

3.4.12 Responsibilities and Coordination

The implementing agency of the proposed project will be the M/Irrigation and Water Resources Management. Implementation of the project requires the support and collaboration from M/ of Water Supply and Drainage, M/ Finance and Planning, M/Environment and Natural Resources, Climate Change Secretariat, NWSDB, WRB, Central Bank, Treasury, Private sector, Registered organizations as tube well constructors, Dept. of Health. A Project steering committee appointed by the M/Irrigation and Water Resources Management will also carry out project coordination and monitoring on bi-annual basis.

3.4.13 List of References

1. Annual Report (2011), Central Bank of Sri Lanka
2. Ferdinando D.N.J., Accelerated Groundwater Development for Rural Water Supplies in Sri Lanka, 6th Rural Water Supply Network Forum, Uganda, <http://rwsnforum.files.wordpress.com/2011/11/169-ferdinando-sri-lanka-short-paper.pdf>, 2011
3. Ferdinando D.N.J., Rural Water Supply in the 21st Century: Myths of the Past, Visions for the Future, <http://rwsnforum.files.wordpress.com/2011/11/169-ferdinando-sri-lanka-short-paper.pdf>, 2011
4. <http://www.ecapra.org/sri-lanka>
5. http://www.mwsd.gov.lk/sub_pgs/Performance2011_English.pdf; PERFORMANCE REPORT – 2011, Ministry of Water Supply and Drainage
6. Solutions for issues in construction of borehole wells in Sri Lanka: A hydrogeological and economic approach; Shanuka Palamure *et al.*, 2012

3.5 Project Idea developed by combination of all three technologies

Improve availability of drinking and irrigation water for the dry zone of Sri Lanka as an adaptation measure for climate change

3.5.1 Introduction/Background

According to climate change projections, dry zone of the Sri Lanka will be vulnerable to extended droughts, and as a result people in the dry zone will face problem of water scarcity. Therefore this project idea was developed in order to improve availability of drinking and irrigation water to the dry zone as an adaptation method by giving special attention on water conservation, water management, maintenance of the water

Quality and water Recycling for productive use. The three technologies described in the previous sections were included as sub projects under this project idea and therefore water sources will be rainwater and ground water. The three subprojects are rehabilitation/restoration of 10 minor tank network (cascade) systems to provide water for agricultural purposes, installment of quality controlled 100 roof top rain water harvesting systems and 25 bore holes especially for drinking and household purposes as in houses, temples, hospitals, schools, hotels etc.

This proposed project will be implemented at suitable sites in the North Central Province. Restoration/Rehabilitation of Minor Tank net works is an adaptation strategy for water conservation for droughts, control and capture of storm water to mitigate flooding and recharge of groundwater. Past experiences have shown that single tank rehabilitation approach is a failure and therefore, rehabilitation of the whole cascade system including the watershed area is proposed⁽¹⁾A survey will be carried out in a scientific manner for identification of cascade systems/minor tanks which need restoration/rehabilitation. For this purpose, data on vulnerability to impacts of climate change, hydrology of the cascade systems, major rehabilitation work, number of beneficiaries from each tank, relocation needs, and amounts of funds available etc will be collected. Rehabilitation work normally involves breach closing, tank bund strengthening, aquatic weeds control and repairs or reconstruction to sluices and weirs etc. in a regular basis.

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 active Farmer Organisations (FOs) based mechanisms will be a good way to maintain sustainability of minor tank systems. At present farmers participation in FO activities is poor and this due to many reasons. Women's participation in FOs is low and even when women attend for FO meetings, their participation is limited to listening only⁽²⁾. FOs needs a lot of capacity building in technical and institutional issues to sustain the minor tank network systems. For this purpose, strong linkages between FOs and Dept. of Agrarian Development and Provincial Councils need to be established. It is essential to implement steps to build capacity of Department of Agrarian Development provincial councils, Department of Health, Farmer Organisations and Cascade Management Teams in order to maximize the efficiency and effectiveness of restoration/rehabilitation/maintenance programmes. Under this, intensive training is needed to relevant officers of Department of Agrarian Development and provincial councils about their roles and functions with respect to farmer organizations and joint management committees, and also about the rights and responsibilities of the FOs. Monitoring of water quality of the tanks selected, health conditions of people consuming water from above tanks will be carried out. It is necessary to study whether there is a relationship between the above two in order to find a solution for prevailing health problems in certain areas in the dry zone.

