M Tech Project Report

On

"Drinking Water Security"
A
Conceptual Framework for Policy Assessment tool of Rural Drinking Water Supply Schemes at Taluka level

By

Vishal Mishra

(Roll. No. 113350004)

Under the guidance of

Prof. Milind A. Sohoni

Centre for Technology Alternatives for Rural Areas (CTARA)

Indian Institute of Technology, Bombay

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Certificate

This is to certify that the project report titled “Drinking Water Security” A Conceptual Framework for Policy Assessment tool of Rural Drinking Water Supply Schemes at Taluka level, submitted in partial fulfilment of the degree of Master of Technology and Development of the IIT Bombay, Mumbai 400 076 is a record of bonafide work carried out by Vishal Kumar Mishra, Roll No. 113350004 under the supervision and guidance at Centre for Technology Alternatives for Rural Areas (CTARA), IIT Bombay.

Prof. Milind A. Sohoni

Examiner (Project Guide)

Abstract

Drinking Water Security has become a challenge for the country, specifically in rural areas. With ever growing population demand is bound to grow and in recent times climate change has aggravated the problem more. Recognising the gravity of situation and considering the “common pool resource” nature of water, governments have stepped in to ensure the drinking water security to their subjects. This has led to evolution of policies and several paradigm shifts in policy formulation. One of them is from supply driven to demand driven. But our own experience and also stated by many others suggests that there is always huge gap between policy and implementation. This gap is mainly due to absence of regular *Assessment, Evaluation and Monitoring* in current practice. In this backdrop the project was formulated. The objective was to develop a conceptual framework for taluka level assessment and evaluation of “drinking water security”. An important consideration was that it should be cost effective, repeatable and can be executed on regular periodical basis by local institutions.

During the project a thorough literature survey was done to understand the current and previous paradigms of the sector and to get familiarised by the key concepts. This was followed by rigorous secondary data analysis at district level. The district chosen was Thane, Maharashtra. Afterwards an assessment protocol using a mix of quantitative and qualitative methods was developed and tested in Shahapur Taluka in Thane. The assessment revealed gross in discrepancy between government data and data collected from the field. It found more than half of the piped water schemes in the sample to be non-functioning. The criteria used in practice for calculating coverage are also not clear. Moreover, people are not aware of different paradigm shifts.

It is believed that more research should be done for evolution of similar assessment and evaluation studies. This should be looked as an opportunity for academia and local government to benefit the community at large.

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0 Introduction

0.1 Background

Water is one of the earth's most precious resources. Though 70% of Earth's surface is water a major 97.5% of this is salt water and only 2.5% is freshwater. Moreover, less than 1% out of this 2.5% amount of freshwater is accessible (the majority is frozen in ice caps or as soil moisture) [Globalchange].

With growing population this amount of water is becoming insufficient. In 2000, 0.5 billion people in the world were chronically short of fresh water out of a total population of six billion [water.org]. As per some estimates, half of the population in the world may have to live without access to their minimum requirement for water by the year 2050. Moreover, India and other developing countries are the worst affected by fresh water crisis mainly because of comparatively lack of better planning to manage their respective fresh water reserves both on the surface and in the aquifers. With a population of above 120 crores, fresh water shortage in India is becoming more and more acute. The per capita water availability in India during the period 1951– 2001 has declined from 5177 litres to 1820 litres per year and it would further decrease to 1140 litres by 2050".[economic times]

The situation is worrisome because individual's health and hygiene is largely dependent on adequate availability of safe drinking water and access to improved sanitation. More than 3.4 million people die each year from water, sanitation, and hygiene-related causes. Nearly all deaths, 99 percent, occur in the developing world. [water.org]

This alarming issue of Drinking Water Supply and Sanitation was raised at international platform when at Millennium Summit of the United Nations in 2000; Eight Millennium Development Goals (MDGs) were set. One of the goals is "ensuring environmental sustainability" and it puts a target as

Target 7c*: reducing by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 at base year of 1990"*

Though the countries are performing well on this target, it will leave at least 672 million people without access to an improved drinking water source even the targets are met. [JMP 2012]

The report noted that despite of reaching the targets a wide range of disparity exists. It also noted that actual number of people without safe drinking water may be more, as not all improved sources in actual fact provide drinking water that is safe. The data collection and measuring water quality also remains a challenge.

It should be noted here that even if safe water is available many a times other problems like, long walking distance to the source, low water quality, lack of a sufficient quantity

of water, high water prices and poor system design emerges. Women and children often suffer disproportionately from these problems and so as some social communities like, tribal and socially backward.

In this scenario, investment in drinking water sector is highly required. A study by WHO shows that actually investment of $ 1 in this sector brings a return of $ 1-4 in long terms. [WHO, WASH-2004]

In past times, there has been a heavy investment in this sector all over the world and it continues. Governments in all countries have tried to bring safe water to their subjects through a number of mechanisms, like construction of new spot sources, piped water schemes etc., and with due course of time a huge infrastructure has been created. But the demand has not been met worldwide despite of all efforts. This demand-supply gap has led policy makers to think again and again to reform policies. In recent times one of the moves were shifting from supply driven-to-demand driven, more participation of public/community etc. Though it has accelerated the growth in the sector, it has its own bottlenecks as found by many studies.

The situation has been same in India also, during last 60 years after independence. The Drinking Water Supply Sector has seen many phases from the era of centrally granted supply driven schemes to new era of centrally assisted demand driven schemes. As per estimates, Government of India (GOI) and States have expended more than $2billion per annum, for rural water and sanitation in the last few decades. However, it has not turned in to necessary level of services. Many studies report that ground reality is different from what is officially reported; moreover many government surveys reveal different level of services also.

0.2 Motivation

The motivation for this study has been developed through our past work with Water Group[1] at CTARA, IITB. The group, through its many studies in past few years has found that there is a stark difference between ground reality and what is reported by government. Though up to now our main focus area has been Maharashtra (especially Konkan Region), the stressed water situation is more or less same in all parts of rural area. This difference is reported by many other reports, studies done by government and individuals which we will refer place-to- place in this report. Also, there has been a wide discussion on whether water is a right or commodity? Rural water supply schemes should be supply driven or demand driven? But what is less discussed, is the causes of failures of schemes, functioning of different implementing departments across the states, their technical capabilities in use of modern technological interventions like, computer software in designing the PWS schemes, etc.

[1] Water group is an interdisciplinary group of faculties and students from CSE and CTARA, IITB working on rural water supply issues.

The author himself has found faulty technical design in one study done in Karjat taluka, Raigad. (see,Tadwadi-Morewadi Single-Village scheme failure analysis. Belsare H., Mishra V.)

0.3 Objectives

Though the efforts of Government in Rural Drinking Water Supply(RDWS) sector, in terms of spending money and creating a huge infrastructure is commendable, the issue that water is still out of reach for a large fraction of population(specially in stress period i.e. summer) poses a question to the approach in this sector. One very clear uncontested understanding is there has been more focus on creating assets (Dugwell, Borewell, Handpump, Piped Water Schemes etc.) without maintaining it and reporting back if it has been failed.

We believe that in this scenario the role of Assessment and evaluation becomes of paramount importance. Though there have been studies of this kind in the past, but *firstly* they at a too large scale (National/State) to uncover the local issues and *secondly* they are too occasional to guide the implementing process. In contrary to this, the *Assessment and Evaluation* studies should be at local level and at periodic intervals so that it can feed to the implementing and monitoring process and further policy design. In recent guidelines, the scope for such kind of intervention has also been created. While the monitoring process is supposed to be routine type activity for the implementing agency, *Assessment and Evaluation* studies require a considerable amount of research. The situation calls for academic institutions to come forward take this opportunity.

The present study is an attempt to understand the said sector across evolution of policies and infrastructure created to implement those policies and programmes, and to conceptualize a framework for *Assessment and Evaluation* Study.

The three main objectives are-

(i) To understand the evolution of policies and programmes in RDWS at macro level.

(ii) To understand the implementation process and administrative capacity at district level.

(ii) To design an *Assessment and Evaluation* Study at taluka level.

Furthermore, while designing the *Assessment and Evaluation* Study it should be repeatable and administrable by persons/teams of reasonable competence and within an expense of roughly 2%of the net investments between two assessments.

0.4 Methodology

The study involves a survey of literature, collection and analysis of secondary data, field visits and reporting. A detailed methodology is given in appropriate sections of the report.

0.4.1 Literature Survey:

A number of guidelines, published papers and reports were studied for the purpose of literature survey. The guidelines are published by central and state governments for the implementation of different programmes and policies. The papers are mainly of individual researchers working in the sector and published in reputed journals. The reports of Planning Commission, DDWS (GoI), CAG, NSSO and other agencies like, World Bank were studied. All these helped to make the basic understanding policies and challenges in the RWS sector.

0.4.2 Data Collection and Field Visits:

A large part of secondary data was collected from IMIS of DDWS (GoI). Secondary data for Thane district was collected from RWS, ZP (Thane). A survey was done to collect the primary data for the pilot study in Shahapur Taluka, Thane.

A series of field visits were done to collect primary data for case studies in Gujarat. Apart from field visits a number of officials were interviewed at different offices of RWS, ZP (Thane), MJP, WSSO (Maharashtra), WASMO (Gujarat).

0.4.3 Stake holders:

Important Stakeholders to this project are-

1. People/beneficiaries of RDWS schemes in rural area

2. Officials at Rural Water Supply Department/ Implementing Agencies

3 .Prospective Local Institutions taking part in these kind of studies.

4. Researchers and Professionals working in the same sector.

0.4.4 Reporting:

The report is divided into six sections.

First section is the introduction part of the report. It presents the review of RDWS sector at National and State Level (Maharashtra). The second section discusses some inherent issues with Central Sponsored Schemes (CSSs) and brings out some concepts and issues in the RDWS sector. Further, it goes on to call for need for role of academic institutions in social sector programmes and sets up the frame work for *Assessment and Evaluation Study*. The third section forms the first part of the said study and focuses on RDWS sector at district level. The fourth section forms the core of the present study. It details out the procedures of the pilot study done in the Shahapur, Thane and its findings. The fifth section is devoted to the study of RDWS sector in Gujarat and specifically on WASMO. This study was of great help to understand some caveats and lacunas in the RDWS sector. The last section talks about conclusions and future work.

