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## SEYCHELLES WATER SUPPLY DEVELOPMENT PLAN 2008-2030

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**MARCH 2008**

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**African Water Facility | Facilité africaine de l'eau**

African Development Bank | Banque africaine de développement

BP 323 – 1002 Tunis Belvédère - Tunisie  
Tel : + 216 71 102 065 Fax: + 216 71 103 744

E-mail: [africanwaterfacility@afdb.org](mailto:africanwaterfacility@afdb.org)

[www.africanwaterfacility.org](http://www.africanwaterfacility.org)

African Water Facility  
Administered by the African Development Bank  
Angle de l'avenue du Ghana et des rues Pierre de Coubertin, Hedi Nouira  
BP 323 – 1002 Tunis Belvédère (Tunisia)  
Tel : + 216 71 102 055 – Fax : + 216 71 103 744  
E-mail: [africanwaterfacility@afdb.org](mailto:africanwaterfacility@afdb.org)  
Web Site: [www.afdb.org/awf](http://www.afdb.org/awf)

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## **LIST of ACRONYMS**

ADB	African Development Bank
AWF	African Water Facility
BADEA	Arab Bank for Economic Development in Africa
BOT	Build, Operate and Transfer
DOE	Division of Environment
DOF	Department of Finance
EIA	Environment Impact Assessment
EMPS	Environmental Management Plan of Seychelles
EU	European Union
GoS	Government of the Seychelles
IWRM	Integrated Water Resources Management
KFAED	Kuwait Fund for Arab Economic Development
LFA	Logical Framework Analysis
LTD	Land Transport Division
m <sup>3</sup> /d	Cubic meters per day
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MLUH	Ministry of Land Use and Habitat
MOFA	Ministry of Foreign Affairs
PIU	Project Implementation Unit
PUC	Public Utilities Corporation
RFP	Request for Proposals
TOR	Terms of Reference
UFW	Unaccounted for Water
WSD	Water and Sewerage Division (of the PUC)
WRM	Water Resources Management
WSS	Water Supply and Sanitation

## **CURRENCY**

Local Currency	:	Seychelles Rupees (SCR)
1 Euro (€)	:	11,84 SCR (ADB exchange rate January 2008)

## LOGICAL FRAMEWORK ANALYSIS – SEYCHELLES WATER SUPPLY DEVELOPMENT PLAN 2008-2030

HIERARCHY of OBJECTIVES	EXPECTED RESULTS	REACH BENEFICIARIES	PERFORMANCE INDICATORS	INDICATIVE TARGETS and TIMEFRAME	ASSUMPTIONS/ RISKS >MITIGATION MEASURES
<p><b>GOAL :</b></p> <ul style="list-style-type: none"> <li>To ensure availability of adequate and affordable water up to the year 2030 to meet needs of the population, industry and tourism.</li> </ul>	<p><b>IMPACT:</b></p> <ul style="list-style-type: none"> <li>Improved quality of life due to availability of adequate water supply</li> <li>Increased economic benefit and productivity</li> </ul>	<ul style="list-style-type: none"> <li>The population at large representing 83,000 inhabitants</li> <li>Industry, tourism etc.</li> <li>Water service providers</li> <li>PUC Staff</li> <li>Water related institutions in the country</li> <li>Gov of Seychelles</li> </ul>	<p><b>Indicators:</b></p> <ol style="list-style-type: none"> <li>Improvements in quality of life statistics related to water.</li> <li>Growth rate and productivity statistics</li> </ol> <p><b>Source:</b> National statistics and reports <b>Periodicity:</b> Annual review</p>	<ol style="list-style-type: none"> <li>Quality of life statistics comparable with those of the most developed countries</li> <li>Economy continuing to grow at current rates.</li> </ol>	<ul style="list-style-type: none"> <li>Sustained commitment of all stakeholders to the project objectives and continued government support and priority for WSS sector                             <ul style="list-style-type: none"> <li>&gt; Water remains an area of concern of the population, industry and tourism, to which gov. has clearly indicated that they will respond as necessary</li> </ul> </li> <li>Lack of donors interest in funding projects                             <ul style="list-style-type: none"> <li>&gt; Preparation of good quality plans and identification of bankable investment projects</li> </ul> </li> </ul>
<p><b>PURPOSE/OBJECTIVES:</b></p> <ul style="list-style-type: none"> <li>Develop plans to meet the rising demand for water supply in the Seychelles until the year 2030.</li> <li>Obtain funding for priority investment projects</li> <li>Improve performance and service delivery of the PUC WSD</li> <li>Improve demand-side management to reduce water usage</li> </ul>	<p><b>OUTCOMES:</b></p> <ul style="list-style-type: none"> <li>Elimination of the water supply shortages presently faced</li> <li>Sufficient water supply projects funded by donors, local government and PUC to meet demand up to 2030</li> <li>WSS services more effectively and satisfactorily delivered to all consumers</li> <li>Reduced demand for water as a result of conservation, reuse, reduced UFW, appropriate tariffs, public awareness.</li> </ul>		<p><b>Indicators:</b></p> <ol style="list-style-type: none"> <li>% of population with sustainable water supply</li> <li>Number and amounts of projects funded</li> <li>Improvements in performance of PUC as measured through benchmarking</li> <li>Per capita water use</li> </ol> <p><b>Source:</b> Baseline data collected under the Study, National statistics and water sector reports <b>Periodicity:</b> Annual review</p>	<ol style="list-style-type: none"> <li>Water supply to 100% of population</li> <li>Funds available for all necessary water projects to meet 2030 demand</li> <li>Performance improvements realised as planned in the study</li> <li>Per capita water use reduced as planned in the study</li> </ol>	
<p><b>ACTIVITIES:</b></p> <ul style="list-style-type: none"> <li>Assess the existing water supply and sanitation situation and prepare demand assessment up to 2030</li> <li>Develop cost effective supply scenarios</li> <li>Prepare preliminary design and cost estimates for selected water supply options.</li> <li>Identify viable projects and prepare priority investment programme to 2015 and implementation plan.</li> <li>Undertake an institutional assessment of the PUC WSD</li> <li>Identify measures to improve demand-side management</li> <li>Organize 3 National Workshops to validate each study phase</li> <li>Hold a donor coordination meeting to mobilise resources</li> </ul> <p><b>Inputs:</b> AWF: € 955,000 GoS: € 126,000 PUC: € 81,900</p>	<p><b>OUTPUTS:</b></p> <ul style="list-style-type: none"> <li>Technically feasible and financially viable plans to meet water needs until the year 2030, with priority investment programme to 2015.</li> <li>Cost-effective projects identified for submission to various donor agencies for funding.</li> <li>Options identified for improvements in service delivery by the PUC WSD, and selected activities undertaken.</li> <li>Options for reduction in water demand identified, and selected activities undertaken.</li> <li>Good representation of donors at coordination meeting and funding pledges secured</li> </ul>		<p><b>Indicators:</b></p> <ol style="list-style-type: none"> <li>Completion of good quality reports as scheduled</li> <li>Number of water projects identified</li> <li>Amount of donor pledges secured</li> </ol> <p><b>Source:</b> Progress reports from PUC, and AWF supervision reports. <b>Periodicity:</b> Quarterly and end of project</p>	<ol style="list-style-type: none"> <li>Inception Report by end of month 7; Study Phase 1 by month 9; Study Phase 2 by month 12; Final report by month 14.</li> <li>National workshop reports by months 7, 9 and 12</li> <li>Adequate projects identified to meet demand up to 2030</li> <li>Adequate donor funding pledged for priority investment programme to 2015</li> </ol>	

## EXECUTIVE SUMMARY

1. The three main islands of the Seychelles (Mahe, Praslin and La Digue) are experiencing an increasing growth in water demand with recurrent water shortages and water restrictions in the dry season as a consequence, in spite of temporary improvements to the system. One of the key recommendations formulated in 2004 by the Government of Seychelles special task force was to prepare a master plan, with a 20 year planning horizon, to identify and prioritize the actions required to increase supply, and also to identify demand management measures.
2. The purpose of this project is primarily to formulate a Water Supply Development Plan for the three main islands of the Seychelles in order to attract the necessary water project investments to meet demand up to the year 2030, and secondly to mobilize the resources for its immediate implementation with 2015 as an intermediary step. The project will also identify and implement measures to reduce overall water demand and to improve the performance and service delivery of the Water & Sewerage Division (WSD) of the Public Utility Corporation (PUC).
3. The overall goal of the project is to ensure availability of adequate water up to the year 2030 to meet needs of the population, industry and tourism. The implementation of the projects identified in the Water Supply Development Plan will have a positive impact on the quality of life of the indigenous population and increased economic development and productivity.
4. The outcomes resulting from the project are essentially as follows:
  - Elimination of the water supply shortages presently faced in the Seychelles, with all of the population having sustainable access to an improved water source, and needs of industry and tourism met.
  - Sufficient water supply projects funded by donors, local government and PUC to meet demand up to the year 2030
  - WSS services more efficiently and satisfactorily delivered to all consumers as a result of post-project implementation of identified actions to improve the performance of the PUC WSD
  - Reduced demand for water as a result of conservation and reuse, reduced UFW, appropriate tariffs, and public awareness.
5. The project outputs over the short term include but are not limited to the following:
  - Technically feasible and cost effective plans to meet water needs until the year 2030, with priority investment programme to 2015
  - Cost-effective projects identified for submission to various donor agencies for funding
  - Options identified for improvements in performance and service delivery by the PUC WSD, and selected activities undertaken.
  - Options for reduction in demand identified, and selected activities undertaken.
  - Good representation of donors at the coordination meeting and funding pledges secured

6. The project study is to be undertaken in three phases consisting of: i) Review Phase; ii) Study Phase 1 which will mainly involve formulation of a demand scenario model for the three main islands; and iii) Study Phase 2 which will focus on the analysis of the different supply options to meet the selected demand scenario of Phase 1. Each of the three phases will be sanctioned by a national workshop gathering water sector stakeholders and donors.
7. The estimated cost of the project is €1,162,900. A provision of 5% of the project's base cost has been considered to cover contingency. The AWF will finance 82% of the project costs (estimated as €955,000), covering the foreign costs of the consultancy services, the foreign or local cost of the equipment to be procured, and the local costs for the national workshops and donor coordination meeting. The Government of Seychelles, through the PUC, will contribute 11% covering the remainder of the local costs of the consultancy contract (estimated as €126,000). In addition, the PUC will provide 7% of the total as in-kind contributions for the Project Coordination Team and office space.
8. The Water & Sewerage Division (WSD) of the PUC, as the Executing Agency, will be responsible for project implementation. A Project Coordination Team (PCT) will be established consisting of a Project Engineer, Assistant Engineer and support staff. The PCT will be responsible to coordinate the implementation of the project study, and will participate actively in the execution, administration, monitoring and supervision of the work. A consultancy firm will be recruited to execute the project study. A Steering Committee will be appointed to monitor the progression of the project and provide policy and general managerial guidance.
9. The total implementation period of the project will be 17 months after Grant approval. The Consultant shall complete all work within a maximum period of 11 months from the receipt of notice to proceed.
10. Procurement arrangement for the consulting services will be through international shortlist. The recruitment process will be the responsibility of WSD, which shall forward the RFP, shortlist of consultancy firms, the results of the evaluation, and the draft contract agreement to the Bank for "no objection". Disbursement will be through the Special Accounts method, with disbursement made by the Bank in two tranches.
11. The proposed project to prepare a Water Supply Services Development Plan constitutes a major component in the Government of Seychelles efforts to improve the water supply situation in the country. The Gov of Seychelles and PUC have shown strong interest in undertaking this project, as evidenced by the 11% local cash contribution (plus 7% in-kind contribution), and their extensive project preparation activities including the submission of a detailed proposal and TOR.
12. It is recommended that a grant not exceeding EURO 955,000 from the African Water Facility resources be extended to the Public Utilities Corporation through the Government of Seychelles in order to carry out the project described in this Appraisal Report.
13. Obligations of the AWF to make the first disbursement of the Grant shall be conditional upon the nomination acceptable to the AWF of the Project Coordinator, and opening of a Special Account in a commercial bank acceptable to the AWF.

# **1 BACKGROUND**

## **1.1 PROJECT RATIONAL AND ORIGIN**

1.1.1 The islands of the Seychelles are currently experiencing water shortages, with the three main islands (Mahe, Praslin and La Digue) experiencing a growth in water demand of around 7-8% annually. Various ad hoc improvements made to the system in the past few years have resulted in temporary improvements to supply, but the rapidly increasing demand always soon outstripped the increased supply. There have been recurrent water shortages since 1998 which have progressively worsened over time. Water restrictions in the dry season have become a regular feature, and with the increasing demand the situation will only become much worse.

1.1.2 Several studies have been carried out in the past to address the water supply problem, the most notable being the studies carried out by Howard Humphrey and Sons in 1971 and by Sir Alexander Gibb & Partners in 1986. Although the development of water supply in the main islands have largely followed the salient findings of these studies, they are now well outdated and require updating to reflect the present situation. Several in-house studies have also been carried out by the PUC, along with demand projections up to the year 2025.

1.1.3 As a result of the deepening water problem, the Government of Seychelles appointed a special task force in 2004 to study the problems relating to water supply in the Seychelles. The committee, as an outcome of deliberations, came up with a number of recommendations to alleviate the problem both in the short term and in the long term. One of the key recommendations was to prepare a master plan, with a 20 year planning horizon (to the year 2025), to identify and prioritize the actions required to increase supply, and also to identify demand management measures.

1.1.4 The Public Utilities Corporation, who is responsible for the provision of water to the islands, has inadequate capacity to undertake a comprehensive Water Supply Development Plan on its own. Consequently funding is needed to procure the services of an experienced consulting firm for carrying out the study.

