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Rural Water Supply in the 21st Century: Myths of the Past, Visions for the Future

Topic: Groundwater Development

Short Paper

Title: Accelerated Groundwater Development for Rural Water Supplies in Sri Lanka

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Abstract/Summary

The policy guidelines of the Government of Sri Lanka, states that rural water supply coverage needs to increase by 14 percentage points by 2020. Organised and accelerated groundwater development is essential to achieve this target. Technical issues such as needs assessment, equipment requirements, hydro-geological investigations and construction quality need to be addressed. Small rural water supplies are operated by community organisations. They need back-up mechanism to support maintenance. In the Sri Lankan context such support needs to be provided by the National Water Supply & Drainage Board (NWSDB) together with the local authorities. Securing funds for rural water supplies is difficult, so linking rural water supply development with major water supply projects is strategically effective. Poor groundwater quality is an impediment and a new concept of 'water for drinking and cooking' is proposed. To achieve physical progress, coordination/facilitation mechanisms at central and regional level such as the established central and regional working groups are important.

Introduction

Sri Lanka has a population of 20.4 million out of which approx. 70% live in rural areas. The safe drinking water coverage in the country is 81% (NWSDB, 2010). As per the current government policy guideline (MFP, 2010), which may appear to be somewhat ambitious, it is required to achieve 94% safe drinking water coverage by year 2015 and 100% by year 2020. This requires an increase of 14 percentage points in the rural sector and 6% in the urban context. Thus more focus will have to be on rural water supplies. Considering the country's water resources, the rural water supplies will have to rely largely on the groundwater source.

As at present there are approx. 4000 small piped water supplies most of which use groundwater in the form of bore holes/large dug wells as per the data of NWSDB Rural Water Section. These are maintained by community-based organisations. Rest of the rural sector use point sources such as hand pumps and dug wells. For sustainability of community water supplies a 3-tier system consisting of, the community-based organisation for minor maintenance, local authority for medium scale maintenance and the National Water Supply & Drainage Board (NWSDB) for major maintenance, has been established. Often maintenance suffers due to incapacity of community-based organisations and local authorities and also due to lack of funds for major maintenance. These result in groundwater systems failing in terms of quantity, quality and reliability.

NWSDB's capacity to drill water wells in sufficient numbers is limited by old and unserviceable equipment. Of the 39 drill rigs supplied to the NWSDB between 1978 and date, the majority are more than 20 years old and largely beyond economic repair; only four rigs are less than 5 years old. Consequently, break downs are frequent and the output of drilled wells has sharply declined in

recent years. The Water Resources Board (WRB), another state agency, undertakes well drilling though to a lesser extent.

There are a few private entities who engage in well drilling. However they are small and not capable of undertaking major programmes. At times, INGO's undertake rural water supply programs but they too entrust well drilling to NWSDB or WRB. The NGO's however could play an important role in community mobilisation and act as a partner organisation in community water supplies.

Accelerated Groundwater Development

NWSDB together with UNICEF who has considerable involvement in the rural water supply sector recognised the need and launched an accelerated groundwater development program in order to accomplish the required growth. Such a program will have to be sustainable from a technical, organisational and financial point of view. The following considerations/interventions have been made in this regard.

Technical Considerations and Interventions

A programme is underway to survey hand pumps to determine the operational status and identify rehabilitation requirements. Action has been initiated to rehabilitate/repair the hand pumps which are non functional. From 2010 up to date approx. 1000 hand pumps have been rectified.

Studies are being carried out to determine the potential to develop the groundwater source. Such studies have already been done in the Matale District in the Central Province and the districts of Mannar, Jaffna, Mullaitivu in Northern Province and Trincomalee in the Eastern Province. Already 36 production wells have been completed in Mannar, Jaffna, Mullaitivu districts under World Bank assistance. Work is underway in the Trincomalee District and part of Mannar District under AUSAID assistance.

A system is being established to adopt appropriate well designs, standard construction materials, ensure construction quality, and develop guidelines for operation and maintenance of groundwater systems.

As at present, the well design guidelines prepared by the NWSDB's groundwater division are being reviewed. The locally fabricated non-standard PVC well screens are being replaced by factory manufactured standard screens. These are being used now and reported to be giving higher yields. The supervision of well construction work has been strengthened with provision of additional technical staff.

