water lines. After a brief preliminary analysis of the existing data, this information is presented in the next figure:

Figure 4-12 – Sint Maarten drainage basins

According to the Storm Water and Drainage Policy Document (2022) from Ministry of Public Housing, Spatial Planning, Environment and Infrastructure of Sint Maarten, the main drains on Sint Maarten can be summarised as follows:

- Drain from Cul de Sac, along the L.B. Scotroad and (Zagersgut) Coralita road to the Fresh Pond and normally then pumped up via the Great Salt Pond into the Rolandus Canal and discharging to Great Bay;
- Drain for Upper Prince's Quarter, along Sucker Garden road via the Rolandus Canal to Great Bay;
- The drainage of Middle Region and Dutch Quarter to the French border, along A.T. Illidgeroad;
- Cay Hill drains through the gutter along Welgelegen to the Little Pond that overflows into the Caribbean Sea;
- Some water drains that end up in Simpson Bay Lagoon In Cole Bay;
- Drainage of the area around Dawn Beach drains along Westin to the Atlantic Ocean.

Figure 4-13 – Sint Maarten drainage basins (Source: Storm Water and Drainage Policy Document (Ministry of Public Housing, Spatial Planning, 2022)

However, according to the same source, the drainage system is too small to properly and safely drain the water during heavy to extreme precipitation events.

4.4.4.2 Wastewater Treatment Plant (WWTP) Illidge Road

Originally built in 1992 and upgraded in 2013, this plant is intended to serve the Greater Philipsburg area and other connected districts. Current design capacity corresponds to 60,000 eq. inhabitants, with a hydraulic capacity of 4715 m^3/day.

The wastewater treatment plant (WWTP) Illidge Road (**Figure 4-14**) consists of preliminary treatment (screening), oxidation ditch with selector and anaerobic stage upstream, secondary clarifier and sludge drying beds.

Figure 4-14 – Google Earth view of WWTP Illidge road

Figure 4-15 presents the major characteristics of the Illidge road WWTP unit operations.

Component	Key characteristics	Additional information
Septage Reception	Manual screen 40 mm spacing	Gravity flow to Inlet Pumps
	Volume 20 m^3	
Inlet Pumps	2 nos + 1 no standby	253 m^3/h per each pump
	total of 2 pumps = 506 m^3/h	
Screen	1 no units	manufacturer: Huber, type: Rakemax
	8 mm open spacing	
	Hydraul.capacity = 480 m^3/h	
Selector	Volume 330 m^3	(devided over 4 compartments)
Anaerobic Tank	Volume 330 m^3	Total anaerobic volume of
	(1 compartment)	Selector + Anaer.Tank: 660 m^3
Aeration Tank	Volume 4100 m^3	Single Carousel type tank.
	Water depth 4.0 m	MLSS = 3.5 kgSS/m^3 assumed for design.
	2 Aerators	Manuf: Landustrie, type: Landy7 (Ø2.2m)
		2x62 kW motor, 2x56 kW aer.shaft,
		OC(20)=129 kgO2/h,
	1 Mixer	Manuf: Landustrie, 1x7.5 kW.
Final Sedim.Tank	1 no unit	SVI = 170 mL/g assumed for design.
	Diameter 30.0 m	qA = 0.67 m3/m2/h
	Surface 707 m^2	
	Side water depth 2.0 m, center 3.08 m	
Return sludge pumping	1 no screw pump	
	390 m^3/h	
Excess sludge pumping	2 nos pumps	Wet mounted pumps.
	2 x 60 = 120 m^3/h.	2x 2kW.
Gravity thickener	1 no unit	With mechanical rake.
	Diameter 11.8 m, depth 3.5 to 3.9 m.	
	Surface 109 m^2, Volume 405 m^3.	
Pumps thickened sludge	2 nos pumps	Dry mounted pumps.
	2 x 20 = 40 m^3/h.	2x 5.5kW.
Drying Beds	9 units a 10x10 m (100m^2)	
	6 units a 10x17m (170m^2)	
	A(total) = 900+1020 = 1920m^2	

Figure 4-15 – Summary of WWTP Illidge road (Annex 2: technical assessment and capex analysis for the WWTP at a.t. Illidge Road)

The WWTP influent is composed of three different sources: (1) wastewater from Phillipsburg, (2) septic wastes from household and commercial activities conveyed by trucks and (3) wastewater from Belvedere and the Dutch side.