1.1.5 A long term Water Supply Development Plan will greatly facilitate a planned development in the water sector over the next 20 years to ensure that demand will be met in a cost-effective and integrated manner. The Water Supply Development Plan will identify new water resources and integrate them with improvements already made to the system in the recent past. Most importantly, it will identify and prioritise technically feasible projects required for meeting the demand until the year 2030, along with their financial viability. This will be an important document to seek donor assistance for the investment required for the implementation of the projects.

## **1.2 SECTOR STATUS AND PRIORITIES**

### **Water Supply**

1.2.1 The 1993 Constitution of Seychelles defines access to potable water as a basic right of all Seychellois. Thus, the Government has set as objective to provide potable water to the entire population as far as practicable, focusing on the three main islands of Mahe, Praslin and La Digue. In this regard the Seychelles had virtually achieved its objective in 2004, as



defined by the MDG indicators, with 100% of the urban population and 75% of the small rural population having sustainable access to an improved water source. However, the rapidly growing demand is causing increasing water shortages, and therefore access does not always mean that adequate water is available when needed.

1.2.2 The Public Utilities Corporation, a parastatal formed under the PUC Act of 1985, is mandated to provide water supply, electricity and sewerage services to the population of the Seychelles. The Water & Sewerage Division of the PUC has a near monopoly in the provision of WSS services, with only small privately owned systems falling outside its scope.

1.2.3 Water supply in Seychelles has traditionally been dependent on abstracting water from numerous small streams. However, due to the steep topography and low retention of the soil and rock, the flow in these streams is erratic and falls to very low values during prolonged periods of drought. Fresh water wetlands also exist, mainly in Praslin. The absence of groundwater has resulted in no point sources being utilized for individual supplies.

1.2.4 The main islands of Mahe, Praslin and La Digue do not have a well defined rural sector. Most of the population is dependent on pipe borne water (around 95%). The few who are not covered are in the higher reaches and are dependant on streams. The outlying islands are mostly resorts and have their own self-managed water supply. The total population in all these 112 islands is only 1092 persons.

1.2.5 The current demand in the main islands is around 35,000 m<sup>3</sup>/d, and at the present rate of growth of 7-8% per year, this will increase to around 150,000 m<sup>3</sup>/d by the year 2025. The available supply has not been able to cope up with the increasing demand, with the current average water production in the three islands under 34,000 m<sup>3</sup>/d. To compound the problem, water shortages regularly occur during the dry period of the year, namely from June to September, due to lack of water storage capacity in the islands. Consequently supply of drinking water has to be contained during the dry periods.

1.2.6 Several piecemeal and ad hoc improvements have been made recently but these were mostly directed to solve the immediate water supply problems. For example, in 2002 the PUC commissioned four desalination plants supplying a total of 8,400 m<sup>3</sup>/d. However, the increase in demand quickly outstripped the supply contribution from these sources.

1.2.7 The distribution system in the three islands consists of over 420 km of pipe of various types. About one third of the pipelines are over 20-30 years old, and have reached the end of their economic lifespan. Seychelles' water is very aggressive and has weakened the pipelines over time, resulting in a marked increase in pipe bursts, further corrosion resulting in impaired water quality, high Unaccounted-For-Water (UFW), and deterioration of service levels to the consumer. Other causes of UFW are meters which are under registering or not registering, and illegal connections. As a result, the UFW in all three islands is a cause for concern, with the UFW on Mahe around 50%, while on Praslin & La Digue it is around 25%.

## **Sanitation**

1.2.8 Provision of sanitation for the islands encompasses a wide range of issues which are generally handled by the Division of Environment. The PUC confines itself presently only to providing piped sewerage services (to Greater Victoria area and Beau Vallon) and septage emptying services to Mahe island. PUC is also responsible for the maintenance of two other

sewerage treatment plants to the South of Mahe, but these are linked to small areas mainly encompassing housing estates. The rest of Mahe Island, Praslin and La Digue are largely dependent on septic tanks and on-site disposal systems, or institutional sewerage treatment plants. PUC's role in institutional schemes is largely in an advisory capacity with the Ministry of Land Use & Habitat, private developers or the private individuals themselves responsible for the implementation and management of the sewage disposal systems.

1.2.9 The designs of the sewerage project for most of the coastal areas in Praslin have been completed and are awaiting clearance from the funding agencies - Kuwait Fund for Arab Economic Development (KFAED) and Arab Bank for Economic Development in Africa (BADEA) - to continue with the construction phase of the project. A feasibility study for a Sewerage Project to La Digue has just been completed. New treatment works will not be required in the Greater Victoria area of Mahe island as the treatment works operates at 30% of its rated capacity. The Beau Vallon Sewerage works on Mahe island is also operating at 25% of its capacity and would permit a fair amount of additional connections and expansions in the sewerage network. The major constraint at the moment is inadequate resources to expand the collection network.

1.2.10 Drainage is not the responsibility of PUC but is handled by the Ministry of Land Use and Habitat and the Land Transport Division.

### **Environment**

1.2.11 The Government of Seychelles is very much aware of the need to protect the pristine Environment which is the main asset for the tourism industry, presently the mainstay of the economy. This concern is reflected in the Environmental Management Plan of Seychelles 2000 - 2010 (EMPS), whereby several projects were identified to limit the negative impact the present rate of development could have on the natural environment. Special emphasis is being placed on the protection of surface and groundwater sources, and the protection of the marine ecosystem through the implementation of the integrated coastal zone management programmes. In addition, all new developments in Seychelles are subject to vigorous EIA procedures.

1.2.12 The ADB's Environmental and Social Assessment Procedures (ESAP) requires that all projects be screened to determine their environmental and social category. In accordance with the ESAP, as this project is a study it falls under Category 3. The proposed study should address the status of poverty and income inequality, gender inequality, and opportunities as well as constraints involving the environment and natural resources. These should inform the development of water-related strategies in the Water Supply Development Plan.

### **Water Resource Management**

1.2.13 The Water & Sewerage Division of the PUC also chairs the River Basin Committee responsible for the protection and equitable distribution of the surface and groundwater resources. The WSD also has a Hydrology section responsible for collecting and analysing Hydrological Data pertaining to the main islands.

## **Pricing Policies and Cost Recovery**

1.2.14 The current balance sheet of PUC indicates that its operations are not economically viable given the low existing tariffs for both water and sewerage services and high levels of UFW. Water supply to poorer sections of society are cross subsidised by other consumers, with the current tariffs in force allowing for a lifeline consumption which is billed at a lower rate than the marginal cost of production. Tariffs that reflect the marginal cost of providing such services, yet recognise social equity concerns, are needed in order for future operation of the organisation to be sustainable. As well, this will assist in attracting donor assistance for the technically feasible and financially viable projects identified as an outcome of the project.

1.2.15 Presently, all major capital investments undertaken by the PUC are funded by the Seychelles Government, with funding also secured from donors. Due to the current financial status, the PUC does not have adequate funds to invest in major projects. However, minor capital works are carried out using the organisation's own resources.

## **Financial and Economic Aspects**

1.2.16 The provision of basic services such as water supply at an affordable marginal cost is very important not only for the indigenous population but also for investment. At present the water shortages hinder development in the main islands which affects the Seychelles economy adversely. For example, the tuna canning factory and most of the new hotel developments have resorted to having their own desalination plants. The cost of providing water in this manner are high, making industrial products non competitive, or acting as a disincentive for increased investments particularly in tourism. The elimination of the water problems currently faced will increase investor's confidence and will result in the increased development of the newly reclaimed areas and tourism.

## **1.3 PROBLEM DEFINITION AND SCOPE OF WORK**

1.3.1 Based on the problems defined in the initial proposal and ongoing discussions with the PUC over the past year, the following outlines the main aspects of the intended scope of work for preparation of the Seychelles Water Supply Development Plan:

1.3.2 *Urban Water Supply:* Since most of the population in the Seychelles live in an urban or peri-urban environment, and are served by the piped water supply network, this will be the main focus of project studies. Geographically, the focus will be on the urban areas in the 3 main islands of Mahe, Praslin and La Digue, as well as the satellite islands in close proximity to Mahe. As well, zones in which significant industrial or commercial activity is prevalent will also be given close attention since industry and tourism are large consumers of water in the country.

1.3.3 The main components of the project study which focus on urban water supply include:

- Demand projections
- Supply scenarios
- Transmission distribution models for water supply on the three main islands
- Conceptual designs of facilities
- Cost estimates both capital and recurrent
- Long term plan with a comprehensive programme of works

- Economic and financial analysis of identified projects
- Priority investment programme to year 2015

1.3.4 **Rural Water Supply:** Only about 5% of the population live in a rural setting and are outside of the pipe borne water supply networks. They mainly live in the higher reaches and are dependant on streams. The absence of groundwater has resulted in no point sources being utilized for individual supplies. The rural population groups living in the main islands (and satellite islands and reclaimed areas in close proximity to the main islands) will be identified as part of the study, and the options and costs of providing them with a safe water supply will be examined in order to address their needs in a systematic and sustainable manner. The other outlying islands have very small populations, and are mainly resorts with their own water supply, so they will not be included in the study.

1.3.5 **Sanitation:** A detailed examination of sanitation aspects will not be part of the project study since sanitation is already well covered by other studies and projects, both completed and ongoing. The main urban areas on the island of Mahe are served by a sewerage network, with considerable excess capacity in the existing treatment works. As well, the PUC has identified the need for a sewage treatment works for the northern area of Mahe. For the other two main islands of Praslin and La Digue, feasibility studies have already been completed and projects identified to provide sewerage services. Rural sanitation is not a major issue due to the small rural population.

1.3.6 **Demand Reduction:** Demand-side management to reduce the amounts of water used is very important in water scarce islands such as the Seychelles. Study and implementation of options to reduce demand will be a significant component of the project, which may include examination of existing bylaws and enforcement, water conservation and reuse options, public awareness campaigns and school education programmes, reductions in Unaccounted for Water, appropriate tariffs, etc.

1.3.7 **Leakage Detection:** This is an important component which will be emphasised in the project. Given the poor condition of many of the pipes there is scope for considerable impact on operation costs through reduction in UFW. The PUC is addressing the problem using its own in house resources, and a leak detection inspectorate is functioning under the distribution section. The consultant will provide support to strengthen this leak detection inspectorate through review of existing practices and assessment of PUC capacity and needs, followed by practical training of staff and supply of new leakage detection equipment as appropriate. As well, it is important to identify the critical sections of the network to prepare a programme for rehabilitation.

1.3.8 **Engineering Design:** Only preliminary engineering designs and outline drawings are part of the study. The detailed engineering design and tender documents will be done in later follow-on projects for which funds would be sought from donors. Various Design, Build and Operate methods will be assessed for possible incorporation in some of the new investment projects which will arise from the Water Supply Development Plan.

1.3.9 **Mapping and Modelling:** The mapping of the network on GIS on the main islands of Mahe, based on aerial imagery, has reached an advanced stage and should be completed soon. As part of the project, the GIS mapping will be extended to the other two islands namely Praslin and La Digue. Preparation of a computerised model of the network in order to assist on subsequent operation and maintenance of the system will be part of the study, along

with the preparation of the TOR or the implementation of a telemetry project for remote supervision of the transmission/distribution system in the three main islands.

**1.3.10 *Alternate Sources/Methods of Water Supply:*** This will form an important part of the scope of consultancy works. The committee appointed to study the water supply problems suggested several innovative approaches such as small cascading dams or rainwater harvesting, since the islands have copious rainfall. PUC has also studied the possibility of constructing a fresh water lagoon on the East Coast of Mahe because of the hydrogeology and limited groundwater resources. Options for the reuse of wastewater will be given emphasis in the study. Other alternatives such as solar desalination or use of waste energy for distillation may be attractive. Pumping using wind power may be interesting for remote areas off the electric grid.

**1.3.11 *Water Resources Management:*** Although components of water resources management will form a part of the project study, a comprehensive IWRM study will not be undertaken. A review of the water resources management aspects currently practised will be done, along with recommend improvements. The requirement for agricultural uses will be factored into the demand assessment under Phase 1 of the study. Water conservation practices will be included under demand management. The project will also look into the possibility of strengthening the Rivers Committee (which is chaired by the PUC), including the legislation required to provide it with more powers and recommendations regarding the enforcement of the legislation. The perceived absence of groundwater in the main islands means that groundwater management will not form a significant aspect of the study. However, there is some abstraction of groundwater in La Digue and the International Atomic Energy Agency (IAEA) is likely to fund a study to improve the abstraction potential. Should the findings of the IAEA study become available in time it would be reviewed as a part of the project. The consultant will be asked to make recommendations as to the need for and scope of a more comprehensive IRWM study.

**1.3.12 *Drainage and Wastewater Handling:*** The drainage aspects are not the responsibility of PUC (they are handled by the Ministry of Land Use and Habitat and the Land Transport Division), and hence are precluded in the study and will not be a part of the Water Supply Development Plan. However certain aspects of wastewater management which impact on the PUC mandate for water supply and sewerage services provision will be assessed. This will include an assessment of the long term capacity of the existing sewage treatment works to handle a greater influx of wastewater from an expanded sewage network, and reuse of wastewater as one of the measures for meeting the demand for water.

**1.3.13 *Environment and Water Quality:*** An assessment and analysis of the pros and cons of different scenarios from the environmental point of view, and an Initial Environmental Examination (IEE) of identified projects, will be done as part of the project study. A detailed Environmental Impact Assessment has not been included in the study since, with so many alternative projects likely to be assessed, it will not be viable to carry out EIA's for all of them at this identification stage. The EIA's will be included as an essential pre-requisite under the next detailed design stage (under other sources of funding) of the priority projects selected for implementation. In addition, water quality issues will be examined as part of the initial review phase of the study, which will include the ambient water quality of sources and output of treatment works, as well as that of the desalination plants.