1 Review of Rural Drinking Water Sector

1.1 Policies and Programmes: Outcomes at National Level

With a population of over 80 crores people to be served daily with adequate safe drinking water over an area comprised of about 16 lakhs habitations in the country, Rural Drinking Water Sector poses a great infrastructural challenge to any State machinery. [IMIS, DDWS (GoI)]

Throughout the years after independence the sector has been evolved and continues to be creating more and more infrastructure. The present section tries to analyse the sector with reference to the policies and programmes implemented in this sector at the national level. Further, we have tried to derive some key concepts developed over the years and their meaning. The chapter closes with the present scenario of the sector.

1.1.1 A brief history:

In ancient times, all the major cities were developed around water sources mainly near rivers. Later on, people learned to make ponds, lakes and to dug wells. For centuries, people have been using these to meet their demand for water. This has been excellently documented in "*Aaj Bhi Khare Hain Talaab"*, a book by Anupam Mishra. The book is a result of a very long study throughout rural India and documents the life and work of several individuals and communities, across the country, in setting up water harvesting and management systems through *talaabs* (lakes / tanks) [Mishra, A].The traditional water bodies are the lifeline of many villages and towns in the country even today.

A major shift in rural water supply happened in early 20th century with starting the construction of hand pumps and bore-wells during British era. Gradually Piped Water Supply Schemes came in to existence in big cities but situation in rural India did not change much.

In 1944, **Bhore Committee** was appointed to look after hygiene and health in rural India; it recommended that the pure water supply should be provided to every inhabitant of the town or the village within a period of 35 years. [Das, 2006]

After independence, Water was put as a state subject in our constitution. Since India took a role of Welfare State with a planned economy, it started a number of rural development schemes. The schemes related to rural drinking water and sanitation were taken as part of Community Development Program which was main thrust for building rural India during first three plans.

In the fourth Five Year Plan, the Government of India provided assistance to the states to establish special investigation divisions to carry out identification of the problem villages. A 'problem' village was defined as one where no source of safe water is available, within a distance of 1.6 km or where is available at a depth more than 15 metres or water source has excess salinity, iron, fluorides and other toxic materials or where water is exposed to the risk of Cholera or Guinea Worm. Following it the

effective role of Central Government in the rural drinking water supply sector started in early 70s with launch of 100% grant aided Central Sponsored Schemes (CSS). Since then GoI has been increasingly investing in this sector. The development in RWS(rural water supply) can be divided in to four different stages. [Brij Pal]

The First Stage- It started in 1972-73 with the launch of Accelerated Rural Water Supply Programme (ARWSP). 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.

The second stage- It started with the launching of Technology Mission in 1986-87, renamed in 1991-92 as Rajiv Gandhi National Drinking Water Mission . Stress on water quality, appropriate technology intervention, human resource development support and other related activities were introduced in the Rural Water Supply sector.

The third stage- It started in 1999-2000 when Sector Reform Projects evolved (after swajal project in U.P.) to involve community in planning, implementation and management of drinking water related schemes. These projects were later scaled up as Swajaldhara in 2002 all over the country which enshrined the SRP principles.

The fourth stage- The sector is now in its fourth stage with introduction of National Rural Drinking Water Programme (NRDWP) in 2009. The main shift in this programme are from habitation level coverage towards household level, from over dependence on single source to multiple sources through conjunctive use of surface water, groundwater and rainwater harvesting and focus on ensuring sustainability in drinking water schemes.[NRDWP,2009]

So far since the first five year plan, the Government (Centre+state) has spent an estimated amount of Rs. 1,10,000 crore in the rural drinking water sector which has resulted into 78% fully covered habitations in the country and (as on 01/04/2012, IMIS).

Table 1.1 gives the plan-wise details of investment in this sector. This table shows the data for both the water supply and sanitation as it has been combined as same sector but in general, it should be noted that Rural Water Supply has always a larger share of the total investment.

It is clear from the table that initially central government did not spend in earlier years and it kept on increasing after the fourth plan with almost getting doubled in recent plans.

Table 1-1: Investments in Rural Water and Sanitation

Plan Period	Investment Made in Rural Water and Sanitation Sector (Rs in crore)	
	Centre	State
1st (1951-56)	0	3
2nd (1956-61)	0	30
3rd (1961-66)	0	48
4th (1969-74)	34	208
5th (1974-79)	157	348
6th (1980-85)	895	1530
7th (1985-90)	1906	2471
8th (1992-97)	4140	5084
9th (1997-2002)	8455	10773
10th(2002-2007)	16254	15102
11th(2007-2012)	39490	49000
Total	71991	84597

Source: [Working Group, 12th Plan]

1.1.2 Institutional Structure at Centre:

The Department of Drinking Water Supply (DDWS) was first formed under the Ministry of Rural Development (MoRD) in 1999, to pay special focus on rural drinking water. Later on, it was renamed as Department of Drinking Water and Sanitation (DDWS) in 2010. Moving on further it was upgraded as Ministry of Drinking and Sanitation in 2011. It is headed by a Minister of state rank who is assisted by number of senior bureaucrats for the disposal of his functions. The Ministry acts as nodal agency for implementation of all the programmes and schemes of Central Government in the sector. A diagram of present organisational structure can be seen in fig.1.1

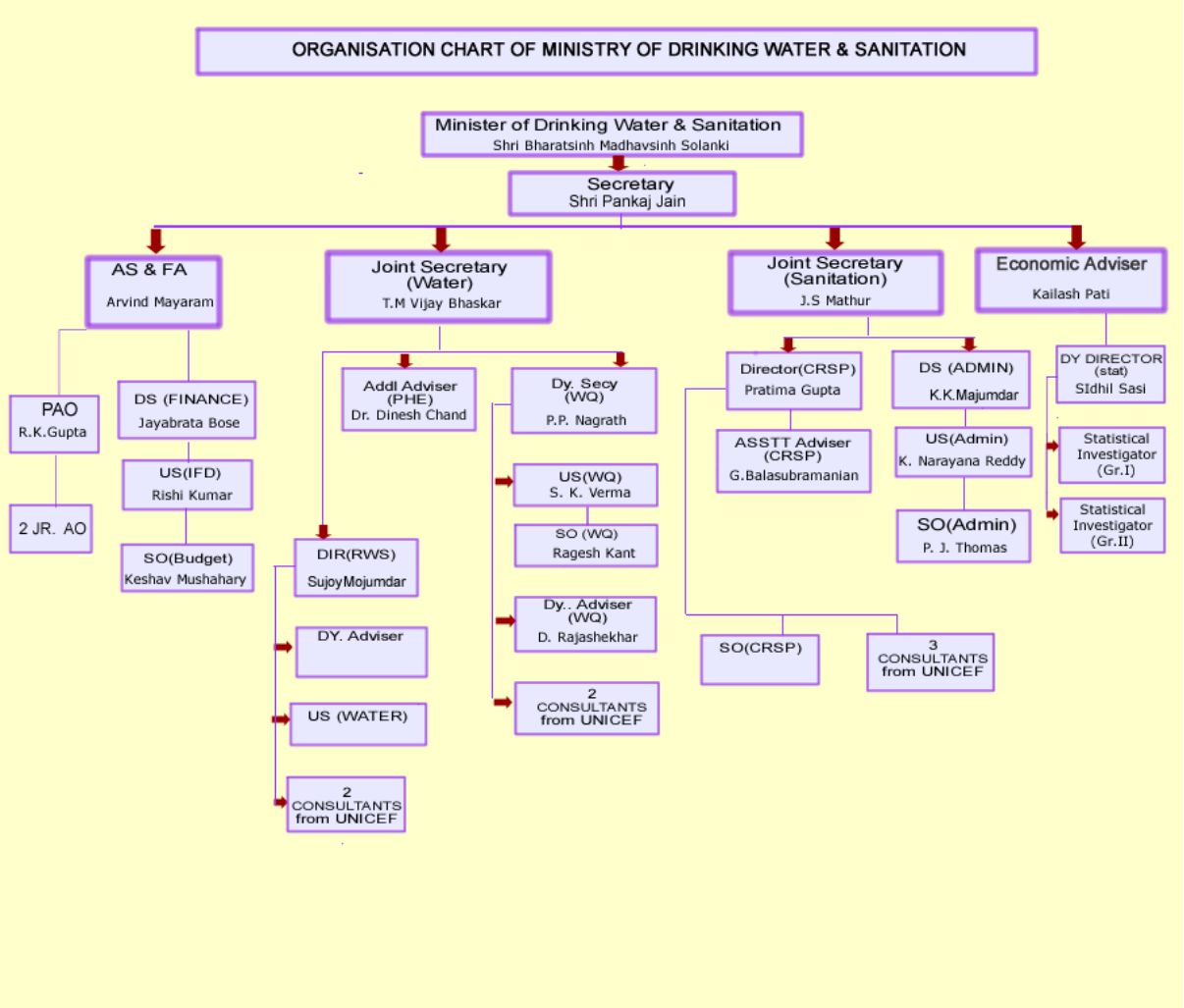


Figure 1-1: Organisational Chart of MoDWS

Source: Website of DDWS (GoI)

1.1.3 Key Programmes in the Sector:

In this section, a brief description of key programmes implemented by Central Government will be given.

1.1.3.1 ARWSP(Accelerated Rural Water Supply Programme)

Accelerated Rural Water Supply Programme (ARWSP) was launched by GoI to supplement the efforts of the State Governments, which was to be financed entirely by grant-in-aid. Following, the introduction of the Minimum Needs Programme (MNP) in the State Sector in 1974-75, the ARWSP was discontinued. The Programme was revived in 1977-78, when the progress in regard to provision of safe drinking water to the identified problem villages under MNP was not found to be satisfactory. In 1986, the Programme was taken up on a Mission mode and the National Drinking Water Mission (NDWM) was launched. It was renamed as Rajiv Gandhi National Drinking Water Mission (RGNDWM) in 1991.First guideline for the scheme was also launched in 1986.

