Institutional and Organisational Strengthening of WASCO Saint Lucia and Regional Water Utilities

Approach and Framework for preparing a Masterplan for Water and Wastewater in Saint Lucia

November 2019
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JOINT VENTURE
CONSULAQUA Hamburg Beratungs-GmbH - Como Consult GmbH

CONSULAQUA Beratungsgesellschaft mbH Hamburg
Ausschläger Elbdeich 2,D-20539 Hamburg, Germany

Como Consult GmbH,
Winterstraße 4-8. D-22765 Hamburg

Contacts for this report
Jan Willem Overbeek  jw.overbeek@gmail.com
Kees de Jong  cornelis.dejong@consulaqua.de
Marc Lüdtke  marc.luedtke@gmail.com
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<th>Description</th>
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<tr>
<td>CAH</td>
<td>CONSULAQUA Hamburg Beratungsgesellschaft mbH</td>
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<tr>
<td>CIS</td>
<td>Customer Information System</td>
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<td>Como</td>
<td>Como Consult GmbH</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>MGD</td>
<td>(imperial) Mega Gallons per day</td>
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<tr>
<td>MSL</td>
<td>Mean Sea Level</td>
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<tr>
<td>MoAFPNC</td>
<td>Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives</td>
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<tr>
<td>NRW</td>
<td>Non-Revenue Water</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
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<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition (Program)</td>
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<tr>
<td>SPD</td>
<td>Strategic Planning Department</td>
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<td>TA</td>
<td>Technical Assistance</td>
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<td>ToR</td>
<td>Terms of Reference</td>
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<td>WASCO</td>
<td>Water Supply and Sewerage Company Inc., Saint Lucia</td>
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1 INTRODUCTION

Activity A.3.5 of the ToR for the project Institutional and Organizational Strengthening of WASCO, Saint Lucia and Regional Utilities requires consultants to “prepare an Outline of Actions for Master Planning of WASCOs future projects, resulting in a compilation of recommendations developed during the course of the consultancy, merged into a conclusive framework for the development of a master plan for WASCO”.

WASCO and Consultants agreed to interpret the above activity as follows:

1. Prepare an overview of existing long-term development plans for water and wastewater within WASCO;
2. Review international best practice for master planning;
3. Recommend an overall framework for strategic and master planning for WASCO
4. Prepare a draft ToR for developing a master plan (including issues like climate resilience)

The above topics are further elaborated upon in the next sections and Annexes to this report.

2 EXISTING DEVELOPMENT PLANS AND STUDIES

To the knowledge of staff within WASCO, no Master Plan for Water Supply and Wastewater for Saint Lucia or a similar study was prepared during the past 15-20 years. However, there are several studies and reports that are useful to be reviewed by consultants involved in the future preparation of a Master Plan.

The Consultant has prepared a list of documents and reports, which are relevant for preparing a Master plan for water and wastewater in Saint Lucia and which are listed in Annex 1. Most documents are available from the office of the General Manager of WASCO, and the secretary in that office maintains a list of documents.

3 INTERNATIONAL BEST PRACTICE FOR MASTER PLANNING

Consultants have reviewed and prepared a PowerPoint Presentation on international best practice about Master planning. The presentation is attached as Annex 2 to this report.

4 WASCO FRAMEWORK FOR MASTER PLANNING

Each water utility needs a Master plan which provides the overall direction for investments and measures that are needed to ensure the reliable, sustainable and efficient supply of safe drinking water and wastewater management services in its service area, based on defined service levels and standards. Master plans generally cover a period of between 20-30 years and will be updated on a regular basis, say at least every 5 -10 years to adjust to a changing environment. Master plans focus on the requirements in terms of water resources and physical infrastructure needed to meet the demand for water and wastewater services. In addition, there may be complimentary studies and investigations related to legislation and regulation, technical, institutional and financial capacity, environmental and climate change aspects, etc.

In addition, and partly based on, the Master plan, a water utility would normally have a Strategic Plan,
covering a period of say 5 years. Preparation of a Strategic Plan follows a systematic process of envisioning a desired future situation and translating this vision into broadly defined goals or objectives and a sequence of steps to achieve them. Also, strategic planning looks at the wider picture and is flexible in choice of its means. A Strategic Plan would normally also include a broad outline of the investments and broad measures which are needed to achieve its goals. WASCO currently has a Strategic Plan for the period 2019-2023.

The third level within WASCO’s planning framework is the process of preparing annual business plans and budgets. Annual business plans would normally focus on achieving more narrowly described targets and objectives, which would normally represent steps in achieving the goals formulated in the Strategic Plans. The annual business plans are accompanied by an annual budget. The key steps in the Planning Framework are presented in the figure below.

WASCO, as any other organization, will be affected by its environment. Regarding planning, it will be important for WASCO to take note of existing Economic Development Plans, Demographic Studies and population forecasts, Spatial Plans, Land Use plans, etc. Also important is relevant legislation and regulations as well as government policies related to water supply and wastewater and the environment.

5 **Draft Terms of Reference for Preparing a Masterplan**

Annex 3 of this report contains a draft Terms of Reference for preparing a Masterplan for Water Supply and Wastewater in Saint Lucia. In this section, a summary of the ToR as well as key issues for WASCO, which need to be addressed in the Master plan, are presented.
5.1 Scope

The scope of the Master plan will be the reliable and sustainable supply of safe drinking water and wastewater management services to the population of Saint Lucia for the next 25 years, based on defined service levels and standards.

5.2 Objective

The objective of the ToR is to guide the formulation of an integrated Master plan, which describes the most efficient way to meet the demand for drinking water and for wastewater management services for Saint Lucia for the next 25 years and prepare a prioritized list of capital investments and complementary studies and projects to achieve that purpose.