Organisational Considerations and Interventions

As per the three tier system for hand pump maintenance as indicated in Fig.1, the CBO is expected to carry out minor maintenance while maintenance that require the services of a mechanic needs to be obtained from the local authority (tier 2) at cost. Often the local authority would not have a trained mechanic and/or the CBO may not be able to pay for such services. For major maintenance such as well flushing and pump overhaul NWSDB also did not have a regular fund allocation. This had resulted in a highly undesirable situation where approx. 50% of the hand pumps became non-operational.

Table 1 Three-Tier maintenance system

Level	Organisation	Maintenance Role
Tier 3	National Water Supply & Drainage Board	Major hand pump repairs
		Hand pump replacement
		Well flushing
Tier 2	Local Authority	Minor hand pump repairs
Tier 1	CBO	Upkeep of basin
		Local drainage

In order to address this issue, agreement has been reached with the Ministry of Local Government to allocate funds to the local authorities to carry out 2nd tier maintenance in case the CBO's cannot afford such repairs. Further, the government would allocate funds to NWSDB for major maintenance of hand pumps. NWSDB will strengthen its District Rural Water Supply Units to facilitate this work. Already these units have been established in 17 (out of 24) districts. Arrangements have been made to open two new units in the Mannar and Trincomalee Districts.

It is hoped that such an institutional arrangement for hand pump maintenance will be effective and sustainable.

District-wise programs for groundwater development considering the needs of un-served and under-served populations are being drawn up. Regional (provincial) level working groups have been set up for this purpose. The main task of the working groups is to study the respective areas in terms of demography, population densities, available water sources, community needs for improved water services and identify requirements for development of groundwater.

The regional working groups consisting of multi-disciplinary professionals – engineers, hydro-geologists, sociologists, chemists have been established with the exception of Northern and Eastern Provinces. While work is in progress in these working groups, development plans have been drawn up for the districts of Badulla and Moneragala which are severely affected during the drought periods each year.

NWSDB's drilling operations are decentralised to the regions. The central groundwater division provides technical support to the regional operations; undertake development studies and also facilitate special projects. The drilling operations are somewhat hampered due to lack of resources. The resources required by the Central and Regional Groundwater Units have been identified. The old equipment has to be replaced progressively. JICA has consented to provide two new drilling rigs.

Development of groundwater resources involves various governmental and non-governmental agencies and it is necessary to have a sound coordination mechanism. A Ground Water Development Working Group has been set up in NWSDB for this purpose. The working group has representation of UNICEF and other external support agencies such as JICA, World Bank and ADB. In addition, it is intended to include a few active NGO's in the working group.

Financial Considerations and Interventions

Funding for maintenance of rural water/groundwater facilities has always been a concern. While CBO's could generate some funds from the users, in most instances there is a shortfall. In a country where health facilities are provided free of charge, there is a justification for the government to grant

an annual allocation for maintenance of community water supplies. It is expected that government would allocate up to 1% of the capital investment on water supply for maintenance of community water supplies/hand pumps from 2012.

In the country, piped water supply facilities have been provided to all main cities and towns. The present investments are on secondary townships and villages. In the absence of proper plans and funding, some of the sparsely populated typical rural areas are also included in these major projects. Project costs escalate resulting in average investments of Rs. 300,000 (US$ 2720) per beneficiary household. This again is on an optimistic assumption that approx. 80% of the households obtain house connections. Typically it would be much less and the level of investment would increase further. In the last 3 to 4 years with an average investment level of Rs. 30 billion (US$ 270 million), services for only 80,000 new households per annum were provided.

Thus there is a need to implement well planned cost effective water supplies in the rural sector. Localised source/groundwater based water supplies cost approx. Rs. 70,000 (US$ 640) per beneficiary household. However, it is well known that most donors including Exim Banks as well as politicians prefer large scale conventional projects rather than community water supplies. Currently limited funds have been provided by World Bank, JICA and AUSAID for service provision in post-conflict North and East.