Table 1-2: Status of Problem Villages during different Surveys

Year/ As on		Problem Villages	
		Identified	Covered
1972	Survey	1,52,000	
1980	Before VIth Plan		94,000
1980	Survey	2,31,000	
1980-85	During VI Plan		192,000
1985		162,000	
	Coverage during VII Plan+2 Annual Plans		159,000
1992-97		3,000	
01-04-1999		2,17,000	

Source: Das, 2006

Table 1.2 shows the number of identified problem villages as per guidelines of ARWSP during different time periods and table 1.3 shows design criteria.

Table 1-3: Design Criteria in ARWSP

As per the guidelines of the Programme, the key features were-

1. Provision of safe drinking water of 40 litres per capita per day (LPCD

2. The water source was to exist within 1.6 km, in the plains and at an elevation of 100 meters in the hilly areas. One hand pump or stand post was to be set up for every 250 persons.

3. Priority was to be given to problem villages (PVs), followed by partially covered problem villages.

Purpose	Quantity (LPCD)
Drinking	3
Cooking	5
Bathing	15
Washing utensils & house	7
Ablution	10
Total	40

Later on, habitations were categorized as follows:

☐ Not Covered (NC)/ No Safe Source (NSS) habitations: where a drinking water source/ point is not available with 1.6 km of the habitations in the plains or 100 metre elevation in hilly areas, or where the habitations have a water source which is affected by quality problems;

☐ Partially Covered (PC) habitations: which have a safe drinking water source, but the capacity of the system ranges between 10 lpcd to 40 lpcd.

☐ Fully Covered (FC) habitations: It would cover all remaining habitations.

Though the programme was started to focus only problem villages, it later on sought coverage of all rural habitations in the country during the 8th Plan period. However, this could not be achieved due to lack of sufficient funds and re-emergence of the Not Covered (NC) habitations. Hence, the Programme continued during the 9th Plan.

In April 1999, GOI restructured the Programme and re-categorised habitations with reference to adequacy and safety factors as Not Covered/No Safe Source (NC/NSS) and Partially Covered/Safe Source (PC/SS). It also introduced the concept of Sector Reforms to achieve the goal of providing safe and sustainable drinking water to all rural habitations of the country through community participation during the remaining part of the 9th Plan period. [ARWSP, 2000]

The objectives of the Programme as modified in April,1999 were-

(i) To ensure coverage of all rural habitations, especially those which still unreached and not having access to safe drinking water;

(ii) To ensure sustainability of the systems and sources; and

(iii) To preserve quality of water by institutionalising water quality monitoring and surveillance through a catchment area approach

The programme was audited by Comptroller and Auditor General (CAG), in 2008. The audit findings reflected that there are issues regarding (a) realistic identification of all problem habitation, (b) proper matching of execution of works with problem habitations, (c) quality of water and (d) sustainability of the resources. Hence, these areas need to be addressed with ground level approach as the efficacy of simply pouring money into schemes and achievement of some numbers (coverage of problem habitation & works executed) disregarding ground situation will remain questionable for addressing the drinking water needs of the problem habitations.[CAG, 2008]

1.1.3.2 Swajaldhara (2002 – 2009)

Sector Reform Project (SRP) were introduced on a pilot basis in 1999 to some selected districts in the country. It started with *Swajal Project* in U.P. which was a World Bank funded project. GoI was inspired by the success of project, and it was scaled up throughout the country in the form of Swajaldhara launched on 25th December 2002. The programme was a paradigm shift from supply driven to demand driven, centralized to decentralized implementation and Government's role from service provider to

facilitator. These three form fundamental reform principles in Swajaldhara. It is based on empowerment of villagers to ensure their full participation in the project through a decision making role in the choice of the drinking water scheme, planning, design, implementation, operation and management including full ownership of drinking water assets. The community was to share partial capital cost either in cash or lobour, or both and 100% responsibility of operation and maintenance (O&M). An integrated service delivery mechanism was also promoted which includes taking up conservation measures through rainwater harvesting and ground water recharge systems for sustained drinking water supply. After the introduction of NRDWP in 2009, the Swajaldhara was submerged in to sustainability component of NRDWP.

Swajaldhara had two streams:

(i) Swajaldhara-I which had Gram Panchayat as the lowest unit for implementing reform initiatives; and

(ii) Swajaldhara-II which had the district as the unit for implementation.

If more than 50% of Blocks/Gram Panchayats in any particular District opt for rural water supply schemes under Swajaldhara –I, the State Government could consider the entire District under Swajaldhara-II.

In swajaldhara guidelines, water was seen as socio-economic good, and was sought for its proper management. It also sought that the rural people should feel as the owners of the Scheme.

Some important features of Swajaldhara were-

(i) demand driven and community participation approach

(ii) panchayats/communities to plan, implement, operate, maintain and manage all drinking water schemes

(iii) partial capital cost sharing by the communities upfront in cash/labour.

(iv) full ownership of drinking water assets with Gram Panchayats; and

(v) full operation and maintenance by the users/Panchayats.

Delivery Structure in Swajaldhara:

As per sector reform programmes, the role of government was changed to facilitator and fund provider while the VWSCs (Village Water and Sanitation Committee), a standing committee of GP became the main implementing agencies. The idea behind this was that operation and maintenance of the schemes should be done by the local people because in supply driven mechanism operation and maintenance became the crucial factor for failure of the majority of the schemes. Further partial capital cost in the form of popular contribution was required so that people feel ownership of the schemes. There was a need for capacity building at village level and also the line departments like PHED,RWS

were required to sensitize with new changes. Therefore new institutions were created and NGOs, civil society organisations were involved at different stages.

In Swajaldhara, four level delivery structure was envisioned.

At central level, the role of DDWS was to allocate funds, provide technical support and training capacity building to states. A special cell with NIC was created for online monitoring of funds and physical progress.

At State Level, SWSM (State Water and Sanitation Mission) was formed. It was responsible for funds release at state level. Moreover as there were already different departments in the states like PHED, RWS for implementing of schemes the role of SWSM was as a coordinator among them. It was also responsible for training and capacity building programmes.

At district level, DWSM (District Water and Sanitation Mission) was formed. It was responsible for baseline survey, development of district plans and monitoring and evaluation of the schemes. It was required to work with NGOs for training and capacity building of VWSCs and also to coordinate the work with ZP and other line departments.

At village level, it was required to form a VWSC. Each of VWSC would have 14 members (7 elected and 7 other representatives from the village including women). It was the VWSCs responsibility to demand the scheme, collect the funds from the villagers, construct (or call the contractor) the scheme as per design document and to take care of operation and maintenance of the scheme for ever.

1.1.3.3 National Rural Drinking Water Programme (NRDWP)

NRDWP was introduced in 2009 as a further modification of all the existing programmes like ARWSP, Swajaldhara. It coincides with Bharat Nirman, another programme of GoI to build rural infrastructure, which was launched by the Government of India in 2005.

The key principles of NRDWP are the same as of Swajaldhara such as decentralization, people's participation and demand led approach. Apart from this, NRDWP has more emphasized on sustainability, multiple water sources, conjunctive use of ground water, surface water and rain water harvesting etc.

Key Features:

☐ Modifications in principle: Water as a public good that everyone can demand and as a basic need that everyone should be able to avail.

☐ Modification in norms: Shift from a fixed minimum quantity per capita per day to the concept of drinking water security with basic unit being changed to household.

☐ VWSCs role: They have to play major role in planning, implementation O&M and monitoring of the schemes. e.g., communities have to prepare and implement the village water security plans, apart from operation and maintenance of the schemes.

☐ Use of multiple sources: Advocates for use of surface water in case of high development of ground water, reliance on multiple water sources.

☐ Management Information System (MIS) Activities:

For effective planning, monitoring and implementation of NRDWP, Information Technology based on MIS was established by Central Government. All the data is made available at one place and monitored. Some of the important aspects of MIS are the status of water supply data is maintained up to habitation level to ensure planning and monitoring at micro and macro level. MIS provides assistance for development of village based GIS maps and its storage and processing, including procurement of GPS instruments for identification and capture of the location of drinking water sources

☐ New institutional framework: Formation of new institutions like, WSSO (Water and Sanitation Support Organisation), BRCs (Block Resource Centres).

Table 1-4: Drinking Water Supply Programmes at a glance

Year	Event
1949	The Environment Hygiene Committee (1949) (Bhor Committee) recommends the provision of safe water supply to cover 90 per cent of India's population in a timeframe of 40 years.
1969	National Rural Drinking Water Supply program launched with technical support from UNICEF and Rs.254.90 crore is spent during this phase, with 1.2 million borewells being dug and 17,000 piped water supply schemes being provided.
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.
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) launched to accelerate the process
1987	First National Water Policy drafted by Ministry of Water Resources giving first priority for drinking water supply.
1991	The National Drinking Water Mission (NDWM) renamed as Rajiv Gandhi National Drinking Water Mission (RGNDWM).