Use of roof top rainwater harvesting systems is an adaptation strategy through rain water conservation and mitigating flash-floods by capturing storm water. It serves also as a method for groundwater recharge. In Sri Lanka, the demand for roof top rainwater harvesting technology is poor. Quite often water quality in storage tanks is poor due to formation of mosquito breeding sites, presence of *E Coli*, leaves and other debris and use of inappropriate roof materials by technology users. Therefore quality controlling of the rooftop rain water harvesting system is necessary. It is also necessary to explore possibility of applying German standards directly or to modify the German standards according to Sri Lanka's requirements. Training and awareness should be provided on good operation and management practices of RWH systems. By introducing subsidy schemes for storage tanks and water quality analytical services for harvested rain water, offering a tax incentive for individuals and businesses interested in installing rainwater harvesting systems and providing health condition monitoring service for persons who consume harvested rain water it is possible to promote use of roof top rainwater harvesting systems. Necessary data (results of climate change modeling, needs, rainfall, quality of rain water and air, urgency etc.) will be collected to identify suitable areas in the North Central Province to implement this technology. Steps will be implemented to build capacity and awareness of Health Department, NWSDB and general public. Inefficient enforcement of National rainwater policy is also a problem and strict enforcement of this policy is required.

Borehole technology for abstraction of ground water for domestic purposes is an adaptation strategy for surface water scarcity as it provides an alternative source for water. This method can be used if surface water is not available or not sufficient or have a bad quality. Most of the boreholes in the country have become failures and therefore to promote the sustainability of boreholes it is necessary to identify areas where suitable hydro-geological conditions are available and quality of ground water is good. Therefore technical assistance will be provided to select sites having suitable hydro-geological conditions. Arrangements will be made to offer a certificate by NWSDB/WRB, on construction of successful boreholes, so that qualified borehole constructing organizations will be available in the country. In order to maintain sustainability of ground water resource and to prevent over extraction it is necessary to provide guide lines pertaining to use of ground water resources in the country. In order to create awareness on sustainable use of ground water it is necessary to conduct awareness programmes annually and also publish guide books (in Sinhala/English/Tamil), leaflets, posters etc. Lack of /insufficient capacity (e.g. lack of trained mechanic for maintenance work, lack of capacity of NWSDB to drill tube wells in sufficient numbers due to old and unserviceable equipment) of relevant institutions/organisations is also a current problem. Private entities who engage in well drilling are small and not capable of undertaking major programmes. Therefore it is necessary to build capacity of NWSDB and WRB to offer an efficient service pertaining to this project. Providing adequate funds is necessary to maximize the output of this project as cost of implementation of this project is high due to high costs of equipment required and construction and repairing of hand pumps which are non functional. It is important to provide financial incentives through loan schemes/import tax reliefs to tube well constructors. Another problem is that, lack of/insufficient R & D pertaining to ground

water. e.g. regular monitoring of changes in ground water availability/changes in water table/ water quality. Lack of/insufficient R & D to identify exact reason(s) for Chronic kidney disease in the North Central Province and to develop a low-cost water treatment procedure are other important problems which need to be addressed. Targeting above, and many other important matters, it is necessary to promote R & D with respect to Ground water.

3.5.2 Objectives

The main objective of this project is to provide water throughout/most of the year (100%), in the North Central Province in the dry zone for agricultural and drinking purposes through properly maintained ten minor tank network systems, 100 quality controlled roof top rain water harvesting systems and 25 sustainable boreholes.

3.5.3 Outputs of the Proposed Project

- Availability of the following lists for the North Central Province.
 - Minor tank network systems (cascade systems) which need rehabilitation/restoration and availability of relevant data bank
 - Areas for installation of roof top rainwater harvesting systems and boreholes and availability of relevant data banks
- Increased awareness and Capacity of Department of Agrarian Development, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams, WRB, NWSDB to maximize the efficiency and effectiveness of the project.
- Well maintained 10 minor tank networks (cascades) selected, 100 Quality controlled RWH systems and 25 boreholes in the North Central Province
- Accepted standards and an annual license system for roof top rainwater harvesting systems and boreholes in Sri Lanka and guidelines for safe and sustainable use of groundwater
- A method to register consumers of roof top rainwater systems and boreholes at NWSDB/WRB
- Awareness programmes for consumers on good operation and management practices
- Mitigate flash-floods by 45 % and reduce water supply costs by 50%.
- A certificate course on construction of successful boreholes offered by NWSDB/WRB and as a result, availability of a list of qualified borehole constructing organizations registered at WRB/NWSDB.

