2. Change of water demand in the residential sector by the Central Water Authority; and
3. Change in groundwater level in those areas, will indicate whether this technology is enhancing groundwater recharge.

1.2.1.6 Risks and their mitigation

Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:

Risk	Level (Low, Medium, High)	Response
Climate Variability – long wet or even long dry periods	Medium	Sensitization campaign to emphasize on optimal use of potable water and behavioural change.
Low level institutional support responsible for providing guidance	High	Dedicated staff will be needed at the level of the institution.

1.2.1.7 Stakeholder mapping

Identify key stakeholders involved in the project including the private sector, civil society organisations, local and indigenous communities, and their respective roles, as applicable:

Stakeholder	Roles and responsibilities
Ministry of Finance and Economic Development	To provide soft loans and ensures that the loan is used for the stated purpose
Ministry of Industry, Commerce and Consumer Protection Ministry of Business, Enterprise and Cooperatives	To provide the enabling framework in terms of contacts, training and visibility, in order to encourage small local business to join the market.
Ministry of Environment & Sustainable Development	To promulgate appropriate legislation in order to protect the interest of the general public.
Central Water Authority & Water Resources Unit, Ministry of Energy and Public Utilities	To monitor that provision for groundwater recharge has been taken into consideration in the design.
Media	To sensitise the general public towards sustainable development and consumption of water resources, water security and impacts of climate change.

1.2.2 Project Ideas for Desalination

The desalination technology is increasingly being implemented in many parts of the world. This technology provides for an alternative source of water which is independent of rainfall. In Mauritius some 10 hotels located along the coastal zones have implemented small capacity reverse osmosis desalination plants, mostly to alleviate water problems during the dry period. The cost of water produced using the desalination plant becomes an attractive option when the hotels have to buy water from tankers. The Government is encouraging the hotel sector to implement this technology in order to alleviate the stress of water sector of the island.

There has been many developments in the technologies of desalination in order to lower the cost and to lower the energy consumption. The present report refers to the reverse osmosis desalination technology. This particular technology is bought off shelf together with the technical support. In order to successfully implement this technology there is a need to train technicians to provide the support needed during the operation and maintenance of the system. The EPA (2011) requires that an EIA report be submitted for a desalination plant and in August 2012,

design sheets for desalination plants have also been promulgated. However the impact of this activity on the long term is not catered by the current legislation. There is thus a need for legislation to ensure safe exploitation of brackish water and for safe disposal of brine. The desalination technology is highly capital intensive and is costly to operate and maintain. The Government in the last budget speech has provided for financial incentives. Soft loans schemes may also help to encourage more hotels to embark on this particular technology.

1.2.2.1 Summary sheet for desalination technology

WATER PROJECT SHEET: Reverse Osmosis Desalination Technology

Brief Project description
The desalination plant will be having a production capacity of 300m3/day and will be treating either seawater of salinity greater than 10,000ppm or brackish water with salinity varying between 1000 to 10,000 ppm. The brine produced will have to be channelled to a dilution tank, before it disposed of in sink wells or in sea outfalls.

Results Oriented Framework

Overall Goal	Development Objectives
i. Tap alternative sources of water.	i. Alleviate the stress on potable water demand. ii. Addressing water security for hotels and building local capacity in the use of the desalination technology.

Inputs	Outputs	Impacts
i. Define new regulation to monitor impacts of brine disposal and abstraction of brackish water. ii. Provide for the enabling environment. iii. Enforcing agency to monitor quality of groundwater. iv. CWA to monitor the demand from these particular beneficiaries.	i. Technology implementation under control. ii. Encourage more hotels to participate in this project. iii. Groundwater quantity and quality well protected. iv.Drop in water demand from the beneficiaries.	i. Minimise local dependence on rain water. ii. Alleviate stress on potable water resources. iii. Increase acceptance of this technology in the country. iv. Further encouragements to be given in this sector to implement a desalination plant.

Estimated costs
MUR 19 Rs Million – Capital cost, installation, operation and maintenance cost of a 300m3/day production plant.

Proposed timeframe	Executive bodies
10 years, with at least 5 successful system every year.	Ministry of Energy and Public Utilities – Central Water Authority & WRU
Cost-benefit analysis	**Risks**
Good option if this technology is used over the whole year and not only during 3 dry months.	Climate variability – long wet periods increasing water availability Lack of technical know-how

Expertise required (based on market maps)

Profile	Key tasks
Few local experts, need to rely on international expertise	• Desalination plant to be purchased from abroad. • Technical experts be called in when needed.

Identification of key stakeholders
Ministry of Energy and Public Utilities
Ministry of Finance & Economic Development
Media
Ministry of Environment and Sustainable Development - National Environmental Laboratory
Private businesses involved in the marketing or development of components of the Desalination Technology

1.2.2.2 Project overview

The desalination technology discussed is the reverse osmosis desalination technology, whereby the desalination plant will be made up of non-corrosive components which are adapted to the treatment of saline water. The plant will be having a production capacity of 300m3/day and will be treating either seawater of salinity greater than 10,000ppm or brackish water with salinity varying between 1000 to

10,000 ppm. The brine produced will have to be channelled to a dilution tank, before it disposed of in sink wells or in sea outfalls. It is assumed that the plant will be in operation during the dry periods only.

Project Scope and Possible Implementation

• Timelines

The project is aiming at encouraging at least 50% of the total number of potential hotels to implement the desalination technology, over a period of 10 years, at least 5 each year.

• Budget/Resource requirements

A 300m3/day reverse osmosis desalination plant involves an initial capital cost of MUR Rs. 14 million. In addition an organisation requires about MUR Rs. 5 milion annually, in order to cater for operation, maintenance and replacement cost. The financial incentives will cater only for part of the initial capital cost. The operation and maintenance cost will be borne by the hotels.