The treated effluent from the WWTP is discharged into Fresh Pond, which connects to the Great Bay Area via a channel that is only opened during periods of heavy rainfall. Fresh Pond also receives additional flows from surface runoff and from the Great Salt Pond through a lock and channel.

Water quality assessments conducted in the Great Salt Pond in 2019 indicated a high presence of contaminants, attributed to sewage influx, terrestrial runoff from surrounding areas, and leachate discharges from nearby Municipal Solid Waste sites.

Both the Great Salt Pond and Fresh Pond have been recognized as Important Bird Areas (IBAs) by BirdLife International, as they support populations of several threatened or restricted-range bird species. Additionally, both ponds are impacted by plastics and other waste materials (solid and liquid), which affect the biodiversity in the region.

Legislation

Treated effluent quality requirements, according to the Hindrance Permit HP.12.006, are presented in Figure 4-16.

F2. Effluent Quality

1. The following table (1) denotes the maximum quantity of the mentioned parameters allowed for the Effluent Quality discharges of the STP

Table 1

Parameter	Unit	Value (yearly average)	General Max. Value*
BOD	mg O_2/l	5	7
COD	mg O_2/l	100	150
Nitrogen	mg N/l	10	12
Phosphorus	mg P/l	2	4
Fecal Coli form	100 ml^{-1}	300	350
Chlorine	mg/l	1,5	2
Suspended Solid	mg/l	10	15
pH	-	6-9	-

* Maximum value at any given moment.

Figure 4-16 –WWTP Illidge road Effluent Quality Requirements (Hindrance Permit HP.12.006)

According to the National Waste Ordinance (AB 2013, GT nr. 135) and the National Ordinance Wastewater (AB 2013, GT no. 142, COUNTRY REGULATION) it is prohibited to discharge and or store environmentally untreated, damaging and or dangerous substances (liquids) into the soil or surface waters (https://decentrale.regelgeving.overheid.nl/cvdr/xhtmloutput/historie/Sint%20Maarten/208544/208544_3.html).

Figure 4-17 is presented the Water quality norms for surface water St. Maarten according to the End Report Environmental Norms, Netherlands Antilles, June 11, 2007, which is followed by St. Maarten.

Tabel V: normen oppervlaktewater Nederlandse Antillen

Parameters: Watertypen:	Zuurstof (DO) mg/l	N-tot. mg N/l	P-tot. mg P/l	Fecaal Coli x/100 ml	Olie/vet mg/l*	Doorzicht (meter)
Recreatie	>5	0,10	0,02	5	0,5	5-25**
Natuur	>5	0,014	0,003	100	0,1	25
Industrie	>0,8	1,27	0,10	100	3	5
Overig (lagunes, meren, estuaria, overig zee)	>4	0,15	0,02	200	0,5	5-25**

Toelichting tabel V:

* tevens: geen waarneembare (zichtbare of ruikbare) vervuiling
** sterk afhankelijk van type water
- oppervlaktewater: zeewater en binnenwateren (lagunes, 'ponds', baaien, saliña's e.d.)
- normen zijn grenswaarden die niet overschreden mogen worden, tenzij anders is aangegeven. Zuurstof (DO) is de minimaal toelaatbare waarde
- naast deze normen geldt toepassing van het **stand-still beginsel** (open norm): handhaving huidige kwaliteit indien die beter is dan normen aangeven (zie FAQ Milieunormering Algemeen, vraag 4)
- verdere toelichting op de tabel: zie Frequently Asked Questions vraag 8

Figure 4-17 –Surface water St. Maarten water quality standards

Operational findings

According to site visit on Nov.02, 2022 and March 13, 2023, based on the data and information provided by the operator, at present a total average flow of about 2,800 m^3/d of wastewater and septage is being treated. Of this total flow about 2,400 m^3/d originate from wastewater and 400 m^3/d originate from septage (48 septage trucks), with an associated annual average pollution load amounts to about 17,400 PE60, which corresponds to 65% of WWTP capacity[14].