1.3.14 **Governance:** The governance policy at a macro level was the subject of the country strategy study done at the insistence of the European Union (EU) as a pre-requisite for the 10<sup>th</sup> EDF. The report is titled '*Country strategy paper and National indicative programme the period 2008 – 2013*'. As a result, the study will not focus upon policy and reform aspects other than as one part of the initial review phase. However, one governance related issue which will receive close attention is development of appropriate cost recovery policies which recognise social equity concerns while providing the basis for financial sustainability of the urban/peri-urban water and sewerage networks.

1.3.15 **Institutional Assessment:** An institutional assessment of the PUC and the need for strengthening of its capacity, especially in asset management, will be an important activity of the project. In this regard, the EU country strategy study noted in the previous paragraph also identified the need for intervention in the institutional strengthening of the PUC. Aspects to be studied include undertaking a performance examination of the PUC through a benchmarking exercise.

1.3.16 **Private Sector Participation (PSP):** The involvement of the private sector in the implementation, operation and maintenance of smaller water supply and sanitation works is of interest to the PUC, and the consultant will be called upon to study the possibility. PSP in the design, construction and operation of larger works will be assessed for possible incorporation in some of the new investment projects. Privatisation will not be a component of the study as it is the subject of macro level policy of the Government of Seychelles.

1.3.17 **Participation and Communication:** Ensuring stakeholder participation - through national workshops to disseminate the findings of the study and obtain further views of the stakeholders to fine tune the proposals - will be an important aspect of the project. It is proposed to include at least 3 workshops at the end of each of the 3 phases of the study. As well, development of a communication/awareness campaign for demand management is planned, including promotion of rainwater harvesting, on-site household water storage, use of water conservation devices, reducing household water losses through proper use and maintenance of taps and piped connections, etc.

1.3.18 **Financial and Economic Aspects:** Tariff models that reflect the marginal cost of providing water supply and sewerage services in order for future operation of the PUC to be sustainable, yet recognises social equity concerns, will be one outcome of the study. In order to quantify the financial and economic impact of water shortages, the consultant will be asked to disaggregate the extent of the water supply problem and its adverse impacts as it relate to household consumption as well as use by the industrial, agricultural and tourism sectors (higher costs of alternate sources, loss in productivity, revenues, excess capacity in industry, etc.). This will provide inputs to the Economic and Financial analysis, including rates of return on investment for identified projects.

1.3.19 **Socio-Economic Issues:** As part of the study, the consultant will be called upon to address various socio-economic issues such as: ensuring affordability of adequate amounts of water to meet basic needs through the use of measures such as cross-subsidies in tariffs to permit 'life-line' quantities for consumption; ensuring equitable access to water supply and sanitation services by the poor, women and the disadvantaged through the use of access subsidies and other means; examining existing pro-poor policies and associated legislation and making recommendations for improvements if necessary; and identification of innovative methods of serving the poor with associated recommendations for implementation. The

consultant will be asked to document the affordability and access to water supply by different socio-economic groups, including female headed households. If necessary, a small household survey may need to be done if recent data is not readily available.

**1.3.20 M&E and Information Management:** The consultant will be asked to assess current practices and needs related to the collection and management of water resources data and information, and make recommendations to improve water sector information management, monitoring and evaluation systems. Proposals will be made for developing a viable M&E system, with specific attention to data reliability, definition of indicators and establishment of targets, in order to enable the GoS to evaluate progress of implementation of the Water Supply Development Plan at regular intervals.

**1.3.21 Resource Mobilisation:** The consultant, in close liaison with the PUC and Government of Seychelles, will organise a donor coordination meeting at the conclusion of the study. The purpose will be to seek funding and secure pledges for the implementation of the priority projects that have been identified as an outcome of the study. Invitations will be extended to a wide range of potential funding agencies, especially those currently involved with the Seychelles water and sewerage sector, which include:

- Multilateral Agencies: Kuwait Fund for Arab Economic Development (KFAED), Arab Bank for Economic Development in Africa (BADEA), African Development Bank (ADB), European Union (EU)/European Development Fund (EDF), Opec Fund for International Development (OFID), IMF/World Bank, Ned Bank (South Africa), Bumiputra Commerce Bank (Malaysia), Other Commercial Banks
- Bilateral Funding: Governments of People Republic of China, India, Great Britain and France

1.3.22 Based on preliminary estimates supplied by the WSD, the following projects may feature prominently in the probable solution for the water supply development.

I.	Lower Grand Anse Dam and Treatment Works (Mahe)	€35 Million
II.	Upper Grand Anse Transfer Tunnel and improvement to Rochon Treatment Works (Mahe)	€8.0 Million
III.	Replacement of distribution pipelines on Mahe, Praslin and La Digue	€5.0 Million
IV.	Relining of existing pipelines on Mahe	€2.0 Million
V.	Plaine Hollandaise Dam on Praslin	€3.0 Million
VI.	Upgrading of Desalination Plants on Praslin and La Digue	€4.0 Million
VII.	Implementation of Telemetry system for Water Operations	€4.0 Million
VIII.	Upgrading of minor treatment works.	€2.0 Million
IX.	Upgrading of Hermitage Treatment Works	€2.0 Million
		<b>€65.0 Million</b>

1.3.23 The above list is not comprehensive and the estimates are not conclusive. They have been provided for guideline purposes only. However, they do give an indication that the outputs of this project will have a very significant impact related to attracting additional investments.

## **1.4 BENEFICIARIES AND STAKEHOLDERS**

1.4.1 The main beneficiaries of the proposed action is the population of the Seychelles, who will have uninterrupted water supply up to 2030. The availability of adequate water will also assist in the economic development of Seychelles which is severely constrained due to the inadequacy of water supply, with beneficiaries including industry, tourism, businesses, etc. Other beneficiaries include the PUC as a result of various institutional strengthening activities, as well as the Gov of the Seychelles through increased funding by donors for water sector projects.

## **2 THE PROJECT**

### **2.1 PURPOSE**

2.1.1 The project is primarily intended to formulate a Water Supply Development Plan for the three main islands of the Seychelles in order to attract the necessary water project investments to meet demands up to the year 2030. As well, the project will identify and implement measures to reduce overall water demand, and to improve performance and service delivery of the Public Utility Corporation.

### **2.2 GOAL AND IMPACTS**

2.2.1 The overall goal of the project is to ensure availability of adequate and affordable water up to the year 2030 to meet needs of population, industry and tourism. The implementation of the investment projects identified in the Water Supply Development Plan will have a positive impact on the indigenous population and the economy of the Seychelles. An adequate and affordable supply of water will result in the improvement of quality of life and increased economic development and productivity on the three main islands.

### **2.3 OBJECTIVE AND OUTCOMES**

2.3.1 The longer term objectives of the project are mainly to:

- Develop plans to meet the rising demand for water supply in the Seychelles until the year 2030.
- Obtain funding for priority investment projects.
- Improve performance and service delivery of the PUC Water & Sewerage Division.
- Improve demand-side management to reduce water usage.

2.3.2 The outcomes resulting from the project are essentially as follows:

- Elimination of the water supply shortages presently faced in the Seychelles, with all of the population having sustainable access to an improved water source, and needs of industry and tourism met.
- Sufficient water supply projects funded by donors, local government and PUC to meet demand up to the year 2030.



- WSS services more efficiently and satisfactorily delivered to all consumers as a result of post-project implementation of identified actions to improve the performance of the PUC WSD.
- Reduced demand for water as a result of conservation and reuse, reduced UFW, appropriate tariffs, and public awareness.

## **2.4 ACTIVITIES AND OUTPUTS**

2.4.1 A range of activities will be undertaken in order to achieve the objectives of the project. The scope of what is to be included in the project has been described above in section 1.3, and the detailed scope of work is presented in the TOR attached as Annex 4 (see sections 5 and Appendix 2 of the Annex). In brief, the project activities fall under the following categories:

- Assess the existing water supply situation and prepare demand assessment up to 2030.
- Develop cost effective supply scenarios.
- Prepare preliminary design and cost estimates for selected water supply options.
- Identify viable projects and prepare investment programme to 2015 and implementation plan.
- Undertake an institutional assessment of the PUC Water & Sewerage Division.
- Identify measures to improve demand-side management.
- Organise 3 National workshops gathering all relevant water sector stakeholders to validate each study phase.
- Hold a donor coordination meeting to jointly plan interventions and mobilise resources.

2.4.2 The corresponding short term measurable outputs directly arising from the project include but are not limited to the following:

- Technically feasible and cost effective plans to meet water needs until the year 2030, with priority investment programme to 2015.
- Cost-effective projects identified for submission to various donor agencies for funding
- Options identified for improvements in performance and service delivery by the PUC WSD, and selected activities undertaken.
- Options for reduction in demand identified, and selected activities undertaken.
- Good representation of donors at the coordination meeting and funding pledges secured.

2.4.3 The study component of the project will be executed in three phases. A brief description of each phase is given below (details are provided in Appendix 2 of the attached TOR). All phases shall include a National workshop to enable stakeholders to review and validate the findings.

2.4.4 **Review Phase:** This will consist of a comprehensive review and assessment of available documentation from previous studies, as well as review of the existing system and operation costs based on the available PUC records. Examination of demographic characteristics, hydrological data, innovative supply options, demand suppression technologies and water resources legislation are other components of this phase.

2.4.5 **Study Phase I:** This Phase will mainly involve formulation of a demand scenario model or water balance study until the year 2030 for the three main islands of Mahe, Praslin and La Digue, and the satellite islands including newly reclaimed areas. It will be based on population projections, commercial demands from industry and tourism, planned projects, housing programmes, land use plans and agricultural needs. Isolated settlements that cannot be integrated into the main system will be identified and projections developed separately. Various measures to reduce demand will be identified and assessed, including review of leak detection practices. The Consultant will prepare a comprehensive design model for demand assessment considering various development scenarios, and the most likely demand scenario will be selected for further study in Phase 2.

2.4.6 **Study Phase II:** This Phase will focus on the modelling and analysis of the different supply options to meet the selected demand scenario of Phase 1. It will include development of a model of the transmission/distribution system, as well as conceptual designs and drawings for the selected options. It will also involve an economic analysis of selected options, and recommendations as to tariff structure. Institutional development aspects will be included, including benchmarking of the PUC and strengthening the leak detection unit. Options for PSP will be examined. The preparation of a priority investment programme along with packaging of the projects in phases for possible donor funding will be important outputs. At the end of the Phase II a donor coordination meeting will be organized, in close liaison with the Government of Seychelles, to seek funding for solutions identified from the study.

2.4.7 The next stages after project completion are expected to include: detailed engineering design and preparation of procurement documents for priority investment projects; issuing of tenders for construction of works for those projects for which funding has been secured; alternately, implementing agreed upon design, build and operate approaches for priority works; implementation by the PUC of recommended actions for improving the performance and service delivery of the WSD; and implementation by the WSD of the various actions to reduce demand including water conservation and reuse, reduced UFW, appropriate tariffs, and increased public awareness. Specific actions for implementing national water sector M&E and Information Management will be undertaken by the GoS.

## **2.5 RISKS AND ASSUMPTIONS**

2.5.1 There are various possible risks during the implementation of the study, with the main risk relating to the delivery of good quality reports on time. This will be mitigated by the preparation of comprehensive TOR to provide clear direction to the Consultant, and close supervision by the Project Coordination Team of the Consultant activities. To achieve this, the PUC must assign qualified staff (as already nominated in the request) to serve on the PCT, provide adequate financial resources, and process all procurement, financial and reporting transactions in a timely manner so as to avoid delays. This is a relatively minor risk given the good capacity of the PUC as evidenced by their quality proposal and TOR, and the strong show of support and quick responses from the PUC to date. Nonetheless the AWF will

constantly interact with the PUC to resolve any problems and ensure their continued commitment, including undertaking project supervision missions if necessary.

2.5.2 At the post-project stage, there are a couple of key risks which may hinder realisation of the anticipated longer term outcomes. Firstly, donors may not show interest in funding projects, which will be mitigated by the preparation of good quality plans and identification of bankable investment projects. As well, the sustained commitment of all stakeholders to achieving the project objectives and corresponding outcomes is essential, particularly continued government support and priority given to the water supply sector.

## 2.6 COSTS AND FINANCING

2.6.1 The estimated cost of the project is €1,162,900, of which €830,000 is in foreign exchange and the remaining €332,900 is in local currency equivalent. A detailed breakdown of the costs is given in Annex 3 and summarized in Table 2.1 below. The bulk of the costs are for the consultancy contract, consisting of staff remuneration, and reimbursable and miscellaneous expenses. The remainder is for equipment and software for the PUC. A provision of 5% of the project's base cost has been considered to cover contingency. The costs are based on the proposal submitted by the PUC, and are in-line with the costs of other similar studies funded by the AWF.

