CHAPTER 2

LITERATURE REVIEW

2 LITERATURE REVIEW

The entire literature review has been carried out by referring to various papers published in the journals and conferences, manuals and reports published by the eminent National and State government and non-government agencies, World Bank, Asian Development Bank, World Environment Federation; Water, Engineering and Development Centre, etc. However, which are found most important & relevant to the present study are documented as follows.

2.1 Background on Water Supply

Water – a precious gift of nature is to large extent mismanaged resource globally. In spite of the huge investments and considerable progress made in the water supply sector all over the world, providing safe water to the un-served and under-served has been the challenging task faced by the most developing countries.

Jimenez A., and Perez-Forguet A., (2010), discussed a number of weaknesses such as low quality of water services, lack of sustainability of constructed infrastructure, difficulties for targeting the poor and inadequate internal information systems that continue undermining strategies for poverty eradication. Also suggested recommendations include new paradigms for the provision of rural water supply such as adoption of water supply as a service that is monitored and supported by the government and needs-based allocation of projects at community level.

Nath K.J. (2002), reported that the failure to provide safe drinking water & adequate sanitation services to all people is, perhaps, the greatest development failure of 20th century. Providing safe drinking water & sanitation to 1 billion unserved people in the next decade would be the

most critical challenge for the humanity as a whole, but most specifically for the national governments in the developing countries.

2.1.1 History of Indian Rural Water Supply

Since the provision of clean drinking water has been given priority in the Constitution of India, with Article 47 conferring the duty of providing clean drinking water and improving public health standards to the State, Rural water supply programs in India can be noted into several distinct phases.

1949: The Environment Hygiene Committee (1949) recommends the provision of safe water supply to cover 90 per cent of India's population in a timeframe of 40 years.

1950: The Constitution of India confers ownership of all water resources to the government, specifying it as a state subject, giving citizens the right to potable water.

1969: National Rural Drinking Water Supply program launched with technical support from UNICEF and Rs.254.90 crore was spent; with 1.2 million bore wells being dug and 17,000 piped water supply schemes being provided.

Transition from technology to policy

1972- 73: Introduction of the Accelerated Rural Water Supply Program (ARWSP) by the Government of India to assist states and union territories to accelerate the pace of coverage of drinking water supply.

During the period 1972-1986, the major thrust of the ARWSP was to ensure provision of adequate drinking water supply to the rural community through the Public Health Engineering System.

1981: India as a party to the International Drinking Water Supply and Sanitation Decade (1981- 1990) declaration sets up a national level Apex

Committee to define policies to achieve the goal of providing safe water to all villages.

1986: The National Drinking Water Mission (NDWM) is formed.

1987: Drafting of the first National Water Policy by the Ministry of Water Resources.

Also, with the launch of Technology Mission in 1986-87, renamed in **1991-92** as Rajiv Gandhi National Drinking Water Mission (RGNDWM); Stress on water quality, appropriate technology intervention, human resource development support and other related activities were introduced in the Rural Water Supply sector.

1994: The 73rd Constitutional Amendment assigns Panchayati Raj Institutions (PRIs) the responsibility of providing drinking water.

1999-2000: Government had considered and approved a proposal to bring about a package of reforms in the rural water supply sector to address major areas of concern namely, coverage of habitations, quality problems in drinking water and sustainability of sources and systems.

For ensuring sustainability of the systems, steps are initiated to institutionalize community participation in the implementation of rural drinking water supply schemes through sector reform. Sector reform ushers in a paradigm shift from the '**Government-oriented supply-driven approach**' to the '**People-oriented demand-responsive approach**'. The role of the government is envisaged to change from that of service provider to facilitator. The Government had also stipulated that 20% of the annual outlay under Accelerated Rural Water Supply Program (ARWSP) be earmarked for implementing reform projects. Under reform, 90 per cent of the infrastructure is funded by the government, with the community contributing 10 percent of the remaining. The reforms initiative, so launched on a pilot basis as Sector Reform Projects in 67

districts of 26 States by the Government of India, was scaled up in December 2002 to cover the entire country as 'Swajaldhara'.