5.3 Methodology

The Methodology of preparing a Master plan for Water Supply and Wastewater in Saint Lucia would involve the following steps:

A. Collection and Analysis of Data

1. Review and analyze existing economic development-, spatial- and water resources plans, population projections and other relevant documentation including relevant legislation and water governance and public health information

2. Define the required service levels and standards for drinking water supply and wastewater management which will function as the basis for planning and design in the Master plan.

3. Review the current use of water and assess and forecast the future demand for drinking water, including an analysis of options for demand management and the review of economic and spatial development plans

4. Assess the current and future availability of (alternative) water resources, and identify adequate and sustainable sources for drinking water and identify any risks, issues and potential constraints for the use of such resources and how these constraints can be mitigated

5. Review the current status, design and performance (including issues such as coverage, service levels, NRW, hydraulics, O&M costs, energy efficiency, etc.) of
   a) The water distribution system(s)
   b) The production - and water treatment facilities
   c) Infrastructure for the collection, treatment and discharge of wastewater

6. Review on site sanitation and current sanitation practices of households and industrial and commercial entities not connected to any sewerage system and identify potential risks to health and environment

7. Identify and formulate alternative options and scenarios for the future development of WASCO’s Water Supply and Wastewater Systems, considering demand management measures
8. Assess the potential impact of natural disasters and climate change on WASCO’s current and future infrastructure

B. Evaluation of alternative scenarios

1. Evaluate the future water supply and demand management alternatives and propose strategic options and scenarios for a sustainable, cost effective and safe supply of drinking water in accordance with the defined service levels and standards

2. Evaluate Saint Lucia's future wastewater management alternatives and propose and prepare preliminary cost estimates of strategic options and scenarios for the sustainable and cost-effective collection, treatment and disposal of wastewater in accordance with defined service levels and standards

3. Assuming the benefits of the various scenarios are similar, carry out a least cost analysis of the different scenarios and options

C. Complementary studies and plans

1. Review WASCO’s current operations and programs and prepare recommendations for further reducing non-revenue water and introducing energy & water saving technology and other measures to enhance operational efficiency

2. Provide recommendations and activities on the creation of a backup source of water supply for Saint Lucia in case of emergency situations

3. Analyse the results of earlier assessment of on-site sanitation facilities and practices and prepare recommendations to enhance on-site sanitation in Saint Lucia and on the potential role that WASCO and other agencies could play in this

4. Prepare a strategic environmental assessment for the Master plan, including social aspects

5. Review current tariff levels and cost structures for water and wastewater and prepare high level recommendations for tariff regimes and cost-recovery and assess the financial capacity of WASCO to finance investments in infrastructure and its borrowing capacity

6. Review current institutional settings and make recommendation for institutional reforms and capacity building needed for the efficient and effective management of water and water supply and sanitation in Saint Lucia

7. Conduct public consultations with key stakeholders including residents for the development of the integrated master plan

8. Develop a set of indicators and targets for monitoring water supply and sanitation development in Saint Lucia

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1 A climate risk vulnerability assessment has been undertaken as well as an adaptation plan of action for WASCO in 2018. This can be used as a basis for this part of the analysis.
D. Preparation of Investment Proposals

1. Based on the above evaluations and studies, select the preferred development scenario(s)

2. Assess investment needs to implement the preferred scenario and prepare investment proposals for water supply and sanitation

3. Rationalize, prioritize investment projects for cost saving and improved synergies among them and prepare a project implementation schedule

5.4 Key Issues to be analysed in the Master Plan

There are several key issues related to water supply and wastewater management in Saint Lucia that need to be addressed in the Master plan, including:

Water Resources and Production:

1. Currently WASCO’s water supply is making exclusive use of surface water sources and springs. The reliability of these resources has decreased over the years. Rivers flows are regularly becoming lower in the dry season and springs run dry. Related infrastructure such as intakes and transmission pipes, is vulnerable to natural emergencies, erosion and landslides

2. Groundwater investigations in Saint Lucia have taken place on several locations and although initial results indicate the presence of groundwater in some areas, further geological investigations are needed to assess the quantity of groundwater that can be abstracted and the technical and financial feasibility of the use of groundwater. Groundwater could potentially be a very useful source for drinking water, as it is clean and has a low vulnerability to climate change and natural disasters.

3. Potential other technologies of producing water should also be assessed, including the feasibility of desalination and the applicability of bank infiltration systems and similar technologies.

4. There are several stand alone water supply schemes for small towns in the southern part of the island, which do not have appropriate water treatment facilities. This issue needs to be addressed.

Design and Lay Out of the Water Supply System and NRW

5. The Northern Part of the island is supplied with water by two major systems, whereas water supply in the southern part of the island is provided through 15-20 stand-alone systems. It may be efficient to combine some of these stand-alone systems. It is also necessary to review the location of the various water treatment facilities. In summary, the Master plan should include a thorough review of the lay out, design, condition and performance of the water distribution network focused on the optimal performance of the system.

6. The level of NRW within WASCO’s water supply system is estimated at 40%-60% and this contributes considerably to WASCO’s costs of operating the system. A thorough review of NRW has been carried out in 2012. In 2018, WASCO has initiated a NRW Reduction Program and a NRW strategy is in place and being implemented. As part of this analysis needed for the Master plan, the causes of NRW will again be reviewed and updated estimates of NRW will be prepared. The Master plan will also include actions to reduce the level of NRW to economically justified levels.
Wastewater Collection, Treatment, Discharge and Sanitation

7. WASCO currently operates one main and two small Wastewater Treatment Plants and there are sewerage systems in Castries (CBD area), the Rodney Bay area and a small area in Vieux Fort. The performance and coverage of wastewater services will be evaluated as part of the masterplan study and proposals for expanding these services will be prepared and evaluated on their technical and financial feasibility.

