Engineering

Research Paper



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ABSTRACT

Country like India where 70% population is rural and economy is still based on agriculture activities, water plays a vital role. A safe, convenient water supply system is one of the highest priorities for the rural poor. After fourth five-year plan large investments have been made for providing and sustaining drinking water supply for villages under various programmes. Piped water (regional rural water supply scheme) has been considered as most reliable mode of supplying safe and regular water to rural areas where there is no access to safe drinking water.

This supply mechanism recommends an integrated and multi-disciplinary approach to planning, formulation and implementation of projects in such a way as to be able to meet the demands of water. The issues become more challenging when the similar planned scheme achieves different level of success on field.

This study is an effort to take a look at how supply a system works in one of the water scarce area (Kutch) of Gujarat. This study also tries to look into various approaches used by different institution to provide safe and secure water supply in the region.

Keywords :

1. INTRODUCTION

Water is considered as one of most scarce resource in the world. Much of the world's water has little potential for human use because 97.3% of all water on earth is saline water. Out of remaining 2.03% fresh water, most of which lies deep and frozen in Antarctica and Greenland, only about 0.67% flows in rivers, lakes and in the soils and shallow aquifers which can be readily used. This little available water is distributed unequally, which makes it more scarce.

Country like India where 70% population is rural and economy is still based on agriculture activities, water plays a vital role. A safe, convenient water supply system is one of the highest priorities for the rural poor. Combined with safe sanitation and better hygiene, improved water services can revolutionize rural public health even in the least advantaged settings leading to Socio-economic Development, Communal harmony and Peace in the society.

Access to safe and sufficient water is human right under international law & provision of water supply and sanitation to the communities is an important function of welfare state. But still facts say that only 81% of urban population and 54% of rural population have excess to safe and regular drinking water. In India supply of safe drinking water has been given highest priority in National water policy. After fourth five-year plan large investments have been made for providing and sustaining drinking water supply for villages under various programmes. Piped water (regional rural water supply scheme) has been considered as most reliable mode of supplying safe and regular water to rural areas where there is no access to safe drinking water. Amongst 18,000 revenue villages of Gujarat state this regional are functioning at various levels.

WHAT IS RWSS?

The World Bank defines RWSS as "A programme of supplying water and sanitation to rural area". In India, RWSS is defined as "A system, which provides drinking water to rural community". While GWSSB a nodal agency in Gujarat, defines RWSS as "Number of villages, when served by a common source, operated and maintained by state government (GWSSB) is called Regional Water Supply Scheme (RWSS)". In the initial years there were very few pipe lined water supply schemes. Criteria of "no-source" were also non-existent. There were mainly problems of not having any existing source of water in or around the villages due to large stretches of saline land in some region. This was solved by pipelined water supply from the nearest possible source to the villages. When the number of villages served by a common source, operated and maintained by state government (GWSSB) and is called Regional Water Supply Scheme (RWSS).

When the Source served only one village was executed by government but operated and maintained by local body is called Individual Water Supply Scheme (IWSS).

A. CRITERIA FOR RWSS/ IWSS

In both cases of RWSS and IWSS implementation of scheme done by GWSSB (local government), but In case of IWSS, execution of the following works is the responsibility of the Panchayat

- Well
- Pump room
- Stand post
- Quarter and wire fence

If the scheme was for more than two villages that is RWSS, execution of the following works is responsibility of Panchayat:

Tank

- Stand post
- Cattle trough

In case of an individual scheme (IWSS) for a single village, the facilities are developed by the GWSSB and handed over to the local body (Gram Panchayat) for routine O&M. If it is a group (for cluster of villages) or a comprehensive (RWSS) scheme, the O&M is handled by the GWSSB

B. CRITERIA FOR "NO SOURCE" VILLAGES

Criteria for no-source, source development by type of source and level of service, financial assistance, scarcity standards, standards, and standards for Quality and quantity of water, minimum distance from the location of source were fixed and this provided the basis for the norms and policies to be followed

- Villages without a single/public well
- Villages where existing source is more than 1 km away
- Villages where a source exists but dries up in summer and the distance of other source from the village centre is more than 1 km
- Villages where sweet water well is not feasible but deep well is required
- Villages having all season live source within 1 km but yields less than 10 LPCD
- Villages where water is deeper than 15 meter or is at 100-meter elevation difference from the village location. (Especially in hilly areas)
- Villages where source is ready but auxiliary work remain to be completed

