Workshop Theme: Water Quality for Human Health

Title: Water Supply Through an Integrated Water Resource Management for Mass IDPs Under Emergency Situation in an Arid Zone - A story from Sri Lanka –

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Abstract*:*

Managing a safe water supply for basic hygiene practices for a mass under an emergency situation is not an easy task for the responsible authorities. However the Government of Sri Lanka together with the help of Non Governmental Organizations (NGOs) managed the situation reasonably well in respect of the Internally Displaced People temporary settled in the relief villages established in the dry zone of the Province of Sri Lanka, in 2009. Supplying water for different purposes extracted from different water sources with different chemical and bacteriological quality through strong water safety plan was the most appropriate solution for this. This methodology practically tested at the field and the experiences gathered are discussed in this paper/poster in order to disseminate globally the positive and negative sides of the approach adapted for the benefit of the other practitioners in the water sector.

Key Words: water safety, emergency situations, integrated approach,

Introduction: Managing a *safe* water supply for basic hygiene practices for a mass population gathered under an emergency situation will not be an easy task for the authorities. However the Government of Sri Lanka together managed the situation reasonably well in respect of the Internally Displaced People(IDPs) in the relief villages in the North of Sri Lanka, in 2009. The Sri Lankan Government made an advance contingency plan in order to provide basic needs of the IDPs started moving in to the Government controlled areas during the final weeks of the rescue operations. During the advance preparations, there was an uncertainty on the exact number of IDPs to be expected due to non availability of accurate population details with the authorities. As a result, planning process was done based on certain assumptions which were later found to be under estimated.

Background: National Water Supply & Drainage Board (NWSDB) which has the national mandate for providing safe drinking water in the country was entrusted with the prime responsibility of providing *safe* drinking water to the relief villages located in Vavunia district closer to the Vavunia town. A few INGO/NGOs also helped NWSDB in achieving this challengeable task together with UN authorities. Under this assignment, a polpulation of around 250,000 were to be provided with safe water in order to maintain their health in a satisfactory manner by fulfilling their minimum basic daily water requirement. Providing safe water in adequate quantities was considered to be one of the major challenges among many other issues.

Vavunia is located in the arid zone of Sri Lanka and considered to be an area with less water resources. A perennial river named Malwathu Oya which flows along the Vavinia district boundary is the main surface water source situated close by. There were also a few minor irrigation tanks available with limited capacities which are usually go dry even in a moderate drought. Due to the water scarcity prevailed in the area; it was not possible to find a single water source with sufficient capacity and quality to cater for the entire water demand of the IDP relief villages. In the vicinity of the relief villages established, some shallow dug wells were available which could provide water with a reasonably good quality. Only chlorination was required as a precautionary measure. Unfortunately, they did not have sufficient yield to cater for a big population. NWSDB carried out some preliminary investigations for deep ground water and found that the aquifers did not have good yields and had some quality issues such as hardness and high conductivity. However, it was revealed that there are some good aquifers available a few kilometers away from the sites. Therefore, it was concluded that a combination of surface water and shallow/deep ground water sources to be utilized as follows during the initial stage:

Drinking and cooking:

- Chlorinated water by fleet of Bowsers
- Handpump tube wells

Bathing, washing and toilet requirements:

- Pumping arrangement from Malwathu Oya and its tributories

During the very initial few days, bottled water donated by various well-wishers could provide the drinking water requirement while IDPs were allowed to use a perennial river close by for washing and bathing activities. Toilet facilities were provided with water brought by the bowsers. Direct using of river water was suspended within about a week due to security reasons and contamination risks on river water. When the population increased gradually within a few weeks, drinking water also was drawn and brought by bowsers from shallow wells in adjoining areas and stored in small capacity water tanks converted to cistern standpipes within the sites. Compared to drinking water need, the other sanitary water requirement was high. As such, it was decided to set up a small scale pumping systems for each settlement clusters drawing water from the close by tributaries of the Malwathu Oya. A piped network together with bathing outlets and yard taps at toilet premises was established to distribute chlorinated raw water pumped from river within each relief village. In the meantime, a fleet of drilling rigs were engaged to drill hand pump tube wells within the sites and installed with hand pumps. This provided a big relief to the water trucking operations as people could draw water from those hand pumps round the clock without waiting for external supply facilitated through water trucking. By this time, six relief villages formally had been established to serve IDPs in a more organized manner.