3.5.4 Relationship to the country's sustainable development priorities

Importance of restoration/rehabilitation of minor tank systems and importance of providing safe water have been recognized in *Mahinda Chinthanaya* – 'Vision for the New Future' the Government of Sri Lanka's Ten Year Development Policy Framework^(4,5). It is reported that 1000 minor tanks will be rehabilitated every year from 2010 at an annual estimated cost of Rs. 500 M. It is also expected to increase safe water coverage by 100% of the population by the year 2020. The Ministry of Water Supply and Drainage, has assigned high priority for the formulation of policies and programme for Rain Water Harvesting and has received Rs.5 Million through 2011 budget to implement a roof top rain water Harvesting Project. Considering the country's water resources, it is now recognized that, the rural water supplies will have to depend mainly on the groundwater source. Thus, the proposed project contributes to national strategy of providing water to the dry zone by restoration/rehabilitation of minor tanks.

3.5.5 Project Deliverables

- Availability of water, social development, economic wellbeing and environmental sustainability of selected areas in the North Central Province
- A detailed report on success of the project, by end of year 10.
- A list of minor tank networks (cascades) in the North Central Province in which need restoration/rehabilitation and a publicly available list of areas for installation of RWH systems and boreholes in the same districts and data banks/website providing relevant updated data
- 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, construction work related to rooftop rain water harvesting systems and boreholes etc. and food security of farmer families
- Reduction of GHG emissions
- Ground water recharge
- Convenience for women by having water for drinking and cooking at the doorstep, at least for part of the year
- Increase in employment opportunities by 6%

3.5.6 Project Scope and Possible Implementation

The project will produce ten well maintained minor tank network (cascade) systems, 100 quality controlled rooftop rainwater harvesting systems and 25 sustainable boreholes in the North Central Province and the project implemented can be adapted to other areas facing water scarcity and also for other relevant national programmes. The data bank/website can be updated with new data. The project will be

sustainable because of good operation and management practices, availability of standards for roof top rainwater harvesting systems, availability of guidelines for ground water extraction and also due to the priority given by the government.

3.5.7 Project activities

1. **Carry out a survey to collect data** on the following.
 - Urgency and results of Climate change modeling etc., needs, number of beneficiaries in vulnerable areas
 - 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.
 - Amount of rainfall during the past few years, quality of rain water, roof top material etc. in order to identify suitable sites for rooftop rainwater harvesting systems
 - Hydrogeology of the sites, quality of ground water and demand etc. in order to identify suitable sites for boreholes
2. **Increase awareness and build Capacity** - of Department of Agrarian Development, Provincial councils and Health Department, Farmer Organisations and Cascade Management Teams, WRB/NWSDB, consumers
3. **Introduction of standards/Annual license/Guidelines** - Formulate standards and an annual license system for roof top rainwater harvesting systems and annual license for boreholes, guidelines for safe and sustainable use of groundwater
4. **Awareness programmes** - for consumers on good operation and management practices
5. **Strict enforcement of policies/mechanisms** - Strict enforcement of rainwater harvesting policy, mechanism to prevent/minimize ground water pollution
6. **Introduction of strategies to promote the three sub projects** - Introduce alternative employments for extended dry seasons and introduce an awards system for Farmer Organisations and Cascade Management Teams showing best tank management practices, Provide necessary equipment at a concessionary rate/ Provide incentives for installation of rooftop rain water harvesting systems and boreholes.
7. **Introduction of a certificate course** on construction of successful boreholes offered by NWSDB/WRB
8. **Introduction of suitable technologies for ground water recharge**
9. **Strengthen the coordination among relevant institutions** – e.g. Develop a collaborative mechanism between Department of Agrarian Development and Provincial Councils pertaining for restoration/rehabilitation work.
10. **Establish a sound maintenance system** for 10 minor tank network (cascade) systems, 100 quality controlled RWH systems and 25 boreholes in the North Central Province.

