Project for a Climate Resilient Water Sector in Grenada (CREWS)

Environmental and Social Assessment
Environmental and Social Management Plan (ESMP)

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Contents

Acronyms

CESMP	Construction ESMP
DI	Ductile Iron
DFID	United Kingdom's Department for International Development
EbA	Ecosystems-based adaptation
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FIDIC	International Federation of Consulting Engineers
GDB	Grenada Development Bank
GHTA	Grenada Hotel and Tourism Association
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Organization for Development Cooperation)
GNOW	Grenada National Organization of Women (GNOW)
GoG	Government of Grenada
IAGDO	Inter Agency Group of Development Organisations (IAGDO)
ISO	International Organization for Standardization
MALFF	Ministry of Agriculture, Lands, Forestry and Fisheries
MGD	Million (imperial) gallons per day
MOFE	Ministry of Finance and Equipment
MoWPU	Ministry of Works and Public Utilities
NAWASA	National Water and Sewerage Authority
NDA	National Designated Authority
NIS	National Insurance Scheme
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
PCU	Project Coordination Unit
PMC	Project Management Committee
PPE	Personal Protective Equipment
PPP	purchasing power parity
PSC	Project Steering Committee
PVC	Polyvinyl chloride
SIDS	Small Island Developing States
SPECTO	Saint Patrick's Environmental and and Community Tourism Organization
SWRO	Salt Water Reverse Osmosis
ToR	Terms of Reference
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WIS	Water Information System

Executive summary

Water supply in Grenada

The National Water and Sewerage Authority, NAWASA, is responsible for Grenada's drinking water supply. NAWASA manages 28 small water supply systems and produces an average of 32,700 m^3/day, or 7.2 million gallons per day (MGD), of potable water.

Annual rainfall in Grenada is high, but there is very a marked dry season from January to May. NAWASA produces about 90% of Grenada's drinking water from surface water, which is water collected from streams by means of small dams and intake structures. Water is treated in water treatment plants (WTPs) and piped to customers mostly by gravity. Almost all Grenada's inhabitants (97%) are connected to the water supply system. Some customers collect an additional supply of rainwater in tanks, a practice called "rainwater harvesting".

While in the rainy season the supply exceeds the water demand, there is a considerable water deficit in the dry season.

NAWASA produces approximately 10% of its drinking water from groundwater wells near the southern coast. This resource is less variable in time than surface water, but shows signs of salinization. Carriacou and Petite Martinique islands have no surface water, and their inhabitants use rainwater collection, plus, more recently, water from two new seawater desalination plants which are functioning on solar power.

Current challenges and adaptation capacity

Interruptions in the water supply are frequent in Grenada, because of the erratic availability of river water and because of technical deficiencies in the water supply system. During heavy rainfall or storms, the WTPs have to shut down because of excessive sediment loads in rivers. It is difficult to maintain the water infrastructure on a small island with limited human and technical resources. Sourcing spare parts and equipment is a challenge. Leaking pipes cause water losses, water quality deterioration, and interruptions in supply due to repair works. These problems tend to hit the poorer households harder because they have fewer alternatives. Deficiencies in water supply also have a higher impact on women, who are more frequently in charge of water-related tasks in the household.

Climate change has already begun to aggravate this issue of inadequacy between available water resources and water demand, and will continue to do so. Along with an increase in average temperatures, which will increase evapotranspiration and water demand, annual rainfall is shifting to more erratic patterns and is projected to decrease. More frequent heavy rainfall events exacerbate the problem of more frequent water supply outages due to high turbidity in the raw water supply. Decreasing precipitation trends and increasing temperatures will lead to more droughts. Saltwater intrusion in coastal groundwater aquifers due to sea level rise will further limit the availability of water in the future.

The upper river catchments, where NAWASA takes water, generally are protected forest areas. The agricultural and the industrial sectors also use water from the rivers, generally downstream NAWASA's intakes. Near the coast, Grenada's rivers are polluted with solid waste and effluents. There is no organization for water resources management in charge of protecting rivers or of allocating water among different users. There is also a general lack of data about hydrology, water

demand, water supply and water quality, as well as climate data. This absence of data and of water resources management prevents planning for adaptation to the impacts of climate variability and change.

The CREWS project

GIZ and the Government of Grenada have prepared the 6-year CREWS project to make the drinking water supply system in Grenada resilient to climate change. The project, with a total cost of approx. 38.1 million EUR, introduces a complete paradigm shift in the water sector. It has three components which tackle the resilience of the three legs of the water system: (1) water governance, (2) water users and (3) the water supply system.

CREWS component 1, "Integrating Climate Resilience into Grenada's Water Governance", includes (1.1) the establishment of a climate-proof legislative and institutional framework in the water sector (1.2) the mainstreaming of climate change in policies and plans with relevance for the water sector and (1.3) the development and implementation of a new tariff structure for NAWASA to sustainably finance investments and to influence water demand subject to climate variability.

As part of sub-component 1.1, a Water Resources Management Unit (WRMU) will be set up to manage water resources independently. One of the tasks of the WRMU will be to define rules for water allocation which will integrate the impacts of climate variability and climate change. The total cost of this component is approx. 3 million EUR.

CREWS component 2 "Climate Resilient Water Users", is the water demand management component. It includes (2.1) the establishment of a fund for financing water-saving devices for commercial water users, (2.2) measures for household and community awareness and education. The cost of this component is approx. 6 million EUR.

CREWS component 3 "Climate Resilient Water Supply Systems" includes (3.1) an upgrade of the existing water infrastructure to make it climate-proof, as well as the implementation of a climate resilient management plan for existing and new infrastructure, (3.2) measures to improve water storage medical facilities, and (3.3) setting up climate-resilient management at NAWASA, including, remote monitoring and control (SCADA) systems, sediment-proofing of water intakes, and emergency preparedness and response planning. Total cost of this component is approx. 27.1 million EUR.

Under component 3.1, which is the main infrastructure component, and component 3.3, the drinking water supply system will be made climate resilient through the following interventions:

(i) increase storage of treated water for periods of droughts or storms with 16 storage tanks;
(ii) interconnect important water supply networks and connect the new storage tanks to the NAWASA distribution system with about 10 km of new pipelines, and the replacement of 13.5 km of existing pipelines;
(iii) increase storage of raw water by acquiring and increasing the capacity of a pond at Petit Etang and of the dam reservoir at Les Avocats;
(iv) increase the use of water from the desalination plant in Carriacou by connecting 9.2 km of pipelines;

(v) make the existing groundwater use sustainable by rehabilitating the existing wells, building 3 new ones, protecting the catchments, and managing groundwater abstraction with the help of a monitoring system;

(vi) add sediment-retaining weirs and/or sediment-proof intakes to existing water intakes.

These sub-components have been carefully selected based on their feasibility and on their added value to increase climate resilience country-wide. They have gone through several rounds of consultations with the Grenadian water sector and civil society.

Introduction to the environmental and social assessment and ESMP

The project is presented for funding to the Green Climate Fund (GCF). An environmental and social assessment has been prepared for the project in conformity with the GIZ's and GCF's environmental and social policies. The GCF uses an interim Environmental and Social Policy based on the Performance Standards of the International Finance Cooperation (IFC) which is compatible with GIZ's Safeguards + Gender Management System (S+G). The Performance Standards (PS) which apply to the project are:

- PS1: Assessment and management of environmental and social risks and impacts
- PS2: Labour and working conditions
- PS3: Resource efficiency and pollution prevention
- PS4: Community health, safety and security
- PS5: Land acquisition and involuntary resettlement
- PS6: Biodiversity conservation and sustainable management of living natural resources
- PS8: Cultural heritage

More information can be found on www.ifc.org/performancestandards.

For the assessment, an independent environmental and social consultant has visited the project sites and consulted with the project team and with relevant stakeholders in Grenada. The consultant has identified potential adverse risks and impacts of the project, as well as issues which may not be technically considered as project-related impacts but may be of concern to stakeholders. The consultant has also assessed the capacity of project-implementing organizations to manage environmental and social risks and impacts. GIZ has conducted a separate gender assessment.

Following the impact assessment, the consultant has developed mitigation and/or compensation measures which are necessary to make the project compliant with the E&S Performance Standards. These measures have been included in the Environmental and Social Management Plan (ESMP) for the project. The goal of the ESMP is to manage the project's impacts over the duration of the project. The ESMP will be executed by the different organizations involved in project management: GIZ, the Project Coordination Unit (PCU), NAWASA, civil works companies and the relevant ministries of Grenada. The ESMP has been validated with the relevant stakeholders.

The project is categorized as "Category B" or "medium" in terms of E&S risks. The project will have a positive environmental and social impact on all the inhabitants of Grenada by increasing resilience to climate variability and climate change and improving water supply, while at the same time having a positive impact on the environment by setting up water resources management, protecting ecosystems and improving the environmental management capacity of relevant organizations.

Potential adverse environmental and social impacts of the project will mostly be site-specific, not irreversible or complex in nature, and readily addressed through mitigation or compensation measures.

Summary of the impact assessment and proposed mitigation and compensation measures

The next sections give a more detailed overview of potential adverse impacts of the project and of the measures proposed to avoid, mitigate or compensate each of them. It should be kept in mind that these impacts are minor: the CREWS project has a strong environmental and social focus in itself, and only some minor impacts need to be corrected.

Impacts of construction works and proposed measures

The civil works included in the project are of limited extent, so that the potential risks and impacts that are typical of civil works will be limited. The only "greenfield" components are the new pipes (10.4 km in Grenada and 9.2 km in Carriacou), the new storage tanks and the new groundwater wells. All water pipes are of small diameter (max 200 mm) and do not require wide trenches.

The construction of 16 storage tanks and three new groundwater wells, as well as the augmentation of the pond at Petit Etang, may require permanent acquisition of a maximum estimated area of 5.3 ha of land by NAWASA, part of which is already government land. The project requires minor temporary land occupation, and creation of rights-of-way for the new pipelines. The ESMP includes the preparation of a Land Acquisition and Land Occupation Management Framework to ensure compliance with Performance Standard 5 for Land Acquisition, and avoid any negative impacts on land users and land owners from the project's activities.

Limited sections of the new pipelines, up to a maximum of 4 km length, may have to cross forest area. A biodiversity survey will be carried out to verify if these areas should be considered as Critical Natural Habitats. Other project components do not encroach upon protected, rare or critical natural habitats.

The construction phase requires careful management of potential nuisances such as dust, noise, traffic impacts, as well as management of occupational health and safety, and specific management of impacts on water streams, trees and forest areas. The ESMP will improve the capacity for environmental and social management of NAWASA and will submit contractors to strict environmental and social requirements to ensure conformity with GIZ's S+G requirements and GCF's Performance Standards during execution of the works.

Impacts on water flows and proposed measures

The project is not expected to lead to an increase in freshwater use as it essentially relies on improved storage, improved water resources management and improved efficiency in water use.. The quantities of piped water will be monitored. The use of piped water in the households could increase in the dry season, as there will be less interruptions in supply, but could be balanced by water demand management and water saving measures.

Due to the planned increase in storage volume at Petit Etang and Les Avocats, the project may lead to a reduction in dry season flow in two small rivers. There is no reduction in the yearly flow or in floods which are beneficial to the ecosystems. No hydrological or biodiversity data are available, but

the catchment at Petit Etang is expected to yield a water volume of 0-3 l/s in the dry season and not to form a proper stream. At Les Avocats, the project could decrease the dry season flow by 0-10 l/s. This impact is minor, as the stream is already impacted by the existing reservoir, and already sees dry periods. Both Petit Etang and Les Avocats watersheds have tributaries replenishing them a little further downstream. No critical aquatic ecosystems will be affected. River intakes are present on many streams in Grenada, with similar impacts which are currently not being assessed.

The ESMP includes an assessment of flows, aquatic biodiversity and water uses in the catchments for a detailed impact assessment of the increase of the storage capacities. Such an assessment will also set an example in Grenada and raise awareness about the need to protect river ecosystems. Both storage systems at Petit Etang and Les Avocats will be equipped with the option to let through a minimum flow if required and if possible during the dry season.

Impacts on water quality and proposed measures

There are no comprehensive data on the quality of water supplied by NAWASA and no data on source water quality. Independent monitoring of drinking water quality is currently non-functional in Grenada. According to NAWASA's annual report and according to information gathered during consultations, drinking water quality is occasionally degraded. NAWASA's reservoirs generally show a high risk of eutrophication and oxygen depletion and this can have impacts on treated water quality as well as on ecosystems. The CREWS project includes the set-up of independent monitoring and reporting on water quality. The ESMP includes measures for NAWASA to improve the management of the quality of raw water in the reservoirs, especially targeted at the reservoirs of Petit Etang and Les Avocats which are part of the CREWS project. This measure also includes management of sediment from silt traps and reservoirs.

The issue of wastewater management has emerged as an issue of concern during the consultations. Most wastewater in Grenada is treated by septic tanks, but the denser coastal zone in the south west of the island has two sewerage systems which currently discharge untreated wastewater in the sea. Impacts of the project on wastewater management are expected to be insignificant, as the project does not significantly increase water use and as only about 5% of Grenada's population is connected to a sewer system. A better continuity of flow could in theory improve the condition of the water and wastewater networks, but this impact is not considered significant either. NAWASA is currently committed to rebuild an offshore sewer outfall in the next few years, but options for sewage treatment should also be investigated. The ESMP includes a feasibility study for improved wastewater management in Grenada.

Other measures required to reach conformity with the E&S Performance Standards

NAWASA's capacity for environmental and social management was assessed against the Performance Standards, and it was judged that management of Occupational Health and Safety and management of waste required improvements. The ESMP therefore includes measures to upgrade NAWASA's environmental and social management system and its health and safety management. The tariff review provides the opportunity to include the cost of the non-urgent measures in NAWASA's future budget.

Performance Standard 1 requires the ESMP to include a stakeholder engagement plan (SEP). The stakeholder engagement plan will tackle issues which are not yet covered by the communication component of the CREWS project, therefore mainly concentrating on construction activities.

A tariff review is included in sub- component 1.3, and has been identified as a subject of concern during the consultations. The Performance Standards do not formally provide specifications which would apply to a review of water tariffs, except for the requirement, under PS1, to report to communities about actions of concern to them. There is a strong commitment from the CREWS project to ensure affordability of drinking water for the most vulnerable households. CREWS' rationale is that the most vulnerable suffer most from deficiencies of the water supply system, and will suffer most from climate variability and climate impacts. Making the water supply financially sustainable and climate-resilient through increased revenues will have a proportionally higher positive impact on vulnerable households. Grenada already has a "social safety net" where the state funds the water bills of the poorer households. This system will be assessed during the tariff study and additional measures will be included to extend affordability of water for all if required. The ESMP gives recommendations for social safeguards to be included in the terms of reference of the tariff study and proposes specific monitoring of this study by the Project Steering Committee, which includes the Ministry of Social Development and civil society organizations. All the relevant stakeholders will be engaged to participate in the tariff study by being regularly informed and consulted, and participating in the analysis of alternatives.

Overview of the ESMP

The following table provides a full overview of the ESMP measures, resulting from the needs which have been identified above. The number of actions is deliberately kept small, to facilitate understanding, adoption and monitoring of the plan.

The ESMP will be implemented by NAWASA, the relevant ministries and the construction contractors (and sub-contractors), with assistance and monitoring of the PCU and GIZ. Also the different ministries of Grenada, as well as civil society organizations, are involved. An annual ESMP report will be submitted to the GCF.

Implementation of the ESMP will ensure that the overall project is in compliance with GCF Environmental and Social Standards and GIZ S+G requirements. The ESMP is published on the GIZ website for 30 days in due time before the Board Meeting in which the Funding Proposal will be discussed, as required by the GCF's Disclosure Policy.

Table 1. Summary of the Environmental and Social Management Plan

	Action	Reference[1]	Responsible entities
1a	ESMP implementation, enforcement, monitoring and reporting	PS1	NAWASA, PCU, GIZ
1b	Reinforced monitoring of safeguards compliance, access to water, and gender issues by the Project Steering Committee	PS1	GIZ, PCU; Ministries
2	Environmental, social, health and safety risk assessment of NAWASA's activities	PS1, PS2, PS4	NAWASA
3	Certified quality, environment, health and safety management system for NAWASA (ISO 9001, ISO 14001 and ISO 45001 or OHSAS 18001)	PS1, PS2, PS4	NAWASA (with technical assistance)
4	NAWASA health and safety management	PS2, PS4	NAWASA
5	NAWASA waste management	PS3	NAWASA
6	Contractor management, and mitigation of environmental and social construction impacts	PS1, PS2, PS3, PS4, PS5, PS6, PS8	GIZ, PCU, NAWASA, contractors, sub-contractors
7	Land acquisition and occupation framework	PS5	GIZ, PCU, NAWASA, GoG
8	Les Avocats and Petit Etang hydrology, biodiversity and water use assessment + design of the intakes to include an option to release a minimum flow + biodiversity survey for forest areas where new pipes are laid (if any)	PS3, PS6	GIZ, WRMU (with technical assistance)
9	Water quality management of river water reservoirs	PS4	NAWASA, Min. of Health
10a	Construction Stakeholder Engagement Plan	PS1	GIZ, PCU, NAWASA, (sub-)contractors
10b	Tariff Review Stakeholder Engagement Plan	Consultations, PS1	GIZ, PCU, GoG
11	Wastewater treatment feasibility study	Consultations, PS3	GIZ, NAWASA, GoG (with technical assistance)

[1] This column gives the reason for which the action is required: mainly, to reach conformity with the E&S Performance Standards. Some actions are also adopted as they were supported by a significant number of stakeholders during the consultations.

1 Project background

1.1 Grenada

Grenada is a small tri-island state of 340 km2 and 110 000 inhabitants. Besides the main island of Grenada, there are two small islands, Carriacou and Petite Martinique. Population density is relatively high. The country had a per capita GDP of 13,000 PPP USD in 2015 (World Bank), which is only a little below world average. Grenada's Human Development Index value for 2015 is 0.754—which put the country in the high human development category—positioning it at 79 out of 188 countries and territories. The rank is shared with Brazil (UNDP, 2016).

The country's economy is very vulnerable to shocks because of its small size, the costs of transportation, the country's exposure to tropical storms and its reliance on the tourism sector. Services represent almost 80% of GDP, with tourism the main source of revenues. Agriculture represents 6.5% of GDP and is a significant source of exports; small farms are also a source of living for many households. Remittances are 3% of GDP. Hurricane Ivan in 2004 destroyed most of the country's buildings and trees and hit the economy very hard, and hurricane Emily hit again in 2005. According to the latest available data from 2008, 25% of the workforce is unemployed, and 38% of the population is below the poverty line (UNDP, 2016). Most non-agricultural goods have to be imported and prices are high. GDP growth has not recovered from the 2000s tourism crisis and from the hurricanes. Public debt is high; the state was unable to service its debt in 2013 and is assisted in its debt restructuring by the IMF.

1.2 Water supply in Grenada

Grenada relies mostly on surface water sources for its drinking water supply. Many small rivers originate at the center of the island, which is a volcanic mountain ridge peaking at over 800 m, and is covered with forest. Annual rainfall is high, from 1000 mm near the coast to over 4000 mm in the central mountains, but there is very a marked dry season from January to May.

Water is supplied by the National Water and Sewerage Authority (NAWASA). NAWASA operates 28 different water systems, of which 27 are located on the mainland Grenada, and one on the sister island of Carriacou.

About 90% of Grenada's average daily production of 32,700 m3/day (7.2 MGD) is sourced from surface water intakes located in the upper catchment areas, piped through gravity flow to water treatment plants (WTPs) which employ slow sand, rapid gravity or pressure filtration, and disinfection by chlorine. All surface water systems have some form of small dam or intake structure on the rivers/streams, as a means of collection of the water. There is a standard operating procedure to shut down the treatment plants during times of heavy rainfall, to prevent the excessive sediment loads reaching the plant.

From the treatment plants, water is reticulated by gravity flow to the populated areas of the island by means of approximately 340 km of transmission and distribution mains varying in size from 50 to 250 mm; with most of the systems being interconnected, predominantly along the lower coastal areas (Figure 1).

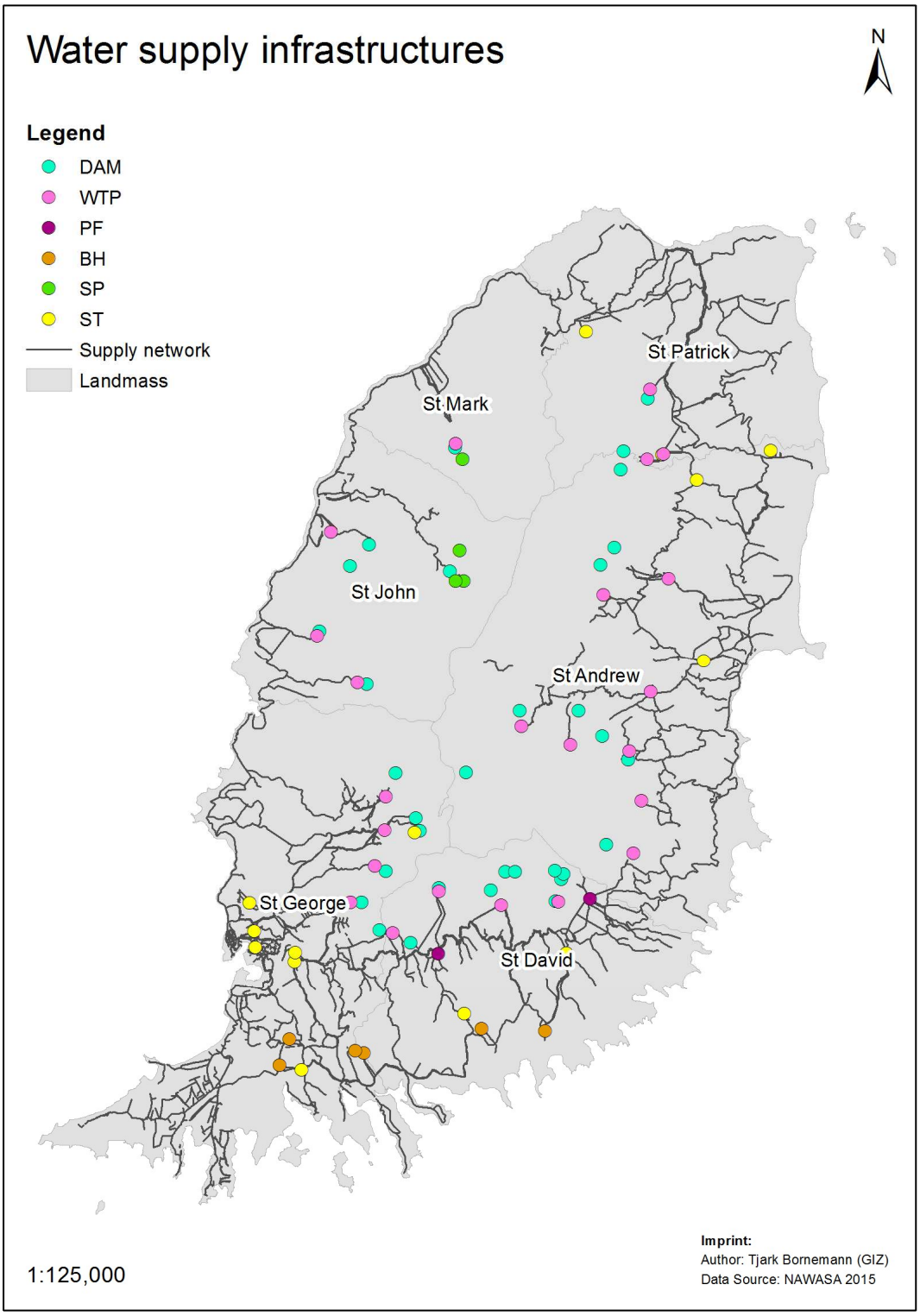


Figure 1. Water supply systems in mainland Grenada. Source: Bornemann, 2015.

PF: Pressure Filter, BH: Borehole, SP: Spring, ST: Storage tank

Approximately 10 % of the total water supply is based on groundwater. Two wells are currently abstracting water 24 hours per day from alluvial aquifers in valleys in the south of the Island. This groundwater is prone to seawater intrusion.

97% of the population is connected to the water supply network. Households – mainly on Carriacou – complement the supply of piped water with rainwater collected in tanks. There are a few public standpipes, and people also still use river water locally, such as for washing laundry.

Due to the high cost of electricity, pumping is limited to five boreholes located in the south east of Grenada; pumping of raw water from the Mardigras dam to treatment plant; and extraction of raw water from the Grand Etang Lake to augment the source of the Annandale WTP during the dry season.