8. The Master plan will also review the options for WASCO and the Government of Saint Lucia to improve on-site sanitation in smaller urban centers and rural areas. Scenarios in which house owners can be supported to improve the sanitary facilities in their houses in accordance with the Physical Planning and Development Act will be developed and evaluated as to their technical and financial feasibility.

Climate change and natural disasters

9. Saint Lucia is vulnerable to the effects of climate change, including rising sea levels and storm surges, increased variability in annual rainfall and increasing numbers of tropical storms and hurricanes. Also issues like erosion and landslides cause serious damage to WASCO’s infrastructure. The Master plan shall include a thorough review of the existing assessment of the vulnerability of WASCO’s infrastructure to climate change and include proposals for projects and measures to enhance the resilience.
ANNEX 1: LIST OF RELEVANT DOCUMENTATION

b. Water and Sewerage Act, 2008
c. First National Communication on Climate Change, June 2011
d. Second National Communication on Climate Change for Saint Lucia, Dec 2011)
e. Third National Communication on Climate Change for Saint Lucia (August 2017)
f. WASCO – Water Supply Investment Plan (March 2011)
g. A sectoral analysis for the Water and Sewerage Sector of Saint Lucia (World Bank, 2001)
i. Options for Enhancing the Water Resources of Fond D’Or Watershed, Saint Lucia (Prof. Frank Dale Morgan, July 2009)
k. John Compton Dam Hydropower Plant Feasibility Study, GIZ February 2015
l. Water Resources Assessment of the Millet Catchment - Roseau Watershed, Atkins, 2008
m. Water Resources Assessment of the Millet Catchment-Roseau Watershed, Halcrow, 2006
n. Post Hurricane Tomas Assessment of the Roseau/Millet Water Supply System and the John Compton Dam, Halcrow Dec 2011
o. Saint Lucia Island-Wide Non-Revenue Water Reduction Programme Phase, WASCO, December 2012
p. Geophysical Exploration for Potential Groundwater Sites in the Roseau Watershed of Saint Lucia by Professor Frank Dale Morgan cs, April 2014
q. Vieux Fort Water Supply Redevelopment Project, Water Audit Report, WASCO Oct 2018
r. Water Resources Study Roseau Dam, Halcrow, 2011
s. Groundwater exploration for Saint Lucia, 2009
t. Climate Risk and Vulnerability Assessment and Adaptation Plan of Action for WASCO Saint Lucia (June 2018)
ANNEX 2: INTERNATIONAL BEST PRACTICE ON MASTER PLANNING

A presentation was prepared and conducted for staff of WASCO on international best practice in Master planning and based on that the key steps of preparing a master plan were identified. The various slides of the presentation are included in this annex.

MASTER PLANNING
DEVELOPING A NATIONAL WATER MASTER PLAN

WATER MANAGEMENT

A successful water management program starts with a comprehensive strategic plan. The plan provides information about current water uses and charts a course for water efficiency improvements, conservation activities, and water-reduction goals. A strategic plan establishes the priorities and helps utility companies allocate funding for water-efficiency projects that provides the biggest impact.
OBJECTIVE OF MASTER PLANNING

In order to make water available for drinking, for industries, agriculture or others, and to safeguard the national resources for future generations, a common planning framework is needed.

- According the United Nations, the primary objective of a Water Master Plan is to establish a basic framework for:
  - orderly and integrated planning and implementation of water resources programs and projects; and
  - a rational water resources management consistent with overall national socio-economic development objectives.

PRINCIPAL COMPONENTS

A National Water Master Plan is not meant to be a static printed document but a dynamic working document.

The processes involved are:

- Assess the present availability, withdrawals, losses and uses of the water resources;
- Formulate alternative development scenarios for water resources and demand/use at various planning horizons;
- Perform the balancing of resources versus demands for the recent past as well as for the alternative development options and
- Identify technical and operational options in order to bridge the gap between resources and demands.
STEPS TO DEVELOPING A MASTER PLAN

In developing a National Water Master Plan there are essentially seven (7) steps to follow and are as follows:

Step 1: Set an Overarching Policy and Goals
Step 2: Assess Current Water Uses and Costs
Step 3: Develop a Water Balance
Step 4: Assess Water Efficiency Opportunities and Economics
Step 5: Develop an Implementation Plan
Step 6: Measure Progress
Step 7: Plan for Contingencies
ANNEX 3: DRAFT TERMS OF REFERENCE FOR PREPARING A MASTER PLAN FOR WATER SUPPLY AND WASTEWATER IN SAINT LUCIA

1. INTRODUCTION

1.1 BACKGROUND

WASCO is responsible for the provision of potable water and sanitation services for the whole of St. Lucia. The island extends over approximately 615 km², whereby the biggest part is covered by rainforest and land for agricultural use. Due to the prevailing geographical and climate conditions, sustainable water supply faces several challenges. Infrastructure deteriorated over time as a result of normal operations. Hurricane Thomas in 2010 and the heavy rains in December 2013 also caused considerable damage to infrastructure. Most of the water supply systems have been affected and severe damage was done to the water supply infrastructure: intakes, transport mains, reservoirs and pumping stations were flooded and partly damaged and the continuity of supply disturbed. Furthermore, part of the infrastructure is old and needs to be replaced. According to a study carried out in 2013, the rate of Non-Revenue Water (NRW) was calculated at about 56%.

The proposed technical assistance (TA) as described in this Terms of Reference (ToR) will support the preparation of an Integrated Master Plan for Water Supply and Wastewater for the Island of St. Lucia. The area for which the Master Plan Study shall be carried out covers the whole island of St. Lucia.