1994	The 73rd Constitution Amendment makes provision for assigning the responsibility of providing drinking water to the Panchayat Raj Institutions.
1999	Formation of separate Department of Drinking Water Supply in the Ministry of Rural Development, Govt. of India. 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 driven approach'. The role of the government reoriented from that of service provider to facilitator.Emphasis on Information, Education and Communication, Capacity Building and Hygiene Education for effective behavior change with involvement of PRIs, CBOs, and NGOs
2002	Scaling up of sector reform initiated in the form of Swajaldhara programme. The National Water Policy revised; priority given to serving villages that did not have adequate sources of safe water and to improve the level of service for villages classified as only partially covered. India commits to the Millennium Development Goals to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015, from 1990 levels.
2005	The Government of India launches the Bharat Nirman Program, with emphasis on providing drinking water within a period of five years to 55,069 uncovered habitations, habitations affected by poor water quality and slipped back habitations based on 2003 survey. Revised sub Mission launched as component of ARWSP for focussed funding of quality affected habitations.
2007	Pattern of funding under Swajaldhara changed: 50:50 centre-state shares.
2009	National Rural Drinking Water Programme launched from 1/4/2009 by modifying the earlier Accelerated Rural Water Supply Programme and subsuming earlier sub Missions, Miscellaneous Schemes and mainstreaming Swajaldhara principles.
2010	Department of Drinking Water Supply renamed as Department of Drinking Water and Sanitation.
2011	Department of Drinking Water and Sanitation was upgraded as Ministry of Drinking Water and Sanitation

Source: [Working Group,12th Plan]

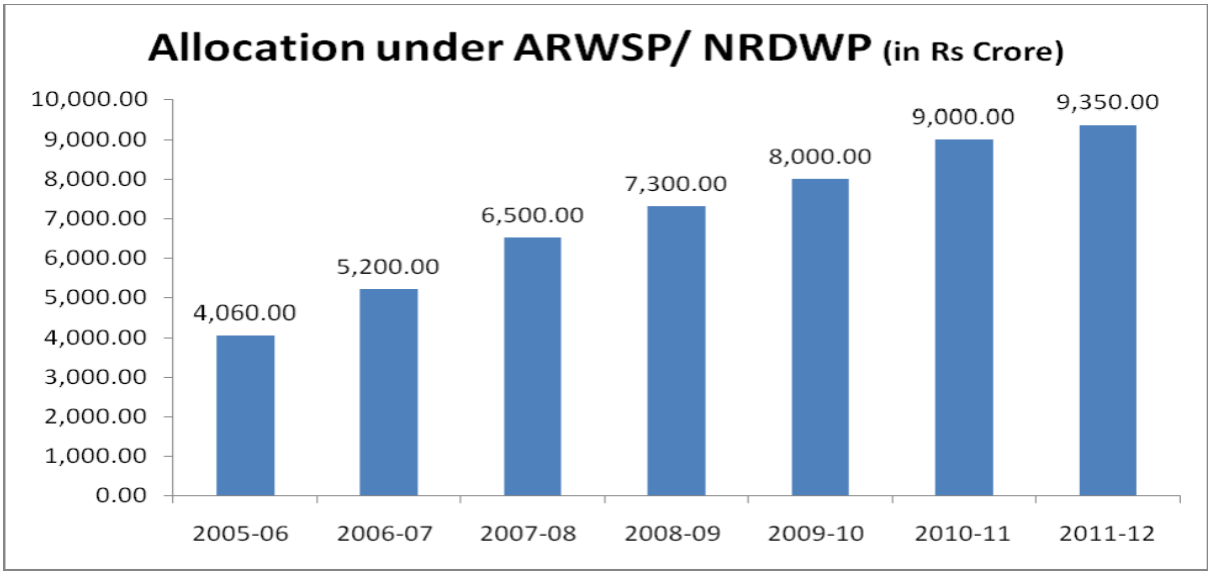


Figure 1-2: Allocation Under ARWSP/NRDWP

Source: [Working Group,12th Plan]

1.1.4 Present Situation of Coverage:

There are several agencies which are involved in surveying for the assessment of the situation in the rural water supply sector. The reports of some agencies are discussed here.

1.1.4.1 Joint Monitoring Programme:

WHO/UNICEF have established a Joint Monitoring Programme (JMP) for Water Supply and Sanitation. It conducts survey on people using improved water sources at regular intervals worldwide. As per JMP, improved water sources could be any of the following: i) piped water into dwelling, plot or yard, ii) public tap/standpipe, iii) tube well/borehole, iv) protected dug well, v) protected spring, and vi) rainwater collection. As per JMP rural population in India having improved water supply in 1990 was 63%, in 2008 it stood at 84%, and in 2010 it was 90%.[JMP 2012]

1.1.4.2 NSSO 65th round (July 2008- June 2009):

National Sample Survey Organisation (NSSO) conducts surveys on housing conditions in India. In the latest 65th round(2008-09) it has found that in rural areas, there has been a gradual increase in the share of both the sources 'tap' and 'tube well/hand pump', and a corresponding decrease in the share of 'well'. In 1993, nearly 19 per cent of the rural households used 'tap' as source of drinking water, which rose to 30.1% in 2008-09. In

respect of 'tube well/hand pump', this was 45 per cent of rural households in 1993 rose to nearly 55 per cent in 2008-09. The coverage from the improved sources of drinking water was 90 per cent in rural areas. [NSSO, 2008]

Table 1-5: Number of households according to their major Drinking Water Source per 1000 population

Major Source Of Drinking Water	Rural			Urban			Rural+Urban		
	49th Round. Jan-June 1993	58th round Jul-dec 2002	65th round Jul-08 June-	49th Round. Jan-June	58th round	65th round	49th Round Jan-	58th round	65th round
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
tube well/ hand pump	445	513	547	185	196	175	377	423	437
protected well	N.A	N.A	55	N.A	N.A	21	N.A	N.A	45
unprotected well	N.A	N.A	63	N.A	N.A	12	N.A	N.A	48
all well	317	179	118	86	51	33	257	143	93
tank/ pond (reserved for	13	8	8	4	2	2	11	7	6
other tank/pond	8	4	3	4	0	1	7	3	3
river/ canal/ lake	17	11	7	1	1	0	13	8	5
Spring	9	8	7	1	1	1	7	6	5
harvested rainwater	N.A	N.A	1	N.A	N.A	0	N.A	N.A	1
Others	3	3	3	14	13	19	6	6	8
all (incl. n.r.)	1000	1000	1000	1000	1000	1000	1000	1000	1000

Source: NSSO Report, 2008

1.2 Policy and Programmes: Outcomes at State Level

Maharashtra is the third largest and the second most populous state in India. It is situated in western region of country bordering to Arabian sea, Gujarat, Madhya Pradesh, Chhatisgarh Andhra Pradesh and Goa. It is wealthiest state in the country and has witnessed a significant increase in the level of urbanisation during last four decades.

The state is classified into six revenue divisions, namely

Konkan, Nashik, Pune, Aurangabad, Nagpur and Amravati. The Nashik and Pune divisions form the popularly known Western Maharashtra; Aurangabad comes under Marathawada; and Nagpur and Amravati division together form the Vidarbha region.

Figure 1-3: Map of Maharashtra

Table 1-6: Population Statistics of Maharashtra

Year	Population (million)			Decadal Growth Rate
	Rural	Urban	Total	
1971	34.7	15.7	50.4	27.45
1981	40.8	22.0	62.8	24.54
1991	48.4	30.5	78.9	25.73
2001	55.8	41.1	96.9	22.73
2011	61.5	50.8	112.4	15.99

Source: Census, GoI

1.2.1 Salient Features of Maharashtra:

1.2.1.1 Physiography

The Deccan Plateau occupies 81.5 per cent of the total geographical area of the state. The main rock type in Deccan Plateau is of Basaltic formation. The Sahyadri Range runs in a north-south direction parallel to the western coast. The average height of the range is about 1000 mt above sea level and its main ridge runs at right angle to the southwest monsoon stream, which forms an important climatic divide. The Konkan, lying between the Arabian Sea and the Sahyadri Range is a narrow coastal lowland, barely 50 km. wide. Mostly below 200 m., it is highly dissected and broken, the Konkan alternates between narrow, steep-sided valleys and low laterite plateaux. The important rivers are Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga, which are located near northern and western boundaries of the state. [GSDA]

1.2.1.2 Climate and Rainfall

Maharashtra enjoys a tropical monsoon climate having four seasons during a year. With an average rainfall of 1000 mm, there is wide variation in the spatial distribution of rainfall across the state. The highest rainfall (3000 mm) occurs over the Western Ghats (Sahyadri) and it drops up to 500 mm within another 50 km eastwards (rain shadow areas), forming the drought prone area which accounts for almost a third of the state's geographical area. A major part of Madhya Maharashtra comes under the rain shadow area. A high to moderate rainfall is received along the coastal planes of Konkan (2000 mm to 3000 mm) and further eastwards in the Marathwada and Vidarbha regions (1000 mm to 1600 mm). The spatial variation in rainfall can be seen in the fig.1-4.

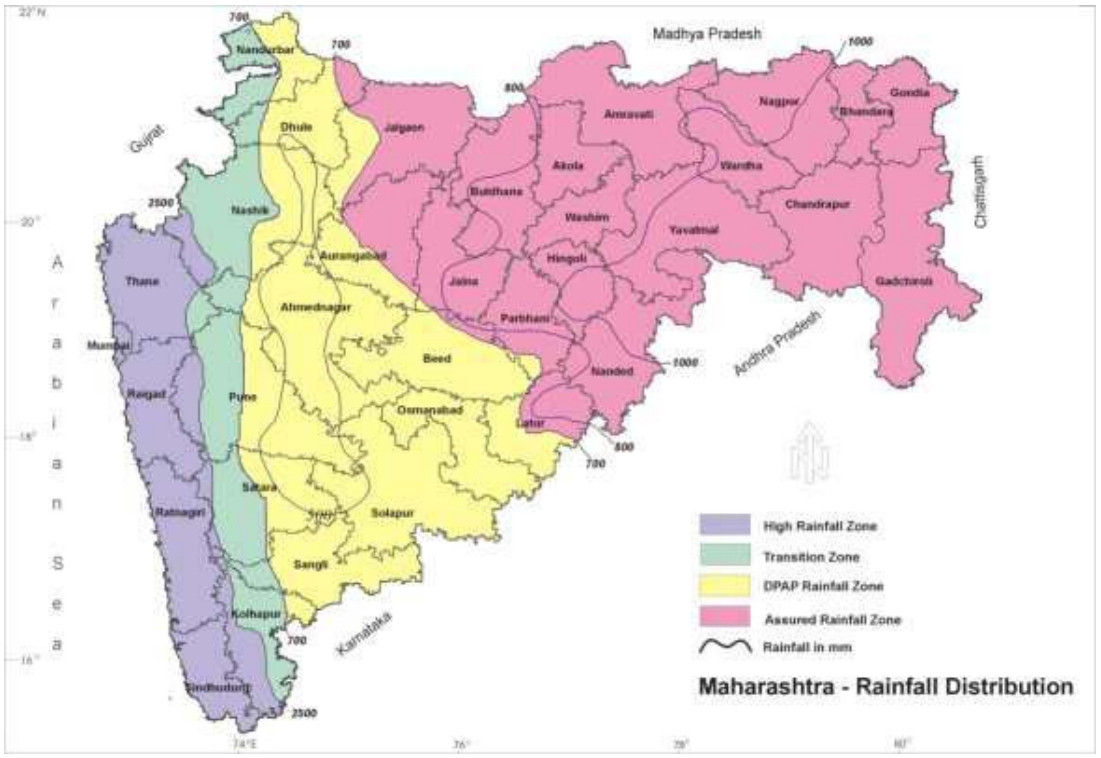


Figure 1-4: Rainfall distribution in Maharashtra

1.2.1.3 GroundWater

A majority population of rural Maharashtra and to some extent urban population is dependent on groundwater for drinking purposes and day by day the groundwater withdrawal is increasing. It should be noted that there is a serious concern about increasing water scarcity is being by experts and several agencies dealing with water.

