groundwater recharge and thereby help in the reduction of surface runoff to the sea and the need to consider alternative water sources in order to ensure water security.

1.2 Action Plan for Desalination

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.

1.2.1 About the technology

Desalination refers to any of several processes that remove some amount of salt and other minerals from water. Desalination involves removing the salt from water to make it drinkable. There are several ways to do it, and it is not a new idea at all. Sailors have been using solar evaporation to separate salt from sea water for at least several thousand years. Most of the world's 15000 or so desalination plants use distillation as the process, and there are also flash evaporation and electrodialysis methods. All these methods are very expensive, so historically desalination has only been used where other alternatives are also very expensive, such as desert cities. However, an exploding world demand for potable water has led to a lot of research and development in this field and a new, cheaper process has been developed that involves heating sea water and forcing it through membranes to remove the salt from the water. Desalination, which was so costly in the past that few considered it a reliable alternative to treating fresh water, has now become cost-effective and streamlined as a result of energy-efficient filtering technologies such as reverse osmosis. There is also a lot of interest in using local, brackish groundwater as a source for desalination instead of ocean water. Such waters typically have only one-tenth the salinity of sea water, so desalination can be accomplished more easily and transportation is less of an issue. Even so, it is still more expensive than other alternatives, but it is indeed becoming more competitive.

Mauritius is characterized by some 75 main coastal villages and about 112 three to give star hotels along the coasts with a total of 12,000 rooms. The potential of using desalinated water is high. In addition the drought season (October–March) coincides with peak season of hospitality industry. Hotels spend some MUR 90/m3 for purchase of water from the CWA through tanker services. The social perception that hotel water supply occurs at the expense of the coastal villages and this may lead to social conflict. Currently, in Mauritius some 10 hotels are already equipped with desalination plants, which they tend to operate specially during the dry periods of the year. In January 2011, the Government informed that it was currently working on a bill to encourage hotels and IRS projects to make provision for desalination plants. It was also pointed out that since 1999 when Mauritius was hit by a severe drought, the Government had since then encouraged coastal hotels to implement a desalination plant. This policy has been strengthened last year, 2012, with the promulgation of a regulation on desalination plant under the Policy Planning Guidelines.

The cost elements associated with this technology are the initial capital cost, the operational cost and the

maintenance cost. For a desalination plant operating at 300m3/day, the initial capital cost is MUR Rs. 14 Million and the operational and maintenance cost amounts to MUR Rs. 3 million per year for plant operating on a year basis. The cost benefit analysis of this technology yielded a value of 0.17. This technology is costly and can cause damage to the environment if the waste disposal is not properly monitored, however it provides for an alternative source of water. It therefore represents a sound and reliable water supply especially during long dry periods, crucial to a small isolated island which cannot consider the option of importing water from nearby countries.

1.2.2 Target for technology transfer and diffusion

Though there are potentially some 120 hotels which are located along the coastal zone, not all the hotels will be able to implement a desalination plant owing to the cost implications and owing to their location, should they wish to desalinate seawater. The target is to get at least 50% of these hotels to adopt the technology, over the next 10 years. The Government is already providing financial incentives and this has to be supported by appropriate legislation in order to achieve the set target.

1.2.3 Barriers to the technology's diffusion

The barriers which have to be overcome in order to successfully promote the desalination technology have been grouped as follows: Economic & Financial, Market Failure & Imperfections, Legislation and Social & Cultural.

Though much development has taken place for desalination of saline water into potable water, this technology remains by far one of the most expensive technologies for the production of potable water. The cost of producing water by the desalination technology becomes comparable to the cost of potable water purchased from the local water authority only during the dry periods. During that period, many hotels buy water from tankers at the rate of MUR Rs. 30. Per m3 and this is more costly than the tap water. So during that time, the cost of producing water by the desalination technology (MUR Rs. 27 per m3) and hence appears to be an attractive alternative. Another major barrier is the lack of experts, both in the development of desalination plants and in the operation and maintenance aspects. As far as legislation is concerned, the Environmental Protection Act, 2011 and the Planning and Development Act, 2004, cater for desalination plant. However there is no appropriate legislation with regards to safe brine disposal, safe exploitation of brackish water, long term monitoring of the impacts of these activities on the quality and quantity of groundwater and no dedicated institution to oversee these activities. Socially, the desalination technology is not well looked upon, owing to the perception that it is highly energy intensive, it is costly and it harms the environment.

A number of measures would be needed in order to address the barriers. Firstly there will be a need for an institution to oversee the setting up and operation of a desalination plant and its short and long term impacts on the environment. There is a need to raise awareness of the benefits and safe practices linked to the implementation of the desalination technology. Mauritius already falls under the category of water stressed countries and in order to address water security there is a need for the country to find alternative sources of water, and this has to be strongly emphasized at national level.