1.2 WASCO - THE WATER AND SEWERAGE COMPANY INC.

In October 1999, the Government of Saint Lucia restructured the water sector by establishing a new entity - the Water and Sewerage Company, Incorporated (WASCO). WASCO is incorporated under the Companies Act and regulated in accordance with the provisions of the Water and Sewerage Act (2004). Today the Water and Sewerage Company Incorporated (WASCO) falls under the portfolio of the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives (MoAFPNC).

WASCO’s head office is in Castries with sub offices in Vieux Fort and Soufriere, and it provides water supply services throughout the entire island and wastewater services in parts of the north and a small wastewater system in Vieux Fort. It serves close to 100 percent of the population with water supply, which consists of about 177,301 residents and approximately a million tourists annually.

WASCO employs approximately 325 staff divided over seven departments namely Information Technology, Finance and Accounts, Corporate Services, Customer Services, Human Resources, Southern Services, Strategic Planning and Operations(Wastewater Services, Water Services, Production, Treatment and Quality, Support Services and Design and Construction). The Production, Treatment and Quality Department is responsible for the production and treatment of potable water island wide whereas the Water Services Department is responsible for the distribution of potable water island wide. The Wastewater Services Department is responsible for the provision of sewer services in available regions. Southern services are responsible for the provision of both water and sewer services in the south of the island for 2 Census 2017
customer from Dennery to Vieux Fort to Canaries.

### 1.3 WASCO’s current water supply and wastewater system

#### Water Resources

WASCO currently depends 100% on surface water sources. The main source is the John Compton dam, which was designed for 3 Million m³ storage capacity. Due to landslides and sedimentation caused mainly by hurricanes, the capacity has reduced to max. 1.9 Mio. m³ (2010).

In addition to the John Compton Dam, WASCO operates 29 other raw water sources and intakes as well as 9 water treatment plants (WTPs).

During periods of intense rainfall, the turbidity level of raw water sources is very high and simple disinfection of the water is insufficient. The current infrastructure is incapable of ensuring the delivery of acceptable quality of potable water to customers during high turbidity conditions. This often leads to interruptions of water supply in some areas.

The reliability of surface water resources in Saint Lucia has decreased over the years. Rivers are regularly without water in the dry season and springs run dry. Related infrastructure such as intakes and transmission pipes, is vulnerable to natural disasters, erosion and landslides.

Groundwater investigations in Saint Lucia have taken place on several locations and although initial results indicate the presence of groundwater in some areas, further geological investigations are needed to assess the quantity of groundwater that can be abstracted and the technical and financial feasibility of the use of groundwater.

Other potential technologies of producing water are also being considered, including desalination and the applicability of bank infiltration systems and similar technologies. The feasibility of such technologies remains unclear.

There are several stand-alone water supply systems for small towns in the southern part of the island, which do not have appropriate water treatment facilities. This issue needs to be addressed.

#### Water production

In 2018, WASCO’s estimated production was around 15.6 million cubic meters of water, out of which 35% from the John Compton Dam. The total water consumption in 2018 amounted to 11.75 Mio. m³.

#### Storage

The storage capacity is provided through more than 80 storage tanks and reservoirs with a combined volume of 21,600 m³. The storage capacity of the system is complemented by the storage capacities available through individual tanks, which many customers have installed privately.

#### The distribution system

WASCO’s distribution system is estimated to be 400 to 600 miles with portions of its pipes dating back to the 1940s. Most customers are served by gravity from Water Treatment Plants or reservoirs. Due to the hilly terrain, more than 50 pumping stations (pressure boosting stations) are operated on a daily basis. In 2019, WASCO supplied about 49,000 connections with water.

#### GIS and SCADA

WASCO with financial assistance from USAID, established a GIS department and is continues its database to provide digital maps of its supply and distribution network. WASCO considers this work of utmost importance as it facilitates the production of maps, allowing constant updating of new system components and thus provides an accurate database necessary for future planning and decision-making.
Some 80% of pipelines are registered and recorded in the GIS, however, part of the data is taken from maps whose accuracy is quite doubtful. Nevertheless, WASCO aims at developing a comprehensive GIS-system representing an accurate picture of WASCO’s water supply system.

A basic Remote Control and Monitoring System (SCADA) to control and monitor the flow of water, regulate pressure and operate pumps was developed several years ago. Currently, two WTPs, several bulk flow meters and four booster pumping stations are linked to the system. However, maintenance of the system has been insufficient, and several parts are not operating anymore, mainly due to natural disasters. A new SCADA system will be installed for the southern network as part of the Vieux Fort Water Redevelopment Project.

**Non-revenue water**

WASCO estimates that total actual non-revenue water (NRW) figures between 45% and 56%. A recent study in Vieux Fort estimated 42.5 % for this supply area. However, the reliability of the data on which this estimate is based was low.

**Wastewater collection and treatment**

WASCO currently operates one major and two small package Wastewater Treatment Plants and there are sewerage systems in Castries (CBD area), the Rodney Bay area and a small area in Vieux Fort.

### 1.4 AVAILABLE INFORMATION

A list of relevant documents is attached to this Terms of Reference and documents will be made available to the successful tenderer.
2. OBJECTIVES AND COMPONENTS OF THE MASTER PLAN

2.1 OBJECTIVE AND EXPECTED OUTPUTS OF THE MASTERPLAN

The proposed study will support the preparation of an Integrated Water Supply and Wastewater Master Plan for Saint Lucia to ensure water security for Saint Lucia’s increasing population and sustainable economic development. The technical assistance (TA) will produce two main outputs (i) an integrated master plan for water supply and wastewater for Saint Lucia; and (ii) a prioritized and costed list of investment programs and projects.