As per GSDA report of Groundwater Estimation Out of the total 353 tahsils, 9 tahsils are categorized as Overexploited, 1tashil is categorized as Critical and 19 tahasils are categorized as Semi-Critical. Out of 19 semi-critical tahsils, in 6 tahsils the exploitation is more than 95% i.e. they are on the verge of transformation into the Over-exploitedcategory.[GSDA, 2008]

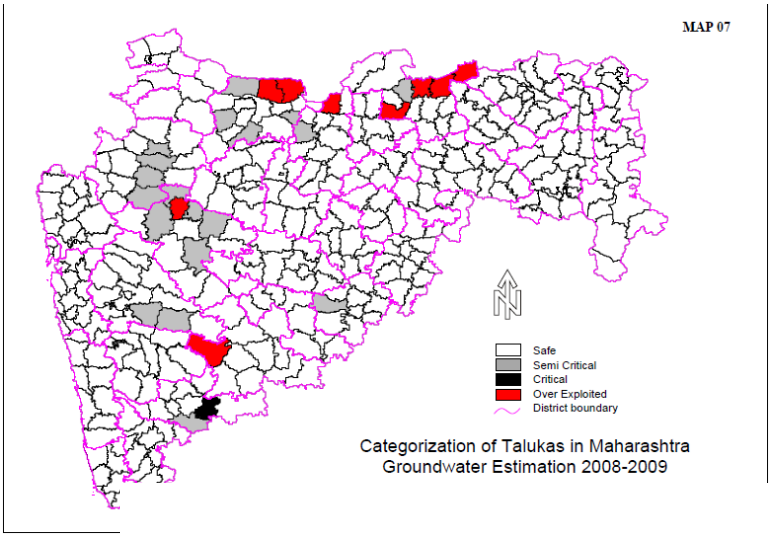


Figure 1-5: GroundWater Development in Maharashtra

Source: [GSDA, 2008]

1.2.2 Institutional Structure in RDWS

1.2.2.1 Water Supply and Sanitation Department:

The Ministry of Water Supply and Sanitation along with the department of Water Supply and Sanitation was created in 1996 to look after Water supply and Sanitation services in the state. The organisational chart can be seen in the fig.1-6.

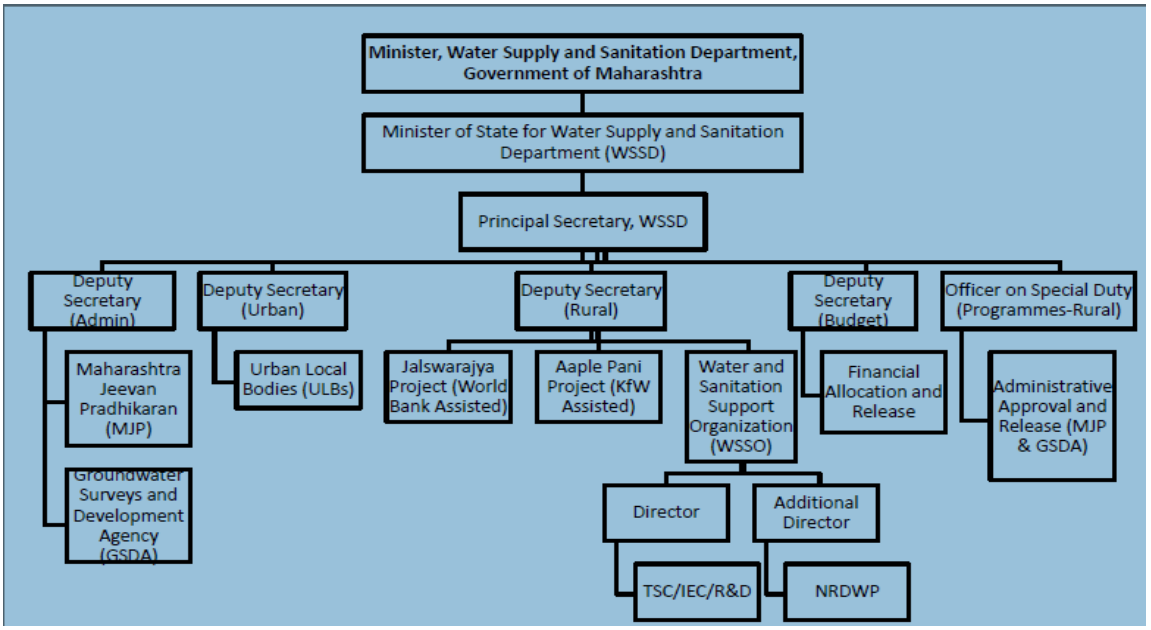


Figure 1-6: Organisational Chart of WSSD, Maharashtra

The Ministry is headed by the Minister of Water Supply and Sanitation and is supported by the State Minister for Water Supply and Sanitation. The Secretary heads the Water Supply and Sanitation Department (WSSD). The WSSD is supported by its two technical wings, Maharashtra Jeevan Pradhikaran (MJP) and Groundwater and Survey Development Agency (GSDA).

Moreover after implementation of PRI act, some of functions of the GSDA and MJP are transferred to Zilla Parishads and Rural Water Supply Department/ Minor irrigation(ZP) has become main implementing agency in rural areas.

1.2.2.2 Maharashtra Jeevan Pradhikaran (MJP):

The Maharashtra Water Supply and Sewerage Board was constituted on the 1st January, 1997 under the Maharashtra Water Supply and Sewerage Board Ac, 1976 for rapid development and proper regulation of Water Supply and Sewerage service in the State of Maharashtra. The name of the Board was changed as Maharashtra Jeevan Pradhikaran (MJP). The Maharashtra Jeevan Pradhikaran with Central Office in Mumbai and Navi Mumbai, has field offices in the entire State. The organisational structure can be shown as-

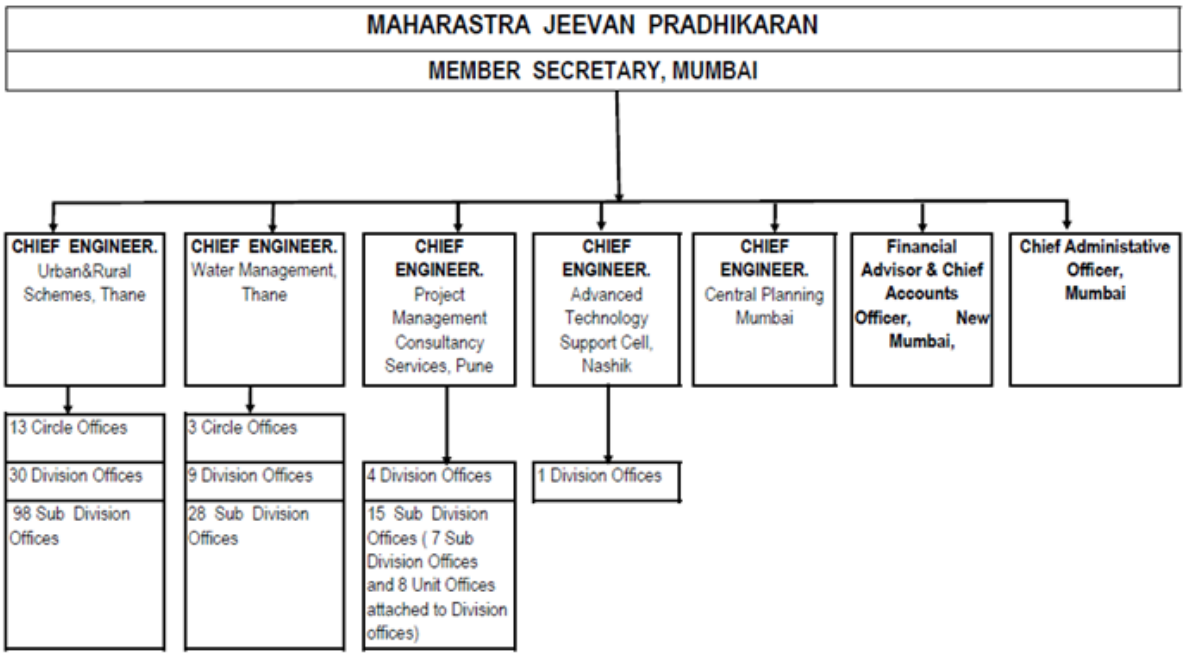


Figure 1-7: Organisational Structure of MJP

Source: Website of MJP

The primary objective of the Pradhikaran is to promote potable Water Supply and

satisfactory sanitation facilities so as to achieve and maintain clean environment. Briefly the Pradhikaran's activities cover the following aspects : .

1. Planning, Investigation, Designing, Execution of all the Municipal Water Supply and Sewerage Schemes.

2. Planning, Designing and Execution of Rural piped Water Supply Schemes sponsored by the Government of India and Government of Maharashtra costing more than 5 crore Rs (earlier it was 75.00 lakh).

1.2.2.3 Ground Water surveys and Development Agency:

It was established in 1972 especially for the development of minor irrigation schemes based on groundwater. Since then it is engaged in the exploration, development and augmentation of groundwater resources in the State through various schemes. This mainly includes, drilling of bore wells/tube wells under Rural Water Supply Programme, rendering technical guidance under minor irrigation programme by locating suitable dug well sites, strengthening of groundwater sources by water conservation measures, artificial recharge projects for induced groundwater, specific studies related to the periodic status of groundwater availability, protecting the existing groundwater resources through technical assistance under Groundwater Act etc. [GSDA]

The organisational structure of GSDA can be seen in the fig. 1-8.