In June 2002, Government approved relaxation of 'coverage' norms under ARWSP to provide for 55 lpcd with a source within 0.5 km in the plains and 50 meter elevation in the hills after coverage of all Not Covered (NC)/ Partially Covered (PC) rural habitations in that State is achieved as per the then existing norms of 40 lpcd with a source within 1.6 km and elevation of 100m. This relaxation was subject to the condition that beneficiaries of the relaxed norms were willing to share a part of the capital cost (which should not be less than 10%) and shoulder full responsibility for subsequent operation and maintenance. Further, in case of quality affected villages or in multi-village schemes where the capital cost was very high, the schemes could be executed and implemented by Government departments and water was to be supplied to individual villages at the periphery of each village. For drinking water distribution within the village, the beneficiaries would share a part of the capital cost (which should not be less than 10%) and shoulder full responsibility for subsequent operation and maintenance of the village water distribution network, while Government Department/Board would maintain the main water supply system up to the village. Government/Board could also collect water rates from the panchayat/village communities for bulk supply of water for drinking purposes. Such water charges and the village O&M cost would be fully met by the users/beneficiaries.

2004: All drinking water programs are brought under the umbrella of the Rajiv Gandhi National Drinking Water Mission (RGNDWM).

2005: The Government of India launches the Bharat Nirman Program for overall development of rural areas by strengthening housing, roads, electricity, telephone, irrigation and drinking water infrastructure. The

target is to provide drinking water to 55,069 uncovered habitations; those affected by poor water quality and slipped back habitations based on 2003 survey, within five years.

2007: Pattern of funding under the Swajaldhara scheme changes from the previous 90:10 central-community share to 50:50 centre-state shares. Community contribution is now optional.

The approach paper for the XIth five year plan calls for a comprehensive approach which encompasses individual health care, public health, sanitation, clean drinking water, access to food and knowledge about hygiene and feeding practice. It also states the need to upscale more schemes related to community management of water reducing the maintenance burden and responsibility of the state. It is envisaged to provide clean drinking water for all by 2009 and ensure that there are no slip-backs by the end of the XIth five year Plan.

The Rural Water Supply (RWS) sector has now entered the next phase with major emphasis on ensuring sustainability of water availability in terms of potability, adequacy, convenience, affordability and equity while also adopting decentralized approach involving PRIs and community organizations. Adequate flexibility is afforded to the States/UTs to incorporate the principles of decentralized, demand driven, area specific strategy taking into account all aspects of the sustainability of the source, system, finance and management of the drinking water supply infrastructure. Adoption of appropriate technology, revival of traditional systems, conjunctive use of surface and ground water, conservation, rain water harvesting and recharging of drinking water sources have been emphasized in the new approach.

With right-based approaches taking roots in the sector, 'access to safe and clean drinking water' being treated almost as a fundamental right, a new set of challenges is emerging in the sector. Fixing the quality

standards, independent laboratories for quality checks, its enforcement, grievance redress systems for quality problems, tariff systems, source sustainability, equity, etc. are the new emerging challenges.

2.1.2 Issues and Challenges

In India today, more than 96 percent of rural habitations - or 720 million people - have access to water infrastructure to supply them least 40 lpcd of water. This wide coverage is a reflection of the investments made by the Government of India over the years. But, while access to water supply has increased over the years, this does not always translate into reliable, sustainable and affordable water services. This is mainly due to the following reasons:

- **Most schemes are planned, implemented and managed by state engineering agencies** and a supply driven approach was followed. The various government departments in charge of the sector often have overlapping responsibilities.
- **Beneficiary groups are generally not involved** in the design, implementation and maintenance of schemes and the involvement of Panchayati Raj Institutions (PRIs) (local governance bodies) is limited.
- **Subsidies are often poorly targeted and ad hoc.** This increases the possibilities of schemes being inefficiently managed, thereby continuously adding to an increasing number of defunct/partially defunct schemes.
- **Depleting groundwater tables / deteriorating groundwater quality** is a continuing threat.

