

RAIN WATER HARVESTING FOR URBAN BUILDINGS IN SRI LANKA

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Introduction

In Sri Lanka increasing population has imposed a considerable strains on the water resources and the urban authorities find it extremely difficult to expand their water supply schemes not only due to financial constraints but also due to limited water resources.

The National Water Supply and Drainage Board (NWSDB), the public body responsible for water supply and sanitation facilities categorizes water supply schemes as urban and rural. Water supply schemes having 1,000 or more service connections are termed urban water supply schemes¹. The urban population of Sri Lanka is presently 31 % of the total population of 19.0 millions², which amount to 5.9 million people and expected to increase more with increasing urbanization. It is predicted in the year 2025, that 60 % of Sri Lanka's population of 23 million will be in urban areas.

The approaches used in developed countries, where universal access to piped water at a high service level is the norm, are generally less appropriate in urban areas in developing countries. Urban water supply in developing countries is usually more complex, with a variety of different sources used by the population with cost and quantities available and quality of water. Different sources of water supply to urban area in Sri Lanka are by piped systems or protected public shallow and deep wells. However, it is recognized that wells in urban areas may not be suitable in the long term due to increasing risk of contamination by wastewater from septic tanks and leaching pits. Pipe water supply too is not continuous in most areas. At present the average duration of water availability per day is 21 hours in the Colombo municipality, 20 hours per day in other municipalities, 14 hours per other area.

Pipe born water also couldn't supply to the expanding population in urban area due to rising cost of production, depletion of resources because of over utilization & delivery losses. The total treated water produced by Sri Lanka's

¹ (Premanath K.L.L.), Concepts and strategies of rural water supply & sanitation

² (Sri Lanka Water Vision 2025)

urban water supply schemes averages about 24 million m³/month or 789,000 m³/day. The present cost to provide one unit (1000 liters) of treated water is about Rs. 21.00, but only a average Rs. 6.50 is charged per unit from the consumer for the first 20 to 25 units³.

At the present rate of consumption, domestic and other need of the population cannot be met with the current supply level. Hence, there is an urgent need to consider alternatives with a view to reduction of water bills through government subsidiary by minimizing usage of treated water to satisfy the water requirement of the people.

Sri Lanka gets an annual average rainfall of 2000 mm, ranging from 900 mm to 6000 mm in different regions. Rain Water Harvesting or 'Roof Water Harvesting' (RWH) techniques successfully used in rural areas offer much hope in supplementing the conventional sources of water supply. Rainwater harvesting has brought much relief during times of drought, water scarcity and recently in areas effected by tsunami for many people living in rural areas of Sri Lanka. At present , more than 21,000 rain water harvesting systems are in operation throughout the country. Rain water harvesting in urban areas has many functions. It can supplement the pipe water system for non- drinking purposes, thus reducing the cost of treatment, introduce conservation of pipe water; and/ also reduce flooding in some cities.

Rain water usage in urban areas

- ④ Supplementary source in households for toilet flushing, gardening, washing, laundry ect
- ④ Factories where there is large use of water and have large roof area.
- ④ As emergency water in fire fighting
- ④ Reduce flooding and storm drainage which is experience by many cities due to increased paved and concrete areas preventing rainwater permeating underground.
- ④ Rain water can also be directed to recharge the aquifer thus increasing the depleted ground water table.

Case studies

Rain water harvesting technology in Sri Lanka has been catering mainly to rural areas where the water scarcity is more severe. However, there is some example of industries, campus and public building who adopted rain water harvesting and benefited.

³ (Domestic water supply 22 March 2001., The Letter of Government)

Millennium Information Technology Ltd, Malabe

Millennium City, Malabe, is a soft ware company which has incorporated rain water harvesting system in their office complex. The site is about 40 Km from Colombo city. It is 120,000 m² building complex situated in a 6.5 ha sloping site. At present about 300 workers occupy the complex. Has a daily demand of 150 m³, including swimming pool and gardening. The maximum number of people at the complex is expected to increase to 600 workers and daily demand to 195 m³ (table 1). The site is connected to the National water Supply & Drainage board pipe water network, therefore provide fro drinking, showers and the swimming pool, which amount to 25% of its daily demand. The balance 75% demand is met by rain water harvesting and waste water recycling.

Rain water is collected from the roof areas of major building which amount to 552 m² and stored in 3 ponds of capacity 2, 315 m³. The system is design for 90 dry day period. Rain water ponds are part of the landscape of the complex and harvested rain water reached the pumps and filter system by gravity taking advantage of the topography of the complex. Through a pressurized pump system water is supplied through a dedicated system for use in toilet flushing, gardening and washing.

All black and grey water of the complex is recycled through a network of septic tank, central vertical flow filter and subsequent ponds, which is gravity fed and used fro landscaping and gardening. The balance landscaping need are met by surface run off pond (1450 m³) located at the lowest location of the complex.

