

# **IMPROVING WATER SECURITY IN THE SOUTHERN PROVINCE AFFECTED BY TSUNAMI THROUGH DOMESTIC RAINWATER HARVESTING SYSTEMS**

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## ***Introduction***

The Tsunami wave on the 26<sup>th</sup> December 2004 claimed estimated 35 thousand Sri Lankan lives and 1.5 million (7.5% of the population) were made homeless around the coast areas in the north, east and south of Sri Lanka. Given the scale of this disaster, there is a compelling need for an extraordinary operation of relief and reconstruction. The government of Sri Lanka was faced with the massive task of rehabilitating the Tsunami affected and reconstructing the areas of Tsunami disaster.

In order to bring the situation back to normal, a number of development programs have to be implemented in the area. Providing water and sanitation facilities would be one of key areas in the development agenda as it is the most basic needs of human beings. However, water scarcity is a major constraint in ensuring the domestic water needs, as the current sources are already over exploited or contaminated. Sea water intrusion has made the present sources unusable. Therefore, people living in these areas are facing serious problems in getting adequate quantity of safe water for their domestic use, in particular for drinking and cooking.

In such a crisis situations, one of the best options is to promote the use of rainwater collected from rooftops. At the time of reconstruction of houses destroyed by the disaster, proper promotion of rainwater harvesting technology will improve the long term availability of water resources, thus reducing the water scarcity. Households will be provided with a safe and reliable water supply on a daily basis as well as in time of emergency.

## ***Methodology***

### *Assessment survey*

The survey was conducted in Galle, Matara and Hambantota district to identify the potential and feasibility of incorporating rain water harvesting systems for domestic water supply in tsunami affected areas. The following information in the 3 district were collected by review of existing literature in both printed and electronic media, interview with central and local authorities, interviews with NGOs concerned and other international organizations implementing water and sanitation programs, on-site visits of the villages of the proposed project area, interviews of key persons and focus group discussions. This includes

- available statistics on populations, housing, water supply and health
- Topographical, geological and hydrological maps as well as hydro-geological, geophysical and rainfall data.
- Assessment of the general rural water supply bottlenecks by Division
- Identification of potential and definitive project locations

### ***Identification of potential and definitive project locations***

Potential project locations were identified by first identifying the list of on going approved housing projects in the 3 districts. Then these sites were visited to assess the water needs, site layout, number of houses, house size, list of beneficiaries and funders. The beneficiaries and funders were contacted where possible to obtain the above information and also to obtain the felt needs and acceptance of rain water systems for drinking purposes. Number of meeting were held with District Secretariat staff, Divisional Secretariat staff, Ministry of Urban Development and Water Supply Staff, National Water Supply & Drainage Board head office staff, District office staff, Divisional office staff, Non government organization involved in housing, water supply and sanitation, householders and villages.

A list of potential sites and locations for implementing rain water harvesting units were prepared.

Table 1: List of number of households identified in the 3 district

<b>District</b>	<b>Division</b>	<b>Number of beneficiary Households</b>
Galle	Bentota, Ambalangoda, Habaraduwa, Hikkaduwa, Balapitiya	1188
Matara	Devinuwara, Dickwella, Matara, Weligama	588
Hambantota	Hambantota, Tangalle, Ambalantota, Tissamaharama	1560

***Assessment of the adequacy of the technical options under consideration for each proposed project location***

Most important component of a rainwater harvesting system is the collector and the storage tank. The mode of collection among other things needs considerable attention. When rainwater is collected for domestic use and when rooftops are used as catchments, amounts collected are restricted and storage is often confined to tanks. The sizes of the tanks suited to individual conditions and requirements need to be evaluated and the temporal changes of the demand for water should also be taken into consideration. Further, the design should differ from location to location according to the length of the dry period and the rainfall pattern of a given locality needs be included in the calculation of the water collection

First step to designing RWH system will be to size the water tank correctly to give adequate storage capacity. The storage requirement will be determined by a number of interrelated factors. They include:

- local rainfall data and weather patterns
- size of roof (or other) collection area
- runoff coefficient (this varies between 0.5 and 0.9 depending on roof material and slope)
- user numbers and consumption rates

Storage requirement was calculated using the supply side approach which uses rainfall and catchment area to calculate the storage size. For this purpose the Rain water performance calculator program developed by Warwick University UK (<http://www.eng.warwick.ac.uk/DTU/pubs/rwhabs/rnrwh04.html>) on the web is used. Monthly Rain fall data of 10 years from each district is fed into the program and tank performance calculation results were obtained for different capacity storage tanks with 50 m<sup>2</sup> roof catchments area and daily nominal demand of 100 liters.

From the data submitted, the programme calculates three performance measures ('reliability', 'satisfaction' and 'efficiency') for each of three tank sizes.

Performance measure for different tank sizes for each district were calculated keeping a constant roof size of 50 m<sup>2</sup> and daily demand of 100 liters. The average roof size of newly constructed houses is 50 m<sup>2</sup>

The daily minimum requirement for water per person is estimated at 20 liters. Therefore for a average family of 5 the daily requirement of water is 100 liters.