Since Grenada's sister islands Carriacou and Petit Martinique do not have any permanent surface water flows, the water supply is mainly based on rainwater harvesting facilities – which makes them highly vulnerable to climate change induced variability of rainfall patterns and extended dry spells. NAWASA has recently started operating a 13 m3/h salt water reverse osmosis (SWRO) plant on Carriacou, and a 5 m3/h SWRO plant on Petite Martinique. Solar energy is used to power the SWROs.

1.3 Current challenges and adaptation capacity

While in the rainy season the supply exceeds the water demand, there is a considerable water deficit in the dry season. The river catchments are too small to store enough water during the rainy season. During heavy rainfall or storms, water supply may stop completely because the WTPs have to shut down. The poor state of maintenance of the infrastructure leads to an estimated 30-35% in water losses, frequent interruptions in water supply, and water quality deterioration. These problems tend to hit the poorer households harder because they have less alternatives; they also end to have a higher impact on women, who are more frequently burdened with domestic tasks.

The institutional, financial and technical capacity in the island is limited due to its small size, and this is visible also in water supply operations. All equipment, spare parts and fuels have to be imported. The WTPs are of a small size, which limits the possibility to apply advanced techniques. There is no comprehensive monitoring of water quantities and water quality. The quality of distributed water seems to be acceptable globally, but many sources indicate that drops in water quality occur which may be due either to raw water issues or to poor infrastructure.

River water is also used for irrigation and for industries and the downstream part of Grenadian rivers is polluted with solid waste and effluents. Water resources management is non-existent, which puts the sustainability of future water supply at risk. There is a general lack of data about hydrology, water demand, water supply and water quality, which hampers sustainable water management and possibilities to adapt to climate change impacts.

Climate change has already begun to aggravate the issue of inadequacy between available water resources and water demand, and will continue to do so. Along with an increase in average temperatures due to climate change, which will increase water demand, annual rainfall is shifting to more erratic patterns and is projected to decrease. More frequent heavy rainfall events exacerbate the problem of more frequent water supply outages due to high turbidity in the raw water supply. Decreasing precipitation trends and increasing temperatures will lead to more droughts. Saltwater intrusion in coastal groundwater aquifers due to sea level rise will further limit the availability of water in the future (GIZ, Vulnerability Assessment, 2017).

The water sector has a high level of exposure and sensitivity to climate change impacts. In Grenada, due to the state of the infrastructure and the limited institutional, managerial and technical capacities, it has also a very limited adaptive capacity.

2 Project description

2.1 Project objectives

In order to avoid critical climate-induced water shortages in the future, the CREWS project supports Grenada's water sector in both (a) reducing its water demand and (b) increasing its water supply to such an extent that resilience to present day climate variability and expected future climate change is ensured. To do this, the project supports the sector in undergoing a comprehensive transformation on multiple levels, which represents a nation-wide "paradigm shift" for Grenada's overall resilience. The paradigm shift in Grenada's water sector will include citizens and businesses as water users, and the public sector as provider of potable water and infrastructure. Behavioral changes will be triggered through appropriate governance, regulation and awareness raising.

The main goal of the CREWS project is to increase systemic climate change resilience in Grenada's water sector. The project aims to achieve this by applying a multi-level approach addressing the resilience at the level of water governance, households and businesses and the water supply system.

2.2 Project summary

The project, with a total cost of approx. 38.1 million EUR (including project management cost and Grenada's contribution, but excluding contingencies), includes three components, covering:

1. water governance
2. water demand management
3. drinking water supply system management

CREWS component 1, "Integrating Climate Resilience into Grenada's Water Governance", includes:

- (1.1) the establishment of a climate-proof legislative and institutional framework in the water sector,
- (1.2) the mainstreaming of climate change in policies and plans with relevance for the water sector and
- (1.3) the development and implementation of a new tariff structure for NAWASA to sustainably finance investments and to influence water demand subject to climate variability.

As part of sub-component 1.1, a Water Resources Management Unit (WRMU) will be set up to manage water resources independently. One of the tasks of the WRMU will be to define rules for water allocation which will integrate the impacts of climate variability and climate change.

The total cost of this component is almost 3 million EUR.

CREWS component 2, "Climate Resilient Water Users", is the water demand management component. It includes:

- (2.1) the establishment of a fund for financing water-saving devices for commercial water users, and
- (2.2) measures for household and community awareness and education, including for rainwater harvesting

The cost of this component is approx. 6 million EUR.

CREWS component 3, "Climate Resilient Water Supply Systems" includes:

- (3.1) an upgrade of the existing water infrastructure to make it climate-proof, including rainwater systems as well as the implementation of a climate resilient management plan for existing and new infrastructure,
- (3.2) measures to improve water storage for medical facilities, and
- (3.3) setting up climate-resilient management at NAWASA, including:
  - *sediment-proofing of water intakes,*
  - *remote monitoring and control (SCADA) systems, and*
  - *emergency preparedness and response planning.*

Total cost of this component is approx. 27.14 million EUR.

Summary of infrastructure works

Under component 3.1, which is the main infrastructure component, and component 3.3 (sediment-proofing of water intakes), the drinking water supply system will be made climate resilient through the following interventions:

(i) increase storage of treated water for periods of droughts or storms with 16 storage tanks;
(ii) interconnect important water supply networks and connect the new storage tanks to the NAWASA distribution system with about 10 km of new pipelines, and the replacement of 13.5 km of existing pipelines;
(iii) increase storage of raw water by acquiring and increasing the capacity of a pond at Petit Etang and of the dam reservoir at Les Avocats;
(iv) increase the use of water from the desalination plant in Carriacou by connecting 9.2 km of pipelines;
(v) make the existing groundwater use sustainable by rehabilitating the existing wells, building 3 new ones, protecting the catchments, and managing groundwater abstraction with the help of a monitoring system;
(vi) add sediment-retaining weirs and/or sediment-proof intakes to existing water intakes.

2.3 Project rationale

The following paragraphs explain the rationale for the CREWS project components, as presented in the CREWS proposal to GCF.

Component 1

The current institutional structure in the water sector is perceived in various recent studies as highly deficient to tackle climate change (see e.g. NAP 2017, NASAP 2015, etc.). Major barriers identified are:

- Grenada has suffered a series of external shocks in recent years, including two devastating hurricane landfalls and the impacts of the financial crisis. This has led to the country's inability to services its debts. The fiscal space for investments in adaptation is insufficient. Public funds for adaptation compete with other development priorities.

- NAWASA's effectiveness to tackle the challenges of climate change are seriously impeded by insufficient revenue streams which are too low to finance long-term investments required to adapt to climate change.

- The National Water and Sewerage Authority (NAWASA) is responsible for protection, quantity/ quality control, while being the main water abstraction institution. Hence, there is a lack of regulatory mechanisms which consider climate change impacts.

- In addition, most of the national water-related policies and plans have not yet been harmonised with Grenada's national climate change policies; hence the planning of interventions to build a climate resilient water sector lacks a sound policy base.

Therefore, this component will build climate resilience in the water governance structures by introducing a new dedicated government unit to ensure sound and climate-proof regulation of the management of water resources. This is international best practice and will lead to:

- Development of climate-proof regulations to protect water resources and to optimise efficiency in water use.

- Limitation of water abstraction from different resources, depending on impacts of climate variability and climate change on the hydrological regimes.

- Priority setting for water uses (domestic, agriculture, commercial).

The water sector's climate resilience will also be strengthened by integrating climate change considerations in sectorial policies with relevance to the water sector (e.g. Forestry Policy, Land Use Policy, Agriculture Policy), which will also support the base for improved regulations in these sectors.

By supporting the development and implementation of a new tariff structure for NAWASA, two results will increase the resilience of the governance structure:

- The possibility to influence water demand e.g. in extended dry spells by introducing seasonally variable tariffs. This would support a transformative shift in pricing with more flexible water tariffs responding to temporary scarcity. Iterative block tariffs will ensure that the poor are not affected and heavy users are taxed more effectively.

- The decision-making on and implementation of capital investments required due to climate change impacts will not be governed anymore by the availability of external funding. Hence, NAWASA can integrate challenges due to climate change in their infrastructure planning more flexibly.

<u>Component 2</u>

Climate resilience of the water users is a key element to make the water sector climate-proof. By improving the efficiency of water usage, exposure to climate-induced water shortages is decreased. The CREWS project hence dedicates a major share of the project budget to:

- Establish a challenge fund for commercial water users (with a focus on the agricultural and tourism sectors as the two major water using sectors), which will provide post-investment grant subsidies to water efficiency measures and e.g. rainwater harvesting systems implemented on hotel or farm level. Eligibility will be determined based on water audits and post-implementation performance. By this, the dissemination of such measures is enhanced, the water risk of the users is reduced and the resilience of the water resources is strengthened due to the reduced freshwater demand. This fund will be managed by the Grenada Development Bank, which can tap a track record in managing a similar challenge fund in the energy sector from 2013 – 2015 with a volume of 750,000 USD.

- Strengthen the understanding and awareness of the general public, the private sector and also political decision-makers on the challenges the water sector is facing due to climate change. Targeted awareness and education activities, public discussions and consultations will on the one hand support the implementation of a number of measures where public awareness and support are key, but will also provide the base for an overall improved management of water resources under future climate variability, and hence again enhance resilience of the population.

Component 3

Climate resilience of the water supply system as tackled by the CREWS project will focus on:

- Capability of NAWASA's water supply (storage, groundwater resources, rainwater harvesting) to provide the required potable water resources – increased storage, more in-built flexibility through interconnections of pipelines, and sustainable groundwater systems will enhance NAWASA's availability to react on dry spells with less surface water availability, or more frequent heavy rainfall events with local impacts.

- Improvements in the storage systems on user levels through support for larger storage at critical infrastructure like medical centres reduce the exposure to climate-induced piped water scarcity.

- Improvements in the possibility to respond to heavy rainfall and other disaster events through disaster proof infrastructure and comprehensive emergency response plans, which will help to ensure that water supply interruptions are minimized.

2.4 Detailed description of the civil works to be realized

Most project activities are "soft" components which are only expected to have positive environmental and social impacts. Those activities identified as a potential source of negative risks and impacts are:

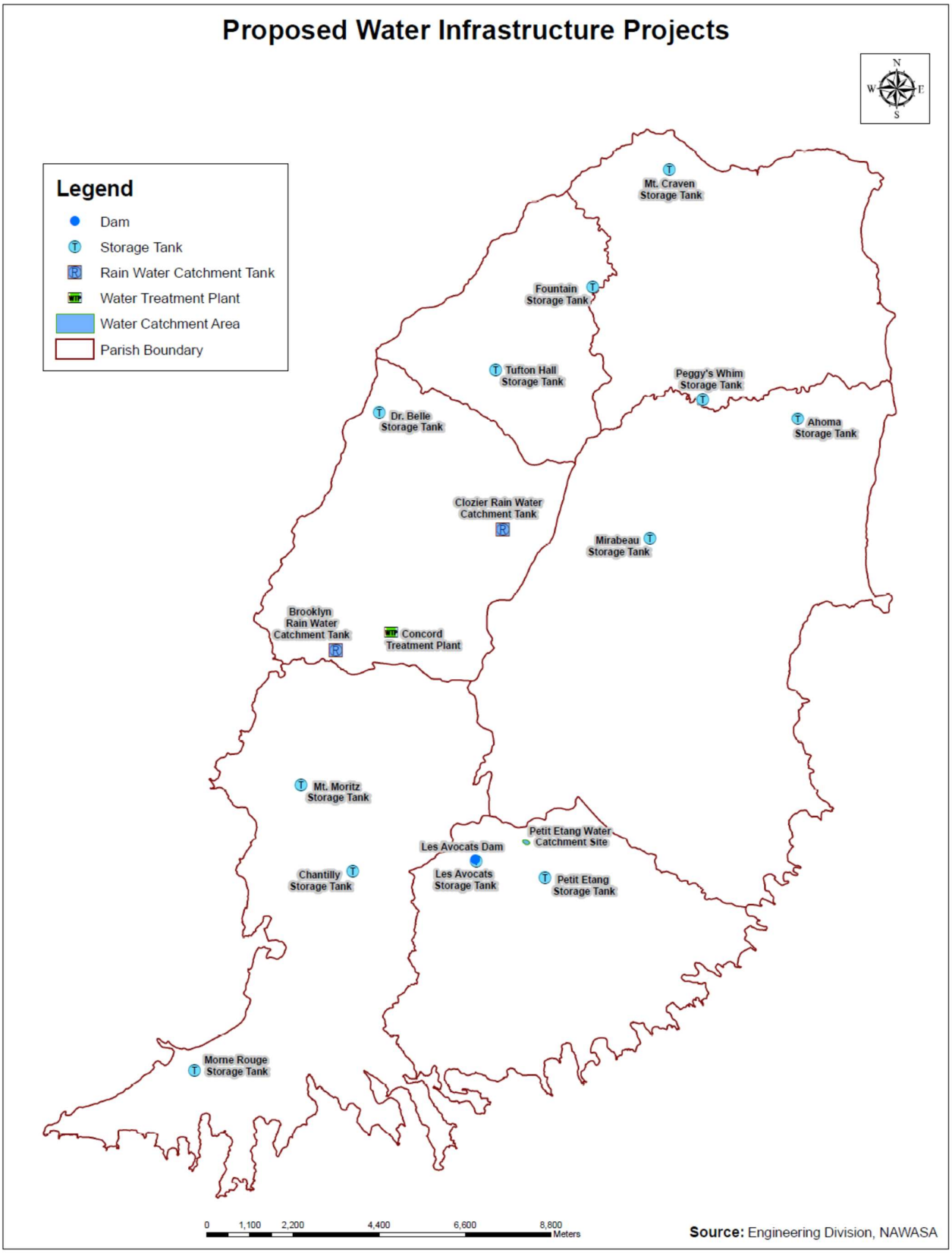
- all activities involving civil works;
- the proposed review of water tariff, which has raised concerns during stakeholder consultations.

These activities require a further assessment. This is why this section focuses on a detailed technical description of the infrastructure works which are part of the project, as well as on the tariff review.

The next paragraphs provide a technical description of the civil works to be realized for the project, under components 3.1 and 3.3. The main goals of these works are to enhance water storage capacity, improve system interconnection, save pumping needs, better utilize the existing groundwater potential, and, for Carriacou, to optimize the use of desalinated water to save other resources.

Photographs of current water infrastructure and of examples of future infrastructure are presented at the end of the chapter (Figure 11.).

Figure 2. Overview map of infrastructure components in Grenada (source: NAWASA)



2.4.1 Overview

The civil works will include the following sub-components:

- Les Avocats/Petit Etang Water Supply improvement : 2 storage tanks of 1364 m3, and replacement of 1.9 km 50 mm GI pipelines by 150 mm DI, allowing gravity-fed service to customers in Marian and Cocoa Road. A storage pond will be built at Petit Etang, and the small dam at Les Avocats will be rebuilt.
- Mirabeau Water Supply improvement: new 1364 m3 storage tank and replacement of 6.8 km distribution mains by 150 mm DI from Tivoli to Canal Road Junction.
- Vendome Water Supply improvement: installation of two 1,364 m3 storage tanks, one 909 m3 storage tank, about 4.5 km of new 100/150 mm to connect the tanks, and replacement of 4.8 km of existing pipeline from Vendome to Tempe Junction by 200 mm transmission mains.
- Western Water Supply Resilience in Gouyave (Dr Belle): installation of one 1,364 m3 storage tank and 0.370 km of new 200 mm water pipes.
- Tufton Hall water supply improvement: installation of one 1,364 m3 storage tank and 3 km of new 150 mm water pipes.
- Peggy's Whim water supply improvement: installation of one 2,273 m3 storage tank, two 909 m3, one 455 m3 storage tank, 2.3 km of new 150 mm water pipes and 0.2 km of 100 mm water pipes.
- Morne Rouge water supply improvement: installation of one 2,273 m3 storage tank and 0.2 km of 200 mm water pipes.
- Carriacou Water Supply Expansion: construction of 3 storage tanks of 230 m3, installation of 9.23 km of water pipes, and further equipment, fittings & spares.
- Drilling of 3 new groundwater wells and definition of groundwater protection catchments.
- Silt Traps and River Intake Retrofits.

The storage tanks are glass-fused to steel bolted water tank serving as distribution reservoir. The 1364 m3 tanks will be constructed on 0.4 ha sites[2]. Works will include earthworks, retaining structures, concrete base, tank erection and installation of appurtenances, and fencing of the sites.

[2] Indicative land size only.

2.4.2 Les Avocats/Petit Etang water supply infrastructure improvement

This sub-component is based on a Feasibility Study done by ENB in 2005 (ENB 2005, Sect. 3). It will comprise the following five sub-projects:

- Construction of a storage tanks at Petit Etang
- Construction of a storage tank at Les Avocats
- Construction of a raw water storage pond at Petit Etang
- Upgrade of Les Avocats river water reservoir
- Gospel Hall/Marian/Cocoa Road Pipeline: replacement of the distribution network from the current 250 mm trunk main from the Annandale WTP, with 1.9 km of 150 mm ductile iron (DI) pipe, replacing 50 mm galvanized iron (GI) pipelines.

The raw water impoundment at Petit Etang will be built 500 m to the north-west of the existing treatment plant. The proposed works are based on a pre-feasibility study carried out by GIS (2016). The impoundment would be built at the location of an existing pond ("étang" is the French word for "pond"). The pre-feasibility study does not propose a final option for the impoundment. An existing embankment, where the road passes, would have to be raised and/or reinforced. According to the study, the bottom of the area would have to lined. It is estimated that the construction would require about 5000 m2 of land (0.5 ha), including the pond itself and possibly impervious collection areas to be created on the hillsides, as shown in the figure below.

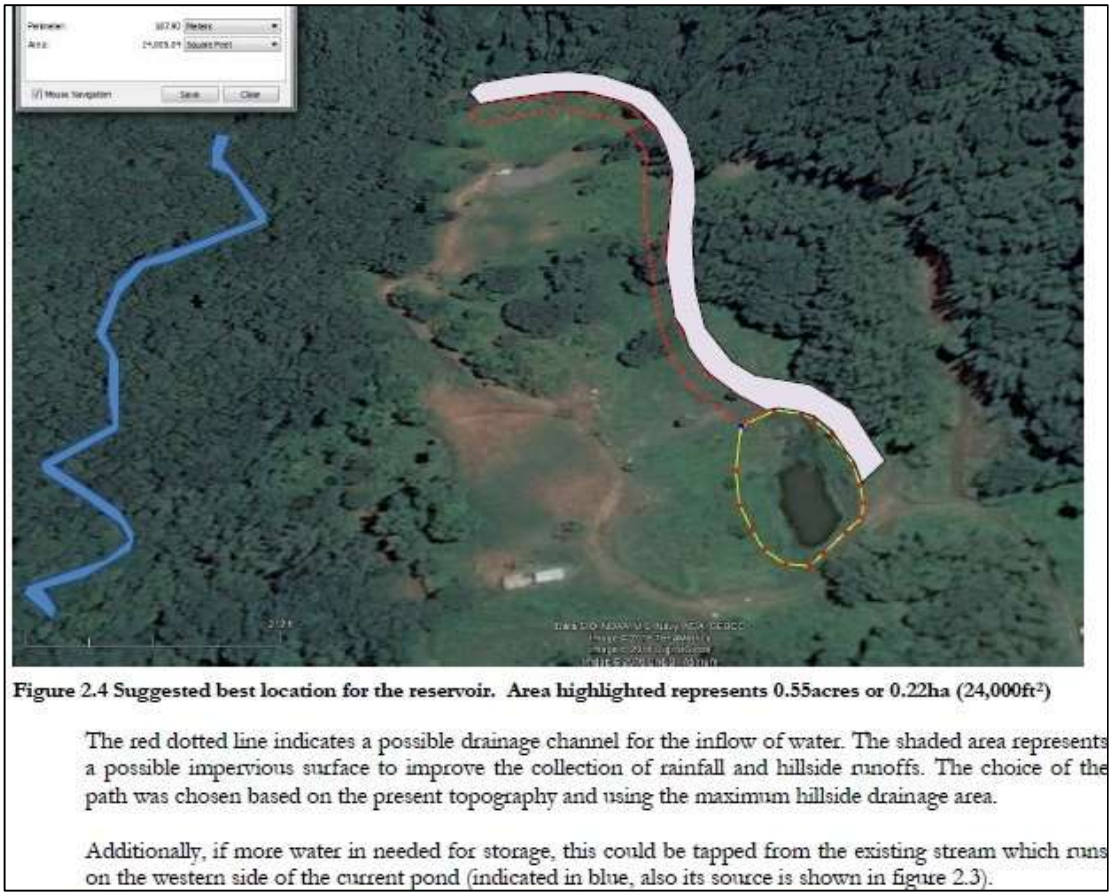


Figure 2.4 Suggested best location for the reservoir. Area highlighted represents 0.55acres or 0.22ha (24,000ft²)

The red dotted line indicates a possible drainage channel for the inflow of water. The shaded area represents a possible impervious surface to improve the collection of rainfall and hillside runoffs. The choice of the path was chosen based on the present topography and using the maximum hillside drainage area.

Additionally, if more water in needed for storage, this could be tapped from the existing stream which runs on the western side of the current pond (indicated in blue, also its source is shown in figure 2.3).

Figure 3. Excerpt of the preliminary design of Petit Etang impoundment (GIS, 2016)

The dam upgrade at Les Avocats will involve the replacement of the existing dam with a dam located 15 or 20 m downstream, on the Baillie's Bacolet River. The existing dam was built in 1957. The dam has not been properly maintained and shows signs of deterioration. There is little information available on its building. The current crest is at an elevation of approx. 349 m, which is about 7.50 m from existing streambed. The catchment area is about 1.2 km2 and there is no information available on hydrology.

The new dam would be a 11.5 m high concrete/gravity dam. The crest elevation will be 352.50 m and the crest length 82.50 m. The spillway elevation will be 350.50 m, or 9.50 m above the river bed.

An alternative was examined whereby the existing dam would be raised, but this created concerns regarding safety of the structure, since the foundations of the existing dam are unknown.

The new reservoir volume will be 15,000 m^3. Low sedimentation retaining weirs will be constructed at the stream bed of three streams discharging into the reservoir. Works will include earthworks, construction of an access road of 105 m length, dam construction and ancillary works. It is unclear if the existing dam will be dredged.

Figure 4. Sketches of the existing (grey) and proposed new (blue) dam at Les Avocats WTP

Sketch of the existing (grey) and proposed new (blue) dam. The darker sections are the spillway locations. Approximate drawing based on the consultant's site visit and on the written description in ENB (2005).

2.4.3 Mirabeau water supply infrastructure improvement

This sub-component includes the building of a storage tank in Mirabeau, and replacement of 6.8 km 150 mm distribution mains from Tivoli to Canal Road Junction.

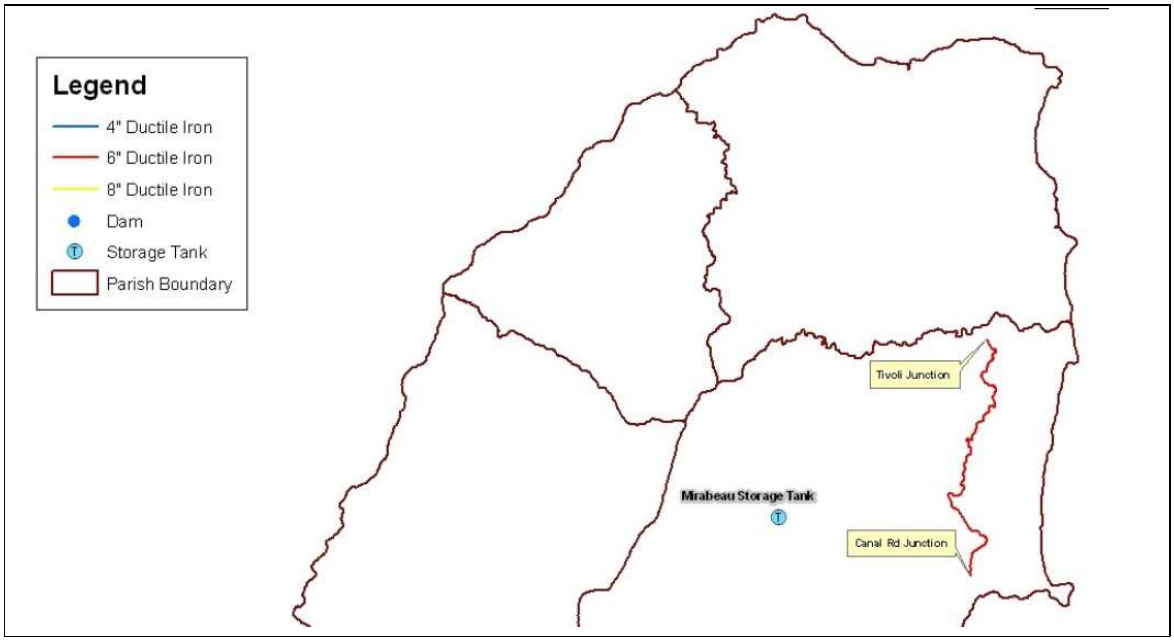


Figure 5. CREWS components for the Mirabeau water supply system

2.4.4 Vendome Water Supply improvement – Mt Moritz and Chantilly

This sub-component is based on a feasibility study done by Gaudriot in 2003 (Gaudriot, 2003, Sect. 2). The sub-component will comprise:

- construction of two 1,364 m^3 glass-fused to steel bolted water tank in Hermitage, east of Mt. Moritz
- construction of one 909 m^3 glass-fused to steel bolted water tank at Chantilly
- installation of 150 mm transmission mains from the Mt Moritz tank to Snug Corner (about 2.3 km
- installation of 100/150 mm transmission mains from the Chantilly tank to Mt Gay (about 2 km)
- replacement of 4.8 km of existing pipeline from Vendome to Tempe Junction (near Mt Gay on the map below) by 200 mm transmission mains.