2.2 RATIONALE FOR THE MASTER PLAN AND KEY ISSUES TO BE ADDRESSED

Rationale

It is important for Saint Lucia and for WASCO to have an overall master plan for water supply and wastewater, which provides the strategic direction for investments in infrastructure and related systems and operations. Such direction has been lacking for the past 15 years and therefore it is important for WASCO to produce such a plan.

Key Issues

There are several key issues that need further analysis prior to making any future investment decisions, including

Water Resources and Production:

- A thorough study and analysis of the optimal use of water resources for water supply does not exist. Currently only surface water sources are used by WASCO, but there may very well be a rationale for the use of groundwater, rainwater and the use of alternative treatment technologies in the production of water.

Design and Lay Out of the Water Supply System and NRW

- A review and analysis of the optimal design and lay out of WASCO’s water supply and sewerage systems has not been carried out for many years and direction for future investments as well as for optimal operation of the current systems is lacking.

- The high levels of NRW have been a key constraint for WASCO to improve its service levels and performance during the past years. As part of the analysis needed for the Master plan, the causes of NRW will again be reviewed and updated estimates of NRW will be prepared and the Masterplan will include recommendations for reducing the level of NRW to economically justified levels.

Wastewater collection, treatment and discharge and sanitation

- The performance and coverage of wastewater services needs to be evaluated as part of the master plan study and proposals for expanding these services will be prepared and evaluated on their technical and financial feasibility.

- The Master plan will also review the options for WASCO and the Government of Saint Lucia to improve on-site sanitation in smaller urban centers and rural areas. Scenarios in which
house owners can be supported to improve the sanitary facilities in their houses in accordance with the Physical Planning and Development Act will be developed and evaluated as to their technical and financial feasibility.

Climate change and natural disasters

- Saint Lucia's is vulnerable to the effects of climate change, including rising sea levels and storm surges, increased variability in annual rainfall and increasing numbers of tropical storms and hurricanes. Also issues like erosion and landslides cause serious damage to WASCO’s infrastructure. The Master plan shall include a thorough assessment of the vulnerability of WASCO’s infrastructure to climate change and include proposals for projects and measures to enhance the resilience.

2.3 COMPONENTS OF THE MASTER PLAN

The objective of this TA is to prepare a comprehensive “National Water Supply and Wastewater Master Plan” for Saint Lucia up to the year 2045. Suitable investment packages shall be defined based on the analysis in the master plan and evaluated through state-of-the-art economic analysis. The Master plan will involve (but not be limited to) the following activities.

A. Collection and Analysis of Data

1. Review and analyze existing economic development-, spatial- and water resources plans, population projections and other relevant documentation including relevant legislation and water governance and public health information

2. Define the required service levels and standards for drinking water supply and wastewater management which will function as the basis for planning and design in the Master plan.

3. Review the current use of water and assess and forecast the future demand for drinking water, including an analysis of options for demand management and the review of economic and spatial development plans

4. Assess the current and future availability of (alternative) water resources, and identify adequate and sustainable sources for drinking water and identify any risks, issues and potential constraints that may constrain the use of such resources

5. Review the current status, design and performance (including issues such as coverage, service levels, NRW, hydraulics, O&M costs, energy efficiency, etc.) of
   a) The water distribution system(s)
   b) The production - and water treatment facilities
   c) Infrastructure for the collection, treatment and discharge of wastewater

6. Review on site sanitation and current sanitation practices of households and industrial and commercial entities not connected to any sewerage system and identify potential risks to health and environment

7. Identify and formulate alternative options and scenarios for the future development of WASCO’s Water Supply and Wastewater Systems, considering demand management measures

8. Assess the potential impact of natural disasters and climate change on WASCO’s current and future infrastructure

B. Evaluation of alternative scenarios
1. Evaluate the future water supply and demand management alternatives and propose strategic options and scenarios for a sustainable, cost effective and safe supply of drinking water in accordance with the defined service levels and standards

2. Evaluate Saint Lucia's future wastewater management alternatives and propose and prepare preliminary cost estimates of strategic options and scenarios for the sustainable and cost-effective collection, treatment and disposal of wastewater in accordance with defined service levels and standards

3. Assuming the benefits of the various scenarios are similar, carry out a least cost analysis of the different scenarios and options

C. Complementary studies and plans

1. Review WASCO's current operations and programs and prepare recommendations for further reducing non-revenue water and introducing energy & water saving technology and other measures to enhance operational efficiency

2. Provide recommendations and activities on the creation of a backup source of water supply for Saint Lucia in case of emergency situations

3. Analyse the results of earlier assessment of on-site sanitation facilities and practices and prepare recommendations to enhance on-site sanitation in Saint Lucia and on the potential role that WASCO and other agencies could play in this

4. Prepare a strategic environmental assessment for the Master plan

5. Review current tariff levels and cost structures for water and wastewater and prepare high level recommendations for tariff regimes and cost-recovery and assess the financial capacity of WASCO to finance investments in infrastructure and its borrowing capacity

6. Review current institutional settings and make recommendation for institutional reforms and capacity building needed for the efficient and effective management of water and water supply and sanitation in Saint Lucia

7. Conduct public consultations with key stakeholders including residents for the development of the integrated master plan

8. Develop a set of indicators and targets for monitoring water supply and sanitation development in Saint Lucia

D. Preparation of Investment Proposals

1. Based on the above evaluations and studies, and on the assessment of WASCO’s capacity to financing in infrastructure, select the preferred development scenario(s)

2. Assess investment needs to implement the preferred scenario and prepare investment proposals for water supply and sanitation

3. Rationalize, prioritize investment projects for cost saving and improved synergies among them and prepare a project implementation schedule
3. Detailed Terms of Reference

3.1 General

All the services of the Consultant described in the following shall be carried out in close cooperation with WASCO. Key stakeholders will be identified, informed and consulted as appropriate. In the Inception Report, Consultants will prepare a consultation schedule for this purpose for WASCO’s approval.