C. CRITERIA BASED ON SERVICE LEVEL

Criteria for "No source " have created many problems and confusions. As villages declared as "no-source" do not have to pay charges for implementation of scheme and gets benefit from piped water supply. This made every village declared as "No-source". To avoid those another criteria of "NC-PC" introduced based on supply rate of water. As per "NP-PC" criteria villages are divided as under:

Criteria	Level of water Supply
PC-4	This includes villages having water supply <40 lpcd but not less than 30 lpcd
PC-3	Water supply rate 20-30 lpcd
PC-2	Water supply rate <20 lpcd
PC-1	10-20lpcd. But not less than 10 lpcd in any season
NC	<10 lpcd

D. CRITERIA FOR QUALITY OF WATER

There is a detailed chemical composition prescribed in water supply manual for acceptable quality of potable water. It can be summarized into three basic criteria

- It should be good in taste. (Includes the chemical composition of water-Hardness, pH, etc.)
- It should be safe for drinking. (Covers standards for source and water treatment level.)
- It should be aesthetically acceptable. (Includes physical characteristics like color, odour, TDS, Turbidity, etc.)

2. REGIONAL WATER SUPPLY SCHEME -AT VARIOUS STAGES

- Policy:
- Implementing agents:
- Users:

2.1 REVIEW OF RURAL WATER SUPPLY SECTOR IN GUJARAT

- 1. Community development programme (CAP)
- 2. Border area development programme (BAD)
- 3. Desert development programme
- 4. Accelerated rural water supply programme (ARWSP)
- 5. Minimum needs programme (MNP)
- National water supply and sanitation programme (NWSSP)
- Drought prone area program and program for welfare for backward class

2.2 RURAL WATER SUPPLY PROGRAM DURING 1961-91 During the first decade of planning provision of safe and adequate drinking water supply was considered a basic requirement to protect people from water borne diseases. During the third five year plan attempt were conducted villages were categorized according to the intensity of the problem.

During the fourth five-year plan, first time the criteria for "no source" villages were fixed and reassessment of the villages was done according to those criteria. Guidelines were given by the central government to integrated water supply system with available major and medium irrigation projects and rec-

ommendations were made to collect water charges; were also made. Both the recommendation although very much needed, so far remains to be implemented to date. A laboratory and workshop were put up at Ahmedabad. Government of India also launched accelerated rural water supply program, under which the water supply scheme were to be sponsored 100% by the central government and the money was given straight to the Gram Panchayat.

During the fifth five-year plan the listing and prioritizing of the problem villages according to the prescribed criteria continued. The problems faced were of source drying, salinity ingress and adequate recharges of groundwater. These schemes were floated under the umbrella of Minimum needs Program (MNP). Occurrence of frequent droughts and changing hydrological situations appeared to be adversely affecting the provision of drinking water supply on sustainable basis

Documents of the five-year plan clearly stated the complexity of the rural water supply. It stated that village water supply is a multi dimensional problem, it is of great magnitude and is challenging from technical point of view. There were places were potable water is not available at a shallow depth. There are coastal areas where local sources don't have potable water and required to be brought from long distances and where group water supply scheme is only solution. In scantily populated areas of Dangs shallow bores are not feasible; the only option is to collect rainwater in man-made masonry tanks. 1981-90 was declared "drinking water supply and sanitation decade".

In sixth and seventh year plan the percentage allocation for rural water supply from the total expenditure incurred on Health and sanitation was 40% and 44% respectively. In six five-year plan funds of 2-3 corers were allocated to district planning board under the sub-head of "Decentralized District Planning". These funds were to be used to be undertaking small works of local importance to be covered under the MNP. Out of total finical outlay for health and sanitation 23% was allocated for rural water supply. The actual expenditure incurred was 6785.63 lakhs, which was 40% of the total outlay, in sixth plan. In the seventh plan 39% (16266 lakhs) of the total were allocated and the actual expenses incurred were 44% of the total mount

3. CASE STUDY

Comparative-review of rural water systems experience - Karnataka Rural Water Supply and Environmental Sanitation Project.