Location of these components is shown on the maps below.

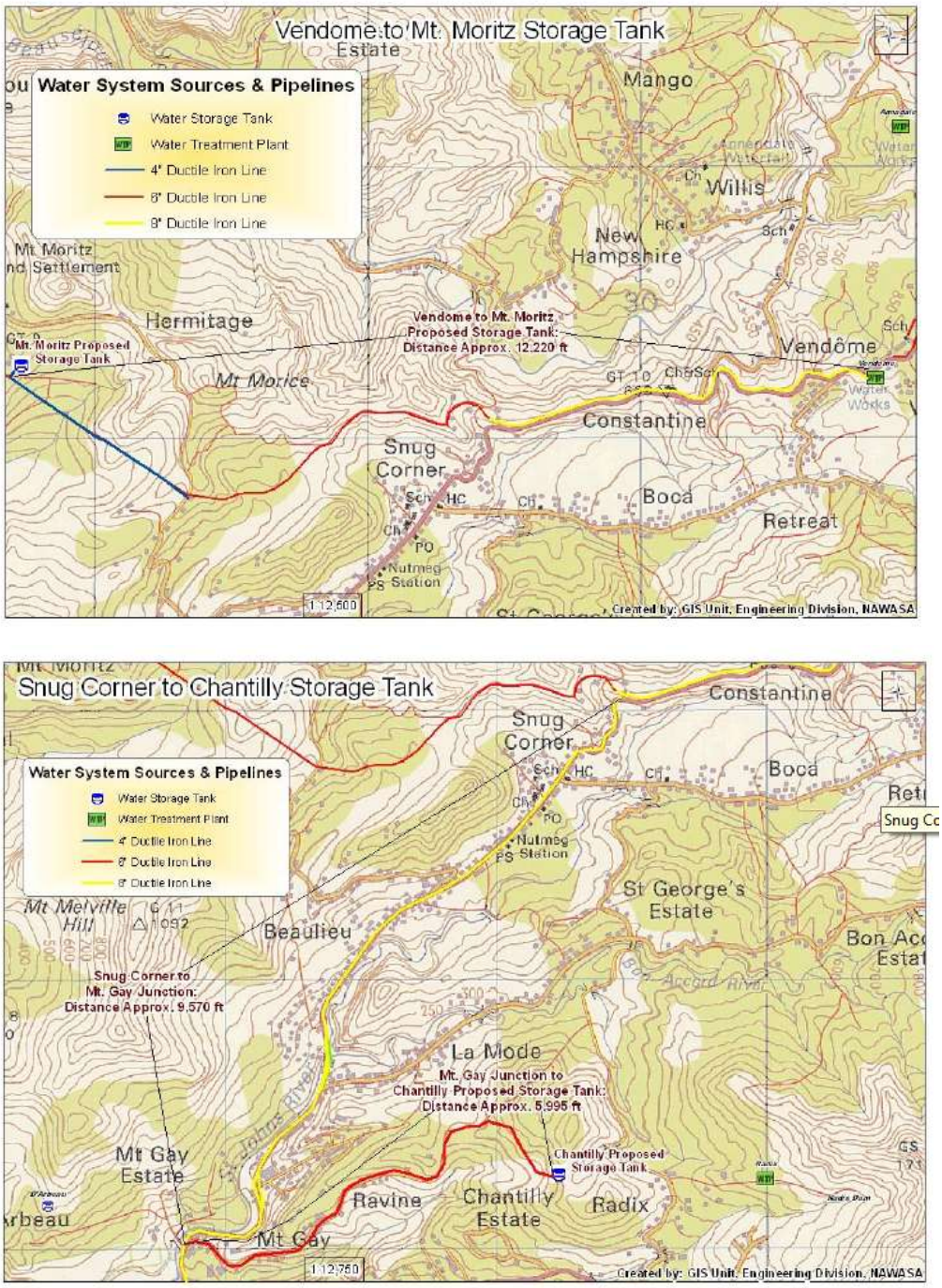


Figure 6. Location of Vendome component (source: NAWASA)

2.4.5 Western Water Supply

2.4.5.1 Gouyave – Dr Bell

This sub-component serves approx.. 2,500 people of the Douglaston water supply system. It is based on a feasibility study done by NAWASA (2017). The Gouyave sub-component will comprise:

- Construction of a 1,364 m3 glass-fused to steel bolted water tank in "Dr Bell", north of Gouyave;
- installation of a new 370 m transmission main to connect the new Dr. Bell storage tank.

2.4.5.2 Tufton Hall

This sub-component serves approx. 2,500 people connected to the Tufton Hall Water Treatment Plant. It is based on a feasibility study done by NAWASA (2017). It comprises the following two sub-projects:

- Construction of a 1,364 m3 glass-fused to steel bolted water tank, serving as distribution reservoir and providing sustainable supply to the Victoria community;
- installation of a new 3 km transmission main to connect the new Tufton Hall storage tank to the Western Main Road along the coast.

Figure 7. Location of the Western components near Gouyave and Victoria (source: NAWASA/Google Maps). In red: protected nature areas.

2.4.6 Northern Water Supply – Peggy's Whim

This sub-component improves Peggy's Whim's water supply system in the northern part of Grenada, populated by 10,000 people or 10% of the overall population. In involves installation of additional storage tanks with a total capacity of almost 4546 m³, which will offer three days of storage.

This sub-component is based on a feasibility study done by NAWASA (2017). The Peggy's Whim project will comprise the following six two sub-projects:

- **Peggy's Whim Storage Tanks**: construction of one **2,273 m³ glass-fused to steel water tank** serving as distribution reservoir and providing sustainable supply to the northern communities.
- **Mt. Craven and Ahoma Storage Tanks**: construction of two **909 m³ glass-fused to steel water tank** serving as distribution reservoir and providing sustainable supply to the northern community.
- **Diege Piece (or Fountain) Storage Tank**: construction of one **455 m³ glass-fused to steel water tank** serving as distribution reservoir and providing sustainable supply to the northern communities.
- **Ahoma and Mt Craven Transmission Pipeline**: installation of **2,300 m of 150mm DI** transmission main, to connect the new storage tanks in Ahoma and Mt Craven.
- **Diege Piece Transmission Pipeline**: installation of **200 m of 100 mm DI** transmission main, to connect the new storage tank in Diego Piece.

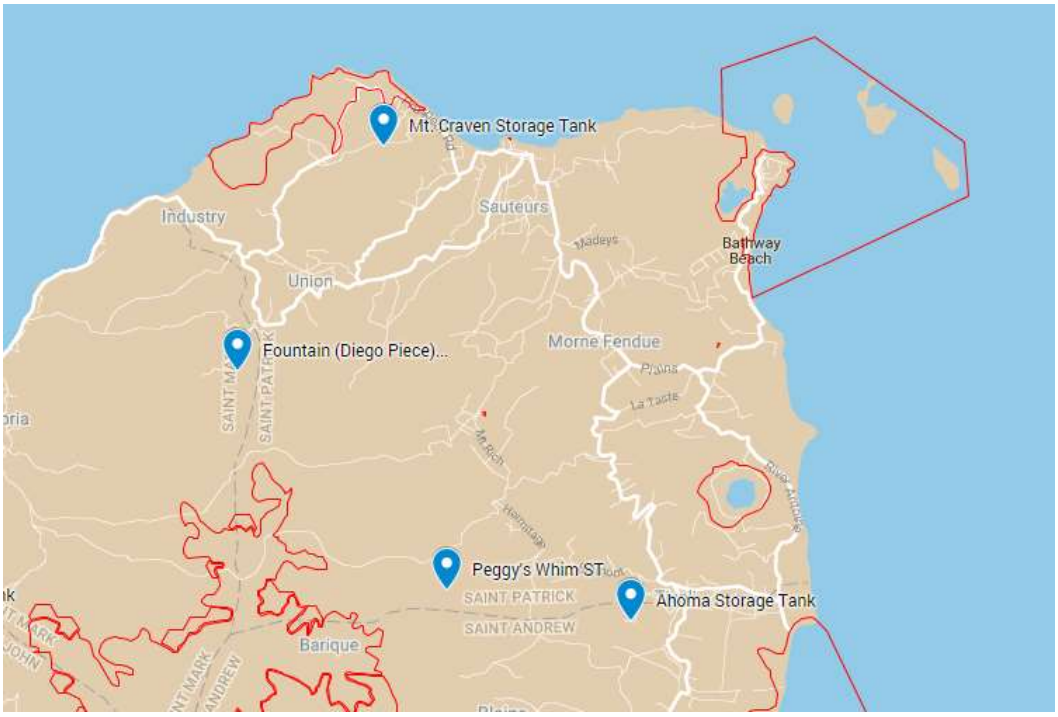


Figure 8. Location of the Peggy's Whim components (source: NAWASA/Google Maps). In red: protected nature areas.

2.4.7 Southern Water Supply – Morne Rouge

This sub-component serves the Frequente/ Grand Anse/ Morne Rouge communities (approx. 4'000 people) served by the Woburn Tank. This additional storage tank will be able to sustain a supply of approx. 3 days. It is based on a feasibility study done by NAWASA (2017). The Morne Rouge project will comprise the following two sub-projects:

- Construction of one 2,273 m3 glass-fused to steel bolted water tank on a hill above Morne Rouge serving as distribution reservoir;
- Installation of a new 0.2 km transmission main to connect the new storage tank in Morne Rouge.

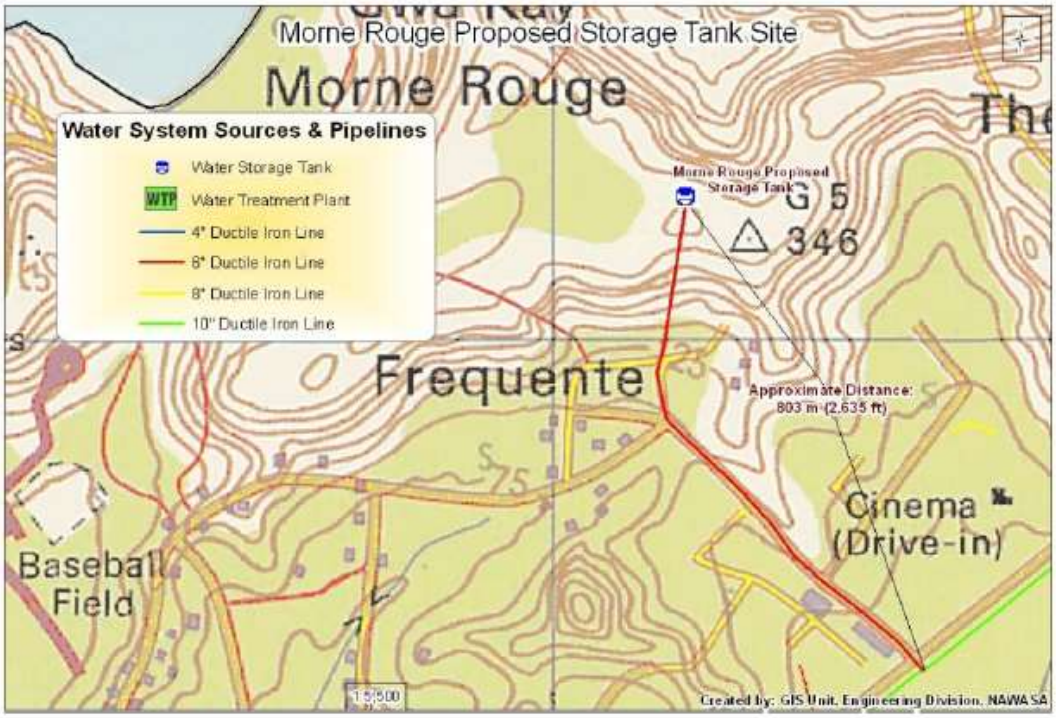


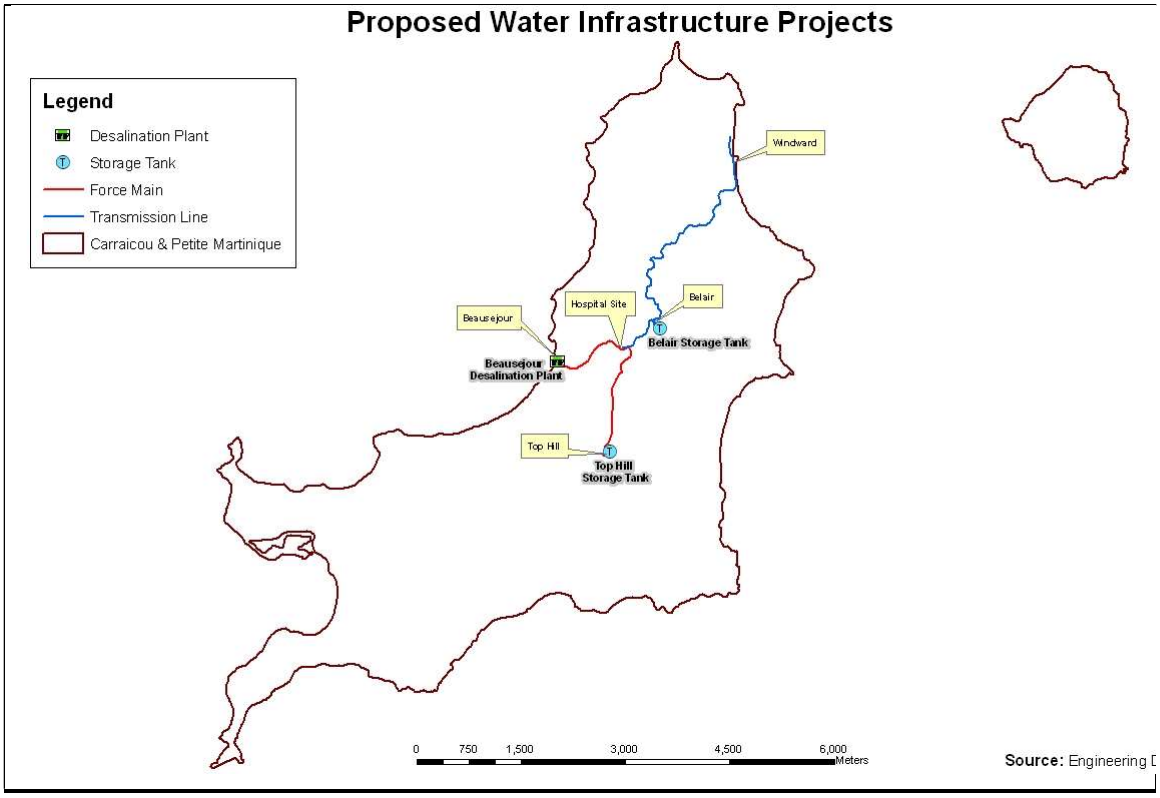
Figure 9. Location of proposed Morne Rouges storage tank (source: NAWASA)

2.4.8 Carriacou component

Carriacou island is currently served by rainwater harvesting and by a Reverse Osmosis desalination plant (Seawater Reverse Osmosis, SWRO). This component involves the extension of the water supply network from the SWRO plant located at Beausejour to the main communities in the northern half of the island. The elements were identified in an earlier Master Plan Study (Stantec, 2001). They comprise:

- the installation of 9.23 km of new 100 mm DI and high density polyethylene (HDPE) pipes (see table below);
- the construction of three 230 m3 water tanks at Top Hill, Belair and near Belvedere, serving as distribution reservoirs for the respective communities.
- Equipment, fittings & spares: installation of a pump at the Hospital site; two pressure-reducing valves at optimal locations; and an inventory of pipeline repair fittings and spares.

Figure 10. Overview map of infrastructure components in Carriacou. Source: NAWASA



2.4.9 Overview of pipelines to be installed

The tables below provide a summary of all water pipes to be replaced or installed, as provided by NAWASA. These data should be considered as an estimate: the data provided by NAWASA were not entirely consistent, and experience with similar projects is that small components may be added or substracted if the project preparation phase extends over time. Therefore, the final length of pipelines may differ from what is presented here. The ESMP prepared as part of the ESIA process will ensure that any impacts arising at later stage from small changes in project definition can be managed.

The pipes are of small diameter and as a consequence, would require only narrow trenches to be excavated (see example in Figure 11.).

Table 2. Pipelines connecting new water storage tanks in Grenada

Works to be executed	Length	Diameter/ material	Location
Pipeline replacement			
Petit Etang: Gospel Hall/Marian/Cocoa Road distribution network	1.9 km	150 mm DI (Ductile Iron)	From the current 250mm trunk main from the Annandale WTP
Mirabeau: Canal Road/Tivoli distribution mains	6.8 km	150 mm PVC	Along Eastern Main Road from Grenville to Tivoli
Vendome : Vendome/Tempe transmission/distribution main	4.8 km	200 mm DI	Vendome/Tempe along the Grand Etang Main Road
Total	13.5 km		
New pipelines			
Vendome: new Mt. Moritz transmission pipeline	2.3 km	100/150 mm DI	From Mt. Moritz storage tank to main pipe (Snug Corner)
Vendome: new Chantilly transmission pipeline	2 km	150 mm DI	From Chantilly storage tank to main pipe (Mt Gay)
Gouyave: new Dr. Belle transmission mains	0.4 km	200 mm DI	From new storage tank to Gouyave Sauteurs Bay Road
Tufton Hall: new Tufton Hall transmission mains	3 km	150 mm DI	From new storage tank to West Coast main road
Peggy's Whim: new Ahoma/ Mt Craven transmission mains	2.3 km	150 mm Di	From Ahoma storage tank to Tivoli and from Mt Craven storage tank to Sauteurs Bay Road
Peggy's Whim: new Diego Piece transmission mains (Fountain)	0.2 km	100 mm DI	From new storage tank to Castle Hill junction
Morne Rouge: new transmission mains	0.2 km	100 mm DI	From new storage tank to Frequente Road
Total	10.4 km		

Table 3. Pipelines included in the Carriacou component

Works to be executed	Length	Diameter/material	Description of location
Beausejour/Hospital forced transmission main	1.2 km	100mm DI and high density polyethylene (HDPE)	SWRO plant to Hospital Tank
Hospital/Top Hill forced transmission main	2.0 km	100mm DI and HDPE	Hospital site to new Top Hill storage tank
Hospital/Belair/Belvedere transmission pipeline	1.9 km	100 mm DI and HDPE	Hospital site to new Belair storage tank + extension to Belvedere
Beausejour/Belvedere forced main	2.3 km	100 mm DI and HDPE	SWRO plant at Beausejour to new Belvedere storage tank
Belvedere/Windward transmission pipeline	1.6 km	100 mm DI and HDPE	North Tank' near Belvedere to Windward and environs
Total new pipelines	9.23 km		

2.4.10 Sustainable use of groundwater resources

This sub-component is based on a study done in 2013 (Gassen, 2013) and on technical assessments done by GIZ in 2013. The rational for the sub-component is to make the best possible use of the available groundwater potential, since this is less vulnerable to climate variations. Thereby it is essential to reach sustainable exploitation of the resources. This sub-component therefore includes:

- Rehabilitation of the existing wells and drilling of 3 new wells
- Determination of the optimal abstraction rate of the rehabilitated and new wells
- Definition and implementation of a system for monitoring well capacity and salinity
- Development of an operation plan of the wells in order to avoid over-abstraction and saltwater intrusion
- Well protection: development and implementation of a concept of groundwater protection zones for the existing wells in order to ensure a constant good quality of the water, e.g. a 3-zone approach, imposing different restrictions on the land use within these zones:
    - Zone 1 includes the direct surrounding of the well. In this fenced area, no other activities than those necessary for the operation of the well are allowed.
    - Protection Zone 2, which is defined by a line from which a particle entering the groundwater takes 50 days to arrive at the well. Within this 50 day line, it has to be ensured that no bacteriological contamination enters the groundwater. This includes restrictions on the use of fertilizers and pesticides.
    - Protection Zone 3 includes the groundwater catchment of the well. In this zone, agricultural activities are allowed, but persistent chemicals from industrial activities should not enter the groundwater.

Existing “Petit Etang” pond

Les Avocats dam (7.50 m high) viewed from downstream

Les Avocats reservoir

River downstream Les Avocats

Example of works for laying small diameter pipes. Source: TCL travaux publics.

Les Avocats WTP

Groundwater well (Chemin)

Storage tank (Observatory WTP)

Figure 11. Photographs

2.4.11 Silt traps and river intake retrofits

The rationale for this component is to reduce the need to shut down water treatment plants because water transports too much sediment during spells of heavy rainfall. To this end, sediment retaining weirs or silt traps will be built immediately upstream of some intakes, and/or some intake mechanisms will be retrofitted (improved):

- mass concrete weirs, of the order of 15m in length and 2.4m height, will be constructed at the following plant intakes: Tufton Hall, Mt. Reuil; Mt. Horne; Pomme Rose; Petit Etang; and Soulier/Vendome;
- the following plant intakes retrofitted with improved (40mm) metal grille and reinforced concrete: Peggy's Whim; Mirabeau; Mt. Plaisir; Petit Etang; Soulier/Vendome; Penny/Vendome; Mon Repos; and Munich.

The figure below shows Mont Reuil water intake, which has been recently retrofitted.

Figure 12. Improved water intake at Mont Reuil water intake ("Tyrolean weir" type grille with slatted horizontal water intake pipe inside the weir)

2.5 Parallel Concord water supply expansion project

A project for the expansion and optimization of the Concord water system (Black Bay River) is expected to be funded by the United Kingdom's Department for International Development (DFID). The component would comprise:

- the construction of a new 4,550 m3/day rapid gravity WTP incorporating clarification, rapid filtration, and disinfection processes, and capable of accommodating the high turbidities which accompany extreme rainfall events. The plant will be constructed on a 0.4 ha site adjacent to the current WTP site;
- the construction of a 1,360 m3 storage tank at la Molinière;
- installation of 25 km of pipes, including in the densely populated areas of Saint George and Grand Anse.

2.6 Proposed tariff review

2.6.1 Background

The functions and powers of NAWASA with respect to the financing of its operations and the levying of rates and charges for water supply, sewerage and other services, are derived from the National Water and Sewerage Authority Act (2010 Revised Laws of Grenada), and subsidiary Regulations. The Public Finance Management Act requires statutory bodies, including NAWASA, to submit to the Minister of Finance in advance an annual business plan including pro forma financial statements.

In 2005/06 The Caribbean Basin Water Management Programme (CBWMP) in association with Price Waterhouse Coopers (PWC) conducted a Tariff Study to facilitate an adjustment to its water supply and sewerage tariffs (CBWMP/PWC, 2006). The then existing tariff was reviewed in the context of its ability to meet internationally accepted tariff objectives of: financial viability; operational and economic efficiency; customers' willingness and ability to pay; and simplicity.

The study included a demand forecast, employed the marginal cost pricing cost concept for the tariff review exercise and developed a Tariff Model with the goal of providing NAWASA with a working tool to project its financial performance and tariff requirements for the ten-year period 2006-2016. The following tariff setting objectives were used: cost recovery; revenue stability; affordability; continuity; fairness or equity; ease of implementation; and economic efficiency – with emphasis on cost recovery and affordability. The consultants recommended a progressive block, two-part tariff structure which represented a 35% increase in both the fixed and variable components of the existing tariff, but which guaranteed low-income users minimum levels of water consumption at an affordable rate.