**Table 2.1: Project Cost and Financing Plan (Euros)**

Description	Total Cost	AWF		GoS/PUC	
		Foreign Costs	Local Costs	Local Cost	In-Kind Contrib.
<b>CONSULTANCY SERVICES</b>					
<b>Review Phase</b>					
Remuneration	95,000	90,000		5,000	0
Reimbursable Expenses	55,200	34,500		12,700	8,000
<b>Sub-Total</b>	<b>150,200</b>	<b>124,500</b>		<b>17,700</b>	<b>8,000</b>
<b>Study Phase 1:</b>					
Remuneration	242,000	232,000		10,000	0
Reimbursable Expenses	93,700	49,500		32,200	12,000
<b>Sub-Total</b>	<b>335,700</b>	<b>281,500</b>		<b>42,200</b>	<b>12,000</b>
<b>Study Phase 2</b>					
Remuneration	254,000	244,000		10,000	0
Reimbursable Expenses	87,100	51,000		28,100	8,000
<b>Sub-Total</b>	<b>341,100</b>	<b>295,000</b>		<b>38,100</b>	<b>8,000</b>
<b>Miscellaneous Expenses</b>	131,000	40,000	70,000	21,000	0
<b>Total Consultancy Services</b>	<b>958,000</b>	<b>741,000</b>	<b>70,000</b>	<b>119,000</b>	<b>28,000</b>
Percentage		83.2%		16.8%	
<b>PROJECT MANAGEMENT</b>	51,000			1,000	50,000
<b>GOODS (Equipment, Software)</b>	99,000	50,000	49,000	0	0
<b>TOTAL ESTIMATED COST</b>	<b>1,108,000</b>	<b>791,000</b>	<b>119,000</b>	<b>120,000</b>	<b>78,000</b>
Contingency 5%	<b>54,900</b>	39,000	6,000	6,000	3,900
<b>GRAND TOTAL</b>	<b>1,162,900</b>	<b>830,000</b>	<b>125,000</b>	<b>126,000</b>	<b>81,900</b>
Percentage		71.4%	10.7%	10.8%	7.0%
<b>TOTAL CONTRIBUTIONS</b>		<b>955,000</b>		<b>207,900</b>	
Percentage Contribution		82.1%		17.9%	

2.6.2 The proposed financing plan is also presented in Table 2.1, with details shown in Annex 3. The AWF will finance 82.1% of the project costs (estimated as €955,000), covering the foreign costs of the consultancy services, the foreign or local cost of the equipment to be procured, and the local costs for the national workshops and donor coordination meeting. The Government of Seychelles, through the PUC, will contribute 17.9% (estimated as €207,900), consisting of 10.8% to cover the remainder of the local costs of the consultancy contract (estimated as €126,000), and the PUC will allocate 7.0% as in-kind contributions for the Project Coordination Team, office space and services for the Consultant (estimated as €81,900).

### **3 PROJECT IMPLEMENTATION**

#### **3.1 THE RECIPIENT/EXECUTING AGENCY**

3.1.1 The Government of Seychelles is the grant recipient. The executing agency of the project is the Water & Sewerage Division (WSD) of the PUC, which is a parastatal organisational under the Ministry of Environment and Natural Resources, formed under the PUC Act of 1985. Basically, the WSD is responsible for the planning and design of water supply and sewerage facilities, and their operations and maintenance. With its strong complement of staff consisting of 5 chartered engineers and 9 other engineers, there is adequate capacity for allocating human resources for this project. The WSD has good experience in undertaking development projects financed by international financial institutions, with 7 similar major projects carried by the PUC during the last 5 years, amounting to about 100 million US dollars. In particular, some of the engineers have handled the preparation of similar development plans and studies. The good quality TOR, which was prepared by the WSD, is further evidence of the capability of its staff.

#### **3.2 IMPLEMENTATION ARRANGEMENTS**

3.2.1 The Water & Sanitation Division of the PUC, as the executing agency, shall be responsible for project implementation. The WSD will set up a dedicated Project Coordination Team (PCT) within the organisation (in line with Paris Aid Effectiveness Declaration), who will supervise and monitor the development of the study. The team will consist of a Project Coordinator and an Assistant Engineer, supported by the necessary technical and administrative staff. The PCT will act as liaison between the Consultant in charge of the studies and other engineering work, and all Government offices as may be necessary to carry out the proposed work. The PCT personnel will participate actively in the execution, administration, monitoring and supervision of the work. It is anticipated that the same key members of the PCT will play a leading role in managing the design and implementation of the downstream priority investment projects.

3.2.2 The project study will be implemented by a consulting firm who will be recruited. The Consultant shall be responsible for maintaining continuous contact with the WSD through the Project Coordination Team. The Consultant shall at all times during the continuity of his services ensure the presence of a Resident Project Manager acceptable to the WSD. The Consultant shall also involve the professional and technical staff of the WSD in the work to be performed by the Consultant's staff, in order to provide the opportunity for maximum transfer of skills.

3.2.3 Prior to the commencement of the project, a 4 person Steering Committee will be appointed to monitor the progression of the project, and provide policy and general managerial guidance during project execution. The Committee will meet on a regular basis (at least 4 times during the project) to review plans and assess progress, in order to offer advice and suggestions to enhance smooth implementation. The steering committee will be chaired by the Minister of Environment, Natural Resources and Transport or his representative, and will consist of representatives of the Ministry of National Development, Ministry of Finance, and the Managing Director of the WSD of the PUC. It will be hosted by the PUC, serving as Secretariat.

3.2.4 At the end of each phase of the project study the findings shall be presented at national workshops and validated. At the overall conclusion of the study a donor coordination meeting shall be organised to jointly plan interventions and seek funding for the identified priority projects.

### 3.3 IMPLEMENTATION SCHEDULE

3.3.1 The total implementation period of the project will be 17 months after Grant signature. The Consultant shall complete all work within a maximum period of 11 months from the receipt of notice to proceed, including mobilization period and the time required for review and approval of the submissions, and organising the donor’s coordination meeting. The target dates for key activities are shown in Table 3.1 below, with details of the proposed implementation schedule given in Annex 2.

**Table 3.1: Implementation Schedule**

Activity	Time in Months	Responsible Agency
<b>Procurement of Consultancy Services</b>		
Grant Signature	Start	AWF/GoS
Submission of TOR and Shortlist of Consultants	0.5	WSD-PUC
Approval of TOR and Shortlist of Consultants	1	AWF
Submission of Proposals	3	Consultant
Evaluation of Proposals and Approval	4	WSD-PUC/AWF
Negotiation and Award of Contract	5	WSD-PUC
Mobilisation of Consultant	6	Consultant
<b>Implementation of Project Study</b>		
Review Phase	7	Consultant
1 <sup>st</sup> National Workshop and PUC/AWF review	8	Consultant/WSD-PUC
Study Phase 1	10	Consultant
2 <sup>nd</sup> National Workshop and PUC/AWF review	11	Consultant/WSD-PUC
Study Phase 2	13	Consultant/WSD-PUC
3 <sup>rd</sup> National Workshop and PUC/AWF review	14	Consultant/WSD-PUC
Final Report	15	Consultant
<b>Donors Coordination Meeting</b>	16	Consultant/PUC/GoS
<b>Project Completion</b>	17	PUC/GoS

### **3.4 PROCUREMENT ARRANGEMENTS**

3.4.1 In accordance with the AWF Operational Procedures, all procurement for goods and services financed by the AWF will be governed by the Rules of Procurement of the African Development Bank. In particular, procurement of goods, and acquisition of consulting services financed by the AWF will be in accordance with the Bank Rules of Procedure for Procurement of Goods and Works or as appropriate, Rules of Procedure for the Use of Consultants, using the relevant Bank Standard Bidding Documents.

3.4.2 The Water & Sanitation Division of the PUC, as the Executing Agency for the project, will undertake all procurement. It is considered that the WSD has the capacity, experience and expertise to manage the procurement of consulting services and the goods and equipment.

3.4.2 Procurement arrangements for the project are summarized in Table 3.2. The procurement of the consultancy services shall be through competition among short-listed international consulting firms. The selection of the consulting firm will be based on technical quality of proposals with price considerations. The recruitment process shall be the responsibility of the WSD, including the preparation of the RFP, shortlist of qualified consultants, evaluation of proposals, and contract negotiations. In this regard, the following procurement related documents shall be prepared by the WSD and submitted for review and “no objection” by the AWF.

- Requests for Proposals from Consultants, including detailed Terms of Reference
- Shortlist of qualified and experienced consultants
- Reports on Evaluation of Consultants' Proposals, including recommendations for Contract Award
- Outcomes of contract negotiations and draft contract agreement

3.4.3 The procurement of the Goods, which consist of equipment and software for the PUC, shall be through National or International Shopping since the items to be procured are generally available off-the-shelf goods of small value, which can be readily purchased locally or internationally. Table 3.2 and Annex 3 provide a breakdown of Goods to be procured and corresponding type of Shopping to be used.

**Table 3.2: Procurement Arrangements**

Description	International Short list	National Shopping	International Shopping	Non-AWF Funded <sup>2</sup>	Total
<b>SERVICES</b>	(851,104) <sup>1</sup> 1,005,374				(851,104) 1,005,374
Consultancy Contract	(851,104) 1,005,374				
<b>GOODS</b>		(51,423)	(52,473)		(103,896)
Personal Computers		(6,299)			
WaterGems Software		(10,498)			
GIS Arc C View		(10,498)			
AO Xerox Photocopier		(3,149)			
Structural Software		(5,249)			
AutoCad 2007 Software		(15,747)			
Leak Detection Equipment			(52,473)		
<b>PROJECT MANAGEMENT</b>				53,522	53,522
Project Implementation Unit				52,473	
Steering Committee Meetings				1,049	
<b>TOTAL</b>	(851,104) 1,005,374	(51,423) 51,423	(52,473) 52,473	(0) 53,522	(955,000) 1,162,791

1) Figures in brackets are amounts financed by the AWF.

2) Consisting of in-kind contributions by the GoS/PUC for Project Coordination Team and office space

### 3.5 DISBURSEMENT ARRANGEMENTS AND EXPENDITURE SCHEDULE

3.5.1 The grant amounts covering the AWF funded portion of the project (as noted in Section 2.6) will be disbursed using the Special Account method of disbursement, in line with the provisions of the Disbursement Handbook of the Bank. The AWF funds will be channelled through the PUC, which will open a Special Account denominated in Euro in a bank acceptable to the AWF.

3.5.2 The proceeds of the Grant shall be disbursed by the Bank in two instalments or tranches, with estimated amounts and timing as shown in Table 3.3. The first tranche will be disbursed within one month of grant signature, and the second tranche will be disbursed upon completion of the end of the Review Phase of the study. Payments will be made to the Consultant based on the work flow and performance as noted in the terms of reference (TOR) of the assignment. The anticipated Consultants payment schedule is shown in Table II of Annex 3, which is based on the draft TOR (see Annex 4) that will be subject to review and possible modification.

**Table 3.3: AWF Expenditure and Disbursement Schedule (amounts in Euros)**

Category of Expenditures	Tranche 1	Tranche 2	Total
Goods	103,896		103,896
Services	276,609	574,495	851,104
<b>Total</b>	<b>380,505</b>	<b>574,495</b>	<b>955,000</b>
	40 %	60 %	

3.5.3 Obligations of the AWF to make the first disbursement of the Grant shall be conditional upon the opening of a Special Account, and the nomination acceptable to the AWF of the Project Coordinator. Supporting documentation for replenishment of the Special Account before the second disbursement will be a summary statement of expenditure and an updated work program and cost estimate for the remainder of the project. All detailed documents related to utilization of AWF funds will be held by the PUC for subsequent verification and confirmation by the external auditors (see Section 3.6).

### **3.6 ACCOUNTING AND AUDIT ARRANGEMENTS**

3.6.1 The Grant Agreement will provide details the specific accounting arrangements and requirements for the opening of a Special Account, from which all eligible payments will be made. The administration of the special account shall be performed by the PUC.

3.6.2 The AWF requires that a statement of expenditure and supporting documents review be performed and certified by an independent auditor at predetermined intervals to ensure that funds have been utilized in line with the grant agreement. The AWF will recruit and retain an auditor for this purpose, and the cost of the audit shall be paid from the AWF administrative budget, not from this Grant.

### **3.7 MONITORING AND REPORTING ARRANGEMENTS**

3.7.1 The ongoing monitoring of the projects will be done by the Project Implementation Unit. As well, the Steering Committee shall review progress during its regular meetings. The Logical Framework matrix included in this Appraisal Report shall serve as a basis for the result based assessment of the outputs of the project during implementation and after completion.

3.7.2 AWF's supervision of the project will include regular communication and correspondence with the PUC, as well as review of the Quarterly Progress Reports and other documents. AWF will consider at any time, as the need may arise, to undertake a field supervision mission.

3.7.3 The WSD of the PUC shall submit to the AWF the documents noted in Table 3.4. The project completion report shall include details on project activities and a comprehensive expenditure report on the utilization of the Grant. The key consultant reports (Review Phase, Study Phase I & II, and the Draft final report) shall be made available to all stake holders. All documents shall be transmitted to the AWF by email, with hard copies to follow.



**Table 3.4: AWF Reporting Requirement**

<b>Documents to be Submitted by the WSD to the AWF</b>	<b>Prepared By</b>	<b>Reporting Schedule</b>	<b>AWF Action</b>
1. Quarterly Progress Report (with report on expenditures)	WSD of the PUC	Months 7, 10, 13	Review and comment
2. Procurement Documents as noted in Section 3.4	WSD	As noted in Section 3.4	Review and “no objection”
3. Review Phase Inception Report	Consultant	Upon completion of WSD review, month 7	Review and comment
4. Study Phase I Report	Consultant	Upon completion of WSD review, month 10	Review and comment
5. Study Phase 2 Report	Consultant	Upon completion of WSD review, month 13	Review and comment
6. Study Final Report	Consultant	Upon completion of WSD review, month 15	Review and comment
7. Consultant Monthly Reports	Consultant	Upon presentation to WSD	For information
8. Minutes of Steering Committee Meetings	WSD	Within 7 days of meeting	Review and comment
9. Minutes of any other project meeting	WSD	Within 7 days of meeting	For information
10. Reports on National Workshops	WSD / Consultant	Within 14 days of workshop	Review and comment
11. Report on Donor Coordination Meeting	WSD/ Consultant	Within 14 days of meeting	Review and comment
12. Project Completion Report	WSD	By end of month 17	Review and acceptance

## **4 EFFECTIVENESS, EFFICIENCY AND SUSTAINABILITY**

### **Effectiveness and Efficiency**

4.1 The effectiveness of this project is related to the likelihood of achieving the expected outputs and outcomes as given in the LFA, which the appraisal team deems reasonable and achievable. The efficiency of the project is related to the overall performance of the PUC and the implementation entities. In this regard, the WSD of the PUC has the apparent capacity to effectively supervise the consultant to undertake the study. The appraisal team noted that the quality of the funding application and the associated TOR and RFP is of a high standard, and that the WSD was open to further development and refinement of the project during the appraisal discussions. The Implementation Unit under the WSD will ensure high level professional inputs and provide collective decision making at the implementation level. The Steering Committee will enable effective monitoring and supervision, and provide the requisite policy direction to ensure ownership by all stakeholders of the Water Supply Development Plan.

