

also as a flash-flood mitigation strategy for Colombo, through quality controlled roof top rainwater harvesting systems. Allocated time for the project is ten years.

The objective of the third project idea 'Promote measures for sustainability of boreholes as an adaptation method for climate change' is to provide potable water throughout the year (100%) for households and general public in selected vulnerable rural areas in the by promoting sustainability of boreholes. Allocated time for the project is eight years.

The objective of the fourth project idea 'Improve availability of drinking and irrigation water for the dry zone of Sri Lanka as an adaptation measure for climate change' is to provide potable and irrigation water throughout the year (100 %) for farmers and villagers in selected vulnerable rural areas in the North Central Province of Sri Lanka. Allocated time for the project is ten years.

Required funds for all four projects will be obtained through local and foreign funding sources. Cost of project management will be borne by the government of Sri Lanka.

## **3.2 Project Idea for Technology 1: Restoration/ Rehabilitation of Minor Tank net works**

### **Project Idea:**

*'Rehabilitation/Restoration and maintenance of minor tank network (cascade) systems in the dry zone of Sri Lanka as an adaptation strategy for climate change'*

### **3.2.1 Introduction/Background**

This project idea was developed by considering the most important actions identified under the Technology 1: Restoration/ Rehabilitation of Minor Tank net works.

Economy of the dry zone mainly depends on paddy cultivation based on minor tanks network systems. According to climate change projections, water scarcity will be a problem in the dry zone because this region will be more vulnerable to droughts. In addition to that, high temperature and dry winds will increase the evaporation rate and also affect the ground water resource. Increases in high rainfall events during rainy season will increase soil erosion, which in turn accelerates the silting up of these tank systems. In order to mitigate the above problems it is important to maintain sustainability of these minor tank systems as an adaptation strategy through water conservation, storm water control and capture and groundwater recharge. It also enhances access to groundwater and hence the expansion in irrigated area. For this purpose, it is necessary to improve operation and maintenance of tanks, catchment areas and canal systems. i.e. Restoration/rehabilitation of minor tanks involves work such as breach closing, tank bund strengthening, aquatic weeds control and repairs or reconstruction to sluices and weirs. Ten minor tank network systems in the dry zone will be selected for implementation of this project.

Lack of sustainability of minor tank systems is a current problem in the country and this is mainly due to poor operation and management practices. Implementation of Farmer Organisations based mechanisms will be a good way to maintain sustainability of minor tank systems. Farmer Organisations can be strengthened through active involvement of Dept. of Agrarian Services and Provincial Councils. In most of the previous restoration processes, selection of cascade systems/minor tanks has been carried out in a haphazard manner/without any scientific basis and as a result such restorations have failed to maximize benefits/returns. As such, it is important to carry out a survey in a scientific manner for identification of cascade systems/minor tanks for restoration/rehabilitation. Under this survey, it is necessary to collect data on vulnerability to impacts of climate change, hydrology of the cascade system, major rehabilitation work needed, number of beneficiaries from each tank, relocation needs, and amounts of funds available etc. A list can be prepared once required data are available.

It is essential to implement steps to build capacity of Department of Agrarian Development, provincial councils, Dept. of Health, Farmer Organisations and Cascade Management Teams in order to maximize the efficiency and effectiveness of restoration/rehabilitation/maintenance programmes.

Monitoring of water quality of the tanks selected and monitoring of health conditions of people consuming water from above tanks and to study whether there is a relationship between the above two are also needed in order to find a solution for prevailing health problems (i.e. kidney disease) in certain areas in the dry zone.

### **3.2.2 Objectives**

The main objective of this project is to provide water throughout/most of the year (80%), for farmers in selected vulnerable areas in the dry zone, through properly maintained ten minor tank network systems.

### **3.2.3 Outputs of the Proposed Project**

- Availability of a list of minor tank network systems which need rehabilitation/restoration and availability of a data bank (need of water resources, number of beneficiaries, type of restoration/rehabilitation work required, hydrology of the tank systems, amount of funds available, etc.)
- Availability of a collaborative mechanism between Agrarian Service Dept. and Provincial Councils pertaining for restoration/rehabilitation work
- Increased awareness and Capacity of Agrarian Service Department, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams
- Availability of alternative employments for extended dry seasons due to climate change
- An awards system for Farmer Organisations and Cascade Management Teams who show best tank management practices

- Well maintained 10 minor tanks selected
- Availability of evaluation reports prepared by project management team