NAWASA firmly placed 'Tariff Reform' on its agenda in early 2009, at which time the organization embarked on a number of key initiatives aimed at improved governance, and increased efficiency and standards of service – including its first ever Strategic Plan (2009-2014). The Water and Sewerage Rates and Charges Regulations came into effect in April 2010. The current water tariffs are shown in the table below. In addition to the new tariff structure which comprised the CBWMP/PWC recommendations of 2006 with minor modifications, the Regulations included changes designed to facilitate modern and efficient business operations by NAWASA. Enactment of the new Regulations was preceded by implementation of a rigorous Public Relations Plan which deployed a range of communication strategies.

Table 4. Rates, charges and fees for supply of water by NAWASA

Tariff Structure Imperial Gallons***/Month	Variable Rate (XCD/ 1,000 Imperial Gallons)	Variable Rate (US$/ 1,000 Imperial Gallons)	Fixed Monthly Charge*	XCD**	USD
Domestic:					
Less than 2,800	8.10	3.00		10.80	4.00
2,800-5,500	13.50	5.00			
Greater than 5,500	20.25	7.50			
Non-Domestic:	21.35	7.91	Below 2,800 gal	15.00	5.56
			2,801-20,000 gal	33.75	12.50
			20,001-100,000 gal	140.00	51.85
			Over 100,000 gal	550.00	203.70
Ships	33.75	12.50			

* The fixed monthly charge is calculated using the average monthly consumption of the owner over the previous calendar year (or part thereof) and such fixed monthly charge shall be reviewed at the end of each year.

**XCD2.70 = USD1.00

**1 Imperial Gallon = 4.546 liters

Customers located in the area served by sewers (about 5% of customers) pay an additional sewerage rate, which for Domestic Consumers is 1/3 of the monthly water rate, while that for Non-Domestic Consumers is 2/3 of the monthly water rate.

The average annual water bill per customer between 2012 and 2016, including the large-scale customers such as hotels, was between 530 and 565 XCD.

Grenada's Government Assistance Programme, aimed at the poorest section of the population, comprises payment of the water connection fee and monthly water bill by the Central Government, thereby providing a "social safety net".

2.6.2 CREWS project

In the context of rising demands for water quantity, quality and service reliability as well as rising direct costs, and given NAWASA's policy of full cost recovery, a tariff review has become imperative for NAWASA to allocate adequate resources for operations and investments. A tariff study will be prepared to consider the infrastructural challenges of climate change and their financial impact. The new tariff system would also need to consider the potential to use seasonally variable tariffs, which would help (a) to cover additional costs during extended dry spells due to higher water production costs, as well as (b) the possibility to financially influence demand if fluctuations in water availability would require reductions water consumptions.

Under the CREWS project, a Tariff Study will be carried out to determine the required adjustment to NAWASAs water and sewerage tariffs in order to improve financial sustainability for the 10-year period 2017-2026. The methodology used for the study will comprise:

(i) Analysis of the performance of the existing tariff;

(ii) Assessment of the future revenue requirements and cost of service of NAWASA including the consideration of climate impacts on investment and operation of existing and new infrastructure;

(iii) Determination of the objectives of the new tariff, including analysis of social acceptance, gender-relevance as well as flexible pricing schemes based on temporary scarcity due to climate change impacts;

(iv) Establishment of the adjustments to the tariff structure and levels required to meet the tariff objectives; and

(v) Assistance to NAWASA in gaining approval for the new tariff.

Further implications of the study are presented in section 6.2.8.

3 Project implementation arrangements

The following paragraphs described the organization for project implementation which is currently planned for the CREWS project. This organization may still evolve. This organization is described because it has consequences for the implementation of the ESMP. Arrangements for implementation of the ESMP will be described in chapter 7.

CREWS project implementation will involve the German Organization for Development Cooperation (GIZ), the Government of Grenada (GoG) through its different ministries, NAWASA, and the Grenada Development Bank. Private companies will procure civil works, equipment and technical assistance. GIZ has been accredited by the GCF to present project proposals and oversee project implementation.

Grenada's NDA

The Department of Economic and Technical Cooperation (DETC) is Grenada's National Designated Authority (NDA) for the Green Climate Fund. Within the CREWS project, the DETC will represent Grenada as the national beneficiary of this GCF funded project and ensure alignment of the project implementation with national policy objectives and goals.

GIZ

GIZ will be the Accredited Entity with the GCF, and also one of the project executing entities, focusing on Component 1: Integrating Climate Resilience into Grenada's Water Governance (except for procurement of equipment for the Water Resources Management Unit), and Sub-Components 2.2: Household and Community Awareness and Education,

Project Coordination Unit (PCU) under the Ministry of Finance and Energy (MoFE)

The PCU is a specialized project management unit with appropriate fiduciary handling capacity gained through several years of experience in managing World Bank and other donor projects, including the national Disaster Risk Vulnerability Project (DVRP) with an overall volume of more than 26 million USD, funded via the World Bank.

The PCU already manages various World Bank and other donor-financed projects. The arrangements allow for utilization of the existing resources (a particularly important aspect for SIDS), assuring consistency of approaches across projects, and for achieving economies of scope and scale.

The PCU will be the executing entity in charge of procurements and management for the infrastructure components of the project. This includes the procurement of equipment for sub-component 1.1 (equipment for Water Resources Management Unit), sub-component 2.3 (NAWASA water meters), and the complete component 3. The total volume of investment handled by the PCU will be approx. 19.5 million Euro. The PCU will seek advice from NAWASA and/or GIZ on technical and engineering specifications.

Grenada Development Bank (GDB)

The Grenada Development Bank (GDB) is a public statutory financial institution established in 1996. The GDB is specialized in providing funding to Small and Medium Enterprises (SME), using funds provided by external development organizations like the Caribbean Development Bank (CDB) or the Caribbean Development Fund (CDF).

The GDB will be the executing entity for the implementation of the grant-based Challenge Fund for Climate Resilient Commercial Water Users, sub-component 2.1 of the CREWS project.

The GDB was nominated by the Government of Grenada and the NDA as Grenada's Direct Access Entity (DAE) or National Implementing Entity (NIE) candidate for the Green Climate Fund, and is currently receiving assistance from the GCF's Readiness Support Programme delivered by GIZ, to support the GDB's accreditation process as an NIE.

Main recipient institutions

(1) National Water and Sewerage Authority (NAWASA)

NAWASA will be the agency responsible for the day-to-day implementation of most of the technical components of the project, in cooperation with the PCU and the GDB, and is considered the main beneficiary.

(2) Ministry of Works and Public Utilities (MoWPU)

The MoWPU provides oversight for NAWASA's activities as a water utility. It is also in charge for the regulation of other utility sectors, like telecommunication or electricity. It is also in charge – via its Physical Planning Unit – for approval of construction planning documents and issuing of permits, based on compliance with building codes.

The MoWPU will play a key role concerning amendments of standards and development of new regulations with regard to buildings. This includes any requirements for water efficiency standards or requirements for mandatory rainwater collection systems for new buildings. In addition, the foreseen new Water Resources Management Unit could be established as part of the MoWPU.

Steering Committee

A Project Steering Committee (PSC) will be established and chaired by MOFE, represented by the Permanent Secretary. Members of the Project Steering Committee include:

- Grenada's National Designated Authority for the GCF;
- One representative of the National Climate Change Committee
- One representative of the Ministry of Works and Public Utilities (MWPU);
- One representative of the Ministry of Agriculture, Lands, Forestry and Fisheries (MALFF)
- One representative of the Grenada Chamber of Industry (GCIC)
- One representative of the Inter Agency Group of Development Organisations (IAGDO), as the umbrella organization of NGOs in Grenada
- One representative of Grenada National Organization of Women (GNOW)
- One representative of the Grenada Development Bank (GDB)
- the Project Coordinating Unit (PCU under MoFE)
- the National Water and Sewage Authority (NAWASA)
- GIZ (as observer).

The PSC will meet twice per year and has the following tasks:

- Provide overall guidance to the project, in particular regarding aspects of targeting the most vulnerable, gender balance, and sustainability.
- Review, feedback and approval of annual work plans, annual reports and audits.
- Ensuring programme synergy and coherence with the evolution of the international and national context, including the overall national adaptation planning.
- Review programme adherence with safeguards.

- Support the coordination of project activities across different line ministries, and between private sector, public sector and civil society.

Project Management Committee (PMC)

On an operational level, the establishment of a Project Management Committee (PMC) will help to have a stringent and smooth implementation of the various project activities and across the project components.

The PMC consists of:

- Head of Project of GIZ in Grenada (if required, supported by GIZ headquarters)
- Project Manager of GDB
- Project Manager of PCU
- Project Manager of NAWASA
- Other relevant partners, as per need

The PMC will meet weekly with the following tasks:

- Define, monitor and coordinate work plans
- Ensure budgets and work plans are on track and monitor project progress
- Identify and resolve bottlenecks and implementation challenges relevant on project level
- Monitor adherence to environmental, social and fiduciary safeguards
- Identify issues required to be brought to the attention of the PMC and/or political decision-makers
- Provide for information exchange and synergies between programme components
- Agree on ToRs, recruitment of experts

Construction supervision

All construction works will be based on FIDIC standards, as well as on recommendations of the CREWS ESMP, and monitored by PCU and NAWASA.

4 Presentation of the environmental and social assessment and ESMP

4.1 Background

The project is presented for funding to the Green Climate Fund (GCF). The GCF uses an interim Environmental and Social Policy based on the Performance Standards of the International Finance Cooperation (IFC). The GCF's interim E&S Policy is used as a benchmark to assess the capacity of implementing agencies, which the GCF accredits in order to prepare and implement projects on its behalf. The GIZ's Safeguards+Gender Management System was approved by the GCF when approving GIZ as an Accredited Entity (AE). It is compatible with the IFC Performance Standards. Therefore an environmental and social assessment has been prepared for the project in conformity with the GCF's environmental and social policy – and by doing so at the same time in compliance with GIZ's Safeguards+Gender Management Systems.

GIZ has initially assessed the CREWS project as a category "medium" project in terms of E&S risks, or "Category B" according to IFC's and the GCF's categorization. The project is expected to have positive environmental and social impacts. Some activities could however generate potential adverse environmental and social risks and impacts that will mostly be site-specific, are not irreversible or complex in nature, and can readily be addressed through mitigation or compensation measures.

Category B projects require a rapid Environmental and Social Assessment (E&S assessment) and the preparation of an Environmental and Social Management Plan (ESMP).

The Environmental and Social Assessment describes potential adverse risks and impacts of the project on the natural and social environments, and identifies the mitigation or compensation measures which are required to ensure compliance of the project with the E&S Performance Standards.

The Environmental and Social Management Plan (ESMP) describes how the identified measures should be implemented over the duration of the project. The ESMP is to be executed by the different organizations involved in project management: GIZ, the Project Coordination Unit (PCU), NAWASA, civil works companies and the relevant ministries of Grenada. Also civil society organizations are involved.

GIZ has contracted an independent Environmental and Social Consultant to confirm the categorization, to prepare the E&S assessment and the ESMP, and to perform the relevant stakeholder consultations.

4.2 Activities performed

The independent Environmental and Social Consultant has visited Grenada during two weeks in May 2017 (1-5 May 2017 and 16-19 May 2017). She was assisted by GIZ staff who have been working in the country's water sector for several years, and by an experienced Grenadian consultant working in the water sector. She worked in cooperation with the GIZ specialist who performed a separate gender assessment of the project.

The E&S consultant visited existing water supply infrastructure and sites where works are planned. The consultant visited NAWASA headquarters, laboratory, WTPs and "Dusty Highway" working site to assess the environmental and social management capacity of NAWASA. She also visited the other

future project implementing bodies: the NDA, the PCU and the GDB. She consulted with government bodies (cf list of persons consulted in appendix).

The GIZ team held a further visit to assess the infrastructure needs in Carriacou and consult with Carriacou stakeholders.

The consultant developed a draft ESMP, which was discussed with GIZ and with NAWASA, and presented during two consultation workshops (see next section).

4.3 Consultations held

During the consultations for the Environmental and Social Impact Assessment, representatives of various Ministries, NGOs, private sector and other donors and implementing entities discussed the approach and the content of the project. These consultations took place on May, 5th and May, 19th, 2017. Beside the consultations, approximately 20 bilateral meetings with key stakeholders have been entertained.

The list of persons consulted is provided in Appendix.

During these consultations, the consultant presented the potential E&S risks and impacts of the project, as well as the draft ESMP. The information collected during these consultations is presented in appendix and in section 6.2.7.

5 Project categorization and scoping of the assessment

5.1 Overview of legal requirements in Grenada

There are about 12 principal items of legislation that govern environmental management, land use, environmental health, and the water sector in Grenada.

The National Water and Sewerage Authority Act, Cap. 208 of the 2010 Revised Laws vests the right to the use of every body of water in the Water and Sewerage Authority (NAWASA) and identifies as one of its functions the provision of a satisfactory supply of potable water for domestic purposes, and a potable or otherwise satisfactory supply of water for agricultural, industrial and commercial purposes (Sect. 6).

The Physical Planning and Development Control Act, 2016, replaced the Physical Planning and Development Control Act 2002, and deals with a wide range of physical planning matters and requires developers to carry out EIA's for the following types of development inter alia:

- Hotels or resort complex of more than 50 rooms;
- Residential development of more than 25 units;
- Marinas;
- Land reclamation, dredging and filling of ponds and swamps; and
- Any coastal zone development.

In addition, the Act requires the preparation of a physical plan for the whole of Grenada, in which land may be allocated for prescribed purposes including protection of coastal zones, special resources and use areas, controlling the disposal of sewage and the pollution of water bodies. It is noteworthy that the new physical planning legislation adopts the OECS Building Code (and hence the Grenada Building Code) through the Physical Planning and Development Control (Adoption of Building Code) Order, 2016.

Table 5. Grenada's Principal Environmental and Water Legislation

Law / Regulation	Responsible Government Agency
Grenada Solid Waste Management Authority Act, Cap. 131A	GSWMA
National Parks and Protected Areas Act, Cap. 206, as amended	Min. of Agriculture – Land Use Division
National Water and Sewerage Authority Act, Cap. 208, as amended	NAWASA
NAWASA Sewerage Regulations, SRO 401/1993	NAWASA
Pesticides Control Act, Cap. 238	Min. of Agriculture – Pest Management Unit
Physical Planning and Development Control Act, 2016	Planning and Development Authority
Land Development Regulations, SRO 13/1988	Planning and Development Authority
Physical Planning and Development Control (Adoption of Building Code) Order, 2016	Planning and Development Authority
Public Health Act, Cap. 263	Min. of Health – Environ. Health Division
Public Health Regulations, SRO 9/1990	Min. of Health – Environ. Health Division
Standards Act, Cap. 310	Grenada Bureau of Standards
Waste Management Act, Cap. 334A	GSWMA

The above Acts and Subsidiary Legislation are found in the 2010 Revised Edition of the Laws of Grenada and online at the Government of Grenada website at www.gov.gd

The Public Health Act, Cap. 263 of the 2010 Revised Laws establishes a Sanitary Authority to exercise a supervisory function over all sanitary matters, and is empowered to make pertinent regulations. The Act deals with power of entry for sanitary inspection of premises (Sect. 76), and is applicable to vessels (Sect. 77).

The Waste Management Act, Cap.334A of the 2010 Revised Laws, which provides for the management of waste in conformity with the best environmental practices, and deals with unauthorized disposal of waste in national parks or protected areas (Sect. 33); prohibition on the importation of waste (Sect. 34); waste storage requirements (Sect. 35); industrial and commercial waste generators (Sect. 38); and management of used oil (Sect. 40).

Land acquisition is governed by the Land Acquisition Act (Act to authorise the acquisition of land for public purposes) of 6th October, 1945, amended by Act No. 16 of 1991, Act No. 20 of 1998.

5.2 GCF requirements and applicable standards

The environmental and social risk categories as defined in the ESS standards of the GCF apply to activities financed by the GCF as follows (GCF, 2016):

- Category A. Activities with potential significant adverse environmental and social risks and impacts that, individually or cumulatively, are diverse, irreversible, or unprecedented;
- Category B. Activities with potential mild adverse environmental and social risks and impacts that, individually or cumulatively, are few, generally site-specific, largely reversible and readily addressed through mitigation measures; and
- Category C. Activities with minimal or no adverse environmental and social risks and/or impacts.

The scope and depth of environmental and social assessment will be proportional to the level of risks and impacts and address the specific requirements of applicable ESS standards. The specific focus of the assessment will be determined by the requirements of the applicable ESS standards. For category A projects that are expected to have significant environmental and social impacts, a full and comprehensive environmental and social impacts assessment (ESIA) is required. For category B projects with limited impacts and with well-developed mitigation and monitoring measures, a limited focus environmental and social impacts assessment and ESMP will suffice (GCF, 2016).

The interim standards of the GCF are the IFC Environmental and Social Performance Standards (PS):

- PS1: Assessment and management of environmental and social risks and impacts
- PS2: Labour and working conditions
- PS3: Resource efficiency and pollution prevention
- PS4: Community health, safety and security
- PS5: Land acquisition and involuntary resettlement
- PS6: Biodiversity conservation and sustainable management of living natural resources
- PS7: Indigenous peoples
- PS8: Cultural heritage

The International Finance Corporation (IFC) Performance Standards can be viewed among others at: http://www.ifc.org/wps/wcm/connect/c8f524004a73daeca09afdf998895a12/IFC_Performance_Standards.pdf?MOD=AJPERES.

All Performance Standards apply to the CREWS project in Grenada, except PS7, since there are no groups of people who might be defined as indigenous in Grenada.

5.3 Impact screening and project categorization

The table below provides a screening of potential positive and negative (risks and) impacts to be expected from the different project components. This *a priori* impact screening is used for project categorization. The risks and impacts will be assessed in detail in chapter 6.

Table 6. Impact screening of the project components against the E&S Performance Standards

Sub-component	Anticipated positive impacts	Potential negative risks and impacts	Applicable PS
Component 1			
1.1: Establishment of a climate-proof legislative and institutional framework in the water sector	Positive E&S impacts	None expected	-
1.2: Mainstreaming climate change in policies and plans with relevance for the water sector	Positive E&S impacts	None expected	-
1.3: New water tariff structure to sustainably finance investments and to influence water demand subject to climate variability	Positive E&S impacts due to improved financial sustainability of water supply	Risk that the new tariffs could affect vulnerable households disproportionately	PS1
Component 2			
2.1: Challenge Fund for Climate Resilient Commercial Water Users	Positive E&S impacts	None expected	-
2.2: Household and Community Awareness and Education	Positive E&S impacts	None expected	-
Component 3			
3.1: Resilience of NAWASA's Supply Systems **- NAWASA Water Storage, incl. connecting pipelines and rainwater harvesting** **- NAWASA groundwater resources** **- Climate Resilient Maintenance Plan for existing and new infrastructure**	Positive E&S impacts + employment opportunities of construction and of maintenance plan	Some limited land acquisition and easements/rights-of-ways and possible change of agricultural practices in the protection areas Potential encroachment on nature area and/or forests Limited nuisances, health, safety and environmental impacts during construction Potential impacts on labour Possible increase of water use due to better conveyance Possible impacts on streamflows None to very minor impacts of groundwater use on ecosystems	PS2, PS3, PS4, PS5, PS6, PS8

Sub-component	Anticipated positive impacts	Potential negative risks and impacts	Applicable PS
3.2: Resilience of Water User's Supply System **- Water Storage and improvements at medical facilities**	Positive E&S impacts	Potential very minor impacts on Occupational Health and Safety (OHS) or customer safety during works	PS2, PS4
3.3: Disaster Resilience of NAWASA's systems: **- Asset Condition Assessment and Vulnerability Analysis**	Positive E&S impacts	None	-
- Silt Traps and River Intake Retrofits	Positive E&S impacts	No impacts on ecosystem continuity Possible impacts on watercourses during works Potential very minor impacts on OHS during works Possible negative impact of sediment dumping when intakes are cleaned	PS2, PS3, PS4, PS6
- Remote Monitoring & Control (SCADA) Systems	Positive E&S impacts + employment opportunities	Potential very minor impacts on working conditions	PS2
- Emergency Response Plan	Positive E&S impacts	None	-

As a result of the impact screening, the project is categorized as B ("medium risks"):

- The project is an integrated approach to improvement of the drinking water sector in Grenada. It is expected to have a very positive socio-economic impact overall, by improving access to drinking water for all users. By combining (i) improvements of the physical water supply system with (ii) water demand management and (iii) water resources management, the project increases sustainability of water supply for Grenada in the long run.
- The project includes a water resources management component that is expected to have a positive impact on aquatic biodiversity and a positive impact on other water users (mainly agricultural). The project may involve a minor increase in the use of freshwater resources, but this impact is compensated by improvements in water resources management island-wide. Local impacts on aquatic biodiversity will be minor, and will be assessed in more detail during the project, which will provide an opportunity to raise awareness in Grenada about the need to protect aquatic ecosystems. Mitigation measures will be included in the design of the upgraded reservoirs.
- The project has a limited infrastructure component which will result in minor loss of (access to) land, minor loss of non-critical natural habitat, and temporary construction impacts. These impacts are site-specific and will be mitigated or compensated.
- All pipelines have a small diameter and require digging of small trenches only. They are expected to be mostly laid along existing roads.

- The project involves limited land acquisition, and limited potential acquisition of easements/rights of way, which will be compensated. The project does not result in physical displacement. It may result in some very minor economic displacement, which will be compensated.
- The project involves rebuilding of an existing small dam[3], works on existing small water intake weirs, and building of small weirs on streams entering reservoirs, where ecological continuity is already disrupted. There are no large dams in Grenada and the project does not involve any new ("greenfield") dams or water intakes.
- The new tariff structure will be developed with a strong commitment to make water affordable for the most vulnerable.
- Activities in the project are not part of IFC's exclusion list.

5.4 Corporate assessment of NAWASA E&S management

Since NAWASA, as the main recipient entity of the project, will be impacted by the project through many of its components, and since the project includes many different components with potential risks and impact on the environment, on labor conditions, on health and safety of workers and of communities, and on land use, which will be managed directly by NAWASA, PS1 (Assessment and management of environmental and social risks and impacts) requires a comprehensive assessment of NAWASA's environmental and social management capacities, as well as an upgrade of this capacity to ensure conformity with the E&S Performance Standards. Such an upgrade will ensure that NAWASA is able to manage the project in conformity with GCF's requirements, even if the project definition undergoes changes. It also reduces adverse risks and impacts from NAWASA's activities which are related to the project components, but not directly included in the project.

5.5 Financial intermediaries

Following IFC's Sustainability Framework (2012), the Grenada Development Bank (GDB), who will manage the challenge fund for water-saving equipment, can be considered a "financial intermediary" (FI) in the project. GDB would be categorized "*FI-3: when an FI's existing or proposed portfolio includes financial exposure to business activities that predominantly have minimal or no adverse environmental or social impacts" (IFC, 2012).*As a result, GDB's environmental and social capacity has not been further assessed.

5.6 Conformity with Grenada ESIA requirements

The Physical Planning Unit (PPU) of the Ministry of Works and Public Utilities is responsible for Environmental Impact Assessment (EIA) in Grenada. Grenada does not require an EIA for projects developed by the government. Approvals are required from the Physical Planning Unit (PPU) for storage increase, pipeline constructions and improvements of water intakes. The PPU has been involved in development of the CREWS project since an early stage. GIZ and the PPU agreed that the present environmental and social assessment would be communicated to the PPU and that this would cover any potential national requirement for environmental assessment.

[3] The International Commission on Large Dams (ICOLD) defines a large dam as a dam with a height of 15 metres or more from the foundation. Dams that are between 5 and 15 m high and have a reservoir volume of more than 3 million m^3 are also classified as large dams.

6 Impact assessment and proposed mitigation and compensation measures

6.1 Purpose

Chapter 6 examines how far the envisaged CREWS Project complies with the interim GCF Environmental and Social Performance Standards and, in case of gaps, proposes measures required to reach conformity with the PS. These measures will be included in the ESMP. They are described in detail, together with a cost estimate and implementation arrangements, in chapter 7. Since this is a Category B project, the impact assessment is relatively rapid and does not seek to quantify all impacts in detail, as long as certainty can be obtained that future project impacts will be managed.