As mentioned before, treated effluent is discharged by gravity into 'Fresh Pond'; flowing from there via a canal towards the sea. The sea outlet into 'Great Bay' is usually closed by sand, which, however, can be removed in case of strong rainfall / high water level in 'Fresh Pond'[15].

Approximately 1200 m^3 tons of sludge are now produced every year[16]. An average of 15 monthly trucks are required to deliver the sludge to its disposal location, i.e. to the municipal landfill[17].

[14] Annex 2: technical assesment and capex analysis for the WWTP at a.t. Illidge road
[15] Sewerage Master Plan 2020 – 2030
[16] Sewerage Master Plan 2020 – 2030
[17] Annex 2: technical assesment and capex analysis for the WWTP at a.t. Illidge road

This sludge is used as a cover material on the "Sanitary Landfill on Pond Island". In the event of rain, storm water is also pumped to the purification system due to incorrect connections. The hydraulic capacity and thus the treatment process are unnecessarily overloaded at these times[18].

According to the technical assessment and capex analysis performed during Nov.02, 2022 and March 13, 2023 it could be checked in **Figure 4-18** that WWTP Illidge Road had a good performance, according to the Hindrance Permit HP.12.006, although there is are some temporary high values probably related with a higher number of septage trucks.

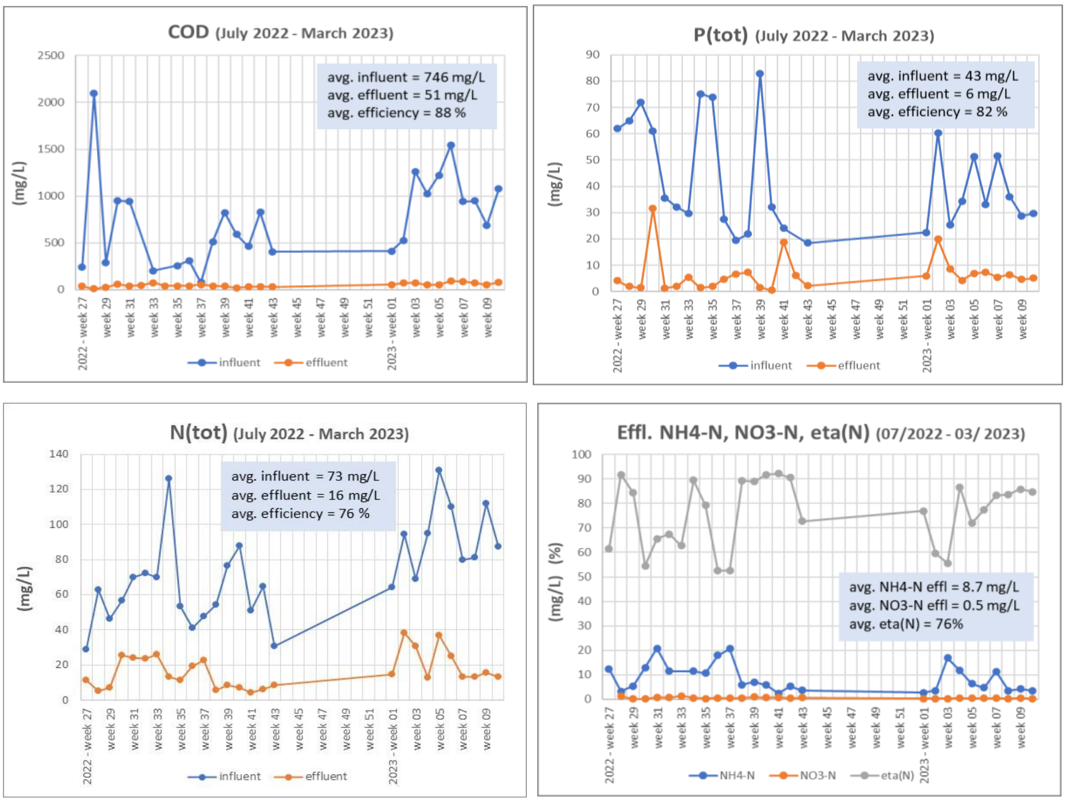

Figure 4-18 –Influent and Treated Effluent quality 01/2022 – 04/2023

Moreover, Figure 4-19 presents the available truck load historical data from 01/2022 to 03/2023, where it seems that WWTP receives an average value of 48 trucks/day. Also, it should be noted that there has been an increase of trucks as from September in the order of 8 trucks/day.

[18] Sewerage Master Plan 2020 – 2030

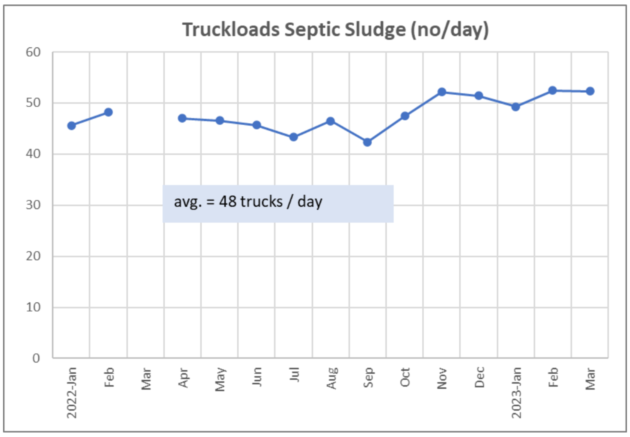

Figure 4-19 –Truckloads septic sludge: 01/2022 – 03/2023

It is also mentioned, in the site visits on Nov.02, 2022 and March 13, 2023 that urgent repairs and replacement of works (installations and equipment) are needed at the WWTP.