Based on these estimates the following tank Performance calculations were made for each district ( Table 2)

Table 2 of Summary of performance calculation for Different size tank in the 3 districts

District	Tank Volume	Reliability	Satisfaction	Efficiency
Galle	3000	<b>92%</b>	<b>93%</b>	<b>36%</b>
	5000	95%	96%	37%
	8000	98%	98%	38%
Matara	3000	78%	80%	49%
	5000	<b>85%</b>	<b>86%</b>	<b>52%</b>
	8000	90%	91%	55%
Hambantota	5000	73%	75%	62%
	8000	<b>80%</b>	<b>82%</b>	<b>68%</b>
	10,000	84%	85%	71%

Based on the above results of tank performance for different district the recommended size of tank for each district are:

Galle district: 3,000-5,000 liters

Matara district: 5,000 liters

Hambantota district: 8000- 10000 liters

## ***Results***

### **Galle district**

In Galle district nearly 60 percent of households drink water from protected wells and 19.3 percent use piped water, another 14 percent drink water from unprotected wells. Nearly 3 percent uses river/ tank/ stream etc for drinking water.

About 4% of housing stock in Galle was affected (11,500 houses were fully or partially destroyed) by the tsunami . The effects of the tsunami on the existing water supply schemes have been restricted to the distribution networks adjacent to the shoreline. However, extensive damage and salinization is reported in many of the well water around the coast.

Galle district has a high annual rain fall of 2400 mm is categorized into Low country wet zone. The main rain fall period is from May to June north east monsoon and September to December from South west monsoon.

### **Matara district**

Water supply coverage at Matara district in 2001 is 29.2 % by pipe water supply, 48.3% by protected wells, 12.0% by unprotected wells, 4.8% by rivers and streams and 5.7% by other means.

Matara fall into the category of low country intermediate zone. The rainfall range from 1100-1400 mm. The main rain fall period is from May to September from South west monsoon and the rest from inter-monsoons from March to April. Meteorological data from 1961 shows a lowest rain fall 1176.2 mm from Kakanadure and highest rainfall recorded of 3919.7 mm from Anilkanda in Deniyaya area.( Table 3 )

Table 3 Rainfall data of some locations in Matara district

Station	1961-1990 Average	2001	2002
Anilkanda	3919.7 mm	2839.1 mm	2705.4 mm
Mapalana	2441.4 mm	1606.5 mm	1824.2 mm
Kakanadure	1633.3 mm	1176.2 mm	2705.4 mm
Mawarala	3173.0 mm	2830.2 mm	3629.9 mm

Source: Meteorological Department

### **Hambantota District**

Hambantota District lacks good surface water resources. Kirindi Oya and Malala Oya are the only two large river basins in the District. However, these are also considered dry river basins with demand overriding supply.

Physical damage to the existing water and sanitation facilities occurred primarily in areas adjacent to the shoreline.

Most of the ground water source in Hambantota is saline, has high mineral content or contaminated,

Hambantota fall into the category of low country dry zone. The rainfall range from <650 mm and is one of the driest areas in Sri Lanka. The main rain fall period is from October to December from SW monsoon and May to April from NE monsoon.

### ***Identified problems of water supply to tsunami reconstructed houses***

1. Ground water sources can not be used due to Salinisation of wells
2. No water supply in relocated houses, since they are build in new lands
3. Delays in construction of Water supply schemes
4. In frequent and reduction of bowser water supplies
5. Drying up of ground water sources
6. Pipe water supply is not reliable and costly

### ***Project Experience***

The project approach utilizes a participatory methodology to ensure the active involvement of government and non- government local partner organizations, CBOs, and beneficiaries in all important aspects of the project cycle. In each stage, women's participation and their involvement in decision making was given due consideration.

Introduction of rain water harvesting systems to tsunami houses brought mixed feeling in the community. At first it was viewed with suspicion and skepticism. The first village selected for implementation of the project was Godagama in Hikkaduwa divisional Secretariat, Galle District, since there was enthusiasm from the community and support from the village temple.

Initially there were 20 requests from this village and project started construction of rain water harvesting systems in 10 of these households. Masons from the village were also selected for training on construction of the tanks.

At the end of 6 months since the start of the project 57 rainwater harvesting systems have been constructed in this village ( 450 in the district). The first 40 tanks were ceremoniously handed over to the beneficiaries by the Minister for Urban Development and Water Supply Hon. Dinesh Gunawardena and other dignitaries on the 29<sup>th</sup> of March 2006.



Fig:1 Hon. Dinesh Gunawardena , Minister for urban Development and Water Supply at the ceremony to hand over the first 40 tanks to the beneficiaries at Godagama



Fig: 2: Rain water tanks at Addunkele, Habaraduwa

### ***Identified benefit to the community***

1. Easy access to clean drinking water
2. Less time spend on collecting water
3. Skilled enhancement in the village
4. Less reliance on external water providers
5. More water security at household level.
6. Better Sanitation practice due to more water available.

### ***Recommendation and Conclusion***

All houses should have a rain water harvesting systems, specially in tsunami areas due to the scarcity of existing water sources. This would supplement other sources whether it is pipe water, wells or other sources. It will create less pressure on pipe water system enabling the authorities to provide coverage to more householders at the same time reduction in cost of treatment.

At household level having a rain water systems means less reliance on others for water supply and saving on water bills, time spend on getting water, more water security, and cleaner water for drinking in some instances.

However, in order to ensure that good quality rain water is collected and used all households has be trained on operation and maintenance of the system. Quality of rainwater should be popularized therefore more people will use for drinking, specially in areas where other sources are contaminated or mineralized. Simple water treatment such as boiling and Solar water disinfection methods should be introduced for drinking water treatment. Households should be provided with simple low cost water quality testing kits so they themselves can monitor the quality and make improvements. Excess rain water should be used for recharging and improving the quality of ground water table. This will improved salinity levels in the wells.