Impact Evaluation Report, Operations Evaluation Department, World Bank.

The main objectives of impact evaluation were to examine the relevance and assess the impacts of the Bank's assistance program on the performance of the rural water supply and sanitation sector in India.

The evaluation was conducted in two phases. During a pilot phase the study team reviewed available background data, developed and field tested the data sheets and questionnaires, elaborated household selection criteria, identified the appropriate sample size and composition, and conducted pilot focus group and community interviews. In the second phase, the study fielded teams of local researchers administer questionnaires on the household and village level, collect secondary data, and fill out technical data sheets on each district and village and the operations of water system.

STUDY YIELD AND CONCLUSION

When beneficiaries make a regular and significant financial contribution to the operation of a water scheme, they feel a sense of ownership.

In communities where substantial portion of O&M costs is covered by users; the users become more concerned about

those management aspects involved with keeping costs low. Thus easy in making committees and faster involvement in various activities related to scheme.

Involve women in the design and management of the W&S service.

The results of this study provide strong evidence that involving users in all aspects of the development, implementation, and O&M of water supply systems can improve sustainability. Involving women makes particularly good sense; women's involvement in system management is critical for performance: women are the primary water collectors in most rural households and have the most interest in ensuring that the W&S service matches their needs and performs well.

Community based W&S services are likely to perform welland have strong impacts in communities with high levels of social capital.

Project designers need to pay close attention to existing levels of social capital in communities, and adjust the approach to service delivery accordingly. The existence of social networks improves group organization and service functioning, as community members are accustomed to working together as a group. Also, social ties among community members deter free riding and encourage community members to meet their commitments.

Depending upon the way RWS projects are implemented, there are indications that social interactions can increase, and social capital growth is possible. Therefore, in the design of projects that finance community-based W&S services-particularly in the design of social mobilization efforts-the existing levels of social capital in communities need to be taken into account.

The effectiveness of water committees influences the performance of the W&S service.

Committees provide users with incentives to contribute the required inputs to the design, construction, and O&M of water and sanitation services-and, together with other project partners, they develop rules. Rules need to be clear and well understood and accepted by all stakeholders, especially those rules that govern the use, operation, and maintenance of W&S services by the water users. Whether such rules exist-and whether they are properly implemented and enforced depends on the social mobilization efforts of the project implementers.

For example, whether women participate in service design and management, and whether households contribute to construction and pay for water (as agreed), depends on whether committees feel they own the project rules.

AIM OF STUDY

To study and understand performance of regional rural water supply schemes, of selected RWSS of Kutch

OBJECTIVE

- Review plans, strategies and policies followed for drinking water supply system
- Study the present status of drinking water supply in Bhuj-Kutch
- 3. Study the various approaches used by different institutions like GWSSB and NGO in rural water supply sector
- 4. Identify current problems regarding water supply schemes

METHODOLOGY

The study started with collection of literature on strategies and policies followed for drinking water purpose in India. The best resources of such information were the library and literature available on Internet.

Second stage was to collect current approaches made by institutions, both government and NGO, in rural water sup-

ply sector. This was carried out by visiting and meeting with the concern department authority. This provided latest data as well as current scenario of the status of rural water supply system. At this stage a clear idea of the approach and strategies followed by various institutes was available.

4. STUDY AREA

There are total 492 RWSS in Gujarat out of which 127 RWSS are in Kutch itself. Kutch is one of the water scarceregions of Gujarat. RWSS are considered as a unique feature, which provide safe and regular water with minimum transmission and evaporation losses

Presently there are 19 RWSS supplying water to 71 villages serving population of 58,332 in Bhujtaluka. This excludes the Banni-I,II&III. It is imparting 15% of total no of RWSS and serving 10.1% of total population of Kutch. Khengarpar RWSS and Javaharnagar RWSS have been selected as case study schemes.

ANALYSIS:

When we compare both the scheme, the total cost of medium RRWSS is much higher almost 3 times than that of small RRWSS. This is because of large distribution network for water conveyance and it contributes 43% (highest) of total scheme cost. But overall comparison shows that medium RRWSS are financially viable than that of small as no persons served are increased and hence per capita cost decreases. The same is inferred when we looked at per capita Operation and Maintenance cost. In absolute number it is higher in Medium RRWSS.