6.2 PS1: Assessment and management of environmental and social risks and impacts

6.2.1 Objectives

The objectives of PS1 are (GCF, 2016):

- (a) Identify funding proposal's environmental and social risks and impacts;
- (b) Adopt mitigation hierarchy: anticipate, avoid; minimize; compensate or offset;
- (c) Improve performance through an environmental and social management system;
- (d) Engagement with affected communities or other stakeholders throughout funding proposal cycle. This includes communications and grievance mechanisms.

According to IFC (2012): under PS1, the review will assess the Environmental and Social Management System (ESMS) of the client, incorporating the following elements: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competence; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review. When relevant, the ESMS should also define roles and responsibilities of third parties in decisions that may affect environmental and social sustainability of the project. Engagement of affected communities is promoted, and an effective grievance mechanism should be implemented when relevant.

The following paragraphs examine in how far the project complies with the requirements of PS1, and in case of gaps, identifies which measures should be applied.

6.2.2 Identification of environmental and social risks and impacts

The impact screening (Table 6. in the previous pages) has identified the areas where detailed impact assessment is required. The detailed impacts will be assessed in the sections devoted to each PS.

6.2.3 Mitigation hierarchy

The CREWS project has been particularly careful, during the design phase, to adopt a "mitigation" hierarchy. The infrastructure component of the project, which generates the most risks and impacts, is kept to a strict minimum. NAWASA has a good practice of minimizing impacts of pipeline routes and locations for storage tanks, by carefully selecting its sites, and will continue to do so for the CREWS project. Water pipes mostly run along existing roads. When land owners are not ready to sell, NAWASA choses alternative sites for its infrastructure as much as possible.

By performing the present environmental and social assessment, together with the ESMP, the CREWS project complies with the requirement of PS1 to minimize, compensate, or offset potential adverse risks and impacts of the project.

6.2.4 Assessment of alternatives (ecosystems approaches, storage)

For projects which do not involve large-scale greenfield infrastructure, PS1 does not formally require an assessment of alternatives.

Ecosystems approaches

However, some stakeholders have wondered if ecosystems-based adaptation (EbA) options have been sufficiently considered in the choice of project components. For instance, several stakeholders have raised a demand to include catchment reforestation in the project components, in order to increase the capacity to store water and to retain sediment.

Hurricane Ivan has destroyed forest area in the river catchments and has probably significantly reduced this capacity, so that the suggestion makes sense. Since then, there has been visible regrowth of trees, but the quality of the resulting forest may not be similar to the original one. An issue is that no studies are available at the moment to assess the possible effects of reforestation measures, nor to define the best approach to catchment reforestation. Data are lacking both on hydrology and on ecosystems. The CREWS project has made a clear choice to include options which were already assessed as highly feasible. Some infrastructure is needed for water supply, and this infrastructure needs to be rehabilitated.

However, the CREWS project provides a very good institutional basis to further develop EbA measures:

- through the WRMU;
- through the wastewater treatment feasibility study, where such options will be considered.

If they are feasible options, EbA measures tend to be more sustainable (environmentally, economically and socially), and offer a number of co-benefits. Another argument is that EbA measures are often better accepted by local communities, but this argument does not fully apply here: interventions proposed by CREWS are very well accepted locally.

Overall, the project has a balanced approach to drinking water supply by combining traditional rainwater harvesting, ecosystem protection, and infrastructure which is necessary to serve the denser coastal areas. The project builds on the local experience of the ongoing Integrated Climate Change Adaptation Strategies (ICCAS) project, jointly implemented by the Environment Division of the Ministry of Agriculture, GIZ and the United Nations Development Program. It relies on inclusion of all water-users in Grenada and the approach has been validated during the many rounds of consultations which have taken place.

A further discussion of options for management of ecosystems in Grenada is provided under the section on PS6.

Storage options

Regarding the storage options foreseen in the project, these were identified under a Water Storage Optimization Study (Bornemann, 2015):

1. *Insufficient storage capacities have been identified as one of the main bottlenecks in the nation's water supply. This limits the capacity of the water supply system to collect sufficient water to bridge the predicted longer-term spells. On the other hand, additional storage of raw water reduces the likelihood of supply interruptions due to high turbidity after heavy*

rainfall events, which are in some models predicted to occur more frequently with climate change.

2. *The GIZ study computed data for water system capacities; various production and consumption parameters including production and consumption trends; climate change impacts; current and future water balances; and water storage coverage. Key outputs of the study include an overall hierarchy of water supply systems which are facing the highest water scarcity risks, and water storage site identification.*
3. *The following eight systems were determined to be the most in need of adaptation measures in terms of storage: Annandale; Pomme Rose; Mirabeau; Les Avocats; Mt. Horne; Mamma Cannes; Clozier; and Petit Etang.*
4. *In addition to the above detailed water storage analysis, CREWS also considers earlier engineering studies and design reports carried out for NAWASA, including an initial pipeline age and condition analysis (Gaudriot, 2003; ENB, 2005; NIRAS, 2010). Consideration was also given to the recently completed National Adaptation Strategy and Action Plan for Grenada (CCCCC, 2015, GOG, 2015b), and a careful review was made of historical field maintenance reports to determine the water systems most at risk and to prioritize sub-projects. And while the benefits of investments in water storage facilities are obvious, so is the need for transmission pipelines to supply water storage tanks.*

6.2.5 Environmental and Social Management System

The consultant has performed a due diligence of NAWASA's environmental and social management. This capacity is relatively low at present, although NAWASA is in relative conformance with some of the Performance Standards (cf respective PS sections of this chapter).

The NDA and the PCU are experienced in implementing projects according to World Bank standards. As said above, the GDB's capacity was not assessed in detail due to the low risk category of this player in the project.

Since NAWASA will manage different components of the project and since one of the aims of the project is to improve the sustainability of NAWASA's activities, the ESMP will include a requirement for NAWASA to improve their environmental and social management capacity, in particular by implementing a certified Environmental, Social, Health and Safety Management System.

6.2.6 Emergency preparedness and response

The CREWS project includes an emergency preparedness and response plan for water supply, which will include all relevant stakeholders including NAWASA and the National Disaster Management Agency. The due diligence for NAWASA has identified the need for an additional emergency preparedness and response plan for potential chlorine gas leaks (under PS4). Besides, through the implementation of its certified ESMS, NAWASA will continuously improve its emergency preparedness and response planning. Together these measures ensure conformity of the project with the requirement for emergency preparedness and response of PS1.

6.2.7 Stakeholder engagement and grievance mechanism

6.2.7.1 Purpose

PS1 requires stakeholder engagement and a grievance mechanism for the project. The CREWS project already includes a comprehensive communication plan geared towards stakeholders and a grievance redress mechanism which will be managed by GIZ.

6.2.7.2 Summary of stakeholder engagement activities undertaken to date for the CREWS project

The project idea has been proposed as an outcome of a climate-finance readiness mission by GIZ and CDB which met with approximately 100 stakeholders in Grenada in 2015. It has since then been discussed with various stakeholders, including NGOs, and was presented in various stakeholder meetings, including a training on accessing climate finance with participants from public sector, private companies, national funding institutions and civil society.

Drafts of the project proposal have been presented in meetings of the Sustainable Development Council (SDC), which is a nationwide open platform to discuss critical climate change, sustainability and environmental issues. In the SDC, private sector, public sector, civil society and schools are represented. These meetings took place in October 2015 in St. George's, on March 2, 2016 in Sauteurs in the Northern part of the country, on March 9, 2016 again in St. George's and on March 15, 2016 in Grenville (East coast).

For the environmental and social impact assessment and gender assessment, about 20 stakeholders were interviewed individually, and two consultation workshops ere held:

- Focus group 1 on May 4th, 2017
- National CREWS stakeholders workshop on May 19th, 2017

In all consultations and workshop meetings members of the National Climate Change Committee (NCCC) were present, which is composed of 13 members of different public authorities and ministries, chaired by the Permanent Secretary of the Environment Division of the Ministry of Education, Human Resource Development, and the Environment and managed by Grenada's Climate Change Focal Point. The discussion with the NCCC included also co-opted members of the adaptation sub-committee of the NCCC. The proposal also has been discussed with the Grenada Chamber of Industry and Commerce and the Grenada Hotel and Tourism Association. In total, from the first idea to the final draft of the proposal, between 400-500 people were consulted – which is almost 0.5% of the total population.

In all discussions the project was highly positively perceived, and it was given highest priority by the Grenadian Cabinet.

6.2.7.3 Consultations on ESIA and ESMP

The consultations on the ESIA and ESMP did not yield much specific information on possible adverse environmental and social impacts of the project components. The people consulted were positive about the project had high expectations about improvements in water supply. The tariff study is perceived positively by some, but is a source of concern for others who foresee an increase in tariffs.

People consulted warned about the need to manage traffic interruptions. There is a very low awareness on biodiversity other than marine biodiversity, mangroves and birds on the island, and there were no reactions as to possible impacts of water abstraction from rivers or disruption of ecological continuity from weirs.

Some people advised that NAWASA should search for more communication with people affected by land acquisition for water infrastructure.

One of the persons consulted was a neighbor to the proposed new "Petit Etang" reservoir, and provided information on the history of the site as an ancient cocoa estate.

6.2.7.4 Stakeholder engagement in the CREWS project

Stakeholder engagement in the CREWS project is integrated in the institutional sub-components 1.1, 1.2 and 1.3, as well as in the awareness raising and education sub-component 2.2.

6.2.7.5 Additional ESMP stakeholder engagement activities

The ESMP will only include additional stakeholder engagement activities:

- a stakeholder engagement plan for the construction impacts
- a grievance mechanism for persons affected by land acquisition and temporary land occupation
- a construction phase grievance mechanism for persons affected by construction nuisances
- a grievance mechanism for construction workers (including NAWASA's workers)

These measures are described in detail in chapter 7.

6.2.8 Social impacts of water tariffs

Consultations about the intended implementation of a new tariff structure for NAWASA have shown that communities are worried about a possible water tariff increase.

There is a strong commitment from the CREWS project to ensure affordability of drinking water for the most vulnerable households. The CREWS project's rationale is that the most vulnerable suffer most from deficiencies of the water supply system, and will suffer most from climate variability and climate impacts. Making the water supply financially sustainable and climate-resilient through increased revenues from heavy users will have a proportionally higher positive impact on vulnerable households.

Grenada already has a "social safety net" where the state pays the water bills of the poorer households. This approach is recommended by international institutions: set appropriate and correct tariffs, and protect the poor by direct subsidies. This approach is already adopted in Grenada. It allows a full cost recovery to avoid insufficient funding of the water utility, which would lead to insufficient services and coverage – from which normally the poor suffer most, since the better off can often afford alternative supplies.

In addition, the existing increasing block tariff allows for a lower cost for low volume users, and high volume users paying more.

The system combining full cost recovery with a subsidy of the water bill by the national social security system and with higher tariffs for higher volume users should normally be continued under the next tariff review. It will be assessed during the tariff study and, if necessary, additional measures will be included to ensure affordability of water for all households.

Another issue of concern which is often raised is that water-sector projects in developing countries, when increasing the number of house connections to the water supply network, tend to abandon the use of public standpipes and other collective types of supply, which in fact reduce access to water for people who are not living in houses which can benefit from tap connections. During the consultations in Grenada, communities have expressed concerns about a possible reduction in the availability of collective standpipes, which are still being used for economic as well as for social reasons.

It is important to understand that this is not the case in the CREWS project: access to piped water is currently already very good in Grenada, where 97% of households have access to improved water sources, and the project does not increase the number of house connections.

The proposed CREWS project includes sufficient safeguards to avoid a negative impact from the new tariff structure. The tariff study will include a full socio-economic assessment of customers' ability and willingness to pay in Grenada before proposing new tariffs. Social guidelines for the tariff study are outlined in chapter 9 and will be included in the Terms of Reference of the study, and monitored during ESMP implementation. PS1 also requires that the project includes ongoing reporting to affected communities about issues of concern to them. Therefore the ESMP will include a specific stakeholder engagement plan for the tariff study.

6.2.9 Conclusion for PS1

The CREWS project has been developed by GIZ, an organization experienced in applying good international practice of environmental and social risks and impacts assessment and management. The project will be implemented under sound arrangements involving organizations with experience in implementing donor-funded projects. The project design is generally in full conformity with PS1. In particular, it has a strong stakeholder engagement component, including a grievance mechanism. Additional measures which are required in the ESMP to reach full conformity with PS1 are therefore limited to stakeholder engagement during construction (including for workers) (**action 10a of the ESMP in chapter 7)**.

Only two issues have been identified which need corrective actions:

- NAWASA as a main implementing entity should improve its general capacity for environmental and social management, to avoid any risks and adverse impacts during project implementation and related to associated activities (**actions 2 and 3 of the ESMP**)
- Although the terms of reference for the tariff review seem conform *a priori* with the Performance Standards, additional social guidelines for the tariff study are provided and will be monitored under **action 1b of the ESMP**. An additional stakeholder engagement and monitoring mechanism for the tariff study has further been included in the ESMP (**action 10b**).

6.3 PS2: Labour and working conditions

6.3.1 Objectives

The objectives of this Performance Standard are (GCF, 2016):

- (a) Fair treatment, non-discrimination, equal opportunity;
- (b) Good worker–management relationship;
- (c) Comply with national employment and labour laws;
- (d) Protect workers, in particular those in vulnerable categories;
- (e) Promote safety and health;
- (f) Avoid use of forced labour or child labour.

Following the impact screening shown in table 5, this section examines the following risks and impacts:

- Labor and working conditions at NAWASA
- Occupational Health and Safety (OHS) risks and impacts of construction works
- Further project impacts on labor conditions.

6.3.2 Labor and working conditions at NAWASA

NAWASA is a public utility with 229 employees (March 2017). The company follows the Grenadian Labour Code, and the due diligence has shown that the company mostly satisfies PS2 with regards to labour and working conditions. A possible issue of concern is the large number of contractual workers, of which some are employed for short periods only, and some for arduous tasks such as cleaning of vegetation or of reservoirs. The company is relatively small and has a limited capacity for human resources management. The gender assessment and the consultations have shown that work of women in technical employment should be encouraged.

NAWASA is not yet up to standard however with regards to Occupational, Health and Safety (OHS) management. The company has just taken the first steps towards implementing OHS management and is still far from compliant with the requirements of PS2 on OHS. An OHS Handbook has been approved in March 2017 but an OHS organization is yet to be implemented. There is some reporting on OHS issues in the monthly and annual reports. Accidents are reported and discussed, but there is no record kept and no statistics. There were no statistics available about traffic accidents. Work in confined spaces is a very significant source of risk for personal working in the water sector, especially in the sewerage system but also in empty water tanks. Procedures for work in confined spaces at NAWASA are not appropriate (masks are not always appropriate, workers do not wear gas detectors, workers are not trained to react). WTPs in Grenada are small and this makes investment in the appropriate safety equipment more costly. Some plants such as Mardigras and Annandale WTPs have good security equipment (railings, hooped ladders etc), but others do not. Storage of hazardous materials for water treatment is not appropriate. Personal protective equipment is relatively well available but, according to NAWASA management themselves, there is not yet a good safety culture among employees. There is a suspicion that civil work companies will be in the same situation or probably worse.

This is why measures are necessary to reinforce management of health and safety both at NAWASA in general, to improve worker's health and safety in general in the water sector, and directly in the project activities.

6.3.3 OHS risks and impacts of construction works

The civil works will provide temporary employment opportunities in Grenada for construction companies. It is expected that labor and working conditions at construction companies will be less good than at NAWASA. Therefore very careful monitoring of compliance with the national labor code, social security requirements, and PS2, is required for the construction phase.

Construction works will lead to health and safety risks for workers, among which injuries, traffic accidents, accidents with heavy work machinery, risk of collapsing of excavations, poor hygiene conditions on working sites, poor housing conditions, increased exposure to UV light, and waterborne diseases. The magnitude of the works is limited; the typical prescriptions for careful management of construction works apply (see chapter 8). A significant risk for pipeline works is the risk of collapsing of excavations. Contractors rarely apply appropriate procedures in this respect and NAWASA should make specific efforts to train its staff on the methods for armoring excavations and apply strict oversight over contractors.

The risk of increased transmission of vector-borne and water-related diseases is not significant for works on small pipelines in the project. The risk will be more significant for works at Les Avocats and Petit Etang and for works on the water intakes on streams, which are executed next to open water.

Several mosquito-borne viral diseases are present in Grenada (dengue, chikungunya, Zika, and encephalitis). Trypanosomiasis and leishmaniasis have been found in canine reservoirs, but cases in humans are rare. Yellow Fever and malaria are currently non-endemic, but outbreaks are predicted to occur with increasing human mobility and climate change. Furthermore, 3 water-related diseases such as leptospirosis, typhoid, gastroenteritis and diarrhea are fairly common and affect those populations with poor hygiene practices.

Labor, housing, and water and sanitation conditions, as well as the exposure of workers to diseases will have to be monitored more carefully if foreign workers are employed, because foreign workers may be submitted to poorer labor and working conditions, will be less frequently immunized against diseases, and less well informed about means of protection.

Supported (armored) excavations (source: Ischenbeck website)

Dengue prevention on working sites. Source: Singapore, Min. Health.

Figure 13. Examples of good OHS practice

6.3.4 Further project impacts on labor conditions

Some activities, such as the maintenance plan, will increase staff needs at NAWASA and thereby provide additional employment within the company. Some activities may require NAWASA workers to increase work in shifts (maintenance, higher requirements for monitoring). There will also be a need for more skilled workers (automated monitoring system). The installation of water meters and the collection of metering data could require workers to be present more often at customer's houses, with increase in typical risks such as conflicts, dog bites and electric shocks which may occur when systems are poorly connected.

The project is committed to employing more women at technical positions. Current observed material conditions for women at NAWASA (cloakrooms, toilets) seem sufficient.

The project does not lead to any retrenchment.

6.3.5 Conclusions for PS2

Occupational Health and Safety (OHS) at NAWASA, and even more in other companies which will be involved in construction works, is a source of concern.

The ESMP includes a requirement for NAWASA to improve health and safety management in general and with regards to the most critical identified risks, and to apply for ISO 45001 or OHSAS 18001 certification of its health and safety management system (**actions 2-4 of the ESMP in chapter 7**).

The ESMP will also include strict prescriptions for the oversight of construction works, to ensure that companies contracted by NAWASA for the project will also work up to the requirements of PS2 (**action 6 of the ESMP**).

Regarding working conditions, NAWASA is in conformity with the Labour Code and working conditions are assessed as good, although working conditions of short-term contractual workers could not be assessed separately and although improvements are certainly possible in terms of gender and grievance mechanisms. Due to the limited scope of the project, no separate recommendations have been developed for improvements of NAWASA's Human Resources policy. It is expected that the improvements in NAWASA's health and safety policy will most benefit the employees referred to above.

Potential changes in working conditions (shifts, increase in skills, more women in technical positions) are not identified as a significant risk. To manage potential residual negative impacts of the project on working conditions, a grievance mechanism for workers is included under the stakeholder management plan (**action 10a of the ESMP**).

6.4 PS3: Resource efficiency and pollution prevention

6.4.1 Objectives

The objectives of this Performance Standard are (GCF, 2016):

- (a) Avoid, minimize or reduce project-related pollution;
- (b) More sustainable use of resources, including energy and water;
- (c) Reduced project-related greenhouse gas emissions.

Based on the impact screening shown in Table 6. oben, this section examines the following risks and impacts:

- Pollution generated by construction works
- Freshwater use
- Wastewater management
- Waste management
- Management of hazardous chemicals
- Management of sludge from river intakes and WTPs
- Energy and greenhouse gas emissions

6.4.2 Pollution generated by construction works

Construction works will lead to typical impacts such as generation of dust, machine fumes, noise, generation of solid waste and effluents, risk of soil erosion, cutting of trees, traffic risks etc. The magnitude of the works is limited; the typical prescriptions for careful management of construction works apply (see chapter 8). In the case of Grenada, the prevention of soil erosion, the protection of vegetation and forest, replanting of cut trees and revegetation of sites are particularly important. The MALFF will be involved in overseeing contractor practices in this respect.

6.4.3 Freshwater use

Data availability

An issue with the impact assessment of the project is that data on hydrology (quantity of river water), hydrogeology (quantity of groundwater) and even water use are not readily available. At this stage, the assessment of impacts of the project on freshwater use can therefore only be qualitative. The project itself will implement water monitoring and data collection systems.

Possible increase of freshwater use

The project is not designed to result in an increased use of drinking water all-year-round. As shown by Bornemann (2015), the current annual production capacity of NAWASA exceeds the current annual water demand; issues occur because the water resource is not well distributed and because climate events, poor infrastructure and poor management cause interruptions in water supply.

The Vulnerability Assessment which was produced for the CREWS project shows that the best available estimate of climate-change induced water demand increase is of 20% by 2050 (CREWS Vulnerability Assessment, 2017). It is expected that this increase can be compensated by reduction in water losses and by water demand management.

The project improves the possibility to use river water during heavy rain spells. This usage hardly impacts river flows, as water abstractions for drinking water supply are negligible compared to flows during heavy rainfall. Floods will be maintained for river ecosystems. Increasing the system's storage capacity only improves the possibility to use this water which would otherwise be "lost".

The only potential significant impact on river water flows occurs only in the dry period and is due to the reservoirs which are part of the project at Les Avocats and Petit Etang.

At Les Avocats, the increase of the reservoir size may lead to a minor decrease of freshwater flows in the Baillies Bacolet River during the dry season, because the new dam will be built immediately downstream a small tributary which currently does not flows into the reservoir. This impact will be very minor, as the river is already impacted by reservoir and already sees dry periods in the current situation. The temporary discharge reduction will only be in the order of 0-10 l/s, which is the visually estimated low flow of the concerned tributary. NAWASA already abstracts this flow at times by means of a water pipe.

At Petit Etang, a partly impervious storage pond will be built upstream the WTP. The catchment is a part of the La Sagesse Watershed. The storage capacity is not clearly stated in the feasibility study, but the storage pond area would be 2200 m2. The area where the pond would be located is relatively flat, so that the storage dam can only have a small height (2-3 m). We may infer that a storage volume of about 5,000 m3 seems feasible.

Annual rainfall on the 8 ha pond catchment area is estimated 167,000 m^3 if using the monthly rainfall data from the feasibility study (see table below). This rainfall is equivalent to about 9 l/s on average in the wettest month and a minimum of 3 l/s in the driest month (see table). Subtracting potential evapotranspiration, for which no data are available, the dry season flow from the catchment is therefore estimated between 0 and 3 l/s. In practice, this means that the catchment does not significantly contribute to downstream flows during the dry season. Therefore the impact of the storage pond is estimated to be minor a priori.

Table 7. Estimated runoff from the future catchment collected by Petit Etang storage pond

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Rainfall													
(inch*)	5.76	4.43	3.86	4.61	3.92	8.3	7.7	9.03	7.45	10.2	11	7.49	84
(mm)	144	111	97	115	98	208	195	226	186	255	275	187	2094
Estimated runoff for a catchment area of 8 ha													
m3	11,520	8,860	7,720	9,220	7,840	16,600	15,400	18,060	14,900	20,400	22,000	14,980	167,500
l/s	4.4	3.4	3.0	3.6	3.0	6.4	5.9	7.0	5.7	7.9	8.5	5.8	N/A

**Source of rainfall data in inches: GIS, 2016.*

Farmers use water downstream the drinking water intakes, but there is currently no coordination between operation of the water intakes and abstraction of water for irrigation. Also the impact of water abstraction for irrigation is currently totally unmanaged. One of the tasks of the WRMU will be to implement water allocation procedures among users.

A detailed assessment of flows and water uses for the two catchments of Les Avocats and Petit Etang will be performed under the ESMP. The assessment will include an inventory of the ecology of the rivers, to examine whether hydrological changes may lead to negative impacts on aquatic biodiversity. Mitigation measures for aquatic ecosystems are discussed under the section about PS6 in this chapter.

A grievance mechanism is established during construction which targets these downstream water users, among others. Contractors will also be required to develop specific and direct communication procedures with these users.

Possible increase of groundwater use

The project includes drilling new groundwater wells. This may not necessarily result in increased water use, but rather in enhanced possibilities to counterbalance groundwater depletion and saline intrusion which are expected to increase with climate change. Also, a possible increase in groundwater use would affect only the downstream part of local rivers, which are currently much impacted already by pollution and water abstraction for irrigation.

In Carriacou, the project will favor the use of desalinated water to allow for possible reductions in groundwater and rainwater availability. This may have impacts on energy use, but the Carriacou component will not result in an increased use of freshwater.