• Goals and objectives

This project aims at alleviating the stress on potable water demand through an alternative source other than rain water. In addition, this project aims at addressing water security for hotels and building local capacity in the use of the desalination technology.

• Components

Robust desalination plants are available on the international market. In addition provisions will have to be made to install a borehole in case brackish water is being pumped, infrastructure to house the desalination plants, sink well for disposal of diluted brine, storage tanks for diluting the brine and pipeline for abstracting seawater and sea outfalls to dispose of brine where needed. In addition, the entire pipe network will have to be catered for.

1.2.2.3 Project framework

Project Goal:					
Development objective:					
Project Component	**Expected Outcomes**	**Expected Inputs**	**Expected Outputs**	**Objectively Verifiable Indicators**	**Expected Impacts**
1.Promulgate legislation/ regulation to ensure environmental protection.	Minimise environmental degradation.	Define new regulation to monitor impacts of brine disposal and abstraction of brackish water.	Technology implementation under control.	Regulations should take local conditions into consideration.	Minimise local dependence on rain water.
2. Provide financial support in the form of rebates	Encourage more hotels.	Provide for the enabling environment.	Encourage more hotels to participate in this project.	The financial support is attractive.	Alleviate stress on potable water resources.
3. Monitor the environmental impacts	Ensure environmental protection.	Enforcing agency to monitor quality of groundwater.	Groundwater quantity and quality well protected.	All those implementing the technology are concerned with environmental protection.	Increase acceptance of this technology in the country.
4. Monitor the impacts on the water demand at national level.	Alleviate stress on potable water resources.	CWA to monitor the demand from these particular beneficiaries.	Drop in water demand from the beneficiaries.	What volume of water is being saved, through this project?	Further encouragements to be given in this sector to implement a desalination plant.

1.2.2.4 Project Justification

• Relationship to the country's sustainable development priorities

Currently about 17 hotels have already implemented a desalination plant, with the objectives of ensuring water security and hence comfort to their customers. As per the Environmental Protection Act 2011 and EIA licence is needed so as to get a development permit and this approach ensures that any potential environmental hazards is given due consideration prior to the development. In addition, since August 2012, guidelines have been promoted under the Planning and Development Act 2004, and this legislation now requires that coastal hotels need to consider the desalination technology.

So promoting the desalination technology does fall in line with the Government policy, and given that this technology targets an alternative water supply source other than rainfall, it contributes to addressing water security.

• Relationship to existing national strategies and plans or reports and assessments under relevant conventions, if applicable:

While the desalination technology does not fall into the category of sustainable development of resources, being relatively highly energy intensive and its by product is not environmental friendly, much progress has been made and worldwide it is gaining wide acceptance.

The current Government policy since August 2011, in the form of Planning Policy Guidelines has been promulgated to encourage coastal hotels to implement desalination technology.

• Project Deliverables

- This project aims at encouraging at least 5 coastal hotels to implement a desalination plant in the first year of the project.
- Over a period of 10 years more coastal hotels would be encouraged to follow the same trend.
- The water demand will be monitored in order to highlight the benefits of this project on the water sector.

1.2.2.5 Monitoring and Evaluation (M&E)

Monitoring of the impact of this activity can be carried out by the following:

1. Change of water consumed by the hotels which have a desalination plant;
2. Satisfaction level of visitor in hotels with regards to water availability; and
3. Change in water demand at the national level.

1.2.2.6 Risks and their mitigation

Indicate risks, including climate change risks that might prevent the project objectives from being achieved, and if possible, propose measures that address these risks to be further developed during the project design:

Risk	Level (Low, Medium, High)	Response
Climate variability – long wet periods increasing water availability	Medium	Hotels may lose interest in using this more costly option. More incentives will be needed to encourage this sector.
Lack of technical know-how	High	A long term training programme is required in order to ensure the technical support over time.

1.2.2.7 Stakeholder mapping

Identify key stakeholders involved in the project including the private sector, civil society organisations, local and indigenous communities, and their respective roles, as applicable:

Stakeholder	Roles and responsibilities
Ministry of Finance and Economic Development	To provide rebates in order to encourage existing coastal hotels to adopt the desalination technology.
National Environmental Laboratory	To undertake regular long term monitoring of disposal of brine in sink wells, on groundwater quality.
Media	To sensitise the general public towards sustainable development and consumption of water resources, water security and impacts of climate change.
Research organisation, and Experts in the field of water and environment.	To help develop accessories and encourage local companies to be involved in the market of desalination technology.

1.2.3 Project Ideas for hydrological model

Hydrological models are sound working tools to ensure effective water resources management. There are different levels of complexity of hydrological models and the selection of a particular model depends on the use of such model. This particular technology is usually operated by a dedicated team of highly skilled technicians. The cost elements of this technology are the cost of the software, the logistics (computers, scanner, and printers), the training of technicians, and the transformation of data into digital format. The benefits are mostly intangible, a better management of water resources will help towards ensuring reliability of water supply over a longer period, will increase the level of water supply satisfaction and will contribute to the economical development of the country with the creation of new jobs, linked to availability of water.

Hydrological models are used to a very low level in Mauritius. The high investment cost in terms of creation of a dedicated unit with all the necessary logistics, the lack of supporting regulations to encourage use of hydrological models and lack of awareness of its potential benefits are some of the barriers which can hinder the success of this technology. In order to ensure the successful implementation of this model, there will firstly be a need to create a dedicated unit, with the logistics such as the software, the computers, printers, scanners, train the technical staff and ensure capacity building for decision making using the hydrological model. The Water Resources Unit is the institution which is directly involved with water resource management of Mauritius, and hence would be the ideal location for creating the dedicated unit.