4.2 In conclusion the overall assessment made by the Appraisal Team concludes that the project is likely to be implemented with the necessary effectiveness and efficiency required by AWF.

## **Sustainability**

4.3 The proposed project has many provisions to ensure the sustainability of the identified downstream investment projects. The financial and economic returns will ensure that the investment projects are self sustaining. The tariff structure proposed as an outcome of the study will ensure the economic viability of the projects and of the PUC as the main service provider, while recognising the needs of the poor. Sustainability concerns will be an important component in the assessment of the range of possible technology options for water supply. The institutional assessment for strengthening the WSD's capacity will ensure that adequate managerial and technical capacity will be built into the institution to sustain the new facilities when they eventually come on stream. A component for training and capacity building of PUC staff is part of the project, including involvement of WSD staff in the Consultants activities to ensure transfer of skills. The WSD staff involved in the study will have an ongoing post-project role in implementing identified priority investments. The environmental aspect along with social implications will be stressed through an EIA for the projects identified in the Water Supply Development Plan. The outcomes of each phase of the project study will be presented to all stakeholders, including development partners, to ensure their full participation and ownership of the proposals.

## **5 CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

5.1 The proposed project to prepare a Water Supply Development Plan constitutes a major component in the Government of Seychelles efforts to improve the critical water situation in the country. The project will identify priority investment projects for funding in order to meet Seychelles water needs up to year 2030. It will also have an impact in reducing the overall demand for water, and will help improve the performance and service delivery of the PUC.

5.2 The project falls within the AWF operational focus area of project/programme preparation relating to sustainable water supply services. The project activities will ensure capital investment project quality and will enable the PUC, through the organization of a donor's coordination meeting, to mobilize appropriate resources. In addition, it is anticipated that the project will result in the identification of many innovative methods of supplying water to isolated island communities.

5.3 The proposed implementation methodology and arrangements are found to be in accordance with the criteria laid down in AWF's Operational Procedures, and the anticipated efficiency, effectiveness and sustainability of the project are considered to be acceptable. The GoS and PUC have shown strong interest in undertaking this project, as evidenced by the 11% local cash contribution (plus 7% in-kind contribution), and their extensive project preparation activities including the submission of a detailed proposal and TOR.

## **Recommendations and Conditions**

5.4 It is recommended that a grant not exceeding EURO 955,000 from the African Water Facility resources be extended to the Public Utilities Corporation through the Government of Seychelles in order to carry out the project described in this appraisal report and the draft TOR hereto attached.

5.5 Obligations of the AWF to make the first disbursement of the Grant shall be conditional upon the nomination acceptable to the AWF of the Project Coordinator, and opening of a Special Account in a commercial bank acceptable to the AWF.

# ANNEX 1: MAP OF SEYCHELLES



## ANNEX 2: IMPLEMENTATION SCHEDULE

Activity	Time in Months																	
	S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>Grant Processing</b>																		
Grant Signature	x																	
<b>Procurement of Consultancy Services</b>																		
Preparation of Shortlist of Consultants and RFP for Approval and Issuing		x																
Submission of Bids by Consultants			x	x														
Evaluation of Proposals and Approval					x													
Negotiation and Award of Contract						x												
Consultant Mobilization							x											
<b>Implementation of Project Study</b>																		
Review Phase								x										
Study Phase 1										x	x							
Study Phase 2												x	x					
<b>National Workshops, PUC/AWF Review</b>									x			x				x		
<b>Donors Coordination Meeting</b>																		x
<b>Reports</b>																		
Review Phase Inception Report								x										
Study Phase 1											x							
Study Phase 2														x				
Final Report																	x	
Quarterly Progress and Completion Reports								x			x			x				x

## ANNEX 3: COST ESTIMATE AND PAYMENT SCHEDULE

**Table I: Cost Estimate (amounts in Euros)**

Description	Unit	Quantity	Unit Cost	Total Costs	Foreign Costs AWF	Local Costs AWF	Local Costs GoS	Local Costs In-Kind
<b>CONSULTANCY CONTRACT</b>								
<b>REVIEW PHASE</b>								
<b>Remuneration</b>								
Project Manager	m/m	1	10,000	<b>10,000</b>	10,000			
Hydraulic Engineer	m/m	1	8,000	<b>8,000</b>	8,000			
Environmental Scientist	m/m	1	8,000	<b>8,000</b>	8,000			
Hydrogeologist	m/m	1	8,000	<b>8,000</b>	8,000			
Biochemist	m/m	0.5	8,000	<b>4,000</b>	4,000			
Leakage Control Expert	m/m	1	8,000	<b>8,000</b>	8,000			
Social Scientist	m/m	1	8,000	<b>8,000</b>	8,000			
Economist	m/m	1	8,000	<b>8,000</b>	8,000			
Design Engineer	m/m	1	8,000	<b>8,000</b>	8,000			
Process Specialist	m/m	1	8,000	<b>8,000</b>	8,000			
M&E Specialist	m/m	1	8,000	<b>8,000</b>	8,000			
Surveyor	m/m	0.5	8,000	<b>4,000</b>	4,000			
Local Inputs	Item		5,000	<b>5,000</b>			5,000	
<b>Sub-total Remuneration</b>		<b>11</b>		<b>95,000</b>	<b>90,000</b>		<b>5,000</b>	<b>0</b>
<b>Reimbursable Expenses</b>								
International Air Travel	No.	12	1,500	<b>18,000</b>	18,000			
Local Air Travel	No.	12	50	<b>600</b>			600	
Accommodation - local travel	Days	33	100	<b>3,300</b>			3,300	
Accommodation - long term	m/m	11	500	<b>5,500</b>			5,500	
Subsistence allowance - long term staff	m/m	11	1,500	<b>16,500</b>	16,500			
Local Transport	Days	30	60	<b>1,800</b>			1,800	
Office Space and Services	Months	2	4,000	<b>8,000</b>				8,000
Documentation	Item		500	<b>500</b>			500	0
Communications	Item		1,000	<b>1,000</b>			1,000	0
<b>Sub-total Reimbursable Expenses</b>				<b>55,200</b>	<b>34,500</b>		<b>12,700</b>	<b>8,000</b>
<b>Total Review Phase</b>				<b>150,200</b>	<b>124,500</b>		<b>17,700</b>	<b>8,000</b>

Description	Unit	Quantity	Unit Cost	Total Costs	Foreign Costs AWF	Local Costs AWF	Local Costs GoS	Local Costs In-Kind
<b>STUDY PHASE 1</b>								
<b>Remuneration</b>								
Project Manager	m/m	2	10,000	<b>20,000</b>	20,000			
Project Engineer	m/m	2	8,000	<b>16,000</b>	16,000			
Hydraulic Engineer	m/m	2	8,000	<b>16,000</b>	16,000			
Leakage Control Expert	m/m	2	8,000	<b>16,000</b>	16,000			
Environmental Scientist	m/m	2	8,000	<b>16,000</b>	16,000			
Hydrogeologist	m/m	2	8,000	<b>16,000</b>	16,000			
Principal Design Engineer	m/m	2	8,000	<b>16,000</b>	16,000			
Process Specialist	m/m	2	8,000	<b>16,000</b>	16,000			
Design Engineer	m/m	2	8,000	<b>16,000</b>	16,000			
Technician (CAD/Operator) 3 staffs	m/m	6	6,000	<b>36,000</b>	36,000			
Social Scientist	m/m	2	8,000	<b>16,000</b>	16,000			
Economist	m/m	2	8,000	<b>16,000</b>	16,000			
Agronomist	m/m	2	8,000	<b>16,000</b>	16,000			
Local Inputs	Item		10,000	<b>10,000</b>			10,000	0
<b>Sub-total Remuneration</b>		<b>30</b>		<b>242,000</b>	<b>232,000</b>		<b>10,000</b>	<b>0</b>
<b>Reimbursable Expenses</b>								
International Air Travel	No.	3	1,500	<b>4,500</b>	4,500			
Local Air Travel	No.	30	50	<b>1,500</b>			1,500	
Accommodation - local travel	Days	60	100	<b>6,000</b>			6,000	
Accommodation - long term	m/m	30	500	<b>15,000</b>			15,000	
Subsistence allowance - long term staff	m/m	30	1,500	<b>45,000</b>	45,000			
Local Transport	Days	120	60	<b>7,200</b>			7,200	
Office Space and Services	Months	3	4,000	<b>12,000</b>				12,000
Documentation	Item		500	<b>500</b>			500	
Communications	Item		2,000	<b>2,000</b>			2,000	
<b>Sub-total Reimbursable Expenses</b>				<b>93,700</b>	<b>49,500</b>		<b>32,200</b>	<b>12,000</b>
<b>Total Study Phase 1</b>				<b>335,700</b>	<b>281,500</b>		<b>42,200</b>	<b>12,000</b>

Description	Unit	Quantity	Unit Cost	Total Costs	Foreign Costs AWF	Local Costs AWF	Local Costs GoS	Local Costs In-Kind
<b>STUDY PHASE 2</b>								
<b>Remuneration</b>								
Project Manager	m/m	4	10,000	<b>40,000</b>	40,000			
Project Engineer	m/m	3	8,000	<b>24,000</b>	24,000			
Hydraulic Engineer	m/m	2	8,000	<b>16,000</b>	16,000			
Environmental Scientist	m/m	2	8,000	<b>16,000</b>	16,000			
Principal Design Engineer	m/m	3	8,000	<b>24,000</b>	24,000			
Process Specialist	m/m	2	8,000	<b>16,000</b>	16,000			
Leakage Control Expert	m/m	2	8,000	<b>16,000</b>	16,000			
Institutional Expert	m/m	2	8,000	<b>16,000</b>	16,000			
Social Scientist	m/m	2	8,000	<b>16,000</b>	16,000			
M&E Specialist	m/m	2	8,000	<b>16,000</b>	16,000			
Technician (CAD/Operator) 3 staffs	m/m	6	6,000	<b>36,000</b>	36,000			
Agronomist	m/m	1	8,000	<b>8,000</b>	8,000			
Local Inputs	Item		10,000	<b>10,000</b>			10,000	0
<b>Sub-total Remuneration</b>		31		<b>254,000</b>	<b>244,000</b>		<b>10,000</b>	<b>0</b>
<b>Reimbursable Expenses</b>								
International Air Travel	No.	3	1,500	<b>4,500</b>	4,500			
Local Air Travel	No.	20	50	<b>1,000</b>			1,000	
Accommodation - local travel	Days	50	100	<b>5,000</b>			5,000	
Accommodation - long term	m/m	31	500	<b>15,500</b>			15,500	
Subsistence allowance - long term staff	m/m	31	1,500	<b>46,500</b>	46,500			
Local Transport	Days	60	60	<b>3,600</b>			3,600	
Office Space and Services	Months	2	4,000	<b>8,000</b>				8,000
Documentation	Item		1,000	<b>1,000</b>			1,000	
Communications	Item		2,000	<b>2,000</b>			2,000	
<b>Sub-total Reimbursable Expenses</b>				<b>87,100</b>	<b>51,000</b>		<b>28,100</b>	<b>8,000</b>
<b>Total Study Phase 2</b>				<b>341,100</b>	<b>295,000</b>		<b>38,100</b>	<b>8,000</b>
<b>MISCELLANEOUS EXPENSES</b>								
Software for transmission system model	Item		20,000	<b>20,000</b>	20,000			
Survey for distribution system modeling	m/m	6	3,500	<b>21,000</b>			21,000	
Household Survey	Item		20,000	<b>20,000</b>		20,000		
Education tours for institutional strengthening and benchmarking	No.	4	5,000	<b>20,000</b>	20,000			
National Workshops	No.	3	10,000	<b>30,000</b>		30,000		
Donor Coordination Meeting	No.	1	20,000	<b>20,000</b>		20,000		
<b>Total Miscellaneous</b>				<b>131,000</b>	<b>40,000</b>	<b>70,000</b>	<b>21,000</b>	<b>0</b>
<b>TOTAL CONSULTANCY CONTRACT</b>				<b>958,000</b>	<b>741,000</b>	<b>70,000</b>	<b>119,000</b>	<b>28,000</b>
<b>Percent of Total</b>					77.3%	7.3%	12.4%	2.9%
<b>Percent Contribution</b>					84.7%		15.3%	



Description	Unit	Quantity	Unit Cost	Total Costs	Foreign Costs AWF	Local Costs AWF	Local Costs GoS	Local Costs In-Kind
<b>PROJECT MANAGEMENT</b>								
<b>Project Management</b>								
Project Implementation Unit	Months	5	10,000	<b>50,000</b>				50,000
Steering Committee Meetings	No.	4	250	<b>1,000</b>			1,000	0
<b>Total Project Management</b>				<b>51,000</b>			<b>1,000</b>	<b>50,000</b>
<b>EQUIPMENT, SOFTWARE</b>								
Personal Computers	Item	4	1,500	<b>6,000</b>		6,000		
WaterGems Software	m/m	1	10,000	<b>10,000</b>		10,000		
GIS Arc C View	No.	1	10,000	<b>10,000</b>		10,000		
AO Xerox Photocopier	Item	1	3,000	<b>3,000</b>		3,000		
Structural Software - Prokon or Equivalent	m/m	1	5,000	<b>5,000</b>		5,000		
AutoCad 2007 Software	No.	1	15,000	<b>15,000</b>		15,000		
Leak Detection Equipment	Item		50,000	<b>50,000</b>	50,000			
<b>Total Equipment, Software</b>				<b>99,000</b>	<b>50,000</b>	<b>49,000</b>	<b>0</b>	<b>0</b>
<b>TOTAL PROJECT MANAGEMENT</b>				<b>150,000</b>	<b>50,000</b>	<b>49,000</b>	<b>1,000</b>	<b>50,000</b>
<b>TOTAL</b>				<b>1,108,000</b>	<b>791,000</b>	<b>119,000</b>	<b>120,000</b>	<b>78,000</b>
CONTINGENCY 5%				<b>54,900</b>	39,000	6,000	6,000	3,900
<b>GRAND TOTAL</b>				<b>1,162,900</b>	<b>830,000</b>	<b>125,000</b>	<b>126,000</b>	<b>81,900</b>
<b>Percent of Grand Total</b>					71.4%	10.7%	10.8%	7.0%
<b>TOTAL CONTRIBUTIONS</b>					955,000		207,900	
<b>Percent Contribution</b>					82.1%		17.9%	

**Table II: Consultant's Payment Schedule (amounts in Euros)**

Activity/Milestone	Time <sup>1</sup> (Month)	Consultant Payment (%)	Consultant Payment
<b>Advance Payment (to be deducted)</b>			
Contract agreement with consultant	5	<b>10</b>	95,800
<b>Review Phase</b>			
Presentation of Inception report	7	<b>25</b>	215,550
<b>Study Phase 1</b>			
Presentation of Study Phase I report	10	<b>25</b>	215,550
<b>Study Phase 2</b>			
Presentation of Study Phase II report	13	<b>25</b>	215,550
<b>Final Report</b>			
Presentation of final report	15	<b>25</b>	215,550
<b>Total</b>			<b>€958,000</b>

1) Shown as months after the signature of the Grant Agreement

## **ANNEX 4: TERMS OF REFERENCE**

The Terms of Reference attached is a Draft version, which must be finalised and submitted to the AWF for review and approval prior to tender for Consultancy services (as noted in Section 3.4).