Operational bottlenecks

It should be highlighted that the following bottlenecks presented are strictly based on information provided and therefore will be validated in the site visits that will be done in June and July.

- Sewage system coverage vs Truckload septic tanks management.
- Wet weather and CSO management.
- WWTP expansion.
- Influent Pumping Station capacity.
- Phosphorus effluent standards.
- Treated effluent disinfection.
- Sludge dewatering solution.
- Sludge management.
- Improved automation system, and SCADA.
- Operation and maintenance.

5. CRITICAL POINTS AND MITIGATION MEASURES

This section presents possible critical aspects that may affect the adequate development of this assignment, whose solution should be considered on subsequent phases, in order to assure the fulfilment of the objectives and schedules defined in the workplan. The 7-month period for the development of Phase 1 of the assignment is a challenge, and all the aspects identified here must be addressed.

Next table summarizes the issues identified as potentially critical, presenting also possible mitigation measures for solving them.

Table 5.1 – Critical points and mitigation measures

Critical issues	Mitigating measures
Availability of information associated to the existing infrastructures	a) Effective communication and coordination between the Consultant Team and the Client, including: – Weekly Meetings; – Presentation of results to the Client with each Deliverable submission.
Availability of other existing data (e.g. population census data and projections by district, etc)	b) NRBP involvement in data collection (data to be provided preferably in digital format and georeferenced);
Identification of all relevant stakeholders	d) Stakeholders' involvement on the decision-making processes;
Evaluation of project draft documents and compilation of comments	e) Support on the evaluation of Environmental and Social issues.