In order to overcome the funding constraint for rural water supplies, a decision was made by the NWSDB to allocate 5% of the investments on all future major urban water supply projects to develop rural water supply/sanitation facilities in the respective province/district. This would enable a steady flow of funds for rural water supplies. These monies are to be used for new schemes, rehabilitation/upgrading, rainwater harvesting, sanitation etc. This strategy is expected to change the course of rural water supplies in the country.

Strategy for areas with poor groundwater quality

In Sri Lanka owing to the geology, rainfall patterns and land use, there is considerable variance in the quality of groundwater. Water quality issues include salinity, hardness, certain minerals such as Iron and Manganese, agricultural pollution etc. Often the groundwater source is rejected by users due to these issues.

The North Central Province, a predominant paddy cultivation area, is plagued with chronic kidney disease (CKD). In certain villages 3 to 4% are affected. Chronic kidney disease accounts for approx. 30% of the total mortalities in the Anuradhapura District in N-C Province. Though the exact cause for the disease is not established medical personnel and scientists believe that water plays a definite role. Chronic kidney disease is present in areas where the groundwater is hard and contains high Fluoride. In the same district where the water supply is surface water based, chronic kidney disease is not present. As such, people in these areas are reluctant to consume groundwater. This fear psychosis is spreading to other agricultural areas in the country as well.

Unless a satisfactory solution is found, all efforts to promote groundwater based rural water supplies will be futile. Thus a new strategy where treated water is provided exclusively for drinking and cooking purposes has been developed. A supply of 5 – 6 lpcd is considered adequate. 1 to 2 litres is the norm for drinking and 4 litres for cooking. The groundwater sources such as dug wells, hand pumps will be continued to be used for all other uses such as bathing, washing, toilet flushing.

Under the proposed system, groundwater could be treated using the appropriate advanced treatment technologies such as reverse osmosis or ultra-filtration. It may be noted that small advanced treatment units suitable even for community operation are available and they are not too expensive. Water tankers could be deployed to supply community tanks within a radius of approx. 10 km from the water treatment centre. In the country's typical rural setting one could expect approx. 12 villages having a total population of approx. 7750. The water requirement for drinking

and cooking would be 40 m3/d. Thus considering 20 hours operation a 50 m3/d treatment plant would suffice. The capacities of storage tanks are designed based on filling being carried out twice a month. The capital cost for such a system would be approx. Rs.11,000 (US$ 100) per beneficiary household. The monthly recurrent cost will be within Rs. 300 (US$ 2.7) per household. It is envisaged that this system could work very effectively, as indicated by the example below.

This concept was tested in a chronic kidney disease affected village named Billewa in the Anuradhapura District in March 2011 as a World Water Day event. The village was provided with 50 nos. 1000 litres storage tanks, one tank to be shared by 3 houses. Each house was given two 10 litre containers. They are expected to fill the two containers once a day and use exclusively for drinking and cooking. Due to time constraints it was not possible to establish a groundwater treatment facility at this location. Instead, for the time being water is transported from one of NWSDB's head works 30 km away. However, the system is a great success and it is reported that some houses outside the village are also using this water. A complete system with a 50 m3/d treatment facility covering a population of 7500 people is to be implemented in Girandurukotte another chronic kidney disease affected area. Possibility of outsourcing the operation to the private sector will be looked into. This could be done once the real costs are established. Outsourcing of the water transport component is quite straightforward and would be a definite consideration.

Figure 1 – Water for drinking and cooking system in Billewe, Anuradhapura

Conclusions and Recommendations

- Groundwater resource is very significant in rural water supply development. However a comprehensive strategy addressing the varied technical, organisational and financial issues should be adopted.
- CBO's often need back-up support. The role played by state agencies and NGO's could vary depending on the status quo of the respective country.
- Appropriate strategies for financing of rural water / groundwater development should be evolved considering the country's investment scenario. When there is a dearth of investments, linking rural water supplies with major development projects would be effective.

- As rural water supplies involve several stakeholders such as user communities, political authorities, NGO's, state agencies, donors, it is important to institute effective coordination/facilitation mechanisms both at central and regional levels.
- The concept of supplying water for drinking and cooking would be very effective in providing cost effective solutions in sparsely populated rural areas where groundwater is available but not fit for consumption. This concept could be recommended for developing countries. This concept could be recommended for developing countries. The private sector could be a partner in this endeavour.

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