**REPUBLIC OF SEYCHELLES**

**MINISTRY OF ENVIRONMENT & NATURAL RESOURCES**

**PUBLIC UTILITIES CORPORATION  
WATER & SEWERAGE DIVISION**



**TERMS OF REFERENCE FOR SEYCHELLES WATER  
DEVELOPMENT PLAN FOR THE PERIOD 2008 -2030**

**DRAFT**

**CLIENT**

Public Utilities Corporation  
Water & Sewerage Division  
P.O. Box 34  
Victoria, Mahe  
Seychelles

**September 2007**

## Terms of Reference for Seychelles Water Development Plan

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## **1. Introduction**

This Terms of Reference defines the requirements for providing consultancy services for the Seychelles Water Supply Development Plan for the Year 2008 to 2030.

Numerous studies were carried out for the Development of the Water Supply for the Seychelles commencing from the study carried out by Howard Humphreys & Sons for Mahe Island in 1971. This was followed by the South Mahe Water Supply Project Studies in 1986 by Sir Alexander Gibb and Partners. This was further expanded to the Mahe Integrated Water Supply Development Study and was carried out by Sir Alexander Gibb and Partners as well. Based on this study feasibility studies and Designs were carried out on the Grand Anse Reservoir and Pipe networks in Mahe Island. More recently demand studies were carried out by Hyder Consulting Ltd of UK (1997) as a component for establishing a Freshwater lagoon in the East Coast of Mahe.

In respect of Praslin a Feasibility study was carried out in 1987 for the construction of the Plaine Hollandaise Reservoir by Consulint International S.r.l of Italy.

Since then many piecemeal improvements to the systems in Mahe, Praslin and La Digue have been carried out to meet the ever increasing Demand sometimes adopting certain recommendations given in the studies listed above. The most noteworthy improvement in recent times was the implementation of the Seychelles Desalination Project which saw the commissioning of four Desalination Plants Two on Mahe 5,000 m<sup>3</sup>/d in Providence and 2,500 m<sup>3</sup>/d in Anse Boileau, 600 m<sup>3</sup>/d in Baie Ste Anne on Praslin and 300 m<sup>3</sup>/d in La Passe on La Digue. The other projects of importance implemented in the recent past are the South Mahe Pipeline, Extension of Hermitage Treatment works from 7,000 m<sup>3</sup>/d to 14,000 m<sup>3</sup>/d, a new treated works at Port Launay of 2,600 m<sup>3</sup>/d and the upgrading of the Le Niol Treatment works from 2,200 m<sup>3</sup>/d to 3,500 m<sup>3</sup>/d.

Demand studies carried out in house by the PUC indicate severe deficits between the projected demand and supply and it is now required to carry out an integrated study to ascertain how the demand could be met by identifying new water resources and by integrating the improvements already made to the system in the recent past. This does not in anyway preclude the suppression of the demand which also has to be addressed as a part of the study.

## **2. Country Profile**

### **2.1 Seychelles**

The Republic of Seychelles is an archipelago of 115 islands scattered over 1.3 million square kilometres of sea in the middle of the Western Indian Ocean North of Madagascar. The group comprises of 41 granitic islands and 74 coralline islands. The total land area is approximately 455 square kilometres. . The capital is Victoria located on Mahe Island and it has an excellent harbour sheltered by a small group of islands off shore. The International Airport of the Republic is also on Mahe and it has the capability of handling large passenger aircraft.

The Seychelles has a temperate climate. The hottest months being March and April (31 Degrees Celsius) and the coolest being July and August (25 Degrees Celsius). The rainfall varies considerably from island to island and month to month. December and January are the wettest months and June and July the driest. The Mahe Island attracts very high rainfall, over 2,200mm per annum. Humidity is uniformly high at an average 80% and mean temperature ranges from a minimum of 24°C to a maximum of 30°C.

The present population in Seychelles is estimated at 83,000. Mahe is the most populated of the islands with a population of approximately 74,000 followed by Praslin - 6,500 and La Digue - 2,500. The population growth rate in the Seychelles is approximately 1.2 %.

The Seychelles economy mainly depends on tourism and fisheries. The Government has introduced various activities incentives to attract local and foreign investors to develop other industries in the Seychelles.

## **2.2 Mahe Island**

Mahe is the largest and most populated island of the Seychelles Archipelago. It is about 27km long and 11km wide. A range of mountains runs down the whole length most of which are over 300m in height, rising to the peak of Morne Seychellois, which is 905m high. The extent of Mahe Island is 154.7 sq km. There are 169 catchments feeding the rivers on Mahe. However due to mountainous nature for the terrain and low retention capacity of the soil the flow in these streams are erratic and falls to extremely low values during times of drought, normally June to October

## **2.3 Praslin Island**

Praslin is the second largest island in the archipelago and also the second most populated with a population of around 6,500 people. It is located around 40kms Northeast of Mahe Island. Praslin Island is granitic in nature and measures 11km in length and 6km in width and has a square area of 41 sq Km. Praslin has its own domestic airport, which could handle medium-sized aircraft, and also a jetty, which accepts passenger ferries and cargo boats.

The topography of Praslin consists of a mountainous ridge extending across the entire island rising to an altitude of around 367m a.m.s.l. and a flat coastal strip. There are 85 river catchments on the Praslin Island. The island is divided into two administrative districts namely Baie Ste. Anne in the East and Grand Anse in the West. The majority of the population is concentrated around the coastal strips.

Praslin Island contains some of the famous tourist centres in Seychelles and is well known throughout the world. It is also referred to as the tourist capital of Seychelles.

## **2.4 La Digue Island**

La Digue is the fourth largest island in the archipelago and also the third most populated with a population of around 2,500 people mostly concentrated around La Passe. It is located around 6kms East of Praslin Island. La Digue is also granitic in nature and measures 5km in length and 3km in width with a square area of around 14 sq Km. The

island is also tropical in nature with an average annual rainfall of around 1,800 mm. Similar to Mahe and Praslin the topography is rugged and consists of 16 river catchments. The population of 2500 is mostly concentrated around La Passe. The rest of the island is largely uninhabited with the main economic activity, which is tourism related with domestic agriculture taking a second place. La Digue is accessible by boat from Praslin with the travel time between the two islands being 30 minutes. The main Jetty is located in La Passe. There is no air connection save for special helicopter flights on charter

### **3. Institutional Framework**

#### **3.1 Implementing Agency**

The implementing agency of the Study is the Water & Sewerage Division of the Public Utilities Corporation (PUC), a parastatal formed under the PUC Act of 1985. The Act stipulates PUC to provide and ensure a continued supply of electricity and potable water and provide a sewerage system to the population of Seychelles.

The Water & Sewerage Division is headed by the Managing Director (Water & Sewerage) who is answerable to a Board of Directors headed by an Executive Chairman. The Managing Director assisted by the Chief Engineer (Water & Sewerage). There are six Principal Engineers, one Chief Water Supply Officer and one charge of the various Sections in the Water & Sewerage Division. The annexed organisation chart provides further details in this respect.

Basically, the Water & Sewerage Division is responsible for planning and designs of water supply and sewerage facilities and the operations and maintenance of water supply including sewerage installations, quality control and also the maintenance of the entire fleet of vehicles and equipment belonging to the Public Utilities Corporation.

The Division also chairs the River Basin Committee responsible for the protection and equitable distribution of the surface and groundwater resources and also has a Hydrology section responsible for collecting and analysing Hydrological Data pertaining to the main islands.

#### **3.2 Water Sector**

The Public Utilities Corporation has the responsibility for the provision of water supply, its quality control and distribution in the three main islands of Mahe, Praslin and La Digue. The Government plans are to provide access to reliable public water supplies to the entire population in these three islands.

Water shortages occur during the dry period of the year namely from June to October each year. PUC has committed itself to develop new sources of water to meet the increase in the water demand. However the increasing water losses in the system are a cause for concern and immediate measures are required to redress the situation.

Several new projects have been initiated in the sector. The South Mahe Water Supply Project envisages the utilization of hitherto untapped water resources in the West of the island particularly the Mare Aux Cochons river and linking the entire transmission

distribution system in Mahe to achieve operational flexibility. The new treatment works at Port Launay capable of producing 2,600 m<sup>3</sup>/d of treated water, utilizing the water resources available in the Mare aux Cochon River has recently been completed. The augmentation of its main treatment works at Hermitage located close to Victoria has also been upgraded from 7,000 m<sup>3</sup>/d to 14,000 m<sup>3</sup>/d.

The other main projects in the sector completed recently are the installation of four desalination plants in Mahe (5,000 m<sup>3</sup>/d and 2,500 m<sup>3</sup>/d), Praslin (600 m<sup>3</sup>/d) and La Digue (300 m<sup>3</sup>/d).

In Praslin there exist two fresh water wetlands and a number of fresh water sources, which have been mobilized to satisfy the requirements of potable water. While these are adequate in the wet season due to lack of fresh water storage within the island the only alternative appears to be supplementation with desalinated water. The groundwater potential in Praslin is limited but the potential to enhance this resource exists. Efforts are also made to enhance the operational flexibility in Praslin by linking the transmission system and also implementing a pumping scheme to transfer water from the wetlands situated in the higher reaches into other catchments.

In La Digue the supply of drinking water is mostly dependent on water from three sources viz. Macgaw, Maurice Payet and the St Ange Rivers. Again due to the topography and the low retention capacity of the soils these streams virtually dries up during the dry seasons. During these periods the water is supplemented using the limited groundwater resources available in the La Passe Area

### **3.3 Sanitation Sector**

Though the PUC Act stipulates the PUC responsibility with regards to wastewater disposal, the major sewered area in Seychelles is the Greater Victoria in Mahe Island with a treatment plant of 7,000 m<sup>3</sup>/d - commissioned recently located South of Victoria at Providence. Another sewage treatment plant to the North of Mahe Island at Beau Vallon has its own sewer network encompassing Beau Vallon and its surroundings. The other areas, which are sewered include a housing estate at Anse Aux Pins. PUC is also responsible for the maintenance of two other sewerage treatment plants to the South of Mahe, namely Pte. Larue and Anse Aux Pins but these serve small areas mainly encompassing housing estates. The rest of Mahe Island, Praslin and La Digue are largely dependent on septic tanks and on-site disposal systems or institutional sewerage treatment plants.

Designs are in progress for the implementation of the Praslin Sewerage Project and feasibility studies are also underway for the implementation of a Sewerage project for the La Passe area in La Digue.

PUC's role in institutional schemes is largely in an advisory capacity with the Ministry of Land Use & Habitat, private developers or the private individuals themselves responsible for the implementation of the sewage disposal systems.

The Division of Environment of the Ministry of Environment & Natural Resources is the regulatory and monitoring authority with respect to disposal of wastes from any establishments located in Seychelles. All new developments in Seychelles are subject to



vigorous EIA procedures where the impacts should be clearly defined and mitigatory measures, if any, should be stated.

## **4 The Existing Water Supply System**

### **4.1 General**

Water supply in Seychelles has traditionally been dependent on abstracting water from numerous small streams. However, due to the steep topography and low retention of the soil and rock, the flow in these streams is erratic and falls to very low values during prolonged periods of drought.

### **4.2 Mahe**

#### **Existing System**

The Mahe water supply is dependent on 28 intakes located on 24 rivers. The maintenance of water supply requires the harnessing of all technically feasible and financially viable resources. A number of possible storage schemes were identified in a study carried out as far back as 1959, but to-date only one catchment on the North East of the island has been implemented. Water is stored partly in the small reservoir on the Rochon River and partly in a much larger reservoir at la Gogue where it is transferred by pipeline.

The Rochon reservoir and treatment works were commissioned in 1969 and the La Gogue reservoir and treatment works were commissioned in 1979. Hermitage treatment works was constructed in such a way that it could take water from either Rochon or La Gogue reservoirs.