DESIGN ANALYSIS

SOURCE: For both the schemes ground water is the principle source for water supply. Detailed hydrogeolical study has been carried out before developing any source (tube well). But in most cases tube wells fail in two to threes year which is very less than expected life (8-10years). Saline water, over exploitation, breakage or corrosion in tube well and less yield are some the major causes of source failure.

Other than above tapping (adding villages in existing scheme) is most common reason for early failure of source and besides that it is influencing the efficiency of scheme. Lack of alternative reliable source is one of the causes for exploitation of ground water.

All sources depends upon natural recharging which is very less compare to rate of pumping, leads to the depletion rate of 3-4 meter per year, which is very high.

USE AND AVAILABILITY OF ALTERNATE WATER SOURC-ES: Most of the alternative sources available were the natural ponds and tend to dry up completely or recede considerably in the month of April and May. The rest of the year these water sources serve as main source for domestic washing, cleaning, cattle washing and drinking for cattle. As per villagers the water from such ponds is potable. This water could be used after proper treatment.

DISTRIBUTION NETWORK: Distribution network of both Khengarpar RRWSS and Javaharnagar RRWSS is linear in nature. The entire flow is gravity flow does not require any pumping in between. Presently as both tube well failed in Nadapa water is being pumped from the sump near Kukama village to ESR to three villages and rest of the villages are getting water from three wells near Khengarpar. At Khengarpar there is an additional ESR of 1,00,000 liter constructed to supply water. All villages of both RRWSS are come under no source category.

PVC pipes are used for distributing water of varying diameter of 160mm to 90 mm. They are economical compare to MS pipes and require less maintenance.

VILLAGE LEVEL FACILITIES: In all visited villages location

of the stand post was found next to the cattle through. Spillage from cattle through and movement of cattle, make outlet difficult to keep clean. There is no provision of drainage near stand posts. In most villages it was found that two cisterns are constructed, only one cistern fills completely. The situated at end of village not get filled up completely, which reducing availability of at second stand post.

Distance of stand post: The average distance of stand post discovered was 200 to 250meters. This is higher than norms of GWSSB (it should be 100-150m). But most of women user found it not so far as they used to travel more than a kilometer before the scheme.

Outlets: The status of outlets reflects a very poor state of maintenance. The most common problems are broken taps, leaking taps, and water spillage, muddy, dirty and unhygienic conditions around stand post. The reasons found are:

- Irregular monitoring of lineman
- Lack of drain for spillage from taps
- Lack awareness among elders
- Washing of pots or utensils near stand post
- Mischievous tempering by children

Roots of "GandoBaval" are also problem-causing elements. Choking and blockage of pipeline due to this roots caused busting of pipeline in Khengarpar RRWSS. If we bifurcates total civil works and repairs, 45% are for missing and broken taps, 35% related repairing of pipeline due roots and Maldhari and remain 20% are related to leakage and miscellaneous things.

PAYMENT OF WATER CHARGES AND PANISAMITEE: GWSSB charges Rs.14 / capita/year as water charge. If we compare this with per capita scheme cost or with per capita O&M cost we found that these are highly subsidized and impracticable. In both RRWSS it has not being paid since implementation.

RRWSS	Annual amount of water charge	Water charge remaining to be collected
Khengarpar RRWSS	Rs. 97,692	Rs. 5, 80, 000
Javaharnagar RRWSS	Rs. 26,824	Rs. 2, 34,000

CONCLUSION

Since independence every year crore of rupees spent by state as well as central government for providing safe and secured water to rural area. But expected results are not achieved yet. This is not because of absence of policies or lack of money and manpower, but due to local level problems are not understood and not solved.

From the study of two schemes that were stared 20 years ago with the aim to provide safe drinking water to the remote rural villagers. In recent years the scheme has undergone tremendous changes and is suffering from technical, management and financial problems.