11. Promote R &D for further improvement of the project
12. Project Management

3.5.8 Timelines for the proposed activities

Table 3.8: Proposed Timelines for Implementation of Proposed Activities

Activity	Year									
	1	2	3	4	5	6	7	8	8	10
1. Carryout a survey to collect necessary data in order to identify suitable areas/sites										
2. Increase awareness and build Capacity of relevant parties										
3. Introduction of standards/ Annual license/ Guidelines										
4. Awareness programmes for consumers										
5. Strict enforcement of policies/mechanisms										
6. Introduction of strategies to promote the sub projects identified										
7. Introduction of a certificate course on construction of successful boreholes										
8. Introduction of suitable technologies for ground water recharge										
9. Strengthen coordination among relevant institutions										
10. Establish a sound maintenance system for 10 minor tank network systems, 100 quality controlled RWH systems and 25 boreholes										
11. Promote R & D										
12. Project Management										

3.5.9 Budget/Resource requirements

Table 3.9: Approximate Budget Estimate for the Proposed Project

Activity/Sub Activity	Budget (US\$) 000'
1. Carryout a survey to collect necessary data in order to identify suitable areas/sites.	5,000 (I)
2. Increase awareness and build Capacity of relevant parties	5,000 (I)
3. Introduction of standards/ Annual license/ Guidelines	1,200 (D)
4. Awareness programmes for consumers	3,000 (D)
5. Strict enforcement of policies/mechanisms	1,000 (D)
6. Introduction of strategies to promote the sub projects identified	2,000 (D)
7. A certificate course on construction of successful boreholes	4,000 (D)
8. Introduce suitable technologies for ground water recharge	2,000 (D)
9. Improve coordination among relevant institutions	2,000 (D)
10. Well maintained 10 minor tank network systems, 100 quality controlled RWH systems and 25 boreholes	30,000 (I)
11. Promote R & D	10,000 (I)
Subtotal: Cost of project activities	65,200
12. Project Management	6,000 (D)
Total cost (Approximately)	71.2 M

The cost of project activities would be US \$ 65.2 million and the project management cost US \$ 6.0 million. Estimated total cost of the proposed project including the project management cost would be US \$ 71.2 million. Required funds will be obtained through domestic (D, 21.2 million) and international (I, 50.0 million) sources as indicated in the budget estimate.

3.5.10 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) would be implemented. Quarterly internal monitoring will be carried out jointly by Ministry of Agrarian Services and Wildlife Conservation, Ministry of Irrigation and Water Resources Management and Ministry of Water Supply and Drainage. 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 line ministries (Ministry of Agrarian Services and Wildlife Conservation, Ministry of Irrigation and Water Resources Management and Ministry of Water Supply and Drainage) in consultation with the donor agency. End of project result evaluation will also be carried out by an independent team appointed by line ministries and it will be incorporated to the Project Completion Report.

3.5.11 Possible Complications/Challenges

Potential challenges for achieving targets of rehabilitation/restoration of minor tank net work (cascade) systems 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 are not yet confirmed.

Potential challenges for achieving targets of installation of roof top rain water harvesting systems are high cost for storage tanks, maintenance, pump, pressure controller and fittings and plumber's labour. Another disadvantage is the limited supply and uncertainty of rainfall. The first rain drains the dust, bird droppings, leaves, etc. which is found on the roof surface and it may contaminate harvested rain water result in health risks. Other disadvantages include low storage capacity which will limit rainwater harvesting, whereas, increasing the storage capacity will add to the construction and operating costs making the technology less economically feasible. Leakages from cisterns can cause deterioration of load-bearing slopes.

Potential challenge for achieving targets of installation of boreholes is poor quality of groundwater in certain areas is a limiting factor for implementation of this project. For example, about 40 % of tube wells constructed in the last decade have been abandoned due to contamination with iron, manganese and fluoride ions, salt water intrusion etc. Type of bed rock is also a limiting factor when selecting suitable sites for installation of boreholes.

3.5.12 Responsibilities and Coordination

The proposed project will be implemented jointly by Ministry of Agrarian Services and Wildlife Conservation, Ministry of Irrigation and Water Resources Management and Ministry of Water Supply and Drainage. 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, WRB, Medical Officers of Health, local and international NGOs,

private sector institutions, Farmer organizations, Cascade Management Teams, Urban Development Authority, CEA, Lanka Rain water Harvesting Forum, Inland fisher communities, Universities, Research Institutes, Central Bank, Treasury, Private sector, Registered organizations as tube well constructors, A Project steering committee appointed jointly by line ministries (Ministry of Agrarian Services and Wildlife Conservation, Ministry of Irrigation and Water Resources Management and Ministry of Water Supply and Drainage) will carry out project coordination and monitoring on bi-annual basis.

3.5.12 List of References

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2. National Conference on Water, Food Security and Climate Change in Sri Lanka-Volume 3. Policies, Institutions and Data Needs for Water Management, Volume 3, K.Jinapala, Sanjiv De Silva and M.M.M. Aheeyar, editors; June 2009
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