#### **Details of Existing Major Treatment works and Dams**

##### **Dams and Reservoirs**

**Rochon Dam:** Concrete Arch Dam, storage 50,000 kl height 15 m, excess water transferred to La Gogue by pipeline

**La Gogue Dam:** Earthfill embankment, storage 970,000kl, height 28 m. the catchment contributing to the reservoir is small and is largely dependent on the excess water from Rochon for it's inflow

##### **Major Treatment Works in Operation**

<b>Location</b>	<b>Rated Capacity(m<sup>3</sup>/d)</b>	<b>Type of Treatment</b>
I. Hermitage	7,000	Pre-Chlorination, Sedimentation, Rapid Gravity Filtration, pH adjustment Disinfection
II.Cascade	7,000	Pre-Chlorination, Sedimentation, Rapid Gravity Filtration, pH Adjustment Disinfection

III. Le Niol	3,500	Sedimentation, Slow Sand Filtration pH Adjustment, Disinfection
IV. Rochon	2,270	Sedimentation, Slow Sand Filtration pH Adjustment Disinfection
V. Baie Lazare	1,296	Pressure Filtration pH Adjustment Disinfection
VI. Providence Desalination Works	5,000	Reverse Osmosis, pH Adjustment, Disinfection
VII. Anse Boileau Desalination Works	2,500	Reverse Osmosis, pH Adjustment Disinfection
VIII. Port Launay	2,600	Pressure Filtration, pH Adjustment Disinfection

### **Minor Treatment Works in Operation**

In addition to the above there are 22 other small water works with capacities ranging from 30 m<sup>3</sup>/d to 1000 m<sup>3</sup>/d serving the Mahe Island

### **Supply Zones**

The water supply system in Mahe consists of three zones namely

- i) East & North East Zone
- ii) South & South East Zone
- iii) West & South West Zone

Comparatively the East & North East zone has the more reliable water supply compared to the rest of the country due to the presence of the Rochon & La Gogue reservoirs. Even though the major treatment works of Cascade and Le Niol do not have storage reservoirs as sources the areas fed by these water works could be supplemented by water produced by the Hermitage and Rochon plants during dry seasons

### **Supply System**

Due to the nature of the topography of the island the supply system involves multiple stages of pumping with many reservoirs located at various elevations and presently the system in Mahe consists of 45 Pumping Stations and 65 reservoirs ranging from 25 m<sup>3</sup> to 2200 m<sup>3</sup> capacity.

### **Distribution System**

Mahe's distribution system consists of 293.7 km of pipeline of which 84.9 km or 28.9% are asbestos cement pipes. Of the asbestos cement pipe, 67.1 km are more than 20 years old and hence very unreliable. A further 11.7 km or 4% of the Mahe pipeline are of

uPVC which is also more than 20 years old. There are also around 20 km of cast iron pipes which are over 20 years old.

### **On going Projects**

The work on the South Mahe Integrated Water Supply Project commenced in the year 2000. This is primarily aimed at providing Mahe with an integrated distribution network linking all the various water supply sources in a single island-wide grid. The project also envisages the upgrading the main Hermitage works from 7,000 m<sup>3</sup>/d to 14,00 m<sup>3</sup>/d and a new treatment works at Port Launay of 2,500 m<sup>3</sup>/d capacity. The work on the Hermitage treatment works is nearing completion while the Port Launay works will be completed at the end of the year. The project also comprises of Seven reservoirs of capacities ranging from 250 m<sup>3</sup> to 2,200 m<sup>3</sup> of which five are completed at the present point of time.

### **Supply Trends.**

The water supplied to Mahe at the end of the year stood at an average of 30,365 m<sup>3</sup>/d. The average growth rate over the period 1976 to 2004 was around 7.74% per annum

## **4.3 Praslin**

### **Existing System**

The Praslin water supply system consists of mainly two independent systems. The Northern and the Western Systems rely mainly on the water supplied by the Fond B'offay and the Salazie Rivers to supply the communities extending from Baie Ste Anne through Cote D'or all the way to Anse Boudin. The Nouvelle Decourverte and the Mt Plasir Rivers serve the communities of Grand Anse, Amitie, Anse Kerlan and Mt Plasir.

The works at the four water supply sources consist of weir intakes, sedimentation tanks, Pressure filters followed by chlorination.

The surface sources are not adequate to meet the demand for water and hence in 2003 the Desalination works of capacity 600 m<sup>3</sup>/d was commissioned. This to a large extent meets the deficit requirement during the dry season

### **Supply System**

Similar to Mahe due to the nature of the topography of the island the supply system involves multiple stages of pumping with many reservoirs located at various elevations and presently the system in Praslin consists of 7 Pumping Stations and 12 reservoirs.

### **Distribution System**

On Praslin, 27 km or 33.8% of the island's 80 km of pipeline is of asbestos cement, of which 26 km are more than 20 years old.

## **On going Projects**

No major works are on-going in Praslin except for upgrading the treatment capacity at the Nouvelle Decouverte works by adding another pressure filter

## **Supply Trends.**

The water supplied to Praslin at the end of the year stood at an average of 2,008 m<sup>3</sup>/d. The average growth rate over the period 1988 to 2004 was around 7.22% per annum.

## **4.4 La Digue**

### **Existing System**

The la Digue water supply system consists of a single treatment station., receiving water three streams viz: the Macgaw, Maurice Payet and St Ange Rivers. Due to the low topography of the island and the low retention capacity of the soils these streams virtually dry up during the dry season and raw water has to be supplemented by a pumped bore hole supply.

The treatment works which was commissioned 1990 consists of an aerator, a sedimentation tank, slow sand filters and a chlorination facility. The main storage reservoir is located in the treatment plant itself

These sources are not adequate to meet the demand for water and hence in 2003 the Desalination works of capacity 300 m<sup>3</sup>/d was commissioned. This to a large extent meets the deficit requirement during the dry season

### **Supply System**

From the treatment works the water is pumped to two sets of reservoirs viz: La Passe and Belle Vue Similar to Mahe due to the nature of the topography of the island the supply system involves multiple stages of pumping with many reservoirs located at various elevations and presently the system in La Digue consists of 5 Pumping Stations and 5 reservoirs.

The La Passe system supplies the consumers along the Plateau areas of La Digue including those of La Passe , Anse Reunion and L'Union The Belle Vue system comprising of an upper and lower reservoir supply the consumers in Upper Belle Vue, Grand Anse, La Retraite, Roche Bois, .La Passe and Grosse Roche

### **Distribution System**

La Digue has 49 km of pipeline, 18 km or 36.7% of which is of asbestos cement and all of it is more than 20 years old.

## **On going Projects**

No major works are on-going in La Digue

## **Supply Trends.**

The water supplied to La Digue at the end of the year stood at an average of 841 m<sup>3</sup>/d. The average growth rate over the period 1988 to 2004 was around 7.54% per Annum

#### **4.5 Unaccounted-For-Water (UFW)**

The UFW in all three islands are a cause for concern. The UFW on Mahe is around 50 % while on Praslin & La Digue it is around 25%. Much of the UFW is lost in leaks and pipe bursts. Other causes of lost water are meters which are under registering or not registering, thus allowing consumers to use more water than what they pay for, water used by the fire services, illegal connections and the flushing of the mains during repairs and maintenance. Seychelles' water is very aggressive and has weakened the pipeline over time, resulting in a marked increase in pipe bursts in 2001-2003 and thus a correspondingly high percentage of UFW.

All water connections are metered, but because of poor workmanship, which has allowed sediment to enter the distribution system, and the age of the meters, it is estimated that a large percentage of these meters are under-registering and also contributing to the high UFW

#### **4.6 Deterioration of Pipelines**

Some of the pipelines laid are over 20 -30 years old, while the asbestos pipes of this vintage have reached the end of their economic lifespan, the cement mortar internal lining in the ductile and cast iron pipelines have also deteriorated. This results in frequent pipe bursts, further corrosion resulting in impaired water quality, high unaccounted for water and deterioration of service levels to the consumer. It is important to identify the critical sections of the network to prepare a programme for the rehabilitation of the network.

### **5. The Study**

#### **5.1 General**

The study is primarily intended to formulate a development plan for water resources in the three main islands of Mahe Praslin and La Digue. The progression for demand of water in the three main islands for some time has seen severe water restrictions in supplies due to inadequate resources to meet the demands. The period from June to October in each year is the period where the situation becomes critical. This is generally due to low rainfall, thus requiring increasing draw offs from the storage reservoirs. Further there are many smaller schemes which are dependent entirely on the run of the river and these rivers dry up within a few days of the onset of the dry season. These conditions results in increasing costs to PUC to tanker supplies to the consumers affected.

The introduction of the Desalination plants has alleviated the condition to some extent but in no way commensurate the condition faced by the drastic reduction of surface water resources.

The other problem faced by the service provider is the increasing demand which is unwieldy and cannot be met with sources already identified. Therefore it is necessary to

identify demand suppression measures and to make a more realistic estimate of the demand for the planning horizon stated in this document.

## **5.2 Areas for Water Supply**

The criteria adopted in the study should include but not be limited to the following

- All areas presently served with piped water Supply
- Areas where the density or population exceed 20 persons per hectare.
- Topography up to the elevation of 300m a.m.s.l.
- Areas in which significant commercial or industrial activity is prevalent.
- All proposed areas for development in the housing sector
- All newly reclaimed areas in close proximity to the main islands
- The islands in close proximity to Mahe namely Long Island, Cerf, Round, Moyenne and Ste Anne.
- Isolated communities in the higher reaches
- Any other areas identified as an outcome of the study

## **5.3 Design Considerations & Constraints**

The study is primarily intended to

- i) Review the Causal Analysis prepared by the Water Committee and modify same to include factors hitherto not considered
- ii) Formulate a Demand Scenario Model for the three main Islands of Mahe, Praslin and La Digue and the satellite islands including newly reclaimed areas until the year 2030
- iii) Analyse and Prioritise the available supply options to meet the projected Demands
- iv) Review the water resources management aspects currently practised and recommend improvements if any (Rivers committee).
- v) Prepare water balance study to identify requirements of competing users, such as agriculture
- vi) Analyse the existing transmission/distribution systems of the three islands and prepare a model for improvements to the system including rehabilitation or replacement of pipelines
- vii) Prepare a computer model of the transmission distribution system and prepare a proposal for the implementation of telemetry.
- viii) Prepare conceptual designs and preliminary Engineering designs for the selected options.
- ix) Phasing out of the developments to match the rising demands and the affordability of implementation
- x) Initial Environmental Examination of Identified projects
- xi) Bench marking of organisation for improved performance
- xii) Preparation of Preliminary Cost Estimates for the selected options.

- xiii) Review and give recommendations for revision of the existing tariff structure to reflect the marginal cost of water
- xiv) Carry out an Economic Analysis for the selected options to ascertain the Financial viability of the options.
- xv) Study Institutional aspects and propose recommendations on the required Institutional Strengthening including asset management systems and practices, and the GIS and Leak detection sections.
- xvi) Analyse current tariffs and develop proposals to rationalise the tariffs to reflect the true marginal cost of services in both the Water & Sewerage sector.
- xvii) Identify possible areas for private sector participation including Design, Build and Operate possibilities for certain facilities
- xviii) Assist PUC to develop a campaign to develop an effective marketing strategy for demand management and associated legislation.
- xix) Assist PUC in organising national conferences to disseminate the findings of the study to the stake holders and obtain further views of the stake holders to fine tune the proposals
- xx) Organise a donor coordination conference with the assistance of the funding agency to seek funding for the solutions identified as an outcome of this study.

In addition to the studies carried out by external consultants, the PUC has also using in-house resources made certain estimation of the demands projected to the 2025. The demand projections have been in the past based on accepted per capita consumption of 140 litres per capita per day and also estimating the institutional demands of major users in the islands. The projections also take into account a progressive reduction of the UFW in the future. A list of projects to enhance the supply resources have been also compiled but this is by no means exhaustive. The studies carried out earlier and estimates made by the PUC will be made available to the selected consultant during the review phase.

The consultant will be required to arrive at a **demand scenario which will be both realistic and manageable**. Similarly the supply scenarios selected should be **cost effective** and also affordable to the country. The study of the transmission and distribution system should also similarly be a **cost effective design**, optimising the use of energy and provide maximum coverage to the population in general. Should these not be possible within the project framework the optimum solution will have to be generated.

The detailed scope of work is presented in Appendix II of this document

#### **5.4 Methodology**

On the commencement of the study the client will appoint a six member steering committee to direct the consultant and monitor the progression of the study. Bi-weekly meetings will be held by the steering committee at which the consultant's representative will have to be present. The consultant will be required to take minutes of these meeting and circulate the same to all participants not later than three days after such meetings.

In addition at each phase the findings shall be presented at national workshops and validated. Finally a donor coordination meeting shall be organised to seek funding for the identified priority projects.

## **6. Scope of Services**

The Consultant shall at all times during the continuity of his services ensure the presence of a Resident Project Manager acceptable to the Client in the Seychelles.

### **6.1 Review Phase**

The Consultant will be initially required to review the previous studies and listed in Appendix 4 would be made available to the Consultant at the commencement of the study.

### **6.2 Study Phase I**

The **Study phase I** will include the necessary data collection for the estimation of the demands until the year 2030. The Consultant will be required to carry out the surveys of all major users of water to ascertain their future demands in order to project the water demands. They will also have to ascertain the land use patterns in the future and also determine the major developments earmarked in the islands such as the newly reclaimed areas. It is envisaged that the consultant will have to consider several development scenarios to arrive at an optimum solution

### **6.3 Study Phase II**

The **Study Phase II** will primarily be linked to selected demand Scenario of Phase I where several supply options will have to be studied to meet the demand. This phase will also involve a study of the transmission distribution system and also involve the conceptual designs and drawings for the selected options. It will also involve the economic analysis for the selected options and packaging the projects in phase in such a way to be presented for donor funding

## **7. Duration of Study**

The duration of the consultancy services is expected to cover a period of 6 months inclusive of the Review phase, Study Phases I & II. The tentative programme for the study is presented in Appendix 5

## **8. Reporting Requirements**

The Consultant shall submit the following reports:

### **8.1 Review Phase**

- a. The review phase shall consist of an inception report reviewing the recommendations in previous studies listed in Appendix 4 and to be submitted within 30 days from the starting date of assignment. The report shall include:



- the findings of Consultant with regard to validity of findings and projections in the reports submitted for review
- identify any problems in logistics;
- Refine and finalise the work plan based on the above issues.