GSDA is responsible for identification of source for Pipe Water Supply schemes and open dugwells under Rural Water Supply Programmes. It certifies the source as fit for use after performing a yield test.

Recently GSDA has come up with a solar based dual power pump scheme. In this scheme a submersible pump working on solar energy is installed on high yielding bore well along with existing Hand pump.

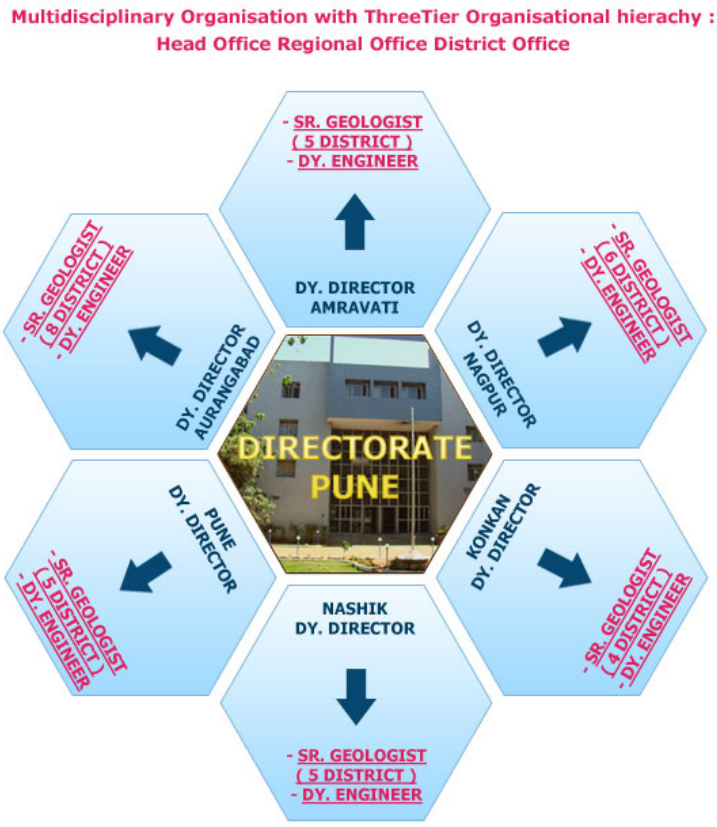


Figure 1-8: Organisational Structure of GSDA

1.2.3 A brief history: Programmes and Policies

The development in Rural Water Supply Sector in Maharashtra is more or less in line with that in central scenario.

Traditionally in rural Maharashtra, the main source of drinking water was dugwell, ponds, lakes, rivers etc as in other parts of rural India. After the independence GoI started community development programmes and provision of water supply and sanitation schemes in the states was a part of it. Under the said programme construction of wells was mainly focussed. The main thrust in RWSS started with the introduction of ARWSP in 1970s. As mentioned earlier a survey was conducted to identify problem villages as defined in ARWSP guideline which showed the number as 17112. [WAPCOS- Maharashtra]

Table 1-7: Number of Problem Vilages during different Plan Periods

Plan period	Problem	Villages	Remaining	Expenditure
VI	17112	15883	1229	373
VII	23306	21717	1589	980
VIII	16790	7951	8839	496

Source: [WAPCOS- Maharashtra]

In 1995, GoM came with a White Paper on drinking water supply. It gave a detailed picture of the sector at that time and put forward new path for policy changes. Due the efforts made in the sector there were 15856 piped schemes, 118429 borewells and 63901 dug wells in 1995 after spending around 2000 crores. [WhitePaper- Maharashtra].

The Paper highlighted some important issues of concern which persist even now, some of them were-

- ✓ The big schemes having large sums were not fully functional on the account maintenance and timely and proper repairs.
- ✓ The drinking water programme is very complicated as the programme is implemented by different agencies at different levels; the lapses in coordination and monitoring have negative effect.
- ✓ Water supply schemes should not be based on ground water sources in the case of villages with population above 2000.
- ✓ In order to protect drinking water sources, it laid special focus on effective implementation of Maharashtra Ground Water Act 1993.
- ✓ Districtwise and taluka-wise water plans need to be prepared, taking into consideration total availability of water and its use for different purposes in future.

As said earlier, historical development of rural water supply in Maharashtra was more or less same as central, but we would like to discuss here some programmes which were implemented at state level.

1.2.3.1 The Era of Master Plan and Sector Reform Programs:

The early 1990s were era of economic liberalism and reforms which affected the RWSS sector also. In case of Maharashtra, this era saw many externally funded programmes from agencies like World Bank, DFID(United Kingdom - Department for International Development).

1.2.3.2 MAHARASHTRA RURAL WATER SUPPLY AND ENVIRONMENTAL SANITATION PROJECT (First World Bank Project)

It was the First World Bank project with a cost of Rs. 504.25 crores implemented during the period 1991 to 1998 consisting of 17 single village schemes and 47 multi-village schemes in 560 villages of 10 districts.[Das 2006]

1.2.3.3 Maharashtra Rural Water Supply and Sanitation Project (funded by the British Department for International Development (DFID)

This project was implemented during a long time of ten years (1990-2000). The project cost was 74.3 crores. The output was 3 regional schemes in 3 districts. Moreover, it is worthwhile to mention that during this era there was a big focus on RRWS (Regional Rural Water Schemes). Apart from the project districts , MJP implemented many of its RRWS in other parts of Maharashtra during this era which is shown in the graph.

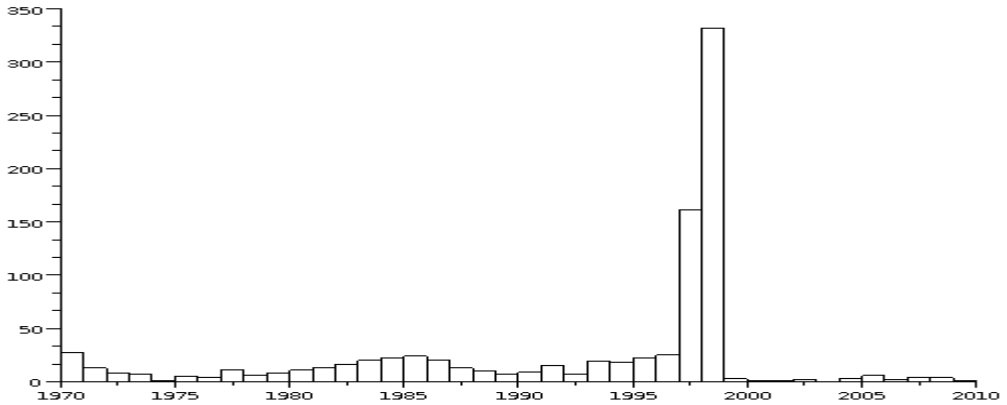


Figure 1-9: Graph showing Number of regional rural schemes sanctioned per year.

Source: Compiled from data collected from MJP office.

The above figure shows number of regional schemes sanctioned per year by MJP. It can be shown here that there are a large number of schemes during 1995-2000. After that very less number of schemes have been sanctioned.

. At that time government had also decided to make Maharashtra “Tanker Free” i.e, to ensure adequate drinking water for all so that water did not have to be supplied via tankers, especially in summer months or in the years of low rainfall. Twenty one out of 32 districts were declared tanker free by 2000.

Table 1-8: Tanker free districts per year

Year	Districts
1996-97	Dhule, Nandurbar, Bhandara, Gondia, Wardha and Gadchiroli
1997-98	Chandrapur, Kolhapur and Yawatmal
1998-99	Sindhudurg, Nagpur and Sangli
2000	Aurangabad, Beed, Nanded, Ratnagiri, Pune, Solapur, Thane, Nashik and

1.2.3.4 Maharashtra Rural Water Supply and Sanitation Project ("Jalswarajya")

Maharashtra Rural Water Supply and Sanitation Project ("Jalswarajya") was a program of Government of Maharashtra launched in September, 2003. It was a community demand driven rural water supply program funded by World Bank.The project was implemented by Government of Maharshtra in 3391 Gram Panchayats in 26 Zilla Parishads to provide 40 litres per capita per day potable water to projected village population.[Jalswarajya]

The development objectives of the proposed project were to:

(i) increase rural households' access to improved and sustainable drinking water and sanitation services; and

(ii) institutionalize decentralization of Rural Water Supply and Sanitation (RWSS) service delivery to rural local governments and communities.

The project used an institutional model in which:

(a) VP(Village Panchayat) and VWSC(Village Water and Sanitation Committee) were the main actors for the project implementation. They were responsible for planning, procurement, construction and O&M of schemes.

(b) At district level, the ZP was the final authority for all project-related administrative, financial and technical approvals.

Table 1-9: Different Stages of Rural Water Supply Sector in Maharashtra

Description	Period	Highlights
Dug Well Era	1960-1970	Providing dug wells Mainly manual drawing, sparingly with power pumps
Bore Well Era	1971-1985	Bore well digging technology introduced Providing hand pumps and power pumps on bore wells. Large scale digging of bore wells for irrigation

		purposes.
Rural Piped Water Supply Era	1985-1997	Increase in the number of piped water supply schemes in rural areas based on surface water sources First World Bank project with a cost of Rs. 504.25 crores implemented during the period 1991 to 1998 consisting of 17 single village schemes and 47 multi-village schemes in 560 villages of 10 districts DFID project (1990-2000) building 3 regional schemes in 3 districts costing Rs. 74.3 crores A White Paper on drinking water supply was published in 1995, to set a direction to the plans and programmes to solve drinking water problems.
Master Plan Era	1997-2000	Highest expenditure for regional and single village piped water supply schemes Estimated cost of Rs. 7,300 crores Till December 2002 expenditure Rs. 4,500 crores
The Policy Reform Era	Since 2000	Demand-driven approach to delivery of rural water supply and sanitation services First state in India to adopt a state wide new reform policy in water supply and sanitation sector. Shifting the role of government from direct provider of service to that of policy formulation and capacity support Beneficiaries to participate in planning, implementation and O&M of facilities Swajaldhara and now NRDWP

1.2.4 Present Scenario:

1.2.4.1 Coverage

As per nsso reports the status of drinking water facilities in Maharashtra can be seen in the given table 1-10. We see that almost 60% of rural population was dependent on tap i.e. piped water schemes in 2009 where as it was 51.8% in 2002. The contribution of Tubewell/Handpump has remain same while that of well has decreased considerably.