Table 1: Demand Composition at Millennium IT Campus		
	Immediate (300 pax)	Future (600 pax)
Water of drinking quality (for washbasins, showers, swimming pool)	40 m ³ /d	69 m ³ /d
Water for toilet flushing – harvested rainwater	22 m ³ /d	38 m ³ /d
Water for landscaping (recycled waste water and stored surface run-off water)	88 m ³ /d	88 m ³ /d
Total demand	150 m³/d	195 m³/d

David Peris Motor Company

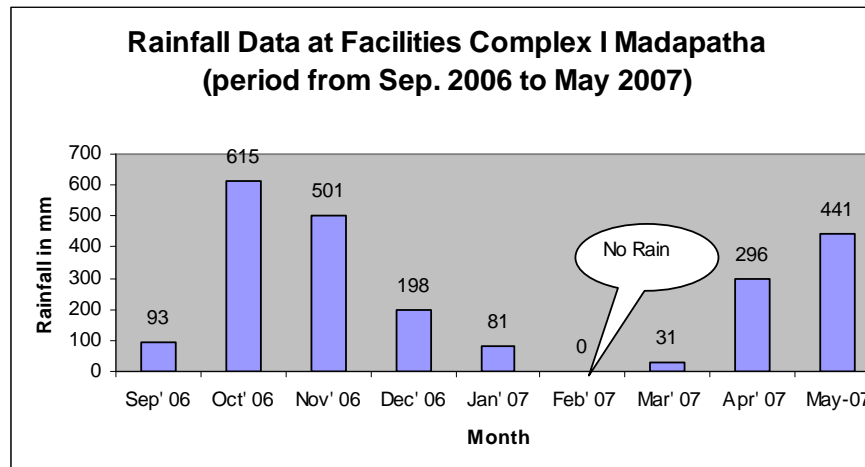
Is a company which imports 3 wheeler (Bajaj) from India and assemble them in Sri Lanka. They have 2 factory complexes located 15 Km from Colombo. They obtain water from NWS&DB and from wells located at the complex. During 3

months of the year from January to March due to low or lack of rain fall they experience sever water shortages (graph 1). This has caused must disruption to their work and hardship for workers due to lack of water showers, washing and toilet use. Therefore, rain water system was designed at both complexes.

The daily demand for water for non drinking purposes is 20 m³ per day and 500 m³ per month at each complex. This demand is met by NWS&DB 2%, tube well 8%, two dug wells 12 and 27% respectively and rain water harvesting 51%.

The rain water is collected from a roof areas of factory and office complex of 5800 m² and ground area of 21,000 m² into two pond of 500 m³ and 275 m³ capacity. Water collected in the ponds are extensively treated through and regularly tested for water quality.

Graph 1



Storage capacity is enough to supply for one month, if recycled it can be used for 2 months. The cost of pipe water is Rs. 42 per m³ , water brought from outside during dry season cost Rs. 250 per m³ rain water cost Rs. 7.25 per m³ . In addition they have no risk of no water.

Economic Benefit of Rainwater Harvesting

Table 2 Economic benefit of rainwater harvesting

Area	Income Group	Average amount of water use per household per month) (m ³)	Average water bill (Rs.)	Feasible amount of Rainwater Collection per month (m ³)	Reduction in water bill per month (Rs.)	% reduction in water bill
Kandy	Low	20	112.5	6	36.00	32
	High	26	257.5	7.8	156.70	60
Negombo	Low	21	132.5	6.3	53.55	40
	High	28	287.5	8.4	177.60	61
Anuradha pura	Low	18	99.5	5.4	30.75	30
	High	26	257.5	7.8	156.70	60

Table 2 shows the result of a study done in 3 urban areas. The rain fall pattern in the 3 districts and monthly water usage, monthly water bills, roof area in low income (Samudhri beneficiary) households and middle income households (monthly income more than Rs. 10,000) were studied. The study indicates that on average in low income households, if 30% of the monthly water requirement was met by rain water then a 34% reduction in water bills can be obtained. In Middle income households, if 30% of the monthly water requirement is met by rain water then the monthly water bill can be reduced by 61% at the present water rates.

Rain Water Policy in Sri Lanka

In 2005 for the first time in Sri Lanka a policy for rain water harvesting was established and approved by the government. The policy objective is to encourage communities to control water near its source by harvesting rain water to improve ground water recharge, encourage urban agriculture, reduce energy consumption and recurrent costs, collect run off for crop production, reduce soil erosion and use for drinking with adequate treatment, and also to minimize the use of treated water for secondary use.

The policy proposed to amend legislation (UDA by Laws) to incorporate rain water harvesting in new construction. The gazette to amend the UDA by laws was presented to parliament by the Hon. Minister for urban Development and passed on the 25th of August 2007. Legislation which follows will make rain water harvesting mandatory in all areas under urban Council, Municipal Jurisdiction with in prescribed time period.

Reference

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