The inception Report shall be presented to a National conference to be validated

- b. Report on the National Workshop to validate the findings shall include
- Minutes of meeting
  - Recommendations/ amendments suggested by the participants

The final inception report shall be submitted seven days after the conclusion of the workshop

## **8.2 Study Phase**

### **8.2.1 Monthly Reports**

Monthly reports to be submitted every 30 days commencing end of second month of assignment. These reports should:

- give the progress on all activities identified in the work plan;
- give recommendations on issues, which require Client's approval for go ahead on subsequent activities in accordance with work plan including assumptions used;
- identify key activities which require client's involvement such as obtaining information or establishing the necessary contacts

### **8.2.2 Study Phase I - Demand Scenarios**

The various Demand Scenarios studied have to be presented along with the favoured option. The demand scenario should be broken down into different zones as stated earlier and should there be isolated pockets which cannot be integrated into the main system such areas should be identified and their projections stated separately.

The findings shall be presented at a National workshop and a final report on phase I based on the recommendations and amendments suggested at the workshop by participants shall be presented within seven days of the workshop.

### **8.2.3 Study Phase II – Supply Scenarios**

Draft design report at the end of fifth month of assignment giving:

- All Supply Scenarios considered with favoured option
- Conceptual layout of facilities;
- Model of Supply and Distribution Network for the three islands
- Priority Investment Programme
- Basic calculations.
- Cost Estimates
- Tariff Structure
- Institutional strengthening including benchmarking
- Initial Environmental Examination

- Telemetry proposal
- Economic Analysis
- Financial Analysis

#### **8.2.4 Draft Final Report**

The draft final report containing all corrections and amendments and including all calculations and drawings shall be submitted at the end of the sixth month. The draft report shall be presented at a National workshop and the recommendations/ amendments suggested by the participants shall be incorporated in the Final Report.

#### **8.2.5 Final Report**

The final report shall be submitted one month after the receipt of comments from the client.

*Note: The Client's approval/comments on the draft final report shall be communicated to the Consultant not later than 30 days after the submission of the draft final report.*

#### **8.2.6 Donor Coordination Meeting**

A report on the Donor coordination meeting shall be submitted within two weeks of the meeting and shall include the

1. Sources of funding identified for the priority projects
2. Schedule of implementation
3. Cash flow of both foreign and local components
4. Procurement Mechanism for each component

### **9. Documentation**

The following documentation will be required as an outcome of the consultancy assignment:

- (1) Review Phase – Inception Report – 10 copies;
- (2) Monthly Report – 5 copies;
- (3) Study Phase I– 10 copies;
- (4) Study Phase II– 10 copies;
- (5) Draft Final Report - 10 copies
- (6) Final Report - 30 copies
- (7) Minutes of Meeting one copy to each participant and five additional copies
- (8) Report on National workshops - 30 Copies
- (9) Report on Donor Coordination Meeting – 30 Copies

## **Appendix I: List of Available Reports**

Numerous texts and papers were consulted during the preparation of this Report. The main reference sources were:-

1. Mahe Water Supply. Final Project Report dated March 1971. Howard Humphreys & Sons.
2. Mahe Water Supply Stage 1B. Feasibility and Outlets Design Report dated November 1974. Howard Humphreys & Sons.
3. Further Studies In Connection With Mahe Water Supply. Volumes 1-6, dated 1979. Howard Humphreys & Sons.
4. Hydrogeology of Anse Royale Coastal Plain. August 1981.
5. Hydroelectric Power Development On Island of Mahe. Pre-feasibility Report dated August 1982. Tata Consulting Engineers.
6. Hydrological Year Book for Seychelles 1984. Government of Republic of Seychelles.
7. Statistical Abstract 2000. Government of Republic of Seychelles.
8. National Population & Housing Census 1994. Government of Republic of Seychelles.
9. National Development Plan 1990-1994. Government of Republic of Seychelles.
10. Environmental Management Plan of the Seychelles 1990-2000. Government of Republic of Seychelles.
11. Seychelles Hydrological Yearbook Update 1985-1986. Seychelles Public Utilities Corporation.
12. South Mahe Water Supply Project. Inception Report dated December 1985 and Project Cost Estimate dated December 1986. Sir Alexander Gibb & Partners.
13. South Mahe Water Supply Project. Executive Summary for meeting of donors, July 1986. Government of Seychelles Ministry of National Development.
14. Mahe Integrated Water Supply Development Plan Study. Final Report Volume I Main Report. Sir Alexander Gibb and Partners, September 1988
15. Mahe Integrated Water Supply Development Plan Study Final Report Volume II Appendices. Sir Alexander Gibb and Partners, September 1988
16. Mahe Integrated Water Supply Project. Inception Report Sir Alexander Gibb and Partners, May 1990
17. Mahe Integrated Water Supply Project. Report on Hydrology and Water Transfer Study Sir Alexander Gibb and Partners, September 1990

18. Mahe Integrated Water Supply Project. Feasibility Study Part 1 Upper Grand Anse Transfer Scheme Report Sir Alexander Gibb and Partners, January 1991
19. Mahe Integrated Water Supply Project. Feasibility Study Part 2 Raising La Gogue Dam Volume 1 Report Sir Alexander Gibb and Partners, October 1991
20. Mahe Integrated Water Supply Project. Feasibility Study Part 3 Grand Anse Dam Volume 1 Report Sir Alexander Gibb and Partners, October 1991
21. Mahe Integrated Water Supply Project. Feasibility Study Part 3 Grand Anse Dam Volume 2 Appendices Sir Alexander Gibb and Partners, October 1991
22. Mahe Integrated Water Supply Project. Project Analysis and Justification Final Report Volume 3 Appendices Sir Alexander Gibb and Partners, October 1992
23. Mahe East Coast Fresh Water Lagoon Project Feasibility Study , Hyder Consulting Ltd December 1996
24. Mahe East Coast Fresh Water Lagoon Project Feasibility Study Addendum , Hyder Consulting Ltd February 1997
25. Environmental Aspects of Proposed Dams at Baie Lazare and Grand Anse dated February 1987. N.W. Hudson, FAO.
26. Inventory of Coastal Plains and Institutional Aspects of Water Management (Extract only) dated August 1987. W. Hassing, EEC.
27. Prasli Treated Water Supply Scheme Phase II Site Investigations and Feasibility study of Plaine Hollandaise Reservoir, Pre Feasibility Report, Consulint International S.r.l, Rome, Italy

## Appendix II

### Detailed Scope of Services

The Consultants shall ensure that at all times during the Consultants' performance of the services in Seychelles a Resident Project Manager, acceptable to the Client, shall take charge of the performance of such services.

The study will have to make recommendations on the basis of their cost effectiveness in meeting the Seychelles water requirements until the year 2030. The studies shall encompass the three main islands of Mahe, Praslin & La Digue and all islands in close proximity to the three main islands and the newly reclaimed areas.

#### (a) Review Phase

1. Review the Terms of Reference to suggest any modifications or improvements deemed necessary for the successful completion of the study
2. To review the Reports listed in Appendix 4 of Part I Terms of Reference to:
  - i) Ascertain the validity of assumptions made in the various studies.
  - ii) Ascertain that the projections of demand made are realistic.
  - iii) Review the various options made in the studies to enhance supply resources
  - iv) Examine the validity of such proposals in the current context.
  - v) Revise the cost estimates to reflect current values.
3. Examine Demographic characteristics of the supply areas to assess water demand
4. Examine innovative approaches to enhance supplies
5. Examine available technology for demand suppression
6. Examine Hydrological data pertaining to available water Resources
7. Examine present legislation pertaining to control of Water Resources (Rivers Committee)
8. Review Causal Analysis of the problems Prepared by the Water Committee and modify the same to include all factors not considered previously and exclude those that are superfluous
9. Review of the existing system  
Based on the available PUC records and other relevant data
  - i) Review and assess system operation, system losses, yield and reliability.
  - ii) Identify critical capacity components of the system.
  - iii) Assess current losses in the system
  - iv) Assess the present status of digital mapping of services (GIS)
  - v) Identify surplus capacity components within the system (particularly treatment works' capacities).
  - vi) Prepare inventory of ambient water quality of sources and output of treatment works
  - vii) Identify deficiencies in treatment works and need for improvement
  - viii) Prepare a system optimisation programme and assess the benefits thereof.
10. Review of the existing Tariffs and operation costs for both water & sewerage
11. Presenting of findings at a national workshop and to determine the way forward

(b)

**Study Phase I**

In this Phase the Consultants will prepare a comprehensive design model for demand considering various development scenarios. This will include the following

- (1) Assessing that the criteria specified will result in adequate coverage of the population in the main islands and satellite islands located in close proximity to the main islands
- (2) Appraising the projects planned in the areas covered and assessing their demand implications
- (3) Collecting data relating to the proposed housing programmes from the relevant government or non governmental organisations and incorporating the same in the demand calculations.
- (4) Studying the demographic characteristics and arriving at suitable population projections for the period.
- (5) Assess the projected commercial demands from industry and tourism related activities including projections of tourists until the design horizon
- (6) Collect data from relevant agencies as to Land use planning for undeveloped areas
- (7) Make reasonable assumptions for other areas such as the newly reclaimed areas for which land use plans are not final at the present point of time
- (8) Estimate water requirement of competing users such as Agriculture of existing and proposed sources.
- (9) Identify settlements which are beyond the supply criteria stated and possible solutions with private sector participation
- (10) Consider additional measures for reducing the water demand. Such measures shall include but not limited to
  1. Tariff Adjustment
  2. Household storage and Rainwater Harvesting
  3. Utilisation of Water saving devices
  4. Consumer awareness and participation in conservation measures
  5. Re-use of wastewaters both treated effluent and industrial wastewater
- (11) Review of leak detection practices and examine training requirement for leak detection staff and the requirement for logistical support.
- (12) Assumptions for UFW in the future along with basis for such assumptions
- (13) Collection of present transmission/ distribution system for modelling the system and for the future telemetry project
- (14) Identify the present constraints in the transmission/ distribution system
- (15) Identify input requirement for GIS
- (16) Examine Legislative, regulatory and Social considerations for assumptions made.
- (17) Projecting the demand to the year to the year 2030 under different demand scenarios
- (18) Collection of Hydrological and Hydrogeological Data to ascertain the adequacy of Freshwater Resources

(19) Presenting of findings at a national workshop and validation

**(c) Study Phase II**

The study Phase II will include the following

- (1) Analysis of Existing Costs of Water and Strategies to minimise costs
- (2) Immediate measures to optimise the yield of the existing system
- (3) Evaluating various supply options to meet the favoured demand model Developed under Phase I. These shall include but not limited to
  1. Run of the river exploitation
  2. Provision of additional bulk raw water storage reservoirs(Dams etc.)
  3. Additional treatment works/pumping stations/ treated water storage reservoirs/pipelines
  4. Meeting agricultural demand by untreated or recycled water
- (4) Conceptual design and preliminary Engineering of the different supply options to meet the demand
- (5) Terms of Reference for implementation of telemetry project for Distribution systems in the three main Islands
- (6) Strengthening of Rivers committee to manage the water resources
- (7) Strengthening of Leak detection Inspectorate including requirement of hardware
- (8) Transmission/ distribution model to serve all communities/areas identified under the demand projections
- (9) Identify critical of pipeline sections for replacement and upgrading based on the model
- (10) Inputs for GIS section
- (11) Basic Calculations
- (12) Cost Estimates both Capital and recurrent expenditure
- (13) Preparation of Priority Investment Programme (Year 2015 target)
- (14) Comprehensive Programme of works and Measures
- (13) Tariff Model for Cost Recovery based on the principle of marginal cost of producing water and affordability of all sectors
- (14) Identify areas for private sector participation and viable BOT models
- (15) Assess socio economic implications of development and presentation of findings to stake holders
- (16) Economic and Financial analysis including rates of return on Investment
- (17) Institutional Aspects
  1. Appropriate management Structure and Professional staff requirements
  2. Technician and other staff requirements
  3. Training
  4. Operation and Maintenance resource Levels
  5. Review of Financial viability of the Division vis-à-vis the entire organisation
  6. Diagnosis of the asset management systems and practices

7. Benchmarking of organisation with similar utility organisations
- (18) Packaging of Projects for possible donor funding including detailed design phase
  - (19) Presenting of findings at a national workshop and validation
  - (20) Organising a donor coordination meeting in close liaison with the Government of Seychelles and the funding agency

**(d) Liaising and Training**

The Consultant shall be responsible for maintaining continuous contact with the Public Utilities Corporation, Water & Sewerage Division, which is the Executing Agency responsible for supervising and scrutinising the study. The Executing Agency will appoint the personnel who will supervise and monitor the development of the study. The team will consist of a Project Engineer in charge of the team, and an Assistant Engineer supported by the necessary staff such as technicians, and so on. The Consultant shall involve the professional and technical staff of the implementation unit in the work to be performed by the Consultant's staff, to provide the opportunity for maximum transfer of know-how.

**(e) Responsibilities and Approvals**

The Consultant shall be responsible for the completeness and accuracy of the data and for taking into account relevant comments from the Executing Agency, i.e. PUC. All conclusions and recommendations presented by the Consultant for consideration and approval to PUC shall be substantiated by economic (present worth) comparisons and by a thorough analysis and comparisons of the merits of each alternative designs considered. The Consultant shall exercise care and diligence in preparing the report and shall provide sufficient manpower to complete the proposed study within the stipulated time of completion.