Monitoring systems focus on infrastructure creation, rather than **provision of services.**

Traditionally, rural water supply has followed a supply-driven approach with access to safe water being considered a social good. The

financial and operational limitations of the supply-driven approaches led to a fundamental policy shift. In 1999, a demand-driven approach was piloted. In 2003, the pilot was scaled up as a nationwide Swajaldhara Program. Community-led decision making, community sharing of costs, and emphasis on service delivery are central to these new programs. However, hardly 10-15% of the entire RWSS funding is channeled through these programs. The main challenge now is the effective implementation and scaling-up of the decentralized demand-responsive service delivery systems.

Opportunities for Improving Service Delivery

- **Clarify Functions of State Rural Water Supply Institutions.** As the role of the state shifts to that of a facilitator, and funds, functions and functionaries are decentralized to PRIs and user committees, it is important to clarify the role of state institutions and agencies in the sector.
- **Strengthen Community Participation.** Several examples in Uttaranchal, Rajasthan, Karnataka and Kerala show that community participation has been successful in improving rural water service delivery. Special training programs (especially for accounting, procurement, financial management) are required to improve the functional capacity of PRIs and user committees. Local communities and PRIs should have a complete understanding of the likely O&M cost of various technology options, determined by technical feasibility, user preferences, and willingness to contribute towards capital and O&M cost.
- **Transfer O&M Responsibilities of Single Village Schemes to PRIs.** State governments should hand over existing Single Village Schemes to PRIs/user committees, after requisite rejuvenation and repair works are carried out. It is important that these assets belong

to the Gram Panchayats, and O&M responsibilities are fully borne by beneficiaries.

- **Establish Cost Sharing Principles.** Although the programs aim to see that O&M cost is fully recovered through user charges (except for high cost schemes which are not affordable), transparent criteria need to be developed to determine affordable contributions and the required state subsidy to ensure that the poor are not hit.
- **Carry out Independent Appraisal of Multi Village Schemes.** Multi Village Schemes should be taken up only when Single Village Schemes are not technically feasible.
- **Address Groundwater Depletion and Quality Issues.** The Groundwater Act needs to be effectively implemented. Also, Water Quality Monitoring Programs need to be better designed and routinely implemented.
- **Implement Monitoring &Evaluation (M&E) Systems.** M&E indicators need to provide a comprehensive coverage of inputs, processes, outputs and outcomes.

Barot J.M. (1996), addressed the challenges into water supply especially for rural India. By siting example of Gujarat, explained what are the systems available, which are the emerging constrains and how they can be redressed into water supply.

Pal Brij (2012) discussed the historical development of rural water supply in ancient India and recommendations of various committees with the focus of fund allocation under various Five Year Plans.

2.2 Role of Monitoring, Evaluation and Performance Indicators in Rural Water Supply Schemes

2.2.1 Role of Monitoring in Performance Evaluation

Periodical monitoring is the key in evaluation of performance of the project and to assess how far the objectives are achieved. In rural water supply projects also monitoring of several parameters on regular intervals helps in checking the overall performance. This helps the implementing authorities in new planning and making policies for the future schemes too.

Shah Binay (1998), presented a methodology for an appraisal and prioritization of rural water supply schemes in Nepal with reference to major factors like technical viability, needs assessment/hardship, community's willingness to participate, financial resources, etc.

Azuma M. and Jayakaran S. (2001), reported the study dealing with the issues of transition and growth of the community-based operation and maintenance system before and after adoption of the National Water Policy (Zambia) and the Water, Sanitation and Health Education (WASHE) concept in Zambia. This comparative study focuses roles of the village water committees, which have gradually evolved from the groups for maintenance of water supply facilities to those for policy/decision making in improvement of their living conditions. Secondly, changes in support system by the local administrations and approaches of interventions by the external agencies were examined.

Mazumdar K. (2002), reported that the dynamics of rural transformation at the grass roots level in India requires a proper understanding of the relationship between technology and society and also economy at the village and the household levels. The selection of a suitable technology is not an isolated activity, but need to be based on

delivering the choice level of service in a way, which will be effective, equitable, sustainable, efficient and replicable.