As per the mitigation measures, some aspects should be highlighted:

a) Effective communication and coordination between the Consultant Team and the Client

The timely accomplishment of the Project activities depends on the successful communication and cooperation between the Client, the Consultant and other relevant stakeholders. All thematic and organizational aspects of the Contract will be agreed upon with the Client. Regular and frequent meetings will be arranged between the Client and the Key Experts proposed for the Project, with expected weekly meetings.

The Joint-Venture considers that the following issues are the most critical:

- In supporting the interaction with the main agencies and other stakeholders;
- In appointing a technical committee to monitor the project, providing support for the project team to clarify doubts and validate documents;
- In ensuring access to the documents that may be relevant to the development of the project.

With this close monitoring of the assignment by the Client, it is expected that these aspects are quickly overcome, to comply with the established timetable. In addition, for the optimization of the assignment schedule and the communication with the Client, it is the Consultant's purpose, the implementation of the following actions:

- Present results to NRBP with each Deliverable submission;
- Share all the relevant information in a "cloud" (Sharepoint) as already stated in section 3.4.3;
- Allow the permanent and up-to-date access to online information of the state of the project by the Client.
- NRPB involvement in data collection.

The main challenge of the Project development is to accomplish the activities of each stage in the required timeframe. Available information, notably recent strategic and policy documents, databases and maps (preferably in digital format and georeferenced), will be the main basis for setting the Project's baseline. Since an intensive level of effort is needed under a tight timeframe, the active involvement and availability from the Client's staff is essential not only for providing data but also to follow the site visits and the technical surveys, when necessary.

Having adequate and quality data at one's fingertips allows for a precise analysis, good results and a rapid intervention in ongoing programs. For this reason, we consider data of high quality and the access to this data to be crucial for the development of the Project.

b) Stakeholders' involvement on the decision-making processes

One of the main critical key issues corresponds to bringing different groups of stakeholders into a dialogue in an iterative and adaptive way. The engagement of multiple stakeholders in dialogue, negotiation, and deal making for achieving a consensus, knowing that there are the ones in favour (allies) and the ones against (blockers or decelerators) is always a risk and in this case, given their importance for the overall strategy and project, a critical key issue that should be moderated, not only with the relative influence of each stakeholder (varying from low to high) but also with support of the Consultant team.

In fact, although this globally in a consensual project, there are several key aspects that can lead to disagreements between the stakeholders and a weakness and/or a threat to achieve the expected outcomes.

Due to the diversity of possible key-stakeholders, the Consultant's experience shows that in a very early stage of the assignment, an effective consensus at key-stakeholder's level about the structure, outputs and criteria to be followed in each stage of the Project must be built and agreed. It might be a time-consuming challenge the decision making of all stakeholders, which is to comply with the assignment timeframe.

It is expected the leading part of NRPB on the selection and invitation of stakeholders for participating in this Project.

Environmental and social issues

In all kind of projects, but specially in projects that deal with environmental and social studies, the Stakeholders involvement and decision-making processes, the effective communication and coordination and the data collection and its quality are essential for the success of such Projects. Therefore, these key issues and their mitigation control are critical to adequately identify and collect all the adequate information to the Environmental and Social Assessment.

The success of these activities will be crucial to a fine-tuned assessment of the environmental and socio-economic and cultural background of the project area and the associated population involved.

All environmental and social studies depend strongly on the correct planning and development of all activities either from project design (the JV will work closely to articulate all the relevant aspects for the E&S issues) as well as from the interaction with the stakeholders and the population that might be affected by the project. Client support with the interaction with the main agencies and other stakeholders is of major relevance.

All public infrastructures that deal with important sewerage schemes usually have a positive impact on populations. But, according to the dimension and size of these infrastructures, sometimes they have direct negative impacts that can jeopardize the daily life of the surrounding communities. A precise evaluation and estimation of the project affected areas and the precise quantification of project affected people (PAP) by these new infrastructures is a key critical issue. Consequently, it is also important to evaluate and define how these negative direct impacts can be minimized.

The climatic conditions may also be a critical issue that may affect the field surveys, where an attempt will be made to schedule these field surveys based on the climate daily/weekly projections.

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