Table 1-10: Percentage distribution of households by major source of drinking water

Area	Major source of drinking water					
	Tap	**Tube well/hand pump**	**Well**	**Tank/pond**	**Others**	**All**
Rural						
65th Round (July, 2008 – June, 2009)	58.9	20.3	18.2	0.6	2.0	100
58th Round (July – Dec. 2002)	51.8	20.4	26.2	0.6	1.0	100
Urban						
65th Round (July, 2008 – June, 2009)	92.0	3.9	1.2	0.2	2.7	100
58th Round (July – Dec. 2002)	95.1	2.9	1.5	0.0	0.5	100

Source: NSSO Reports

However it should be noted here that these figures show only the dependency on the different sources. It does not tell that whether people are getting adequate water throughout the year as the problem of drinking water security worsens in summer months.

1.2.5 New Institutional Developments:

Under the aegis of the NRDWP it was proposed to form WSSO (Water and Sanitation Support Organisation). In Maharashtra development regarding setting up of WSSO was very slow, it was finally established in March, 2012. It is named as WSSO and headquartered at Mumbai.[WSSO-GR]

As per a GR dated 12th March 2012, the organisational structure would be like-

Figure 2.7: Proposed Organisational Structure of WSSO

Figure 1-10: Organisational Structure of WSSO

As per December, 2012 Director (WSSO) was appointed and recruitments for other posts were in progress.

The functions of WSSO as envisaged in NRDWP are as follows:

- It would deal only with software aspect of RWS sector and may not be involved in implementation of water supply schemes.
- It would work as a facilitating agency like a bridge between the PHED/ Board and the Community Organizations, assisting the PRIs and VWSCs to prepare water security plan and execution.
- To do evaluation studies, impact assessment studies, R&D activities and share the findings with PHED(WSSD in case of Maharashtra) for corrective action.
- To take up MIS and computerization programmes, GIS mapping and online monitoring systems, including those for water quality monitoring & surveillance.

Similarly at block level it is proposed to have a Block Resource Centre (BRC) in each block.

As envisaged in NRDWP guidelines, Block Resource Centres (BRC) are required to provide continuous support in terms of awareness generation, motivation, mobilisation, training and handholding to village communities, GPs and VWSCs. The BRCs will be under the administrative control of Block Panchayats. The running of BRCs can also be outsourced to reputed NGOs and in this case it is desirable that in a district, all BRCs are managed by a single NGO/out-sourcing agency. [BRC]
Each BRC should be headed by a Block Coordinator who will be over all responsible for the block.

Further depending on the population each block can be divided in to two or three clusters as-

Sr No	Population of Block	No of Clusters
1	Less than 70,000	One
2	70,000-1,50,000	Two
3	More than 1,50,000	Three

Roles and responsibilities of Block Coordinator:

i.) Doing the fieldwork in the Gram Panchayats assigned.
ii.) Handling matters relating to community mobilization in drinking water and sanitation;
iii.) Helping the Gram Sabhas in selecting/electing VWSCs in all villages in the block, opening of the Bank account, etc.
iv.) Training VWSC/ GP members about planning, implementation, operation and maintenance of water supply systems.
v.) Assisting GPs/ VWSCs to operate and maintain their water supply systems.

2 Central Sponsored Scheme in RDWS- Issues and Scope

In the earlier section we have seen the influential presence of Central Government in RDWS in states. We would like to argue here that sectors like RDWS have many localised issues which Central Sponsored Schemes (CSS) often fail to realize. This section tries to analyze some of the issues which are common to CSSs and has been experienced specifically in RDWS sector. The analysis has been built on relevant literature and our own experience in the sector (primarily in Maharashtra and to some extent in Gujarat). Later on, towards the end of section framework for *Assessment and Evaluation Study* has been discussed.

2.1 Central Sponsored Schemes-issues

In Indian context, there are several issues which have raised concerns about applicability and requirement of Central Sponsored Schemes (CSS) in social sectors [Chaturvedi 2011, Rath 2012, Garg 2006]. In this section we have tried to look on some of them in the backdrop of RDWS.

The Constitution of India has clearly defined the role of Central and State Governments in the federal structure. Almost all Government business activities are categorised as Central List, State List or Concurrent List in the seventh schedule. The Central Government is mandated to make laws on subjects in the Central list and states on the State list. States are primarily responsible for major sectors like health, education, employment, etc. which often involve large public expenditures. Recognising the higher resource requirements of the States, the Constitution mandates to transfer funds to the State Governments through statutory transfer of tax receipts collected by Centre through the Finance Commission award. In addition, the States access central plan funds through Centrally Sponsored Schemes (CSS) and Central assistance to State Plans. The Central Assistance to State Plans has two components viz. normal Central Assistance and Additional Central Assistance that consists of Assistance for Externally Aided Projects and Assistance for Special Programmes based on specific criteria and guidelines.

Furthermore, it is worth noting here that Central Government is also mandated to make provisions for state specified subjects on the account of international commitments. The Centre often takes this opportunity to override the state business and come with *Flagship Programmes.* A number of CSS in social sectors are example of this kind of intervention including flagship programmes like, ICDS, SSA, MDM, MGNREGA, IAY etc. The MDWS is no exception to this which has flagship programmes like ARWSP, Swajal Dhara etc. in past and NRDWP, Total Sanitation Campaign (TSC) etc. currently.

A table showing year-wise allocation to CSS has been presented here-

Table 2-1: Year wise Budgetary Allocation

Year	CSS		Central Assistance to State Plans (Rs. crore)
	No.	BE (Rs. crore)	
2002-03	188	31,389	44,344
2003-04	213	32,141	49,814
2004-05	207	38,312	51,766
2005-06	204	55,924	34,901
2006-07	155	71,996	45,518
2007-08	99	81,620	61,614
2008-09	133	1,01,824	77,075
2009-10	138	1,37,137	84,490
2010-11	139	1,57,051	96,412*
2011-12	147	1,80,389	1,06,026#
* revised estimates, # Budget estimates			

Source: [Chaturvedi 2011]

Table 2-2 Plan-wise Budgetary Allocation

Plan	GBS	No. of Schemes	CSS	% of CSS to GBS	Central Assistance to States and UTs	% of Central Assistance to GBS
Ninth Plan* (1997–2002)	3,16,286	360	99,001.68	**31.30**	1,38,394	**43.75**
Tenth Plan* (2002–07)	594,649.00	155	229,763.14	**38.64**	2,03,117.00	**34.15**
Eleventh Plan	15,88,273.24	147	660,506.00	**41.59**	3,97,418.93	**25.02**

Source: [Chaturvedi 2011]

From the above two tables it is quite evident that though the number of CSS are gradually decreasing, the portion of GBS to CSS is steadily increasing. The pattern of assistance for States under CSS varies from 100% to 90:10 for North-East States, 50-50 in NRDWP, 65:35 in SSA, 75:25 in IAY and no. of other schemes.

There is a growing concern over this kind of Centre-state relationship. This can be categorized in two broad categories, *firstly*, It puts challenge to federal and financial structure of a Nation State and *secondly* which we see more important is the inherent ability of central scheme to cater to the local problems. In the continuation of latter concern, we want to argue that this kind of arrangement prohibits local knowledge institutions to take active part in development process. Various committees have been

constituted to look into issues related to CSS by Central Government. The latest one is Chaturvedi Committee, which was constituted by planning commission under chairmanship of B.K.Chaturvedi to suggest the restructuring of CSSs [Chaturvedi, 2011]. We have taken some of the issues as pointed in the report and analysed it in the context of RDWS sector.

2.1.1 Lack of flexibility in CSS schemes

CSS does not take into account adequately the need for flexibility in physical and financial norms of projects. In order to take full cognizance of divergence amongst States in geographic condition, level of economic development, nature of gaps in physical infrastructure and demography flexibility is required [Chaturvedi, 2011]. Since in most of the cases, the sectors fall under domain of the State Governments or concurrent list the State Governments are also implementing schemes in such areas. This may result in duplicity of efforts. Hence, there is need for flexibility of convergence.

This is also true in case of RDWS in Maharashtra. In spite of Central Schemes there has always been presence of a number of schemes i.e *Jalswarajya, Aaple Pani, Shivkalin etc.* Every Year State runs a *tanker* program on drinking water scarcity to the tune of several billions apart from NRDWP. There is no scope in NRDWP to tackle this kind of issue.

2.1.2 Adverse implication of counterpart funding of CSS on State finances

Rapid increase in CSS and need for counterpart funds has led to pre-empting of resources of State Government for their Plan priorities. In several cases, it has also led to difficulties in accessing CSS funds due to shortage of counter-part funds with a State. States have raised their concern on it at various platforms like NDC meetings [Chaturvedi, 2011].
In case of RDWS sector also the NRDWP puts several kind of conditionality on states to put matching funds.

2.1.3 Negligence of State priorities

CSSs are tied to guidelines which have National priorities defined by Central Government.

To site one of the examples in RDWS sector-

In a letter to states the central ministry wide RD Letter No W-i6011/5[89-TMI] *Dated*: May 24, 1989 says-

"*Recently, it has come to the notice of this Department that some of the States have conducted fresh surveys from 1986 to 1988 to identify new problem villages as per their own criteria and have reported coverage of such newly identified problem villages under the State Sector Minimum Needs Programme. This is in violation of the guidelines Issued by the Central Government under Centrally Sponsored Accelerated Rural Water Supply Programme..... No new survey should be conducted without getting prior approval of the Central Government*"

We would like to bring in discussion one more factor which has considerable influence.

2.1.4 External Factors influence

It is quite evident after looking on evolution of RDWS sector in India that there is an affective presence of external factors, e.g. UN commitments, World Bank etc. At the same time how effective is that presence can always be questionable.

As early as the launching of Technology Mission in 1986-87 was under the influence of the fact that the decade was declared as "Development Decade for Safe Water and Sanitation" by UN and the goal was set as "water and sanitation for all by the end of the decade".