Each scheme has its own characteristics, which are unique and place specific. Technical features affect non-technical aspects and vice versa. Problems in each RRWSS should be tackle differently on grass root level. For example in Khengarpar RRWSS the tail end village is at distance of 28km from the source, having different problems (fault in laying village level pipe) than that in Lotia village (high consumption by dominating village) just 11 km away from the source. Tapping is another major problem in Kutch (no of villages keep on adding in a implemented RRWSS-by political efforts, as scarcity measures or for temporary emergency), causing de functioning of scheme. Khengarpar RRWSS was originally designed for 2 village and a hamlet but presently serving 8 villages.

Awareness about water as scarce resource or need of water for drinking, irrigation uses or importance of conservation of their traditional resources is absent among villagers. Health education, importance of hygiene, income generation activity and panisamitee activities are lacking. After earthquake such activities have started by various NGOs and getting good response from villagers. Main agenda for most of the NGOs working on water issues remain up to development / construction of rain water harvesting structure at household level, awareness programme on dry irrigation, basic sanitation, health precaution measures, etc. (source development not addressed). The board does not address drinking water issue during scarcity while emphasis is on check dam and water harvesting structure in scarcity plan.

Another problem was that after the commencing of the supply system, the sample is to be taken from the source to ensure quality of water supplied. The sampling is to be taken once in every three months. While in actual practice, the samples are taken when the villagers or user complains about the water quality.

SCOPE AHEAD

Since the supply system is duplication of the pipeline system much attention should be paid on the following areas of the supply system:

- 1. Protection of sources
- 2. Modification in norms
- 3. Consciousitization
- 4. Formation of Panisamitee
- 5. Support of NGO's
- 6. Sanitation and health education
- Other related activity

PROTECTION OF SOURCES

Least priority for environment has been given in case of any water supply source. Reliability of a source developed for supply of water is very important. If the source fails than the scheme again become defunct and the village reappear as a problem village. Such incidences have happened in the both the study scheme and common in every region.

Most of the sources in Kutch (almost 95%) are dependent on ground water supply. Ground waters due to over exploitation and inadequate recharge either dwindle out or get deteriorated in quality due to ingress of salinity, fluoride and other factors.

To improve the recharging, water harvesting at village level and at source level must be adopt by NGO and villagers. Restoration of tradition source and protection of present local must be taken in to consideration along with recharging. Control abstraction through water charges or restricting private bore wells or legislative actions can be esteemed.

In scarcity plan or in master plan importance is given to construction of check dams or deepening of lake instead of that construction of water recharging structure should be given preference.

MODIFICATION IN NORMS

Norms should be region specific. Effort should be made not to copy the same norms throughout by minor changes can help a lot. A simple example is tapping problem, while in designing if care is taken for online-villages, problems can be solved. Similarly in calculation of losses (10% taken constant irrespective of size and topography of scheme) in system considering topography, length of pipeline, network type will also help in solving complication arising on later stage.

CONSCIOUSITIZATION:

Most villages are not conscious about their duties and rights. They felt that it is responsibility of government to supply water at free of cost. A massive programme of creating awareness of community at all levels viz. people professionals and politicians have been taken up. The main focus of such awareness programmes is toward explaining the importance and value of water, its conservation and protection of resources. Moreover people are also persuaded to participate in programmes of Water Supply and share responsibilities.

This includes field level camps, exhibitions and use of media. These activities are co-ordinates by the training institute of the Board, which are supported by NGOs and other agencies.

FORMATION OF PANISAMITEE

Formation of village level Water Committee (Panisamitee) is an important aspect to get the community involved in the sector programmes. The Panisamitee is a village level local group of voluntary members supporting the administration in the local affairs, particularly O&M village level distribution and protection of assets.

The State Government through a resolution has directed all local bodies (village Panchayats) to form PaniPanchayats involving various groups with women representation. Such Panisamitee are expected to support the local administration in day-to-day problems of water supply/sanitation and also extend assistance in collecting water changes.

If the panisamitee is formed many problems can be solved. This will make the users responsible for the working of system.

With proper organization and delegation of responsibility among the members of the samitee the following problems can be addressed:

- They can complain about the repairs required at any place to the engineer's office. Or they can them self-ask competent person in village to repair and adjust the expense to be paid in terms of grains or goods as settled between them.
- Similarly cleaning of the cistern can be settled among themselves
- They can get into collecting water charges as per their understanding

On long term they can be provided with training in repairs and maintenance of the system. Overall the officials will be free and relaxed so as to get into other issues.