Assesment of Water Requirement:

Water Allocation (250,000 people):

Drinking & Cooking need	= 15 lpcd
Bathing and washing etc	= 35 lpcd
Total requirement	= 50 lpcd

Bathing & washingwater requirement (35lpcd)	= 250,000 x 35lpcd	= 8,750 m^3/day
Drinking & cooking Water requirement (15lpcd)	= 250,000 x 15 lpcd	= 3,750 m^3/day
Hence total water requirement		= 12,500 m^3/day

Table 01 - Fragmented Water Requirment of Each Zone

Relief Villages (Zone)	Population	Drinking	Other	Total cum/d
Kathiragamar Village (Zone -0)	18,800	282	658	940
Ananda Kumaraswamy Village (Zone -1)	15,000	225	525	750
Ramanathan Village (Zone -2)	40,000	600	1400	2000
Arunaalam Village (Zone-3)	26,200	393	917	1310
Zone-4	100,000	1500	3500	5000
Zone 5	50,000	750	1750	2500
Total	250,000	3750	8750	12,500

Water Sources

The major challenge of the National Water Supply & Drainage Board was the lack of reliable and sufficient water source within the sites. No shallow water wass available and only a fraction of the water requirement ccould be found through deep ground water. The average yield expected from a hand pump tube well was found to be around 5-10 lts per minute only. The production bore holes drilled in and around the area also did not promise a satisfatory ground water potential in meeting the full drinking water need. As a result of surface water studies carried out, Malwatu Oya and its tributories running adjoining the settlement areas was selected as the most productive water source. The water discharge of the river was managed by Department of Irrigation and Irrigation Department principally agreed to maintain a minimum flow to meet the water requirment of the releif villages during the camping period. With this gurantee, Malwathu oya could be considered as the major water source for the five zones. Therefore, it was propsed to go for a combination of surface water and ground water to meet the full water requirement of 12,500 Cum/day.

Supply Options: A combination of options was selected as follows:

- Tube wells with hand pumps (250 persons/well)
- Bowser supply
  - from shallow wells, production boreholes and treated surface water to plastic tanks kept at site (1000 Lts tank/100 persons)
- Surface water
  - Untreated water through a piped network for bathing and washing
  - A part of surface water being pumped to the network was drawn out at the each camp and treated with package treatment plants for the above bowser supply

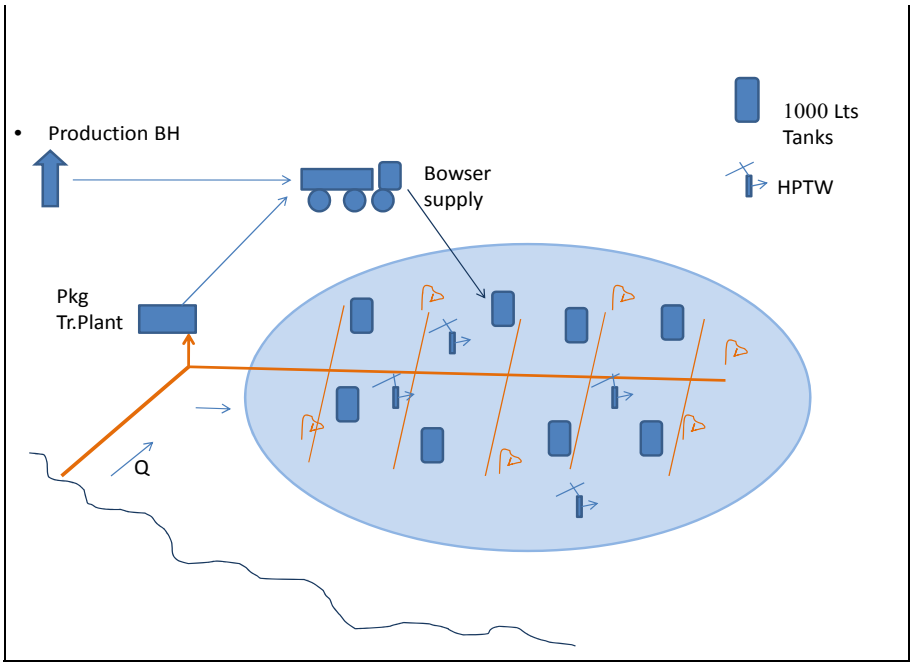

Fig 01 – Schematic Diagram of the Supply Option

Source Capacities Assessed:

Total Water requirement	=	12,500 Cum/day
<u>Hand Pump Tubewells</u>		
Proposed No of Hand Pump Tube wells	=	220
Average yield from a well	=	7.5 lpm
Excepted water from Hand Pump Tube Wells	=	220 x 7.5 lpm x16hr
	=	1584 cum/day
	=	say 1500cum/day

<u>Production tube wells fitted with submersible pumps to feed trucks</u>

Number of wells proposed	=	10
Expected average yield/well	=	125 lpm
Total expected production (with 16hrs operation)	=	1200 cum/day
<u>Surface water</u>		
Therefore, Surface water requirement	=	12,500 - 1500 - 1200
	=	9,800 cum/day

Water Balance

Drinking water:

Drinking water requirement	=	3750 cum/day
from HPTW	=	1500 cum/day
from production wells	=	1200 cum/day
from surface water through package treament plants	=	1050 cum/day

Surface water:

for other washing /bathing purposes	=	8750 cum/day

All the investments were made in accordance with the above technical master plan in such a manner that all investments would be properly coordinated and would not go waste once the transit villages are evacuated. Responsibilities were shared by all the parties while community facilitators and skilled operators found within the IDPs were trained to support local operations within relief villages. With all these arrangements, the authorities were able to provide a supply of around ***18-20 Litres per person*** on average for drinking & cooking purposes which was the most critical consideration.

Experience Gathered and Conclusions:. The well water trucked by bowsers and the drinking water produced by the package treatment plants were always chlorinated to ensure bacteriological safety. Washing water supplied through the pipe network was not chlorinated and the IDPs were informed not to use them for drinking and cooking purposes. Hand Pumps installed within the sites did not serve the full purpose as the people rejected some of them for drinking due to high hardness (although they were within the WHO standards) in spite of their bacteriological safety. However, those rejected wells were used by the IDPs for other secondary purposes, especially for face washing and cleaning cloths during rush hours. The health authorities together with NWSDB were highly concerned of possible bacteriological contamination of all types of water supply arrangements especially by local contamination. Source contamination of hand pump tube wells within the sites by local users and, possible pollution of river water through local use and drainage were the key issues. There were minor contaminations reported on shallow wells which had been using for isolated camping sites due to local drainage occurred during the peak demand hours as a result of inadequate drainage facilities. And also, there were some incidents reported due to negligence by the users such as using the untreated water distributed for washing and bathing purposes for drinking. In order to ensure the water safety within relief villages, it was required to implement a comprehensive water quality surveillance programme. Under the guidance of Health Ministry, NWSDB initiated a systematic water sampling programme. A mobile laboratory equipped with field test kits was engaged by the NWSDB for systematic water quality monitoring in all sites whereas cross check testing were carried out independently by the Public Health Inspectors under the guidance of Health Ministry. The outcome of the test results were discussed at the institutional meetings held regularly. Also, a public awareness campaign was launched with the help of camp authorities to sensitize the IDPs on possible contamination.

All those actions led to a hygienically safe water supply for the IDPs and there were no major pipe borne diseases were reported other than a few isolated cases, up to the time the resettlement programme commenced. This situation evidenced the successfulness of the programme implemented. The above strategy of supplying water with different quality standards for different purposes was a very appropriate approach in an emergency especially when the water demand is extremely high. If the decision was to provide fully treated water from a single source of water, it would have been practically impossible and in case if it was feasible, it would have taken a much longer time for the construction phase. However, ensuring the *water safety* within a restricted compound with a very high population density was more challenging than bringing the required water quantity to the site.