The consultant will ensure that all the studies and analysis as requested in this ToR are carried out in accordance with international professional standards and produce high quality deliverables.

3.2 Collection and Analysis of Available Data

During the initial phase of the study the Consultant will collect, review and assess existing studies and relevant data and information, including (but not limited to):

- available technical documents, reports, studies
- information on economic development plans, national, regional and urban planning and development studies including spatial plans, land-use patterns and area development
- information on relevant legal and regulatory documents related to water supply and sanitation and water resources management in Saint Lucia
- studies and documentation on water resources management, water resources availability, surface water, groundwater, rainwater etc.
- information on the existing water supply and wastewater systems and on current sanitation practices in Saint Lucia
- existing water quality data (sampled and analysed by WASCO and Ministry of Health) related to potable water supply
- existing demographic data and studies (e.g. Central Statistical Office of St. Lucia) regarding the population in the municipalities and villages in Saint Lucia
- reports and studies on Climate Change Risks related to Saint Lucia

3.3 Forecast the Demand for Water Supply and Wastewater Services

Based on existing data and assessments the Consultant shall collect and analyse all relevant socio-economic data as necessary for the Master Plan Study. The Consultant will carefully check availability, completeness and reliability of data. The preparation of the demand forecast will include, but not be limited, to the following activities:

- Assessment of population projections for Saint Lucia and for the individual municipalities and villages on the island. Analysis and mapping of population densities and distributions in Saint Lucia and identify regions in line with potential future water supply.
- Review future economic development plans and assess growth for key sectors, such as tourism, industry, agriculture etc.
• Implement customer satisfaction surveys among a representative sample of the population of Saint Lucia regarding water supply and wastewater services and assess willingness and ability to pay for better service levels.

• Assess current consumption levels for domestic, commercial, institutional, industrial and other relevant groups of customers, including cruise ships and hotels for the demand forecasting areas;

• Estimate the future demand for water for the various groups of customers for the different regions, considering the potential effects of water demand management measures.

• Assessment of current and future NRW figures and peak factors for the various supply zones

• Develop a water demand projection for Saint Lucia for the period of the Masterplan and subdivide demand among the different regions. Assess and present different scenarios for high/medium and low growth.

The results of this activity will be a Report on Demand Forecasting for Water Supply Services in Saint Lucia.

3.4 ASSESSMENT OF WATER RESOURCES

The Consultant will assess the current and future availability of water resources suitable for water supply. This activity will include but not be limited to the following activities:

• Review existing studies and data on the availability of surface water resources in Saint Lucia, including dams, rivers and springs and assess the long-term capacity to supply a sustainable volume of water for water supply.

• Review and assess potential other technologies of producing water including the feasibility of bank infiltration systems and similar technologies.

• Review existing studies and data regarding the availability of groundwater in Saint Lucia and carry out further geological investigations in high potential areas to assess the feasibility of using groundwater as a source for water supply. If positive, prepare a Terms of Reference (including cost estimates) for carrying out test drilling in defined areas, to confirm the availability and quantity of groundwater that could be used for water supply in Saint Lucia.

• Review the availability and use of rainwater and the re-use of wastewater as potential sources of water

• Assess the technical and financial feasibility of desalination as a potential source for drinking water supply.

• Review the legal and regulatory framework for water resource management and water management practices in Saint Lucia and identify potential future constraints and risks for the water supply and wastewater sector

• Prepare recommendations about the future availability and use of water resources for the water supply sector in Saint Lucia.

The results of this activity will be presented in a Report on Water Resources for Water Supply in Saint Lucia.
3.5 PHYSICAL ASSESSMENT OF THE CURRENT WATER SUPPLY SYSTEM

The Consultant will review the current status, design and performance of the water distribution system(s), the production facilities, transport pipes and water treatment plants. This activity will include but not be limited to the following activities:

- Collection of all required data on the existing water production and supply facilities such as water intakes, raw water transmission lines, water treatment facilities, potable water transport systems, reservoirs, main water distribution networks and secondary and tertiary networks
- Review of existing data and information on past water production and consumption in present and potential future supply areas;
- Assessment of the existing monitoring and control systems, including the use of SCADA
- Analysis of the current performance and operational and maintenance problems and deficiencies of the system;
- Identification of areas in need of rehabilitation based on defined criteria;
- Assessment of the validity and use of the GIS-system in order to reflect the entire water supply system accurately.
- Presentation of information regarding the existing water supply systems including mapping of each distribution network in the supply area as required for conceptual planning

The result of this activity will be a Report on the Assessment of the current Water Supply System in Saint Lucia and recommendations for improvements/redesign/upgrades and improved performance.

3.6 PHYSICAL INVENTORY AND ASSESSMENT OF CURRENT SEWAGE COLLECTION AND WASTEWATER TREATMENT FACILITIES AND SANITATION PRACTICES

The Consultant will assess the physical condition and performance of current wastewater collection, treatment and discharge facilities operated by WASCO. This will include, but not be limited to the following activities:

- Inventory of technical and operational design criteria of existing and planned sewerage collection, wastewater treatment and discharge facilities regarding type, degree of treatment, actual and potential capacity etc.
- Assessment of the condition and performance of the current wastewater collection networks, the collection of domestic and industrial wastewater, the requirements for industrial wastewater, etc.
- Inventory and assessment of performance of the current wastewater treatment plants, including the three main treatment facilities as well as any other facilities, the treatment processes in place, water quality monitoring facilities and practices, etc. Description of the degree of treatment and re-use of treated wastewater and sewerage sludge
- Inventory and assessment of the current discharge facilities and methods including an assessment of the effects and potential risks for the environment and public health.
- Preparation of a schematic map showing the areas with existing central sewerage collection, in GIS-compatible format.