### 3.2.4 Relationship to the country's sustainable development priorities

Importance of restoration/rehabilitation of minor tank systems has been recognized in *Mahinda Chinthanaya* – 'Vision for the New Future' the Government of Sri Lanka's Ten Year Development Policy Framework<sup>11</sup>. In this Policy Framework, under the "*Dahasak Maha Weu* Programme" (Thousand large Tank Programme) it is planned to complete rehabilitation of 10,000 tanks by 2020 with the participation of farmer community. It is also reported that 1000 tanks will be completed every year from 2010 at an annual estimated cost of Rs. 500 M. It is also reported that, for rehabilitation of minor tanks, farmers are expected to make a meaningful contribution in the form of labour, with the major proportion of the finances being provided by the government or other agencies such as NGOs and the private sector. Another aspect reported is that, the private sector investors will be encouraged to invest in fields such as eco-tourism and agri-business, where return on investment is attractive. Thus, the project contributes to national strategy of providing water to the dry zone by restoration/rehabilitation of minor tanks.

### 3.2.5 Project Deliverables

- Water will be made available for consumers of the ten minor tank networks under the project
- A detailed report on success of the project, by end of year 10.
- A list of minor tank networks which need restoration/rehabilitation
- Increase in rice yield and cropping intensity, cultivation of other field crops such as chilli, mung bean etc. in the dry season resulting 50 % increase in income of farmers
- Increase in employment opportunities by 30% through fishery, bricks etc. and for food security of farmer families depending on the restored cascade systems
- Increase in eco-tourism by 10 %
- Reduction of GHG emissions

### 3.2.6 Project Scope and Possible Implementation

The project will produce ten well maintained minor tank network systems and the project implemented can be adapted to other minor tank network systems in areas facing water scarcity. The list of minor tank network systems identified can be used for other national programmes on restoration/rehabilitation work. The data bank/website can be updated with new hydrology data of minor tanks. The project will be

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<sup>11</sup> Mahinda Chinthana Policy Framework, Department of National Planning; 2010.

sustainable because of the active involvement of Farmer Organisations in operation and management of minor tank systems due to the increased income, alternative employment opportunities and incentives they receive and also due to the priority given by the government. This project is not focused on restoration/rehabilitation of individual tanks, but on networks of minor tanks and therefore it will not be a failure as most of the previous restoration projects

Considering the importance of rural development in the Dry Zone, there have been numerous minor tank rehabilitation projects and therefore this project has links with such projects.

### 3.2.7 Project activities

1. Carry out a survey to collect necessary data (need of water resources, number of beneficiaries, type of restoration/rehabilitation work required, hydrology of the tank system, amount of funds available, etc.) in order to identify minor tank net works which need restoration/rehabilitation.
2. Develop a collaborative mechanism between Department of Agrarian Development and Provincial Councils pertaining for restoration/rehabilitation work
3. Awareness creation and capacity building of Agrarian Service Department, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams
4. Introduce alternative employments for extended dry seasons due to climate change
5. Introduce an awards system for Farmer Organisations and Cascade Management Teams showing best tank management practices
6. Restoration/Rehabilitation /Operation and maintenance work of 10 minor tanks selected
7. Promote R & D on Monitoring of water quality, health conditions, cascade hydrology and other relevant issues
8. Project Management

### 3.2.8 Timelines for the proposed activities

Table 3.2: Proposed Timelines for Implementation of Proposed Activities of Project 1

Activity	Year									
	1	2	3	4	5	6	7	8	9	10
1. Carry out a survey to collect necessary data in order to identify minor tank net works which need restoration/rehabilitation.										
2. Develop a collaborative mechanism between Agrarian Service Dept. and Provincial Councils pertaining to restoration/rehabilitation work										

3. Awareness creation and Capacity building of Agrarian Service Department, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams										
4. Introduce alternative employments for extended dry seasons due to climate change										
5. Introduce an awards system for Farmer Organisations and Cascade Management Teams showing best tank management practices										
6. Restoration/Rehabilitation /Operation and maintenance work of 10 minor tanks selected										
7. Promote R & D										
8. Project Management										

### 3.2.9 Budget/Resource requirements

Table 3.3: Approximate Cost for Implementation of the Proposed Activities of Project 1

Activity	Budget (US\$) 000'
1. Carry out a survey to collect necessary data to identify minor tank net works which need restoration/rehabilitation.	7000 (I)
2. Develop a collaborative mechanism between Agrarian Service Dept. and Provincial Councils pertaining to restoration/rehabilitation work	1000 (D)
3. Awareness creation and Capacity building of Agrarian Service Department, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams	2300 (D)
4. Introduce alternative employments for extended dry seasons due to climate change	2000 (D)
5. Introduce an awards system for Farmer Organisations and Cascade Management Teams showing best tank management practices	1000 (D)
6. Restoration/Rehabilitation /Operation and maintenance work of 10 minor tanks selected	21000 (I)
7. Promote R & D	6,000 (D)
<b>Total for above activities (Approximately)</b>	<b>40.3 M</b>
8. Project management (10 % of above cost)	4000 (D)
<b>Total cost (Approximately)</b>	<b>44.3 M</b>

(D-Domestic; I-International)

The cost of project activities would be US \$ 40.3 million and the project management cost US \$ 4.0 million. Estimated total cost of the proposed project including the project management cost would be US \$ 44.3 million. Required funds will be obtained through domestic (D, 16.3 million) and international (I, 28.0 million) sources as indicated in the budget estimate.