The World Bank report (2008), mainly covers the states of Andhra Pradesh, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal. The study largely covers the rural population of the states and the schemes cover hand pumps, mini water schemes, single village schemes, multi village and regional schemes. This has found that the overall efficiency of schemes under demand-driven programs is greater than that of schemes under supply-driven programs. However, the study is a 'reality check' on the existing design of schemes and do not largely involve the large and regional rural water supply schemes. The outcome of the study also limited to the region specific and may not be applicable to all state or regional conditions without making appropriate changes.

2.2.2 Issues related to Water Tariff, Cost recoveries and Affordability

Landge Hemant C., et.al. (2008), suggested the basic criteria for designing the survey format to derive appropriate information, methodology to assess willingness to pay and level of affordability of the beneficiaries. This methodology is used to assess willingness to pay and affordability of three towns of Maharashtra.

Dhanabalan M. ((2009), described the methodology and procedures to fix the water tariff in water supply schemes. The water tariffs design was to harness the objectives of the 24 X 7 service delivery in Hubli-Dharwad, Belgaum & Gulbarga Municipal Corporations in state of Karnataka, Which mainly categorize the water tariff structure for domestic consumer, non domestic consumer and commercial/industrial consumer.

Kartic P.N.L. and Yohan G. (2009) presented a basic conceptual framework for understanding the main practical issues and challenges relating to cost recovery of providing water supply services in Vijaywada Municipal Corporation. The case study mainly focuses on the analysis of the subsidies and cross subsidies received in urban municipal area for water supply services among the Above & Below Poverty Line consumers, metered and non-metered consumers and residential & non residential (Commercial) consumers.

2.2.3 Role of Community or Users in Water Supply Services

Tripathi S.K. and Lal Bharat (2001), reported the reforms in Indian rural water supply sector and community participation initiatives of Uttar Pradesh, Kerala and West Bengal was reported as successful.

Mazumdar K. (2002), emphasizes on the advantage of investing in community participation activities has been tremendous and the cost involved in this support is not necessarily expensive (about 2.5-3% of the project cost). Thus, the major challenges in India is to develop the capacity and capability within the government agencies to plan for, manage and to some degree coordinate mobilization of support from both the Gram Panchayats and the communities.

Mhaisalkar V.A. and Gawalpanchi R.R. (2002), reported the success of Borujwada, taluka Saoner, Maharashtra rural water supply scheme due to involvement of community participation in the various stages of scheme namely, planning and design, construction and operation and maintenance. Also, study reveals the importance of community education in the overall improvement in personal health and hygiene.

Vasavada Shilpa (unpublished paper), carried out a situation analysis of Women's participation in Swajaldhara and recommended the

important role and involvement of the women in various Pani Samitis to at least 50%.

Olatunji Timothy (2003), emphasized the importance of community participation in the sustainability of rural water supply. Community effort at maintenance is largely hindered by lack of spares and adequate institutional support. Water service providers in the rural areas must work closely with the community empowering them in decision making as regards site selection, choice of technology, community involvement, etc. It is when the community participates freely and willingly that a water supply project stands a good chance of providing long-term benefits.

Shanthasiri H.K.S. and Wijesooriya R. (2004), carried out a case study on community involvement in rural water supply of Sri Lanka and reported various advantages such as feel of ownership, decision making amongst beneficiary, concerns for non revenue water, etc. and disadvantages such as time-consuming activity, non participation in labor contribution, non acceptance for chlorination due to traditional habits and reluctance for installation of water meters due to its high cost.

2.2.4 Performance Indicators – Development as Needs

Identification and development of an indicator the evaluation of progress or overall performance is common management practice. In rural water sector, despite large involvement of community and significant expenses occurred worldwide, Performance Evaluation based on specific indicators was not so popular before one or two decades.