6.4.4 Wastewater management

The issue of wastewater management has emerged as an issue of concern during the consultations. Most wastewater in Grenada is treated by septic tanks, but the denser coastal zone in the south west of the island has two sewerage systems which currently discharge untreated wastewater in the sea. Impacts of the project on wastewater management are expected to be insignificant, as the project does not significantly increase water use and as only about 5% of Grenada's population is connected to a sewer system. A better continuity of flow could in theory improve the condition of the water and wastewater networks, but this impact is not considered significant either. NAWASA is currently committed to rebuild an offshore sewer outfall in the next few years, but options for sewage treatment should also be investigated. The ESMP includes a feasibility study for improved wastewater management in Grenada. NAWAS has already sourced funding to undertake this study.

6.4.5 Waste management

An important issue in Grenada is the deficient waste management, and especially hazardous waste management. Although waste collection is good, there is no controlled landfill for household waste, and systems to eliminate, treat or recycle hazardous waste are missing. Rivers in their downstream stretches are littered with solid waste. Not all waste oil is collected. NAWASA has mentioned issues with the disposal of chemicals used in its water quality laboratory, as well as problems with old chlorine gas containers not appropriately disposed of decades ago.

According to NAWASA, in case of water pipe replacement works, old pipes are generally left near the road and are taken away by inhabitants. There is also room for storage of old pipes at NAWASA's "Dusty Highway" center. Housekeeping should be improved at this center, which should be achieved thanks to the implementation of an ESMS system. There are no asbestos cement pipes in Grenada. However, the absence of control of waste generated by replacement of old infrastructure is not acceptable, especially in case of old PVC pipes which should ideally be recycled, and residuals disposed in controlled landfills (non-existent in Grenada).

Measures are developed in the ESMP:

- for NAWASA to improve the accounting and tracking of its waste flows, and to make all possible efforts to dispose of its waste in an appropriate way. The absence of proper waste management cannot be solved by NAWASA on its own, but NAWASA can make efforts to improve its waste management (waste oil, lab chemicals etc.). A suggestion is to pool waste with other companies for possible exportation. The national electricity company GRENLEC and one of the biggest construction companies of the island are located on the same "Dusty Highway" road in Grand Anse, St. George's and could cooperate on waste management.
- to control pollution related to construction activities.

6.4.6 Management of hazardous chemicals

NAWASA's storage and handling of oil, chlorine and other chemicals has been assessed as not appropriate under PS2, and will be improved as part of the ESMP. Used oil from NAWASA's garage is apparently collected by an external company, although not all interviewed staff was able to give the same information. The garage is located on Dusty Highway in Grenada's coastal zone. Drainage at the garage was inappropriate and oil was leaking towards what workers referred to as "a municipal drain" (in fact, a natural stream).

6.4.7 Management of sludge from river intakes and WTPs

Interviews with WTP staff has suggested that sludge from the treatment process from the smaller WTPS is dumped into rivers and streams. No comprehensive assessment of management of sludge and sediment from river intakes was performed. This issue will be tackled through NAWASA's comprehensive environmental management improvement. A requirement is also included in the ESMP for appropriate handling of sediment from reservoirs and water intakes which will be upgraded through the project.

6.4.8 Energy and greenhouse gas emissions

Water supply in Grenada relies littles on pumping, because of high energy costs. The upgrade of pipelines which is included in the project will result in minor savings of energy and therefore of greenhouse gas emissions.

While in principle the use of energy for pumping is relatively limited, a potential has been identified for the project to include energy efficiency measures and renewable energy, which might be considered in a parallel project. However, Grenada's electricity sector has been monopolistic and is in a transition to a liberalized market where the use of decentralized renewable energy will be promoted. While the respective act has passed parliament, the necessary regulations are currently still outstanding, but it is expected that they will be put in place in 2018. However, the required institutional and legal changes have been considered beyond the capacity and scope of the CREWS project.

The new filling of freshwater reservoirs at Petit Etang and Les Avocats will lead to decomposition of flooded vegetation and organic soil material, resulting in emissions of carbon dioxide and possibly methane gas. This effect will be small since the reservoirs are small. To reduce underwater decomposition and emission of methane gas, it is recommended to "fill and flush" the reservoirs at the beginning of their operation.

6.4.9 Conclusion for PS3

Environmental management in Grenada in general should greatly be improved: deficiencies can be observed in the area of waste disposal, river pollution, air pollution, use of fossil fuels… The water supply sector is not the most significant polluter, but there is a risk of pollution from NAWASA's activities by hazardous materials such as fuels, used oils and water treatment chemicals, as well as by sediment and sludge if inappropriately dumped in rivers.

Therefore the ESMP includes general measures to improve the environmental management at NAWASA (**actions 2 and 3 in the ESMP in chapter 7**) and more specific measures relating to waste management (**action 5**) and water quality management in reservoirs (**action 9**).

The CREWS project scores high generally on PS3 as it is geared towards more sustainable water use, and reduces energy use and thereby greenhouse gas emissions. The CREWS project will build an institutional environment which will allow a better monitoring of the use of water resources and a better sharing of these resources.

The following additional measures are taken as part of the ESMP in the field of water management:

- detailed assessment of water flows (**action 8,** see also PS6)
- communication with other water users during construction (**construction stakeholder engagement plan 10a)**)
- feasibility study for wastewater management (**action 11**)

Because the project only involves infrastructure works of small magnitude, risks of pollution and adverse impacts on the environment during construction are also relatively limited and can be managed by good practice. The ESMP includes strict prescriptions for the environmental management of construction works, to ensure that companies contracted by NAWASA to work on the project will work up to the requirements of PS3 (**action 6 of the ESMP**).

Figure 14. Picture showing the challenges of Grenada's environmental management

6.5 PS4: Community health, safety and security

The objectives of this Performance Standard are (GCF, 2016):

- (a) To anticipate and avoid adverse impacts on the health and safety of the affected community;
- (b) To safeguard personnel and property in accordance with relevant human rights principles.

Following the impact screening shown in Table 6., this section examines the following risks and impacts on communities:

- Water quality
- Health and safety of communities related to the operation of water supply infrastructure
- Health and safety of communities during construction works

6.5.1 Water quality

It has not been possible to obtain comprehensive data on quality of drinking water supply in Grenada, which in itself is a significant E&S issue. The only monitoring of drinking water quality is currently done by NAWASA itself, since the Ministry of Health, normally in charge of monitoring water quality, does not have appropriate laboratory facilities. NAWASA publishes diagrams in its annual report which show that a small percentage of samples contain bacteriological pollution, but no numbers could be obtained to compare water quality with the standards of the World Health Organization. Besides, consulted stakeholders mention the frequent occurrence of sudden deterioration of tap water for various reasons. One of the causes of this deterioration can be the eutrophication of raw water, which may cause a mud taste in water, or lead to an oxygen deficit causing iron and manganese to dissolve in water. Both these issues cannot be treated currently by NAWASA's WTPs. NAWASA staff mentions that these issues may occur at Mardigras reservoir.

Regardless of the current state of Les Avocats reservoir, the upgraded reservoir may suffer from intense eutrophication in its first period, since there will be a sudden inflow of organic matter when the water level increases and encompasses the vegetated area around the dam. Depending on rainfall conditions, water at the bottom of the dam will become anoxic.

The ESMP includes a water quality management component for reservoirs, with recommendations to monitor and to improve oxygenation of water from dams.

The WRMU which will be set up under the CREWS project institutional component will have the task to monitor water quality independently.

6.5.2 Health and safety of communities related to the operation of water supply infrastructure

As mentioned under PS2, NAWASA is required to make progress in its management of health and safety issues. This applies to workers as well as to communities. A main risk which is not yet properly handled at NAWASA is that of a possible chlorine gas leaks; emergency plans for chlorine gas leaks need to be developed for WTP's situated in populated areas and chlorine gas containers need to be better handled. The ESMP includes measure to improve NAWASA's routine management of health and safety issues, as well as measures to control health and safety risks during construction. The main risks for communities during construction are traffic accident risks.

No actions are required in the field of security management. NAWASA's security management is considered appropriate, as all the sites are relatively well fenced and guarded.

6.5.3 Health and safety of communities during construction works

Construction works will lead to typical impacts such as generation of dust, machine fumes, noise, traffic interruptions, increased risk of traffic accidents etc. The magnitude of the works is limited; the typical prescriptions for careful management of construction works apply (see chapter 8). The issue which appeared of most concern during consultations was the issue of traffic interruptions, which will be significant on some roads, because Grenada has mainly narrow, winding mountain roads.

The works on waterways will all be executed in areas where no public is present. No increased risk of transmission of waterborne diseases is expected.

6.5.4 Conclusion for PS4

The project has a mostly positive impact on community health and safety, as it will improve water quality management, reduce the risk of water contamination due to poor infrastructure, and improve public safety through better emergency preparedness and response.

Gaps identified in NAWASA's management of community health and safety are dealt with through NAWASA's improvement of health and safety management (**action 4 of the ESMP in chapter 7**). Management of health and safety during construction is dealt with by contractor management and oversight (**action 6)**.

6.6 PS5: Land acquisition and involuntary resettlement

The objectives of this Performance Standard are (GCF, 2016):

- (a) Avoid/minimize adverse social and economic impacts from land acquisition or restrictions on land use:
- (i) Avoid/minimize displacement;
- (ii) Provide alternative project designs;
- (iii) Avoid forced eviction.
- (b) Improve or restore livelihoods and standards of living;
- (c) Improve living conditions among displaced persons by providing:
- (i) Adequate housing;
- (ii) Security of tenure.

6.6.1 Summary of CREWS land use impacts

The CREWS project may affect land use in the following ways:

Permanent land acquisition:

- The project description includes acquisition of 13x0.4 ha of land for the construction of storage tanks on the main island. The dimension of 0.4 ha seems however overestimated when considering the existing new tank at the Observatory, where the land plot is 0.2 ha, which includes sufficient space around the tank for construction and storage (Figure 9).
- The project requires acquisition of three plots of land for the construction of smaller storage tanks in Carriacou, a suggested plot size is 0.1-0.2 ha each.
- The project requires acquisition of land for drilling new groundwater wells and establishing a fenced area. A suggested plot size, based on existing wells, is 0.1-0.2 ha.
- The project requires land acquisition for Petit Etang impoundment, which size is not well known yet, but may be estimated 0.5-1 ha according to the information available from the feasibility study.

Hence total land acquisition needs are estimated between 3.7 and 5.3 ha (see table next page).

NB. Land required for the dam upgrade at Les Avocats is owned by NAWASA.

Figure 15. Land occupation required for a storage tank

Aerial view of the existing NAWASA round storage tank at the Observatory. The diameter of the tank is approx. 20 m, and the plot of land drawn around it in grey/black is 0.2 ha.

Table 8. Summary of land acquisition requirements for the project. All number in hectares.

	Number	Land requirement per site (min-max)	Total (min)	Total (max)
Large storage tanks	13	0.2-0.4	2.6	5.2
Small storage tanks (Carriacou)	3	0.1-0.2	0.3	0.6
Groundwater well sites	3	0.1-0.2	0.3	0.6
Pond at Petit Etang	1	0.5-1	0.5	1.0
Total			**3.7**	**5.3**

Temporary land occupation

- The project requires potential occupation of land around or near above defined plots for construction activities such as storage of machinery and materials.

Rights-of-way

- Rights-of-way will be created for the laying of 10.4 km of new pipelines in Grenada.
- Rights-of-way will be created for the laying of 9.23 km of new pipelines in Carriacou.

Table 9. unterhalb shows the type of environment where the new pipelines will pass. The pipelines will mostly be laid on existing roads. This means that the rights-of-way are not expected to impact existing houses. The first few meters (ca. 50-100 m) of pipeline next to each storage tank will generally be located either on private area, either in forest. They may impact a few private gardens. NAWASA usually lays the pipelines so as not to impact existing buildings.

The pipelines for Mt Moritz (2.3 km) and Tufton Hall (3 km) will pass mostly through forest. This issue will be examined further in the section on PS 6 (biodiversity conservation).

Land use restrictions in groundwater protection zones

The project includes the creation of groundwater catchment protection zones, which may require restrictions of activities:

- land use restrictions in the “50 day zone” (no fertilizers, pesticides and bacteriological pollution)
- land use restrictions in the full groundwater catchment: no persistent/industrial pollution allowed.

The catchments are expected to include mostly agricultural activities. Current activities in the immediate vicinity of groundwater wells include cultivation of crops and animal husbandry. The size of the future groundwater protection zones is difficult to estimate at this stage. It will probably be difficult to define exact catchments scientifically, and an arbitrary boundary will probably have to be set.

Table 9. Environment of the new pipelines

Works to be executed	Length	Type of environment
Mainland Grenada		
Vendome: Mt. Moritz	2.3 km	Partly forest, partly probably along forest path
Vendome: Chantilly	2 km	A few meters through forest, the rest along Ravine road
Gouyave: Dr Bell	0.4 km	A few meters through gardens, the rest along Dr Bell road
Tufton Hall	3 km	Mostly through forest
Peggy's Whim: Ahoma/ Mt Craven	2.3 km	Along roads
		Along roads
Diego Piece (Fountain)	0.2 km	About 100 m through estates/gardens, then along roads
Morne Rouge	0.2 km	About 100 m through natural land but within an urbanized area, then along the road
Total Mainland Grenada	10.4 km	
Carriacou		
Beausejour/Hospital	1.2 km	Expected along roads according to available maps; detailed maps unavailable.
Hospital/Top Hill	2.0 km	
Hospital/Belair/Belvedere	1.9 km	
Beausejour/Belvedere	2.3 km	
Belvedere/Windward	1.6 km	
Total Carriacou	9.2 km	

6.6.2 Assessment of current practice against requirements of PS4

NAWASA's Legal Department manages land acquisition for water supply infrastructure and the establishment of rights-of-way for water pipelines. NAWASA first negotiates with land occupiers directly. Agreements for rights-of-way are often reached easily, but agreements for land acquisition are more difficult to obtain. If an agreement about the price is reached, then NAWASA starts the legal acquisition procedure. NAWASA usually pays a little above market prices for land.

But many people in Grenada don't have land titles, and the availability of official land titles is often a bottleneck. NAWASA insists on the availability of land titles, and may assists land "owners" in getting a proper title. Grenadian law provides for creating land titles in cases when customary ownership can be proven.

NAWASA turns to compulsory land acquisition (expropriation) only in extreme cases. Compulsory acquisition is managed by the government. NAWASA always tries to locate its infrastructure so as to minimize the needs for land acquisition, and often changes project location if there is a risk that the land acquisition procedure will take too long.

When agricultural land is acquired, crops are compensated for according to valuation done by the Ministry of Agriculture. Our experience however is that in many countries, these official valuations do not allow for compensation for lost incomes.

During the assessment, NAWASA was able to show a very good documentation of its recent land acquisition procedures. Regarding buying prices, NAWASA performs its own land valuation and also asks for an independent valuation. When acquiring only a part of a plot of land, NAWASA claims that they take into account whether the remaining portion can still be used, or becomes worthless due to its small size – in which case the entire plot has to be acquired.

NAWASA's complaint is that procedures are very lengthy, often longer than three years, mainly because of land title issues. This is exacerbated by the fact that plots of land may often be owned by Grenadians who reside abroad.

The NDA and the PCU have significant experience in implementing resettlement action plans for the World Bank. They complain that World Bank standards delay projects too much or block them completely, for instance by requiring illegal squatters to be resettled properly.

Consulted civil society organizations did not complain about land acquisition or expropriation procedures in Grenada per se, but wished there would be more discussion with affected persons, and that the latter would be "made feeling special" when letting go of their land for the government.

6.6.3 Gaps with PS5

NAWASA's procedure can be considered as relatively appropriate, but the following improvements are required to comply with PS5:

- definition of a grievance mechanism;
- develop the practice of offering land of similar or higher value in exchange for the acquired land, instead of buying it;
- include a socio-economic assessment of income and living conditions of affected persons;
- compensate not only for land but also for lost incomes, including in the case of rights-of-ways.

6.6.4 Development of a Land Acquisition and Land Occupation Framework

The project does not result in physical displacement. It may result in some very minor economic displacement, which will be compensated.

In view of the limited extent of land acquisition, since NAWASA's practices for land acquisition are relatively appropriate, and since alternatives exist for the location of the plots of land to be acquired (the type of infrastructure considered can generally be located in different places), it is not considered necessary for this project to prepare a Resettlement Action Plan or Resettlement Framework Policy.

Instead, and considering that the project also includes different types of land use impacts (easements/rights of way, restriction of activities in groundwater catchments, issues with buildings on pipelines to be replaced), the suggested approach is to develop a comprehensive land acquisition and land occupation framework for the project.

The suggested approach is that the NAWASA, the MoWPU and the MALFF develop this specific Land acquisition and land occupation framework for CREWS, overseen by the NDA, the PCU and GIZ. The procedure should be in full conformity with PS5 or World Bank standards for physical and economic displacement, for which the PCU has experience. The framework should be developed in a transparent way and involve consultations with civil society.

The following procedures need to be included:

- the definition of an acceptable procedure for temporary eviction of squatters on pipeline rights-of-way, including communication with affected people and help in rebuilding lost assets (monetary compensation to be avoided); any temporary eviction should be documented,
- the definition of an acceptable procedure for management of possible cases when houses have been built over pipelines which need to be replaced,
- the definition of guidelines for compensation for forced changes of activities in the groundwater protection zones.

6.6.5 Estimate of land acquisition and compensation costs

Land acquisition costs are to be covered by the Government of Grenada, and are not considered an ESMP cost. Land acquisition costs are difficult to estimate beforehand for water infrastructure, because there are generally alternative locations, so that NAWASA will partly be able to adjust its final design to minimize land acquisition costs. Besides, it is recommended to offer new land instead of buying land, which can reduce the cost. Using the minimum market price for built land of 3 USD per square feet (which is bound to exceed the price for agricultural land) and a maximum area of 5.3 ha yields a maximum total land cost of 1,765,000 USD.

Provisions need to be made by the project for the compensation costs for lost incomes, usually not taken into account by the Government. These are estimated used the following rules of thumb:

- Average income is estimated 10,000 EUR per year based on Grenada's per capita GDP.
- It is supposed that compensation will be for people with a standard Grenada farm size of 2 ha and an average income of 10,000 EUR/year (this being probably a large overestimate).
- Compensation rates are calculated based on the % of the farm affected by land acquisition, for a 3-year period. The assumption is that an alternative source of income has been found after three years, since the affected person will have been compensated for the land itself.

Table 10. Estimate of compensation costs for lost incomes. All data in EUR.

		Assumption on % of farm Affected		Income compensation over 3 years	
	Assumption on number of affected persons	Min	Max	Min	Max
Large storage tanks	13	10%	20%	39000	78000
Small storage tanks (Carriacou)	3	5%	10%	4500	9000
Groundwater well sites	3	5%	10%	4500	9000
Pond at Petit Etang	1	25%	50%	7500	15000
	Total (EUR)			**55500**	**111000**

The resulting compensation costs would vary between 55,500 and 111,000 EUR approx. To this figure is added a value of 50,000 EUR for possible compensation of lost incomes related to pipeline works and pipeline rights-of-way. Hence, the ESMP will include a provision of 160,000 EUR for income compensation.

6.6.6 Conclusion for PS5

The project's impacts on land use and related impacts on livelihoods of affected people are minor, and can be fully mitigated and compensated by the establishment of a land acquisition and land occupation framework, which will be set up and implemented jointly by GIZ, PCU, NAWASA and the GoG (**action 7 of the ESMP**).

6.7 PS6: Biodiversity conservation and sustainable management of living natural resources

The objectives of this Performance Standard are (GCF, 2016):

- (a) Protection and conservation of biodiversity;
- (b) Maintenance of benefits from ecosystem services;
- (c) Promotion of sustainable management of living natural resources;
- (d) Integration of conservation needs and development priorities.

Following the impact screening of Table 6. , this section examines the following risks and impacts of the project:

- Impact on protected, rare or critical habitats
- Impacts on forest land
- Impacts on aquatic ecosystems

The section also discusses options with regards to maintenance of benefits from ecosystems services, sustainable management of living natural resources in Grenada and integration of conservation needs:

- Discussion on sustainable management of aquatic biodiversity in Grenada
- Option for reforestation in Les Avocats catchment

6.7.1 Impacts on forest land

The project does not involve significant destruction of forest area.

Some works will be executed in forest and may require the cutting of trees:

- The storage tank at Les Avocats will be placed in forest land.
- Various sections of the pipelines will run along small forest roads, or possibly through forest.
- The works at Les Avocats dam will require some tree cutting around the existing reservoir.
- Access to these sites by machinery may not be possible without cutting a few trees.

The construction ESMP will require contractors to respect national legislation on forestry, to minimize the cutting of trees, to report on tree cutting, and to replant the trees that have been cut on sites to be designated in the tenders by the Ministry of Forestry.

The forest in these areas has been previously damaged by Hurricane Ivan and it is not expected that trees of high commercial value will be affected.

Overall, the project will contribute to sustainable management of forests, as it will promote better protection of mountain area catchments through the Water Resources Management Unit.

6.7.2 Impact on protected, rare or critical habitats

None of the project activities are located in nature conservation areas. The dam at Les Avocats and the reservoir at Petit Etang are not located in protected areas either (source: IUCN and UNEP-WCMC (2017), World Database on Protected Areas – confirmed by consultation with Grenada's Land Planning Unit). Only Mt Moritz storage tank is located on the border of an area identified in the World Database of Protected Areas (IUCN and UNEP-WCMC, 2017), as "Surveyed/Undesignated Protected Area".

The land at Petit Etang which will be occupied by the new pond is currently partly an existing pond ("Etang" in French), partly grassland from an ancient cocoa estate.

The most critical elements of the project with regards to potential impacts on biodiversity are the Mt Moritz and Tufton Hall pipelines, which will be laid through forest on a length of resp. (less than) 2.3 km and 3 km.

The design for these pipelines is not yet finalized. They can still be laid for a large section along existing roads or forest paths, which is recommended to avoid cutting of trees and disturbance to ecosystems, and will also be favoured by NAWASA for technical feasibility reasons.

To verify if none of the impacted forest areas can be considered as critical natural habitat, it is necessary to perform a biodiversity assessment of the fauna and flora of the envisaged areas for the pipelines. This survey is included in the ESMP as a sub-set of measure 8a. Critical habitats are defined as areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. (IFC PS6). The latter 3 points do not apply to the mentioned areas in Tufton Hall and Mount Moritz. The survey will examine if endangered or endemic species are present in the areas. If so, the pipeline routes may not be feasible according to IFC's requirements for PS6.

If the defined forest areas are non-critical, the mitigation measures defined in the previous section will apply, and reforestation in other areas (such as Petit Etang) will contribute to offsetting the local impacts.

6.7.3 Impacts on aquatic ecosystems

The project is not designed so as to increase freshwater use and as such, it is not expected to significantly affect aquatic ecosystems (neither river streams, nor mangroves which need inputs of freshwater).

The analysis done for PS3 confirms that the only potential impact is a possible small reduction of flows in the dry season for Baillies Bacolet River and in the Petit Etang catchment. For the latter, it is unsure whether it forms a proper river downstream.

The WRMU will collect data on hydrology and aquatic biodiversity to examine the need for adopting measures to protect aquatic ecosystems, such as minimum flows in all rivers, but more specifically in the Baillies Bacolet River which could be impacted by the project. Minimum flows are not included as a requirement in the project ESMP since such requirements are normally always overridden for drinking water use (see discussion below).

However, as a precaution, all new NAWASA river storage systems will be equipped with a device to let through a minimum (or environmental) flow during the dry season. This applies to the project for Les Avocats dam upgrade and Petit Etang new storage pond.

At Les Avocats dam, potential release of an environmental flow can be provided by taking water from a silt-trap weir on one of the tributaries. Another option would be to release water from the dam; the water should be released from sufficient depth to be cold enough, but deep water will contain more nutrients and will be anoxic; therefore the best depth for the release weir is not straightforward to define. Moreover the weir would have to be equipped with an oxygenation device. At such small discharges, better effects for the ecosystem are likely to be obtained more efficiently by using the tributary directly. The option for Petit Etang needs to be considered in the detailed feasibility study.

Finally, the weirs which will be built to trap silt on the other water intakes will be located just upstream existing intake and will not disrupt ecological continuity.

6.7.4 Discussion on sustainable management of aquatic biodiversity in Grenada

The awareness in Grenada about the need to manage aquatic biodiversity in river streams is very low. Information is missing on hydrology as well as on aquatic biodiversity. Awareness about impacts of small dams and water intakes on streams is very poor.