In addition to the above, the Consultant will assess current on-site sanitation practices applied by the
population of Saint Lucia. Optimal use will be made of existing studies and information. Field visits and surveys will be used to a limited extent to verify information where needed. This part of the study will include, but not be limited to, the following activities:

- Assess current on-site sanitation facilities and practice of households, commercial and industrial entities, hotels, etc. in Saint Lucia
- Assess the legal and regulatory framework for on-site sanitation in Saint Lucia
- Assess the risks involved with current on-site sanitation practices.
- Based on the risk assessment, develop recommendations for the development or extension of piped wastewater collection and treatment systems in Saint Lucia
- Develop recommendations for alternative measures which may improve the outcome of on-site sanitation practices in Saint Lucia

The result of the above activity will be a Report on the Assessment of current Wastewater Collection, Treatment and Discharge and Sanitation Practices in Saint Lucia.

### 3.7 Definition of Service Levels and Standards Used in the Masterplan

Consultants will prepare a short report which will define the future service levels and standards to be used in the development of the master plan. This will include, but not be limited to the following activities:

- Define the legal requirements that apply to drinking water supply and wastewater services in Saint Lucia
- Define any technical and other standards regarding the quality of water and wastewater
- Define and list any basic design criteria which the Consultant intends to apply in the Masterplan study

The Report on Service Levels and Standards for the Master plan will be presented to and approved by WASCO.

### 3.8 Selection of the Preferred Scenarios and Option(s)

Based on the work done in the previous sections and the required service levels and standards, the consultant will develop alternative (combinations of) options for i) meeting the future demand for water supply and ii) wastewater services in Saint Lucia. This may include the rehabilitation of existing assets to optimize current operations and performance or the development of new infrastructure as well as a range of complementary measures. Consultants will, in close consultation with WASCO, develop two to three alternative and realistic scenarios for Water Supply and Wastewater respectively. These scenarios will involve:

- Identifying possible combinations of water resources for the sustainable and safe supply of drinking water, considering the regulatory framework and the effects of urbanization, deforestation and climate change
- Defining (combinations of) options for the design of transport and distribution networks, water treatment plants, storage facilities, pumping stations, etc. This may involve the potential combination of existing networks. Consultants will carry out a preliminary hydraulic analysis of the selected alternatives.
- Defining (combinations of) options and scenarios for the further development of piped
collection, treatment and discharge of wastewater in Saint Lucia

- Identify criteria based on which the preferred (combination of) options will be evaluated. Criteria will include investment and operation costs, but may also include expected hydraulic performance, ease of operation, sustainability, etc.

- Review and update current studies on the effects of climate change for Saint Lucia and on WASCO’s infrastructure and propose and cost measures to improve resilience of the propose infrastructure investments against climate change.

Preliminary designs for the alternative options will be prepared and costed and (assuming the benefits are similar) the alternatives will be subject to Least Cost Analysis. Based on this and the evaluation of other criteria, the consultants will recommend the preferred options to WASCO for approval.

For hydraulic analysis of the water supply system alternatives, the Consultant shall use software of which the outputs are compatible with the presently used GIS software used by WASCO.

The above activity will result in a Report on the Evaluation of Alternative Scenarios and Alternatives for Water Supply and Wastewater in Saint Lucia.

### 3.9 Description of the Preferred Scenarios and Option(s)

Once WASCO has approved the choice of the Preferred Option(s), Consultants will proceed with describing the Preferred Options, which shall comprise but not be limited to the following:

- Conceptual design of the preferred (combination of) options for both water supply and wastewater, including description of complementary measures

- A hydraulic analysis under various system conditions of the main water supply system(s)

- Cost estimates for Investment costs and the cost of Operation and Maintenance

- Preparation of maps (of appropriate scale) showing:
  - The general layout of each transport system in the present and future supply scenario including rehabilitation and extension, with details of all basic elements of the revised system for the proposed target years as mentioned above;
  - the general layout of each distribution network in the present and future supply scenarios including rehabilitation and extension, indicating all basic elements of the revised system for the proposed target years as mentioned above;
  - the proposed zoning of distribution networks
  - the location and size of the proposed structures (reservoirs, pumping stations)

- Investment packages for both Water Supply and Wastewater infrastructure, comprising a logical sequence of physical investment packages, including the costs of related design, supervision and other consultancy costs.

The above activity will result in a Report on the Preferred Scenarios for Water Supply and Wastewater Management in Saint Lucia.

### 3.10 Complementary Studies

After selecting the Preferred Scenarios for Water Supply and for Wastewater, Consultants will carry out the following complementary studies. Each study will result in a separate Report.

a. Review and assess WASCO’s ongoing NRW Reduction Program and similar programs aimed at
achieving improved efficiencies and prepare recommendations for i) reducing non-revenue water and ii) improving energy efficiency and iii) introducing water saving technology.

b. Review alternatives and make recommendations for a backup source of water supply for Saint Lucia in case of emergencies. Assess the vulnerability of WASCO’s current and future infrastructure and prepare (an update of) an emergency response plan for WASCO in order to keep basic services working during emergencies and crisis.

c. Analyse the results of earlier assessment of on-site sanitation facilities and practices and prepare recommendations to enhance on-site sanitation in Saint Lucia and on the potential role that WASCO and other agencies could play in this.

d. Conduct a strategic environmental assessment for the Master plan based on the proposed investment and complementary measures. The environmental assessment shall be based on the legal requirements for environmental assessment in Saint Lucia.

e. Review and assess WASCO’s current and future financial costs and revenues and financial performance. Analyze the effects of the proposed scenarios in the Master plan for water and wastewater on WASCO’s financial performance and make recommendations for

   i. Current and future tariff regimes for WASCO aiming at achieving full cost recovery
   ii. Realizing potential cost savings with the aim of achieving full cost-recovery
   iii. Estimating the Borrowing Capacity of WASCO to finance (part of) the investments proposed in the Master plan
   iv. Identification of potential sources of finance to fund the proposed investment in the Master plan

f. Review current institutional settings and organization capacity of WASCO and related institutions and make recommendations for institutional reforms needed for the efficient and effective management of water supply and sanitation in Saint Lucia, including capacity building requirements.

g. Conduct public consultation with key stakeholders including residents for the development of the integrated master plan.

h. Develop a monitoring and evaluation system and define key performance indicators and targets for water supply and sanitation in Saint Lucia and propose how these indicators will be monitored.