Stephen David A. (2000), described the Key Performance Indicators developed for the several rural water supply of schemes in South Africa's Reconstruction and Development Program (RDP). The Performance Indicators derived fall into three categories, namely, Quality

of Service, Financial Health and Accountability of Water Committees. However, they are not taking into account the positive (or negative) impact which the social, cultural and political environment can have on a scheme's viability and sustainability.

Soley Foster and Thogersen Jens (2003), carried out a monitoring and evaluation of rural water supply in Ghana and revealed the importance of monitoring and evaluation system and also noted that the four main performance indicators serve as basis of the monitoring and to estimate the community's overall operation and maintenance performance namely, Management performance, Operational performance, Maintenance performance and Hygienic Operation performance.

Still D.A. and Balfour A.F. (2006), described the efforts and role of various agencies in South Africa for the evaluation and monitoring initiatives in water supply sector. They reported that the monitoring program with scores of indicators, are failed due to non sustainability in practice. They suggested Water quality, Reliability and Source sustainability are only the Key Performance Indicators for evaluation of health of the water supply schemes.

Dwivedi Arun Kumar and Bhadauria Sudhir Singh (2007), have defined the Performance Indicators as variables, whose purpose is to measure change in process or function. They have categorized the Performance Indicators for performance evaluation of water supply namely, Users' opinion & Satisfaction PI's, Management PI's, Financial PI's, Level of Service PI's and Materials, Parts & Equipments PI's and Personnel PI's. However, this fails to include the role of community participation, affordability issues, willingness to pay, water tariff and subsidy issues, which are obviously affecting the sustainability of the water supply schemes.

The World Bank (2008) study was an attempt to check the performance of the rural water supply schemes implemented in 10 states (excluding Gujarat). This covers largely the only the rural water supply schemes based on Hand pumps, Mini water supply of single or several villages and few multi village or regional water supply schemes. The main objective also was to compare the performance by certain indicators in demand driven and supply driven water supply schemes.

2.3 Justification for the Present Study

The concept of monitoring and evaluation is not a new one. As stated above various researchers, policy makers and implementing bodies have used the concept of monitoring and evaluation for respective water supply schemes with different objectives. Each of study reveals the specified objectives related to the scheme only. Most studies were carried out on single village schemes or several are on multi village schemes, emphasizing the success related to scheme.

India is not a nation with only diversity of culture, religion and language but also geographic conditions, altitudinal and agro-climatic conditions make it a mega diverse. Further, in India, Constitutionally, Drinking water supply is a State Subject and hence, drinking water to rural habitations are provided by state governments. Being multiple states of India, every state with mega diversities of social, political and economic conditions, the water supply approaches and policies also changes from state to state.

Regional Rural Water Supply Schemes implemented in the state of Gujarat have witnessed major transformations in last two decades or so from its supply-driven to demand-driven or combination of both for bulk water supply as supply-driven and distribution as demand-driven, shift of

local source to sustainable and reliable surface water source, etc. make important to study.

It is therefore proposed to conduct comprehensive study for the critical evaluation and development of Performance Indicators which are applicable for such Regional Rural Water Supply Schemes. Such work has not been attempted and it is indispensable to develop PIs for RRWSS. The study will be useful to derive the future strategies for the development of water policies of the state for rural habitations.

2.4 Objectives of the Study

- To undertake observations on available infrastructure and distribution networks of water supply in the state of Gujarat with reference to regional rural water supply schemes
- To analyze the performance of regional water supply schemes with special reference to its source of water, coverage, quality of water, treatment facilities, technical efficacy & adequacy for the distribution of water
- To develop the performance indicators for overall service, management and financial performance evaluation of RRWSS (Source sustainability, Adequacy of water, Service reliability, Acceptable water quality, Cost on capital, operation & maintenance, Recoveries of tariffs)
- To scale up the potential for development of efficient & equity water distribution amongst the villages in various RRWSS
- To identify the impact of implemented schemes on socio economic activities as well as the overall life of the rural habitants

2.5 Methodology of the Study

As the water is subject of state in India, therefore, the responsibility of water supply for various needs of the society is mainly dealt by the state authority. As the state cater the demands from various sectors such as Irrigation water, Industrial water, Urban and Rural water, number of Government departments or subsidiaries of state government are involved. For managing the supply of bulk water in RRWSS mainly GWIL, SSNNL, Irrigation water department, various dam authorities and GWSSB are responsible. While for in-village water distribution system often the local authorities such as Taluka/Gram Panchayats, Pani Samitis and/or WASMO and some NGO's are responsible. Therefore, to understand the overall scenario of rural water supply schemes in Gujarat, data collected from above agencies, interactions with the officials and field visits in selected RRWSS have been made.