Currently there are 17 hotels which are already operating a desalination plant, and with the recent Government policy, more hotels will be embarking on this technology in the near future.

1.2.4 Proposed action plans for Desalination

The Technology Action Plan for the successful implementation of the Desalination Technology will have to be developed based upon the following framework:

1. The legal and regulatory framework
2. The institutional support
3. The financial support

	Barriers Category	Barriers	Potential measures	Responsible Institution	Time Frame	Cost implications MUR Rs.	Indicators of Risk
1	Economic and financial	High capital, operational and maintenance cost.	Government to provide financial incentives	Ministry of Finance	0-10 years	Rs. 17 Million per desalination plant at the rate of 5 plants per year over 10 years.	The hotels may not be able to invest in this technology owing to financial constraints on their part.
		Highly energy intensive and no regulations to impose on conditions of renewable energy	Encourage companies to look for more energy efficient systems	Ministry of Environment & Sustainable Development	0-5 years	Need to invest in Research & Development projects – Rs. 2 Million	
2	Market Failure/ Imperfection	Lack of local experts involved in the development of desalination plants	Local companies to work in collaboration research centres and international partners in order to provide the skilled workers needed to encourage more hotels to adopt the desalination technology. companies to look for more energy efficient systems	Research organisation, and Experts in the field of water and environment.		Cost of training by experts from abroad – Rs. 200,000 per training session Total number of training sessions – at least 2 per year over 10 years.	The training would have to be sustained and hence involved higher cost elements.
		Lack of technical experts for the operation and maintenance of the plants					
		Lack of technical known-how locally, need to rely on external support.					
3	Policy, Legal and Regulatory	By-product, brine, has to be disposed of in a safe manner but no regulation specific to brine disposal exists so far.	Promulgate appropriate legislation – safe exploitation of brackish water, safe disposal of brine, monitoring of impacts of both brackish water exploitation and brine disposal.	Ministry of Environment & Sustainable Development	0-5 years	Consultancy services to be paid for in order to work out appropriate legislation Rs. 1 Million.	Geological structure differs from country to country and off shelf policies may not work in the local context.
		Lack of appropriate legislation governing safe exploitation of brackish water.					

		Lack of appropriate legislation/regulation governing the monitoring of the impact of exploitation of brackish water and disposal of brine on the groundwater.					
4	Social, Cultural & Behavioral	Lack of awareness of the development of desalination in the world. Social impact of this technology as viewed by coastal villagers.	Undertaking of intensive and focus groups awareness campaigns with regard to the need for desalination and the benefits of this technology.	Central Water Authority	0-5 years	Awareness campaigns at the rate of Rs. 200,00 per session, with at least 1 session over 10 years.	
5	Institutional & Organisational Capacity	No local institution to monitor the impacts of this activity on the environment and the country's resources.	Setting up monitoring programmes specific along the coasts to monitor that the practice of desalination	National Environmental Laboratory (NEL)	0-5 years	Cost to cover tests and services from MoESD – NEL, to amount to Rs. 2 Million per year over 10 years.	Unless this required is supported by appropriate legislation it may be difficult to ensure sound monitoring.

1.3 Action Plan for Rainwater Harvesting

The rainwater harvesting technology is aimed at residential level, a roof top rainwater harvestor, with a simple design. The main features consisting of the collection system (pipe and gulleys), the connecting pipe with an outflow for discharge of settleable solid particles, a container (500litres), and an overflow with drainage facilities, in the form of absorption pits, in order to promote groundwater recharge.

1.3.1 About the technology

Rainwater harvesting is a simple technology used for collecting and storing rainwater from rooftops, the land surface or rock catchments using simple techniques such as jars and pots as well as more complex techniques such as underground check dams. Rainwater harvesting captures, diverts, and stores rainwater for later use. Captured rainwater is often used in landscaping and for secondary uses. Commonly used rainwater systems are made up of three principal components; namely, the catchment area, the collection device, and the conveyance system. These systems can range from the low tech, hence low cost to the more advanced technology and thus relatively higher cost.

Typically, independent trials in some countries have shown that domestic rainwater harvesting system can reduce mains-water consumption by around 50%. The rainwater harvesting technology requires relatively very low investments, low skilled labour and low operational costs, but provides high benefits. Many countries are realizing that in the future surface and groundwater supplies will not be able to meet future water demand. Water conservation and development of alternative water supplies would become a necessity in the near future in order to meet our growing demand for fresh water.