The establishment of the Water Resources Unit provides an opportunity to develop sustainable river management in Grenada. To this end, the first step is to gain knowledge on hydrology and on the quality of the ecosystems.

It was observed in May 2017, in the dry season, that flows in the rivers used for drinking water abstraction were in the order of magnitude of the production capacity of the WTPs. For instance 5-20 l/s for the smaller catchments (Mardigras, Les Avocats), and around 100 l/s at Annandale.

The possibility of applying an Environmental Flow (or Minimum Flow) requirement for Grenadian river streams, or for streams included in the project components, was examined, but was rejected for several reasons:

- In countries where such a flow is implemented, drinking water is a priority over the environmental flow. This means that even when there is a requirement to leave a minimum water flow in a river, companies which abstract river water for drinking water supply do not have to respect it. Therefore, imposing a minimum flow at the NAWASA intakes would not make much sense.
- A minimum flow that would be released from a reservoir in the dry season, would be of poor quality. This was visible at Mon Repos intake in May 2017: the reservoir was eutrophic and water spilling over was degraded.
- The upstream rivers systems have a dense network of tributaries; generally there are tributaries coming into the rivers a few hundred meters below the weirs or dams, which constitute a minimum flow in a natural way.
- The needs of the ecosystem are unknown in Grenadian rivers and should be assessed first.

6.7.5 Option for reforestation in Les Avocats catchment

This option was examined as it was suggested during the consultations, reforestation being a sensitive issue in Grenada. Since the project might lead to a slight decrease in the dry season flow in

Baillies Bacolet River, a possible compensation would be to replant trees in the Les Avocats catchments, to increase storage of rainwater by vegetation and hopefully improve dry season river flows.

Hurricane Ivan caused deforestation in the catchment in 2004. According to Les Avocats feasibility study (ENB, 2005), forest around the dam was destroyed. Deforestation in the catchment resulted in a decrease of available water resources in the dry season. During our visit in 2017, the forest near the dam had grown again. The available Google Earth satellite images are from 2003, 2011 and 2017; within the limits of this type of analysis, the images tend to show that the tree density has returned to a condition not far from the pre-Hurricane situation. Therefore the option of replanting trees did not seem directly beneficial for this catchment.

Since replanting of cut trees will be a requirement for contractors, our suggestion is that the Ministry of Forestry will advise on the best area to replant these trees, which could be in the Les Avocats catchment or elsewhere.

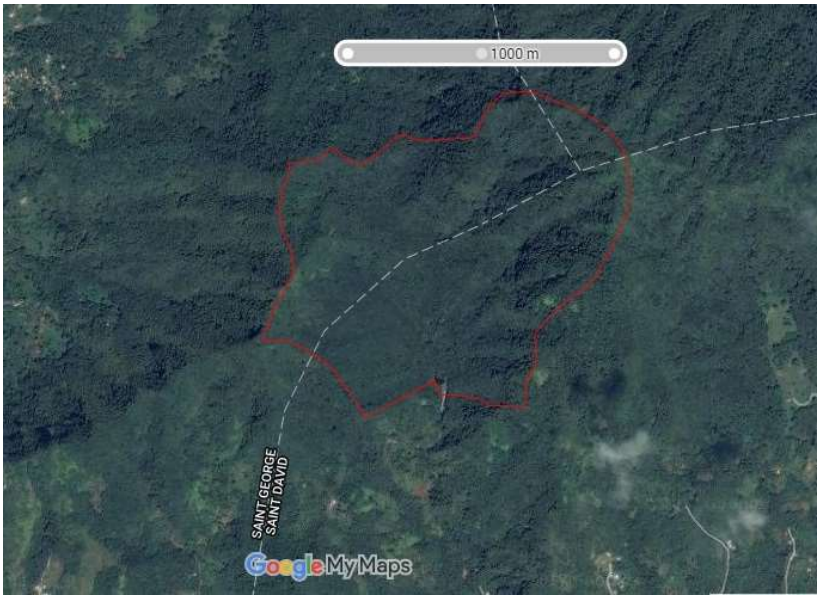


Figure 16. Les Avocats catchment

6.7.6 Conclusion for PS6

The project is expected to have a minimal impact on biodiversity, which will be monitored (**action 8 of the ESMP**) and compensated or mitigated in needed. The setting up of the WRMU by the CREW project, and the aquatic biodiversity assessment which will be part of action 8 of the ESMP, are expected to make a start in Grenada for the conservation of aquatic biodiversity. Thereby the project benefits are expected to widely exceed the potential adverse impacts of the project.

6.8 PS8: Cultural heritage

The objectives of this Performance Standard are (GCF, 2016):

- (a) Protection and preservation of cultural heritage;
- (b) Promotion of equitable sharing of cultural heritage benefits.

The project does not affect known cultural heritage sites. A "chance finds" procedure is included in the contractors ESMP, so that contractors will need to report to the authorities in case of when historical remains are found during excavations.

7 Environmental and social management plan

7.1 Objectives

The ESMP implements the proposed mitigation and compensation measures defined as a result of the impact assessment. The objectives of the ESMP are to:

- ensure conformity of the project with the GIZ's and GCF's environmental and social safeguards;
- reduce, mitigate and compensate project-related adverse risks and impacts;
- improve company-wide (corporate) environmental and social management at NAWASA, to guarantee that NAWASA will implement the project, as well as future water sector projects, without generating adverse risks and impacts for people and for ecosystems.

The number of actions is deliberately kept small, to facilitate understanding, adoption and monitoring of the plan.

7.2 Overview of measures and costs

The table below provides an overview of the measures included in the CREWS-ESMP, as well as the estimated costs which will be covered by the CREWS-ESMP, and the counterpart to be provided by Grenada (essentially staff).

The CREWS-ESMP budget is estimated as follows:

- 150,000 EUR for implementation of NAWASA's integrated environmental and social management system
- 50,000 EUR for priority health and safety equipment
- 200,000 EUR for hydrological and biodiversity assessments at Les Avocats and Petit Etang
- 160,000 for income compensation within the Land acquisition and land occupation management framework
- 25,000 for water quality monitoring equipment at reservoirs
- 5,000 EUR for material costs of stakeholder engagement

Funding is available from the GoG for a wastewater treatment feasibility study and the costs for this study are not included in the ESMP.

Total cost is 590,000 EUR (or 2% of total project costs).

There will be opportunities to pool some of the actions and costs with the parallel DFID project for the upgrade of Concord WTP. The main identified synergy is to implement good international industry practice for chlorine gas management at Concord WTP and disseminate learnings to other WTPs.

7.3 Detailed presentation of ESMP actions

The next pages provide detailed presentations of the actions.

Table 11. CREWS Environmental and Social Management Plan, overview

	Action	Reference[4]	Responsible entities	CREWS-ESMP financing	Counterpart
1a	ESMP implementation, enforcement, monitoring and reporting	PS1	NAWASA, PCU, GIZ	-	2 part-time staff at PCU, 1 staff at NAWASA
1b	Reinforced monitoring of safeguards compliance, access to water, and gender issues by the PSC	PS1	PSC (PCU, GIZ, Ministries)	-	Staff costs
2	Environmental, social, health and safety risk assessment of NAWASA's activities	PS1, PS2, PS4	NAWASA	-	Staff costs
3	Certified quality, environment, health and safety management system for NAWASA (ISO 9001, ISO 14001 and ISO 45001 or OHSAS 18001)	PS1, PS2, PS4	NAWASA	150,000 EUR for technical assistance and certification audits	Staff costs
4	NAWASA health and safety management	PS2, PS4	NAWASA	50,000 EUR for priority health and safety equipment	Staff costs, plus future annual budgets
5	NAWASA waste management	PS3	NAWASA	-	Staff costs, plus future annual budgets
6	Contractor management, and mitigation of environmental and social construction impacts	PS1, PS2, PS3, PS4, PS5, PS6, PS8	GIZ, PCU, NAWASA, contractors, sub-contractors	Contractor E&S measures included in construction cost, estimated 2% of construction	Staff costs
7	Land acquisition and land occupation management framework	PS5	GIZ, PCU, NAWASA, GoG	Compensation for lost incomes estimated 160,000 EUR	Staff costs[5]
8	Les Avocats and Petit Etang hydrology, biodiversity and water use assessment + option for environmental flow + forest biodiversity survey for new pipes (if any)	PS3, PS6	GIZ, WRMU	Technical assistance 200,000 EUR	Staff costs
9	Water quality management of river water reservoirs	PS4	NAWASA, Min. of Health	Monitoring equipment 25,000 EUR	Staff costs, plus future annual budgets
10a	Construction Stakeholder Engagement Plan	PS1	GIZ, PCU, NAWASA, (sub-)contractors	2,500 EUR communication material	Staff costs
10b	Tariff Review Stakeholder Engagement Plan	Consultations, PS1	GIZ, PCU, GoG	2,500 EUR communication material	Staff costs
11	Wastewater treatment feasibility study	Consultations, PS3	GIZ, NAWASA, GoG	Already provided by GoG	Staff costs

[4] This column gives the reason for which the action is required: mainly, to reach conformity with the E&S Performance Standards. Some actions are also adopted as they were supported by a significant number of stakeholders during the consultations.

[5] Land acquisition costs are to be covered by the GoG, but are not included in the ESMP; the ESMP will finance compensation for lost incomes.

7.3.1 ESMP implementation, enforcement, monitoring and reporting (1)

ESMP Action 1a

ESMP implementation, enforcement, monitoring and reporting

Objective: to allocate staff and define responsibilities for day-to-day implementation of the ESMP, including monitoring and reporting

Responsible entities : GIZ, PCU, NAWASA (Project Management Committee)

Actions:

- PCU staff following the project will be a (part-time) civil engineer with training in environment (project manager) and a part time social and communications specialist, preferably with training in gender aspects.
- NAWASA will appoint an environmental and OHS specialist, who will be responsible for implementing the ESMP tasks concerning NAWASA.
- The ESMP will be reviewed at the beginning of the project, with possible modification of the timeframe for actions. The ESMP will then be reviewed and possibly amended each year.
- An annual E&S monitoring report will be prepared by PCU with input from NAWASA, validated and completed by the Steering Committee (see next ESMP action 1b), and submitted to the GCF.

Timeframe:

- Entire project duration
- Weekly meetings of the Project Management Committee
- Annual report

Cost

- Staff costs

Monitoring and reporting

- Annual ESMP report stating the advancement of all ESMP actions

Target

- The annual monitoring report is submitted and the ESMP is implemented

7.3.2 ESMP implementation, enforcement, monitoring and reporting (2)

ESMP Action 1b

Reinforced monitoring of safeguards compliance, access to water, and gender issues by the Project Steering Committee

Objective: specific monitoring of sensitive issues identified in the E&S assessment at the level of the Project Steering Committee (PSC), which will be reinforced by involvement of the Ministry of Social Housing and Development

Responsible entities : Project Steering Committee + Ministry of Social Housing and Development

Actions:

- Specific high-level monitoring of sensitive project issues
  - biodiversity conservation
  - gender aspects
  - social impacts of the tariff setting
- Involvement in preparation of the terms of reference for the tariff study, taking into accounts the principles exposed in chapter 9
- GIZ is to follow compliance of the project with:
  - environmental and social safeguards;
  - gender policy
  - tariff study terms of reference

  with input from specialists from headquarters. This can be done by periodic monitoring visits from GIZ experts.
- The Ministry of Social Housing and Development and civil society members to be involved
- Coordination with action 10b on stakeholder engagement for the tariff study
- Specific monitoring to be included in the annual E&S monitoring report (see action 1a)

Timeframe:

- Entire project duration
- Bi-yearly meetings of the Project Steering Committee + ad hoc involvement if needed
- Annual report

Cost

- Staff costs

Monitoring and reporting

- Annual ESMP report stating compliance with relevant safeguards and policies

Target

- The annual monitoring report is submitted and the ESMP is implemented

7.3.3 Environmental, social, health and safety risk assessment of NAWASA's activities

ESMP Action 2

Environmental, social, health and safety risk assessment of NAWASA's activities, including contracted civil works

Objective: the risk assessment is usually a first step in implementation of an environmental and social management system. NAWASA does not currently have a full overview of all environmental and social risks and impacts related to its activities. This step is recommended to be carried out stand-alone at the very beginning of the CREWS project to help raise awareness at NAWASA about important E&S issues and improve the management of contractors at tendering stage.

Responsible entity: NAWASA (to appoint environmental, health and safety engineer)

Actions:

- List all activities of NAWASA and assess possible environmental and social risks and impacts by using examples from other water supply companies around the world and consulting with NAWASA staff
- use results to improve requirements for contractors
- use results as basis for ESMP action 4
- use results as basis for future ISO 14001 certification

Timeframe:

To be done as soon as possible (3 months)

Cost estimate:

Staff costs only

Monitoring and reporting:

- provide results in annual ESMP report to GCF

Target:

- Qualified EHS engineer recruited
- Environmental and social risk assessment available

7.3.4 Quality, environment, health and safety management system for NAWASA

ESMP Action 3

Implementation of a certified quality, environment, health and safety management system at NAWASA

Objective: to improve NAWASA's corporate environmental and social performance, setting up an integrated Quality, Environment and OHS Management System with ISO 9001, ISO 14001 and ISO 45001certification is advised. The objective is to implement good environmental and social practice in everyday operations, in the CREWS project, and future activities. NAWASA has made a start defining Standard Operating Procedures, and should continue in order to reach certification.

Responsible entity: NAWASA, assisted by a consultant

Actions:

- Define a target for NAWASA certifications taking into account the limited capacity available on the island (type of certification, activities to be certified). Suggestion: headquarters and Dusty Highway, Grand Anse activities.
- Define a person responsible for quality management
- Year 1: engage a consultant for the preliminary assessment
- Prepare documentation of procedures (involvement of all NAWASA staff is essential)
- Year 3: first stage certification audit
- Year 4: second stage certification audit
- Re-certification every 3 years

Timeframe:

- First certification in 2022

Cost estimate:

- 150,000 EUR for integrated ISO 9001, ISO 14001 and ISO 45001 certification (excluding NAWASA staff costs)

Monitoring and reporting:

- regular reporting is part of the process
- reporting on advancement in annual ESMP report to GCF

Target:

- ISO Certifications obtained

7.3.5 NAWASA health and safety management

ESMP Action 4

NAWASA health and safety management

Objective: health and safety has been defined as an area requiring improvement in NAWASA's operations, to reach conformity with Performance Standards PS2 (occupational health and safety) and PS4 (community health and safety). NAWASA has made a start by preparing Occupational Health and Safety (OHS) procedures. These should be extended and implemented.

Responsible entity: NAWASA (to be led by HR management)

Actions:

- Set up a health and safety reporting system
- Define OHS responsibilities and training needs at NAWASA at all hierarchical levels
- Prepare improved procedures for the areas of concern identified in the risk assessment (see action 3), and define required investments in safety equipment. Include at least:
    - improvement of chlorine gas handling and storage: at least, cylinders should be secured at all times, handled on carts, stored separately from other chemicals, in appropriately sized and ventilated rooms; cylinders should be disposed of properly;
    - preparation of emergency plans in case of chlorine leak for WTPs surrounded by residents
    - prepare emergency plans in case of contamination of drinking water by hazardous chemicals;
    - procedure for work in confined spaces, necessary equipment among other: gas detectors.
- Include procedures in NAWASA's existing OHS system
- identify priority investments to be funded under CREWS
- Prepare an annual budget for health and safety to be included in the tariff study

Timeframe:

- 2 years (including priority investments)

Cost estimate:

- 50,000 EUR for priority equipment
- Staff costs to be covered by NAWASA
- Further equipment costs should be covered by NAWASA's annual budget

Monitoring and reporting:

- monitor accident statistics at NAWASA in general, and related to CREWS project
- report to CREWS project management committee (PCM) and in annual ESMP report about:
    - NAWASA OHS organization
    - improved OHS procedures
    - annual health and safety budget
- report about accident statistics in NAWASA annual report

Target:

Acceptable accident statistics (including for contractors)

7.3.6 NAWASA waste management

ESMP Action 5

NAWASA waste management

Objective: The objective of this action is for NAWASA to improve the accounting and tracking of its waste flows, and to make all possible efforts to dispose of its waste in an appropriate way. Although the CREWS project itself is not expected to be a source of exceptional waste generation and waste collection is generally good in Grenada, there is no controlled landfill, and systems to eliminate, treat or recycle hazardous waste are missing. Not all waste oil is collected. Specifications for CREWS construction waste management are included under action 6.

Responsible entity: NAWASA (to be led by Environment, Health and Safety engineer with input from other staff)

Actions:

- Identify all sources of waste at NAWASA from routine as well as from construction activities (materials such as pipes and spare parts, construction waste, water treatment chemicals, oils, lab chemicals)
- Identify possible ways to manage waste in Grenada (storage, collection, treatment, exportation, recycling, pooling with other companies,…)
- Set up a waste management plan
- Participate in institutional development of waste management in Grenada if any
- Identify yearly costs for waste treatment, recycling, exportation etc.

Timeframe: institutional involvement as soon as possible; waste management plan to be developed in year 3 of the project (a longer timeframe is given for this action so that other actions can be prioritized at the beginning of the project)

Cost estimate:

- Waste management for CREWS to be covered in contractor ESMP (action 6)
- Routine waste management should be covered by NAWASA's annual budget, knowing that waste management costs are higher in Grenada due to the need to export some waste: to be included in the tariff study

Monitoring and reporting:

- monitor waste flows
- report to CREWS project management committee (PCM) and to GCF (in annual ESMP report) about NAWASA's waste management plan
- communicate about NAWASA's effort in Grenada
- report about waste management budget in NAWASA annual report

Targets:

- All used oils and hazardous chemicals to be disposed of according to good international industry practice

7.3.7 Mitigation of environmental and social construction impacts

ESMP Action 6

Contractor management, and mitigation of environmental and social construction impacts

Objective: establish and implement procedures for the oversight of (sub-)contractors in respect of environmental, occupational health and safety, and social performance during construction (Contractor ESMP).

Responsible entities: PCU, NAWASA, contractors, sub-contractors, Ministry of Forestry (for supervision of revegetation and tree replanting)

Actions:

- Allocate staff and define responsibilities and procedures at NAWASA for contractor environment, health and safety oversight and monitoring
- Train staff
- In tender documents, on top of FIDIC and other legal requirements, include requirements to prepare a CESMP (Construction E&S Management Plan), to be submitted with the technical proposals and separately quoted in the financial proposals
- The CESMP should at least address all issues listed in appendix (noise, dust and air quality, waste management, spill prevention and management, watercourse protection, revegetation) and standard OHS requirements (risks review and prevention plan, OHS organization and management, personal protective equipment (PPE), emergency procedures).
- Costs for CESMP items should be clearly stated in the bids and contracts
- The CESMP is to be reviewed by GIZ, NAWASA and the PCU at the bid evaluation stage and agreed at the contract negotiation

Timeframe:

- CESMP to be included in contracts
- Regular oversight and monitoring of implementation during project duration

Cost estimate:

Cost to be clearly stated by contractors in bids. Normally 1-3% of total construction cost.

Monitoring and reporting:

- the contractors report weekly on their own performance to NAWASA
- NAWASA inspects construction works
- NAWASA and PCU control reporting and determine corrective actions if needed
- in the annual ESMP report:
    - report on contractor monitoring organization at NAWASA
    - confirmation that CESMP was required in the bidding documents
    - review and approval of each CESMP
    - contractor E&S performance and payment

Targets:

- CESMP included in all contracts
- CESMP fully implemented by the contractors
- CESMP costs paid to contractor

7.3.8 Land acquisition and land occupation management framework

ESMP Action 7

Land acquisition and land occupation management framework

Objectives: the project may require the acquisition of up to 3.8 ha of land, as well as temporary land occupation and the establishment of rights-of-way. NAWASA's land acquisition practices have been assessed as appropriate. To reach full conformity with Performance Standard PS5, as well as with the UN Basic Principles on Development-Based Evictions and Displacement[6], it is required to:

- share documentation so as to keep all stakeholders informed of the adopted procedures, and allow for verification of conformity with international standards;
- develop a grievance mechanism (to be managed by GIZ/PCU)
- develop guidelines for points which can be improved in NAWASA's current land acquisition/management of rights-of-way procedures and for the specific case of restrictions that could be imposed in the groundwater protection areas.

Responsible entities: the framework is to be prepared jointly by NAWASA, GIZ, the PCU, the MALFF, the MoWPU and the Ministry for Social Development. Daily implementation will be the task of NAWASA and contractors, with oversight from PCU and GIZ, and support from the Ministry of Landuse Planning.

Actions:

The Land acquisition and land occupation management framework will be a document which should include:

- an overview of Grenadian legislation and description of NAWASA's current land acquisition procedure,
- the definition of a documentation procedure for land acquisition for the CREWS project,
- the definition of the grievance mechanism,
- the following improvements of the existing procedure for land acquisition:
    - if possible, instead of buying the land, exchange it for other land;
    - if not, prices should reflect market replacement value;
    - compensate not only for land but also for lost incomes (including in the case of rights-of-ways)
    - develop communication with affected people outside the mere price negotiations;
    - include a socio-economic assessment of income and living conditions of affected persons;
    - offer a recognition for affected people (such as name tag on final site/building)
- the definition of an acceptable procedure for temporary eviction of squatters on pipeline rights-of-way, including communication with affected people and help in rebuilding lost assets (monetary compensation to be avoided); any temporary eviction should be documented,
- the definition of an acceptable procedure for management of possible cases when houses have been built over pipelines which need to be replaced,
- the definition of guidelines for compensation for forced changes of activities in the

[6] This is the primary human rights reference document to establish state obligations before, during and after evictions/ displacement. These apply irrespective of whether someone, under domestic law, settles legally or illegally.

groundwater protection zones.

The framework should be developed in a transparent way and include consultation with civil society.

Timeframe:

- To be engaged before tendering
- Reference to Land acquisition and land occupation management framework included in tenders
- To be followed all through project duration, grievance mechanism duration to be defined

Cost estimate:

- Land acquisition costs are to be covered by the Government of Grenada, while prices will be controlled under the present framework;
- Possible additional compensation costs for lost incomes (including for the establishment of rights-of-ways) are estimated 70,000 EUR.

Monitoring and reporting:

- Land use framework to be presented to GIZ/GCF
- Report annually on any activities under the Land acquisition and land occupation management framework
- Reporting on complaints received through the grievance mechanism and solutions adopted

Targets:

- All affected persons are compensated for possible losses, and this is documented
- All grievances are solved in conformance with the procedures defined in the grievance mechanism

7.3.9 Hydrology, biodiversity and water use assessment

ESMP Action 8

8a Baillies Bacolet river hydrology, biodiversity and water use assessment

8b Petit Etang catchment: hydrology, biodiversity and water use assessment

+ Design of both intakes to include an option to release a minimum flow

+ Biodiversity survey of forest areas impacted by new pipelines (if any)

Objectives: assessment of flows, aquatic biodiversity and water uses in the catchments for a detailed impact assessment of the increase of the storage capacities at both water systems. Both storage systems will be equipped with the option to let through a minimum flow if required during the dry season.

+ survey of terrestrial fauna and flora to identify if areas where the pipelines for Mt Moritz and Tufton Hall will be built should be considered are Critical Natural Habitat.

Responsible entities: Water Resources Management Unit, NAWASA

Actions:

- Record rainfall in the catchment areas
- Periodically measure water flows at different points along the streams (WRMU)
- Obtain data from NAWASA on water abstraction
- Make an inventory of other water uses in the catchment (to be done several times in the year), consult with potential fishermen
- Appoint a consultant for an aquatic biodiversity assessment of the streams and an analysis of conclusions based on all the collected data
- Survey of fauna and flora in any forest areas where new pipes will be built
- Define if conservation of a minimum flow is required based on the needs for ecosystem protection
- Define if reforestation measures are required in the catchments
- Les Avocats: environmental flow to be released from tributary silt trap weir
- Petit Etang: possibility to release an environmental flow to be included in design

Timeframe:

- Preparation 6 months, study 1 year

Cost estimate:

- Baillies Bacolet 150,000 EUR, Petit Etang 50,000 EUR

Monitoring and reporting:

- Study report to be addressed to GIZ

Targets:

- Studies are finalized
- The WRMU sets targets for water allocation in the concerned catchments
- The reservoirs are built with the option to release an environmental flow
- The experience is replicated to other catchments
- Assessment of forest areas where new pipes will be built as Critical Habitats or not

7.3.10 Water quality management

ESMP Action 9

Water quality management for reservoirs

Objectives: NAWASA should better control water quality and especially oxygen levels in reservoirs to avoid negative impacts on ecosystems and on quality of treated water. Dredging of sediment from reservoirs should be controlled to avoid pollution, especially during the Les Avocats dam upgrade. Once the sediment traps are built at water intakes, it is necessary to implement appropriate management of sediment when the traps are cleaned.