The selection of the representative RRWSS for study is carried out based on the following points keeping in mind:

- **Hydrology of the area**: Rainfall varies highly in the state of Gujarat. South Gujarat receive more than 1500mm rain fall per annum, middle Gujarat receive around 1000mm per annum, the Saurashtra region receive less than 600mm rain fall per annum while Kachchh region is partly a desert area and receive minimum rain fall. The prosperity of the area and quality & quantity of water is also highly varying. Therefore, four major schemes for the detailed evaluation are selected, one from the region of South Gujarat namely, RRWSS Variav group, Surat, two from the Saurashtra region namely RRWSS Gadhada group, Bhavnagar & RRWSS Ishwaria group, Amreli and one from the Kachchh region namely RRWSS Mandvi group, Kachchh.

- **Land use pattern/Urbanization:** The RRWSS Variav group, Surat representing South Gujarat (rich in water resources) cover the combination of industrial, urban and rural areas.
- **Water quality:** The Saurashtra region has the 1100 Km long costal belt. Surface water resources are limited & local ground water resources are not adequate in catering summer demands. Also, local ground water is suffering the water quality problems such as salinity (Total Dissolve Solids), Fluoride, Arsenic and other mineral matters. Therefore, RRWSS Gadhada group, Bhavnagar and RRWSS Ishwaria group, Amreli, at later time, shifted on reliable bulk water supply from Saurashtra Pipe line project.
- **Geography:** Kachchh is the largest district (geographical area wise) of Gujarat, located on the border of India and Pakistan covers largely the desert land with negligible water resources. Even though after the earthquake in the year 2001 and with the development of pipe line project based on river Narmada water, rapid growth of industries and construction of ports has been observed in the region. So from this point of view, RRWSS of Mandvi group and Kachchh group are therefore selected for the study.

A house to house survey has been initiated largely to collect the responses of Users' in above four selected RRWSS. The users' data survey work has been allotted to the Advantage India Private Limited, Ahmedabad with the financial support of GWSSB. The users' data survey cover about 2465 responses of 61 villages of four selected RRWSS (RRWSS Variav group, Surat – 863 responses and 20 villages, RRWSS Gadhada group, Bhavnagar – 559 responses and 14 villages, RRWSS Ishwaria group, Amreli – 581 responses and 14 villages and RRWSS Mandvi group, Kachchh – 462 responses and 13 villages). While

planning the users' data survey, villages are selected as per its distances from the head water works (head village, intermediate village and tail end village). A care has also been taken for selecting the users that they should largely represent the business, caste & sex group.

Further, in addition to above four selected RRWSS, for evaluating certain PIs, the overall RRWSS operated in South & Central Gujarat are undertaken. For evaluation of financial performance of RRWSS relying on bulk water supply in Saurashtra region, a separate study has been carried out with the GWSSB (Rajkot zone office) and GWIL officials.

As Cluster Storage Strategy is an optional part of in village water distribution system, a separate study has been carried out in the seven villages of two districts, Surendranagar and Kachchh. Based on the influencing factors such as population size, variation in caste & inter-caste conflict issues, availability of water, topography of the area, economic conditions in terms of agricultural and industrial growth in and around village and the success observed in CSS model; villages are grouped and desk study of documents developed by UNICEF, WASMO & GWSSB are studied and field visits are made for interaction with users' and managers of the schemes.

Based on the observations & findings of above studies, Performance Indicators are identified which can be used to design, monitor and/or evaluate the performance of new or existing regional rural water supply schemes.