SUPPORT OF NGO's

NGOs are a missing link between the programme implementing authorities and the beneficiaries. They work as a catalyst and motivator. In the present day context their role is very vital. A large number of NGOs are working in the field and support is received in the sector activities. They are initially involved in software activities and efforts should be on to involve them in O&M and other activities leading to community management.

OPERATION AND MAINTENANCE

O&M of Rural Water Supply Schemes is an important aspect to deliver regular and satisfactory supply to the communities.

Since village level organizations are not capable to operate comprehensive schemes (Major Schemes covering large number of villages), such schemes are operated by the GWSSB (Govt.). But village level maintenance can be arranged by formation of panisamitee. Support of NGO should be taken in creating understanding about importance of O&M in success of scheme. Trained and motivated manpower helps in strengthening the organization through efficient and economic implementation/ maintenance of programmes. There should be capacity building programme for villagers, linemen, mistry who can actually run any scheme effectively. Or the GWSSB can deliver this responsibility to Panchayat as they doing in the case of individual water supply schemes.

SANITATION AND HEALTH EDUCATION

Safe and secure water supply is the main aim of GWSSB, not served be cause of improper maintenance at outlets and unawareness of users in terms of filtering, storing water at household level.

To improve the environmental sanitation in the surrounding of the source, distribution places (Stand posts) and houses maintenance of clean sanitation is an essential activity. Open defecation also contributes heavily towards contamination of sources and spread of diseases.

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OTHER ACTIVITIES

Other activities, initiated to achieve sustainability of Rural Water Supply include following actions.

- Formation of District Level Advisory Committees and State Level steering committee having representation of all groups is made to review and monitor the activities.
- To improve the cost recovery, the existing system is strengthen and support of PaniPanchayats/NGOs envisaged.
- 3. To improve the socioeconomic status of the beneficiaries, income-generating activities are taken up.
- To appreciate and enhance the involvement and role of women in particular, gender sensitization activities are taken up.

REFERENCES

Barot J.M, Gandhinagar, SUSTAINABILITY OF WATER AND SANITATION SYSTEMS, Sustainability of rural water supply, 21st WEDC conference- Kampala-Uganda-1995. | Government of India (Extracts from the Project Concept Document, as amended) OPERATIONAL GUIDELINES FOR SECTOR REFORM PROJECTS FOR IMPLEMENTING COMMUNITY BASED RURAL WATER SUPPLY PROGRAMME. | Government of India, Documented 2002, NATIONAL WATER POLICY. GWSSB, |NORMS and POLICY FOR RURAL WATER SUPPLY IN GUJARAT-1978. | Government of India, Ministry of Rural Development, Department of Drinking water supply, June 2003, GUIDELINES OF SWAJALDHARA. | Gujarat Water supply and Sewerage Board, Gandhinagar, February 2003, ACTION PLAN 2003-04. | Gujarat Water supply and Sewerage Board, Gandhinagar, GWSSB ACTS, 1979. | Gujarat water resource development corporation Itd, GUJARAT GEOHYDROLOGICAL MAPS, Depth water level maps etc, Copyright National Informatics center, Gujarat, www.gwrdc.nic.in/index.asp | Government of Gujarat, Water resource department, PRESENT STATUS OF RWSS IN GUJARAT-2000, www.gidb.org | Kakade B, Kulkami H, Butterworth John, Watershed and water services, SUSTAINABLE ENVIRONMENT SANITATION AND WATER SERVICES, 28th WEDC conference, Calcutat, 2002. www.nic.org/waterservices.pdf | Mahajan, Vinay, BharwadaCharual, SWISS AID - India, June 1997, VIRDAS TO WATERPIPES - PAST AND PRESENT OF DRINKING WATER SCARCITY IN RURAL KUTCH, Ahmedabad, ManavKalyan trust, Sabarkantha, Gujarat. | Paul, Samuel , COMMUNITY PARTICIPATION IN DEVELOPMENT PROJECTS: THE WORLD BANK EXPERIENCE, World Bank1987, Washington. | Raval M.N, School of planning, Urban and regional planning student, Unpublished thesis, 2000, RURAL WATER SUPPLY – STUDY OF SIDHPUR AREA, CEPT, Ahmedabad.