### **3.2.10 Measurement/Evaluation**

Project specific Logical Framework Matrix (LFM) and Performance Measurement Framework (PMF) will be carried out for monitoring and evaluation of progress of implementation, during the course of the project. This will help to identify problems and to provide solutions to rectify such problems during the implementation phase. A scheduled internal monitoring programme (quarterly) and periodic external evaluation (biannually and mid-term) will be implemented. Quarterly internal monitoring will be carried out by the planning unit of the Ministry of Agrarian Services and Wildlife Conservation. For this purpose indicators at different stages of the project will be monitored and evaluated. External evaluation will be carried out by an independent panel of experts appointed by the line ministry in consultation with the donor agency (Ministry of Agrarian Services and Wildlife Conservation). End of project result evaluation will also be carried out by an independent team appointed by the line Ministry and it will be incorporated to the Project Completion Report.

### **3.2.11 Possible Complications/Challenges**

Potential challenges for achieving project targets are lack of a national water policy for the country, political intervention in decision making, poor enforcement of environmental policies/rules, lack of regular water quality monitoring programmes, absence of principles for sharing water between the upper and lower riparian as well as between drinking and irrigation purposes, allocation of water by large water users to themselves regardless of the needs of others and high cost of heavy machinery and equipment required for heavy rehabilitation processes. Another challenge is that reason(s) for prevailing kidney diseases reported in Anuradhapura, Polonnaruwa etc. are not yet confirmed.

### **3.2.12 Responsibilities and Coordination**

The implementing agency will be the Ministry of Agrarian Services and Wildlife Conservation (M/AS&WC). Implementation of the project requires the support and collaboration from M/Local Government and Provincials, M/Health, M/ Finance and Planning, M/ Fisheries and Aquatic Resources, M/Science & Technology, M/Environment (Climate Change Secretariat), Dept. of Agrarian Development, Provincial Councils, Dept. of Health, NWSDB, local and international NGOs, private sector institutions, Farmer organizations, Cascade Management Teams, Inland fisher communities, Universities, Research Institutes,

A Project steering committee appointed by the M/AS&WC will carry out project coordination and monitoring on bi-annual basis.

### 3.2.13 List of References

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2. Ariyabandu Rajindra De S and Aheeyar M.M.M., Secure Water Through Demand Responsive Approaches-The Sri Lankan Experience, ISBN 0 85003 7271, Overseas Development Institute, 2004
3. Dayaratne M.H.S.,A Review of Alternative Strategies for Improving Farmer-Managed Irrigation Systems in Sri Lanka IIMI Country Paper-Sri Lanka-No.7 ,1991
4. Impact of Climate Change on Agriculture in Sri Lanka, C. Shanthi de Silva, 2012, <http://climatenet.blogspot.com/2012/09/impact-of-climate-change-on-agriculture.html>
5. Krishnaveni M, Sankari Silva, Rajeswari A, Rehabilitation of Irrigation Tank Cascade System Using Remote Sensing GIS and GPS, International Journal of Engineering Science and Technology (IJEST)ISSN : 0975-5462, 2011, p.1624
6. Mahinda Chinthanaya - The Department of National Planning; 2010
7. Sri Lanka's second national communication on climate change, Ministry of Environment, 2011

### 3.3 Project Idea for Technology 2: Rainwater harvesting from rooftops for drinking and household uses

#### Project Idea:

*Promote roof top rainwater harvesting technology, as an adaptation measure for climate change*

#### 3.3.1 Introduction/Background

This project idea was developed by considering the most important actions identified under the Technology 2-Rainwater harvesting from rooftops for drinking and household uses.

According to climate change projections, water scarcity will be a problem in the dry zone because this region will be more vulnerable to droughts. Quality of ground water in certain areas in the dry zone is poor. In addition to that certain coastal areas in the dry zone, surface and ground water will be affected by sea level rise. Another problem caused by climate change is flash-floods due to heavy rains within a short period. The Colombo Metropolitan Area (CMA) is one of the Sri Lanka's urban areas most exposed to flash-floods due to climatic and non-climatic factors. Promoting roof top rainwater harvesting technology giving special attention on Quality controlling of the rainwater harvesting system is an adaptation strategy