Responsible entities: WMRU, NAWASA, contractors

Actions :

- NAWASA: better control of oxygen contents in reservoir:
  - daily monitoring of oxygen and turbidity in Les Avocats and Petit Etang reservoirs and downstream, during construction and filling up
  - Fill up the upgraded reservoirs in the rainy season and flushing after first filling up
  - Automatic measurement of reservoir oxygen content at sensitive reservoirs (Mardigras, Les Avocats, new Petit Etang reservoir) (included in CREWS SCADA)
  - Feasibility study for an intake system to aerate reservoir water before the WTP. The system is to be included in the future Les Avocats and Petit Etang intakes.
- Contractors, NAWASA: reservoir sediment management:
  - Prepare a sediment/sludge management plan to avoid any dumping of sediments in streams. Sediment should be provided to farmers or disposed of on appropriate land.
  - Dredging of sediment from reservoirs should be controlled to avoid pollution, especially during the Les Avocats dam upgrade
  - Once the sediment traps are built at water intakes, it is necessary to implement appropriate management of sediment when the traps are cleaned.
- NAWASA: prepare a wastewater management plan, see action 11.

Cost estimate:

- 25,000 for water quality measurement equipment

Monitoring:

- Include results of oxygen measurements at WTP intake in reporting to GIZ/GCF
- Include number of complaints about water quality in reporting to GIZ/GCF
- Report about quantities of sediment/sludge dredged at water intakes and their destination

Target:

- Annual independent monitoring report of drinking water quality is issued
- Reduction or low number in complaints about water quality
- No fish mortality
- No sludge or sediment dumped into streams

7.3.11 Construction stakeholder engagement plan

ESMP Action 10a

Construction stakeholder engagement plan

Objectives: since the CREWS project already includes a stakeholder engagement plan and a grievance mechanism, the ESMP includes only an additional stakeholder engagement plan, concerning the construction impacts. An additional stakeholder engagement action on the tariff review is included as action 10b (next action).

Responsible entities: PCU, GIZ, NAWASA, contractors

Actions

- Additional stakeholder identification. Additional stakeholders not already targeted by the main CREWS project and concerned by the construction phase are for instance:
  - companies that will be contracted for the infrastructure works
  - workers employed by these companies
  - NAWASA workers
  - users of water resources which may be affected by the works, that is river water users downstream Les Avocats dam and downstream the future Petit Etang pond;
  - users of future Petit Etang impoundment site, in particular members of the shooting range club using the area;
  - users of drinking water which may be affected by service interruption during the works;
  - road users along pipeline works routes and near tank construction sites;
  - residents living along pipeline works routes and near tank construction sites
- Identification of communication needs and planning of means and frequency of communication
- Establishment of:
  - a grievance mechanism for persons affected by construction nuisances (to be managed by NAWASA and PCU),
  - a grievance mechanism for construction workers (including NAWASA's workers) (to be managed by PCU).

(the grievance mechanism for persons affected by land acquisition and temporary occupation is included in ESMP action 7, and the project-wide grievance mechanism is developed by GIZ for the CREWS project)

Cost estimate:

- Staff costs
- 2,500 EUR for possible material costs

Monitoring:

- stakeholder engagement plan submitted to GCF
- all grievances to be recorded
- reporting on stakeholder engagement activities in annual ESMP report

Target:

- All affected persons are sufficiently informed about possible construction impacts
- All grievances are solved in conformance with the procedures defined in the grievance mechanism

7.3.12 Stakeholder engagement for the tariff study

ESMP Action 10b

Tariff review stakeholder engagement plan

Objectives:

PS1 requires to report to communities about actions of concern to them. The tariff study has raised concerns during the consultations. Specific social guidelines will be applied to the terms of Reference and the social impacts of the study will be monitored (Action 1b). The present action ensures that are the relevant stakeholders are informed and consulted for the study.

Responsible entities: Project Steering Committee (PCU, GIZ, MoWPU, Min. of Social Development), see also action 1b**.** It is important that this action should be executed independently of NAWASA.

Actions:

- Identify relevant stakeholders, including other water users such as the agricultural sector
- Regularly inform and consult relevant stakeholders and the public about advancement of the tariff review
- Include stakeholders in the choice of tariff alternatives

Cost estimate:

- Staff costs
- 2,500 EUR for possible material costs

Monitoring:

- Reporting on stakeholder engagement activities in annual ESMP report

Target:

- No specific target

7.3.13 Wastewater treatment

ESMP Action 11

Wastewater treatment: prepare a study investigating wastewater treatment possibilities

Objectives: it is not expected that the CREWS project will significantly increase the needs for wastewater treatment, but the wastewater treatment issue is a strong concern of consulted stakeholders, and should be part of efforts in the ESMP to improve general water quality in Grenada. NAWASA is committed to rebuild a sewer outfall, but it is required to also investigate options for treatment.

Responsible entities: NAWASA, GIZ

Actions

- Engage a consultant to assess wastewater treatment options and perform a feasibility study
- Include a consultation component in the assessment of options
- Ecosystems-based adaptation measures to be favored in the design of possible options

Timeframe:

- 3 years

Cost estimate:

- 180,000 EUR for technical assistance

Monitoring and reporting

- NAWASA and the consultant to report on progress of the study to stakeholders
- Study to be provided to GIZ

Targets

- NAWASA has a strategic plan to invest in wastewater treatment

8 Outline of the requirements for the Construction ESMP (CESMP)

8.1 Non-exhaustive list of items to be required in the Construction ESMP:

The list below is a minimum list of Environment, Health and Safety items to be covered in the construction ESMP. These requirements come on top of any requirements of the Grenadian law, which should be respected at all time by contractors, in particular the Labour Code. All sub-contractors should satisfy the same level of requirements. The list is non-exhaustive.

8.2 Organization, staffing, reporting and continuous improvement

- Description of how the contractor allocates staff and defines responsibilities and procedures for OHS and environmental management
- Description of how the contractor allocates staff and defines responsibilities and procedures to ensure that all sub-contractors respond to the same requirements
- Information on possible quality/OHS/environment management certifications of the company
- Qualification, training and safety induction of workers
- Risks review and prevention plan
- Emergency procedures
- Organization for reporting on performance and determining corrective actions
- Provision for modifications based on a continuous improvement approach during the execution of works
- Quality requirements and inspection of machinery
- Cost of the C-ESMP

8.3 Generic management of construction impacts

- Worker's accommodation
- Sourcing of materials
- Disposal of materials
- Waste management
- Dust management
- Noise protection
- Soil erosion management
- Management of liquid effluents
- Management of hazardous materials, including oil and fuel
- Management of excavated materials
- Work in excavations (including prescriptions on armoring excavations)
- Management and disposal of cleared topsoil
- Revegetation of cleared areas
- Protection of waterways against turbidity
- Construction site signalization (and fencing if required)
- Traffic signalization
- On-site communication with the public
- Use of personal protective equipment

- "Chance find" procedures in cases when archaeological remains are found during excavations
- *non-exhaustive list*

8.4 Items specific to Grenadian context and CREWS project

- More specific oversight of worker's accommodation in case of workers from abroad
- Methods adopted for ensuring continuity of water supply, especially during Les Avocats dam works; including communication plan with NAWASA about possible accidental interruptions
- Temporary roads and temporary land occupation (refer to CREWS landuse management plan)
- Replanting of the same number of trees, that have to be felled during the works, in a location to be agreed with the Ministry of Forestry
- Specifications on possible tree cutting along the Les Avocats reservoir edge (to be validated by the Ministry of Forestry)
- Prevention against waterborne diseases
- Waste management plan, including methods for disposal, and preferably recycling, of old pipes; if any waste is to be exported out of the country, this should be clearly stated and a cost figure included
- Management of dredging materials
- Communication with downstream users during any river works

8.5 References to other plans

Contractors and sub-contractors should be informed at the tender stage about the requirements to participate in:

- the grievance mechanism for workers,
- the grievance mechanism for the public,
- the Land acquisition and land occupation management framework,
- the stakeholder engagement plan.

9 Outline of social guidelines for the tariff study

9.1 Development of the terms of reference for the tariff study

Under the CREWS project, a Tariff Study will be carried out to determine the required adjustment to NAWASAs water and sewerage tariffs in order to improve financial sustainability for the 10-year period 2017-2026. The contents of the study are outlined in section 2.6

The objective of the present guidelines are to ensure that the tariff review will benefit all water users and

To this end, the terms of reference for the tariff study will be developed under supervision of the Project Steering Committee, who is responsible for compliance with GCF's and GIZ's environmental and social policies (cf ESMP action 1b). The following paragraphs provide an outline of possible requirements to be included in the Terms of Reference, and to be monitored during CREWS project implementation. These requirements should be further developed by the Project Steering Committee.

9.2 General social impact objectives to be set for the tariff study

The tariff study should assess the full social and economic implications of the tariff system and possible changes therein, and recommend measures/ designs to avoid/ mitigate negative impacts and ensure affordable access to water and sanitation for all, in particular marginalised households.

9.3 Full social and economic assessment

The tariff study will include analysis of the baseline situation of the socio-economic situation of households in Grenada and their access to water. It should assess the current situation in particular for vulnerable households, such as the single-parent-headed households (this concern 50% of Grenada households and almost all of these are headed by a woman), as well as the possible marginalised households The study will then assess the full social and economic implications of the tariff system, and possible unintended negative impacts on access to water and sanitation through the various possible forms of a water tariff policy. The study should assess several tariffs scenarios.

The assessment should answer the following question in particular: under the current "state safety net", where the state pays the water bills of households living in poverty, who is the defined target group and who actually benefits from these payments and who perhaps not and for which reasons? By way of example, do households have to apply for state support, and do they perhaps feel stigmatised and therefore abstain from applying? How exactly is the interplay between these state payments and the tariff system?

9.4 References to international human rights standards

The tariff study should be undertaken with systematic reference to international human rights standards on the rights to water and sanitation and the notion of affordability in particular.

With regard to the notion of affordability of water, a multitude of reference documents and material have been developed by subsequent UN Special Rapporteurs on the Rights to Water and Sanitation, namely the report on the notion of affordability (UN doc. Number A/HRC/30/39), the booklet on water services and more material including compilations of good practices.

9.5 Stakeholder engagement

The terms of reference should include the requirements for stakeholder engagement as outlined in ESMP action 10b.

9.6 Analysis of alternatives

The study will assess several tariffs scenarios or alternatives. The planning of the study should allow for sufficient time to submit the alternatives to stakeholder consultation.

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Appendix : Stakeholder consultations

Summary of persons consulted for the ESIA



DATE	ORGANISATION	NAME	FUNCTION
1 May	GIZ	Dieter Rothenberger	Project Manager
2 May	GIZ	Marion Geiss	Project Officer
2 May	TP Smith Engineering	Terrence Smith	Water supply engineering/EIA expert
2 May	NAWASA	Christopher Husbands	General Manager
2 May	NAWASA	Whyme Cox	Head Eng. Department
2 May	Department of Economic and Technical Cooperation, NDA	Fitzroy James	Head of unit
2 May	Department of Economic and Technical Cooperation, NDA	Titus Antoine	Deputy Head
2 May	Statistical Office	Halim Brizan	Head of the statistical office
2 May	NAWASA, Les Avocats/Petit Etang/Vendome/Montreuil water supply systems	Andy Lewis	Technician
2 May	NAWASA, Les Avocats WTP	Keron Alexander	Les Avocats WTP operator
3 May	Min. of Health	Deryck Ramkhelawan	
3 May	Min. of Education, Environment Division	Aria St. Louis	Head of unit
3 May	Min. of Education, Environment Division	Andre Joseph-Witzig	
3 May	Min. of Agriculture, Forestry Division	Trevor Thompson	Head of land use division
3 May	Min. of Public Works	Fabian Purcell	Head of Physical Planning Unit
4 May	NAWASA, Observatory Water Works and Laboratory	David Gabriel	Laboratory Manager
4 May	NAWASA, Production and Quality Department	Kingsley Alexander	Head of Department
4 May	NAWASA, Human Resources	Pantsy Ventour	Head of Human Resources
4 May	NAWASA, Legal Department	Xiomara Forsythe	Legal counsel
4 May	NAWASA, Customer Services	Marylin Patterson	Head of customer services
4 May	NAWASA; Communication Unit	Chryselle Jerome	
5 May	GNOW	Gloria PayMin.ne-Banfield	
5 May	SPECTO	Claudette Pitt	
5 May	Grenada Hotel and Tourism Association (GTHA)	Pancy Cross	
5 May	MBIA – Met Office	Fletcher Frank	
5 May	IAGDO	Sandra Ferguseon	
16 May	GIZ	Roman Roehrl	Project preparation advisor
16 May	GIZ	Maren Huser	Gender expert
16 May	Min. of Agriculture	Dillon Palmer	Deputy Head of Forestry Division
16 May	Min. of Social Housing and Development	Elaine Henry-MacQueen	Senior Pgm Officer Gender and Family

DATE	ORGANISATION	NAME	FUNCTION
16 May	Min. of Social Housing and Development	Claudine Mark Benjamin	
16 May	NAWASA, Transmission and Distribution Department ("Dusty Highway")	Joel Thomas	Head of Transmission and Distribution Department
16 May	NAWASA, Transmission and Distribution Department ("Dusty Highway")	Aaron Joseph	Head of spare parts department
17 May	NAWASA Annandale, Mardigras, Venome water supply systems	Allen Gilbert	Civil technician Production and Quality Department
17 May	NAWASA Annandale WTP	Rudolph Daniel	Plant Operator
18 May	Bureau of Standards	Leonard St Bernard	Head of Laboratory Services Division
18 May	Grenada Development Bank	Mervyn Lord	General Manager
18 May	National Disaster Management Agency	Kelmont Dufont	Coordinator
18 May	National Disaster Management Agency	Simeon Grainger	Community programme officer
18 May	PCU	Margret Belfon	Head of Unit
19 May	GDB	Natasha Joseph	
19 May	Central Statistical Office	Paul Drumen	
19 May	Grenada Tourism Authority	Nikoyan Roberts	
19 May	National Coalition on the Rights of the Child	Andrea Alexander	
19 May	GNOW	Ghyslyn Williams	
19 May	GNOW	J Louce Pascal	
19 May	GIZ	Rand Abu Ajamia	
19 May	Min. Social Development and Housing	Samuel St Bernard	
19 May	Carriacou Affairs	Davon Baker	
19 May	SGU	Odvan Edwards	
19 May	Mini. of Petite Martinique	Sasha (?) Walker	
19 May	Min. of Health	Andre Worme	
19 May	Grenada Organization for Consumer Affairs	Mitton Coy	
19 May	Grenada National Council of the Disabled	Carlene Pezar	
19 May	Met Office	Gerard Tanner	
19 May	Friend of the Earth	Joseph Antoine	
19 May	Grenada Solar Energy Research Institute	Earl C-L Roberts	

NB Persons met several times are only mentioned on the first date of encounter

CREWS ESIA consultation – Focus group 1 – Wednesday 3th May 2017

Persons present

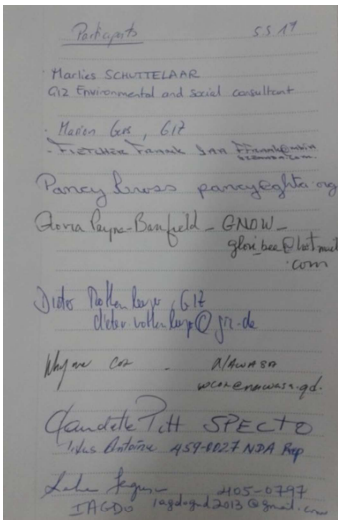
ORGANISATION	NAME
ESIA Consultant	Marlies Schuttelaar
GIZ Grenada	Marion Geiss
NaWaSA	Whyme Cox -Eng
TP Smith Engineering	Terrence Smith
Min. of Health	Dhanraj Ramkhelawan
Ministry of Education, Environment Division	Aria St. Louis
Min. of Education, Environment Division	Andre Joseph-Witzig
Min. of Agriculture, Forestry Division	Trevor Thompson

Summary of meeting

Marion Geiss presents the context, Terrence Smith the project, and Marlies Schuttelaar the Environmental and Social Assessment and a draft ESMP.

The persons present would all like to see a more detailed document describing the project. There were some comments on the planned tariff study: an economic valuation should be made of water for all uses, not only the drinking water use. This includes agricultural use. And also fire water availability. Desertification issues are important. Small non-NAWASA water sources used by communities should be taken into account. Stakeholders insist on taking into account the ability to pay of the poorer households. Some wonder if the tariff study is really a priority. Standards for water quality are to be developed. Water quality monitoring should be made public.

CREWS ESIA consultation – Focus group 2 – Friday 5th May 2017



Persons present

ORGANISATION	NAME
ESIA Consultant	Marlies Schuttelaar
GIZ Grenada	Dieter Rothenberger
GIZ Grenada	Marion Geiss
GNOW	Gloria Payne-Banfield
NaWaSA	Whyme Cox -Eng
NDA office	Titus Antoine
SPECTO	Claudette Pitt
TP Smith Engineering	Terrence Smith
Grenada Hotel and Tourism Association (GTHA)	Pancy Cross
Met Office	Fletcher Frank
IAGDO	Sandra Ferguson

Summary of the meeting

Dieter Rothenberger presents the context, Terrence Smith the project, and Marlies Schuttelaar the Environmental and Social Assessment and a draft ESMP. See attached power point presentation.

- Question: will users of privately owned water sources have to pay for water abstraction under the future law? Answer by GIZ: there are not really privately owned water sources. All surface water and groundwater belongs to NAWASA except for some springs located entirely within estates. In the future water will belong to the State. All the users will have to pay for water, including Glenale. Private rainwater collection will be free.
- How about the broken sewage pipe? Answer from NAWASA: NAWASA has launched tenders for replacement of the pipe and hope that a contractor will be selected for the works by the end of the year.
- Why can't sewage be treated? Answer from NAWASA: the ideal objective is to have Grenada's wastewater treated. Some hotels as well as the airport already have WWTPs. T.P. Smith explains that centralized wastewater treatment is difficult and costly in Grenada because of the requirements for land. The NDA says the issue needs more thought. GIZ says that wastewater treatment is not a climate change adaptation action as such and that therefore a solution for wastewater (be it reconstruction of the pipe or construction of a

WWTP) cannot be included in the CREWS project proposal to GCF, the more so because such an investment would probably take up the largest part of the funding.

- The GHTA as well as SPECTO declare they are happy with the project proposal.
- The representative from the Met-Office says that water storage is the big challenge in Grenada. Shouldn't it be made compulsory for all buildings to have rainwater storage? GIZ present the rainwater harvesting project that is under construction in Blaize.
- GNOW and SPECTO stress that land acquisition is a sensitive issue and ask for an approach whereby the land owners are given the time and explanations to understand why expropriation of their land is required. Many owner remain strongly attached to their land, consider making them "feel special" and keep some ties to the land they have given up. A discussion also ensues about the principles of the wayleave which landowners and land users have to respect for NAWASA pipelines.
- Could NAWASA use Heritage sites such as Fort George, Fort Patrick and Fort Matthew for water storage, and also it NAWASA could financially contribute to their upkeep? Other people present do not agree with this proposed financial contribution.
- Is there security at all NAWASA sites? Answer by NAWASA: all sites are fenced, WWTPs are manned 90% of the time, and there is security at many sites. A person present saw a person enter Vendome WWTP for bathing and suggest that NAWASA use CCTV (videosurveillance). Others are of opinion that the best way to improve security is to foster cooperation from residents.
- GIZ asks if the people present think that the project could have an impact on gender equity. The general opinion is that improvements of water distribution will lessen the work of women who often are the ones to fetch water or do the laundry at standpipes or rivers. The consulted persons however observe that the habit of going to the standpipes and river is often kept up even when water distribution is good. This can be out of habit, out of pleasure at socializing, or out of need to save on the cost of piped water.
- SPECTO suggest it would be interesting to examine the water use behavior of selected communities, such as Rose Hill in St Patrick with many farmers and children.
- Awareness raising is needed to prevent people from polluting rivers, such as bus drivers who clean their vehicles in streams. GIZ says that the proposed WRU could have this role.
- NAWASA states that there are no important deforestation issues in the raw water catchments. However after Hurricane Ivan not enough replanting was done.
- Discussion about the water quality issues at Mardigras WTP.

CREWS project - Natonal Stakeholder Workshop – Friday 19th May 2017




Persons present

GIZ	Dieter Rothenberger
GIZ	Roman Roehrl
GIZ	Maren Huser
ESIA Consultant	Marlies Schuttelaar
TP Smith Engineering	Terrence Smith
NAWASA	Christopher Husbands
NAWASA	Whyme Cox
Department of Economic and Technical Cooperation, NDA	Titus Antoine
Min. of Social Housing and Development	Elaine Henry-MacQueen
Min. of Agriculture, Forestry Division	Trevor Thompson
GDB	Natasha Joseph
Central Statistical Office	Paul Drumen
Grenada Tourism Authority	Nikoyan Roberts
National Coalition on the Rights of the Child	Andrea Alexander
GNOW	Ghyslyn Williams
GNOW	J Louce Pascal
GIZ	Rand Abu Ajamia
Min. Social Development and Housing	Samuel St Bernard
Carriacou Affairs	Davon Baker
SGU	Odvan Edwards
Mini. of Petite Martinique	Sasha (?) Walker
Min. of Health	Andre Worme
Grenada Organization for Consumer Affairs	Mitton Coy
Grenada National Council of the Disabled	Carlene Pezar
Met Office	Gerard Tanner
Friend of the Earth	Joseph Antoine
Grenada Solar Energy Research Institute	Earl C-L Roberts
National Disaster Management Agency	Simeon Grainger
Min. of Health	Deryck Ramkhelawan
Min. of Education, Environment Division	Andre Joseph-Witzig
Grenada Hotel and Tourism Association	Pancy Cross

Stakeholder Consultation for the Environmental and Social Impact Assessment for the Green Climate Fund (GCF) Proposal "Climate Resilient Water Sector in Grenada (Crews)"
19 May 2017
Pubic Worker's Union
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Summary of the meeting

- 08:54 Introduction by Dieter Rothenberger
- Prayer
- 09:00 Opening remarks by Titus Antoine, National Designated Authority
- 09: 04 presentation by Dieter Rothenberger: general background of the project
- 09:21 Presentation by Roman Roehrl: Vulnerability Assessment
- 10:15 presentation by Terrence Smith: project contents
- 11:53 Presentation by Marlies Schuttelaar: ESIA and ESMP
- 12:22 Presentation by Maren Huser: Gender Assessment

The persons present were generally very positive about the project. People were interested in the vulnerability assessment and commented on the assumptions made, especially on the economic valuation. The proposed risk-based approach, whereby quantitative targets are set for the project (such as increasing water efficiency), even if it is not possible to assess beforehand exactly in how far these targets will answer the climate change problem, was approved.

Several stakeholders asked whether specific users would be included in the project, and were reassured: Carriacou users, people using rainwater collection, households… People also recommended that water demand management will be applied to golf courses, private dams, swimming-pools…

Stakeholders expressed concerns regarding the nuisances generated by pipeline works, such as dust and air quality. Concerns were also expressed regarding a possible increase of water tariffs.

Stakeholders described current issues observed with the water supply system, such as water quality, supply interruptions, traffic disruptions due to long repair works. NAWASA's general manager and head of engineering department were able to give direct answers, in particular with respect to the difficulty in sourcing tar for repairing roads after pipeline works.

Stakeholders asked for inclusion of different topics in the project: capacity building, air quality, wastewater treatment, forest conservation, water-saving toilets, employment (especially of women), data collection, wastewater reuse, increasing runoff due to urbanization, inclusion of single-parent vulnerable households, disposal of old pipes, location of pipes out of areas which are at risk to be flooded…

Many of these aspects are included in the CREWS project, but Dieter Rothenberger explained that it would not be "manageable" to deal with all the water-related subjects. The components included here are those for which feasibility studies are available; further improvements of the water sector are certainly desirable, but should be based on further feasibility studies. Reforestation is a good example.

The inclusion of gender aspects in the project was discussed in depth and the stakeholders present expressed their wish that the recommendations will be effectively implemented.