3.11 PREPARATION OF AN INVESTMENT SCHEDULE

Based on the physical investment packages proposed for the Preferred Option and the results of the complementary studies, Consultants will formulate a set of investment packages and measures. Each investment package or measure will be costed. To come to a prioritized list of investments, consultants will proceed as follows:

- Formulate and obtain approval from WASCO on a set of criteria to prioritize the proposed investments and measures. Criteria may include:
  o Direct effect on improved service levels
  o Pro-poor focus
  o Improved efficiency and potential cost savings for WASCO
  o Synergy amongst proposals and measures
  o Risk level/Vulnerability level
o Direct health impact
o Protection of the environment

- Consult with WASCO and conduct stakeholder workshops during which an initial prioritization of investment will be carried out in a transparent manner.
- Prepare a prioritized list of investments divided in short, medium- and long-term investments
- Prepare an Investment Plan, suggesting how implementation of each package or measure will be undertaken and by which agency.

The above activity will result in costed and prioritized Investment Schedule of physical projects and complementary measures.

3.12 PREPARE A MASTERPLAN FOR WATER SUPPLY AND WASTEWATER MANAGEMENT IN SAINT LUCIA

The Consultant will summarize the findings of the sub reports prepared in the above in one report called Master plan for Water Supply and Wastewater Management in Saint Lucia. The report will describe the objectives and methodology applied in the Master plan and present the preferred options, the complementary measures and the resulting Investment Schedule.

4. ORGANISATION OF THE STUDY

4.1 TIME AND REPORTING SCHEDULE

The project is estimated to have a duration of 9 months.

The following milestones are foreseen in the project:

1. Inception Report to be submitted within 6 weeks of the start of the study, including
   a. An analysis and review of the available data.
   b. An updated approach and workplan based on the analysis of the available data.
   c. A detailed workplan for the implementation of the TA

2. An Intermediate Report to be submitted within 4 months of the start of the project, including:
   a. The inventory and assessment of current water supply and wastewater infrastructure
   b. The proposed options and scenarios for future Water Supply and Wastewater
   c. The proposed preferred option

3. A draft Master plan for WSS in Saint Lucia within 8 months of the start of the project, including
   a. A Summary of the Master plan Study
   b. The results of the complementary studies
   c. The proposed Investment Schedule

4. A final Master plan for WSS in Saint Lucia within 9 months of the start of the project.

In the technical proposal the Consultant shall propose a detailed work plan, which will be updated in the Inception Report.
In preparing the technical proposal, the Tenderer shall assume an approval time of 4 (four) weeks for the four envisaged Reports.

4.2 ORGANISATION OF SERVICES

The Master plan Study will be managed by the Strategic Planning Department of WASCO. WASCO will appoint a Project Manager who will be the focal point for the Consultant within WASCO. The Consultant will report to the Project Manager of WASCO.

WASCO will provide the Consultant with access to all existing information, data, reports and maps and will assist the Consultant in obtaining other relevant information and materials from other institutions and authorities.

WASCO will assist the Consultant in organizing field trips and organizing field surveys.

The Consultant must arrange at his own cost for transport, adequately furnished offices and the necessary office equipment including communication facilities.

4.3 REPORTING

All documents shall be submitted as hardcopies and softcopies.

All documents and reports prepared by the Consultant will to be submitted to WASCO for comments. All reports shall be submitted in draft and final versions. The Consultant shall allow 4 weeks for commenting and approval by WASCO of these reports.

All reports shall contain an executive summary. All reports will be provided in digital format/softcopies (MS Word and pdf-format, MS Excel, drawings in AutoCAD and pdf-format, maps in GIS, WaterCAD files (open and editable formats)).

4.4 ANTICIPATED STAFFING

The following staff is foreseen for the project.

Team Leader – International Full time

Qualifications and skills:

University degree in water engineering and planning or equivalent; Sound experience in project management of a team composed of international and local experts; good command of English.

General professional experience:

- At least 10 years of international professional experience in the sector and experience with master planning for water supply and wastewater
- Project management for at least 5 projects (international experience) of similar nature in preparation of studies, feasibility studies and master planning.

The team leader is expected to be present on site during all the activities for the elaboration of the studies.

Additional Experts
Additional experts for the specific tasks of the project with profound experience in the relevant fields:

**International**

- Water Resources Management Expert
- Sanitary Engineering Expert
- Hydraulic Modelling Expert
- Economist/ Financial Expert
- Institutional Expert
- NRW expert
- Operation and Maintenance Expert
- Asset Management Expert

**International / national**

- Geographer / Architect / Spatial Planner
- Water Supply Engineer
- GIS Expert / AutoCAD Drafter
- Electrical – Mechanical engineer / pump specialist

The above list is a tentative list of experts. The Consultant shall feel free to add extra and/or multi-skilled staff, as necessary and appropriate to accomplish the task based on professional judgement.

**General professional experience:**

At least 5 years of international professional experience in the relevant fields. Substantial input in at least 3 projects of similar nature.