The paradigm shift from supply driven to demand driven was also brought in external funding agencies like, World Bank. It is quite evident as this concept was first experimented in a World Bank funded project in UP (Swajal).

One more example to be worth mentioning is of *Jalswarajya Project*, in Maharashtra. It was a World Bank project implemented from 2003 to 2009. After four years of completion, the World bank which proclaims to be strong advocate of accountability and transparency has not yet disclosed the project completion report. Interestingly there is no document available on it project website commissioned after 2003. [World Bank, 2003]

2.2 Concepts and issues- Rural Drinking Water

In recent past, many new concepts and issues have been developed in the rural drinking water sector pertaining to the situations discussed in the earlier section.

2.2.1 Coverage- A Normative Concept

We have found that now-a-days the rural drinking water sector is full of *normative concepts* i.e. to say based on norms. The coverage is one of them. The notion of coverage gained importance as there was a reversal of the method of target of villages for intervention. While it began with the earlier notion of "Problem Villages" which assumed that a village was non-problematic unless identified otherwise. However, this changed with the ARWSP where the state and the center stressed on complete coverage of all habitations. Even in the demand-driven Swajal Dhara, there was stress on coverage. Along with coverage, came the norm of 40lpcd. This came first in ARWSP and remained same during Swajaldhara. In NRDWP there is a possibility of increasing it to 55 lpcd if the villagers are ready to pay.

2.2.2 Supply Driven/Demand Driven (Swajal Dhara Principles)

As discussed earlier, rural drinking water supply sector went through a paradigm shift from supply driven mechanism to demand driven. The *Swajal Dhara* principles were enforced throughout the country.

Demand Expression: VWSC

The core concept of *Swajal Dhara* is that demand expression by the community is a must for initiation of a scheme. The institution mandated with the ability to make demand is Village Water and Sanitation Committee, which is supposed to be a standing committee of Gram Panchayat. We have found few issues of concern in regard to this.

The first one is that there is very low penetration of IEC in the rural areas. In absence of this, people do not realise the importance of VWSC in this new era of implementation. This has been seen in our ground work, in different parts of Maharashtra. Also, this has been revealed in evaluation report of RGNDWM by planning commission. It says that VWSCs exist in less than one fifth of villages and what is more surprising is that only 1% of respondents in a village were aware about VSWC. It indicates that either in most of the villages VWSC does not exists or even if it exits it is on paper only.

The second issue stems because of the recognition of "Habitation" as a unit for coverage, and designating VWSC (which exists at Village level) as authority for demand expression. In areas where a Village consist of 8-12 habitations there is no doubt that possibility of neglecting priorities of few habitations exits.

The third issue is related to the instrument of delivery. This institutional set up limits, if not prohibits the scope for Multi-Village Schemes (MVS). A MVS is a piped water scheme which serves a number of villages or habitations. So for initiation of MVSs, a number of villages or habitations should come on same platform and sign an MoU. This is always a very challenging job in practice.

People's Participation=Public Contribution:

There were several reasons that people's participation came to be deemed as important. Firstly, in the supply driven mode, this was a marginal requirement to enable better maintenance of the scheme. However, in the Swajaldhara program, when scheme demand, contribution towards capital expenditure, complete O&M and so on were the prerogative of the GP. To top this all, the 73rd amendment of 1990 also created a discourse of decentralization which provided the background to people's participation. As per the guidelines, the community should contribute towards the capital cost of schemes in the form of cash /labour / land or combination of these. However, at least 50% of the community contribution will have to be in cash. This is seen as a indicator of people's participation and willingness. However, this has not been seen in practice.

In a meeting for discussion on MSNA(a proposed World Bank funded water supply in Maharashtra)in which the author was present, the concept of "Public Contribution" was strongly opposed by a very senior official of WSSD, Maharashtra. To quote him-

"It is a known secret that the Public Contribution/Popular Contribution is not popular at all and we all know that it is paid by the contractor"

This fact has also been revealed in our ground work in Maharashtra and Gujarat.

Source Sustainability:

One more important feature of *Swajal dhara principles* is the component of "Source Sustainability". In initial sector reform period it was only recommended and kept as optional. But later in NRDWP it was made as a compulsory component with at least 20% of NRDWP fund must be utilised in sustainability component. However, the MDWS in an order dated 28/03/2011 relaxed it to 10%.

2.2.3 Technical Nature of RDWS- Different Failure modes

Water Supply Sector (both rural and urban) is fairly technical in its nature. This is due to the fact that almost all the abstraction methods whether based on surface water/ground water or a handpump/PWS are engineering having features. Even in case of open dug well the site selection is of due importance which requires *yield test* again an engineering process. In case of Piped Water Scheme it becomes more evident as it requires a good delivery system network design failing to which schemes become unable to deliver the required amount of water to the target beneficiaries and eventually dies out. This problem is more pronounced in Multi village Schemes and in hilly regions having poor aquifers ([Sugave, 2011][Belsare et.al, 2012])

In recent times, an important component of policy has been a big push towards piped water supply (PWS) in rural areas. Though some have argued about this obsession with PWS [Das, 2006], we find that in states such as Maharashtra where distance of houses from source can be large, PWS is the option of choice. But we see there is clear negligence about the above mentioned technical nature of rural drinking water sector in relevant literature. In best of our knowledge there is no comprehensive report which the tackles the different failure modes of Piped Water Schemes. The major challenges to the sector as seen in the government documents are, overexploitation of ground water, non-recovery of o&m charges and less participation of people. These factors result in slippage of covered habitations [(Strategic Plan, 2011), (PC, 2012)]. In our discussion with officials of the implementing agencies, we have found that there is a general consensus that schemes fail due to poor O&M and people do not pay. However, many a times schemes fail due to sub-optimal/ bad design or wrong source (insufficient) selection and people do not pay due to poor service. And further it forms a vicious circle in which "blame" is attributed to one and another. The failure of a drinking water scheme is a technical failure, and to varying degrees, a socio-economic, an administrative and finally a policy failure. Thus, it is important that we analyse a scheme failure and correctly attribute the "blame" and also evaluate the extent to which national policy could have had an influence on the failure [Pooja et.al, 2013].

There is provision for reporting non-functional schemes in the IMIS, GoI. As per the latest data, only 6,717 out of completed 49,48,137 (0.14% of total) are reported non-functional with only 30 non-functioning schemes in Maharashtra. This is too low to be realistic as per our experience in the ground in Maharashtra. This clearly indicates under reporting and subsequent negligence of different failure modes at policy level.

The failure analysis in different parts of country becomes more important in the backdrop of proclaimed strategic plan of MDWS, GoI. The goal set by the Ministry of Drinking Water and Sanitation in its strategic plan for 2011-2022 is to ensure that at least 90% rural households are provided with PWS by the year 2022 at 70 lpcd norm[Strategic Plan, 2011]. Though it is highly ambitious, but we would like to stress that the sustainability of schemes should be ensured considering technical as well as social nature of Piped Water Schemes

2.3 Way Forward: State-Academia-Public Collaboration

The role of Academic Institutions in various social sector programmes has been echoed at many platforms. In the Central Government's Programme, *MNREGA*, there is a concept of Professional Institutional Network (PIN). It was constituted for steady, sustainable interventions that enhance the quality of the programme. The network is supposed to undertake an impact assessment to identify within districts and across states, efficient management practices, procedures, processes, factors that have contributed to good performance and the positive outcome and impact. At present there are 42 institutions in the network with the leading academic institutes like; IITs, IIMs and CSOs like; CSE, AFPRO etc.

In rural water sector also there is a similar concept present. As per NRDWP guidelines, MDWS assigns leading academic institutes and CSOs as Key Resource Centres (KRC).

The objectives of KRCs are to ensure that sector professionals are sensitized for change in role, responsibility and attitude through need-based in-service training/ exposure utilizing services of specialists/ experts. The KRC is also supposed to fill the knowledge and capacity gap amongst the sector professionals through specialized training and capacity building programs to meet the challenges of leadership, managerial, administrative, technical aspects.

However, we see that in practice the PIN members have limited themselves to production of few occasional assessment reports whereas the KRCs are limited to occasional training programmes.

Our vision of State-Academia-People collaboration is slightly different. We see a closer participation of academic institutions in social sector programmes and eventually to bigger developmental goals. In the current practice of education, there is no wonder that there must not be any course on rural water supply or rural roads in any leading academic institute in the country(for a detailed discussion see, [Sohoni]).

As opposed to current practice, the academic institutions can play a more vital role by inclusion of societal need based curriculum provided such kind of demand is generated.

The rural water supply sector, like other social sectors lack capacity in terms of human resources. A nation-wide study to map this in water and sanitation (WATSAN) sector was done by Plan India, in 2009. It would be worth mentioning here some of its observations and recommendations regarding the supply side (academic institutions) management. The study observes that-

There is no college which offers training on social engineering related subjects. The project management which deals with exploration and selection of suitable technical options, project planning (participatory mode), design, costing, generation of user contributions for capital cost, involving the beneficiary in construction etc. does not

form the part of syllabus. The design of degree again indicates the problems of inappropriate linkages between the supply and demand sides.

Though colleges have placement cells but they are more linked with job market in the private sector. There is no such mechanism that connects the students with the jobs and opportunities in social & development sector generally and with jobs in WSS sector specifically.

Also, There is need to expand the scope of engineering related degrees as the current structure is too technical and does not provide any knowledge on the current approaches followed in the country in the water supply and sanitation sector. Hence, it is proposed to have subjects on social engineering (awareness generation and capacity building initiatives), project planning, implementation, management, etc. [Watsan, 2009]

However we also emphasize that local academic institute at regional or district level should be brought in the rural water supply and other developmental processes.

The present study is a step forward towards this goal. We see *Assessment and evaluation* as crucial step in successful implementation of any policy. We take this opportunity to prepare a framework for it, which can guide local institutions to take up such kind of studies.

2.4 Assessment and evaluation- Concept and Evolution

Assessment and evaluation form the core concepts in policy formulation and its implementation. The importance of assessment and evaluation for better outcomes of any policy is an undisputable concept. This has been expressed in many reports and studies [PC, CAG, MoSPI]. In recent times, this has also gained importance in various guidelines [NRDWP, 2009; Strategic Plan 2011; PC, 2012]

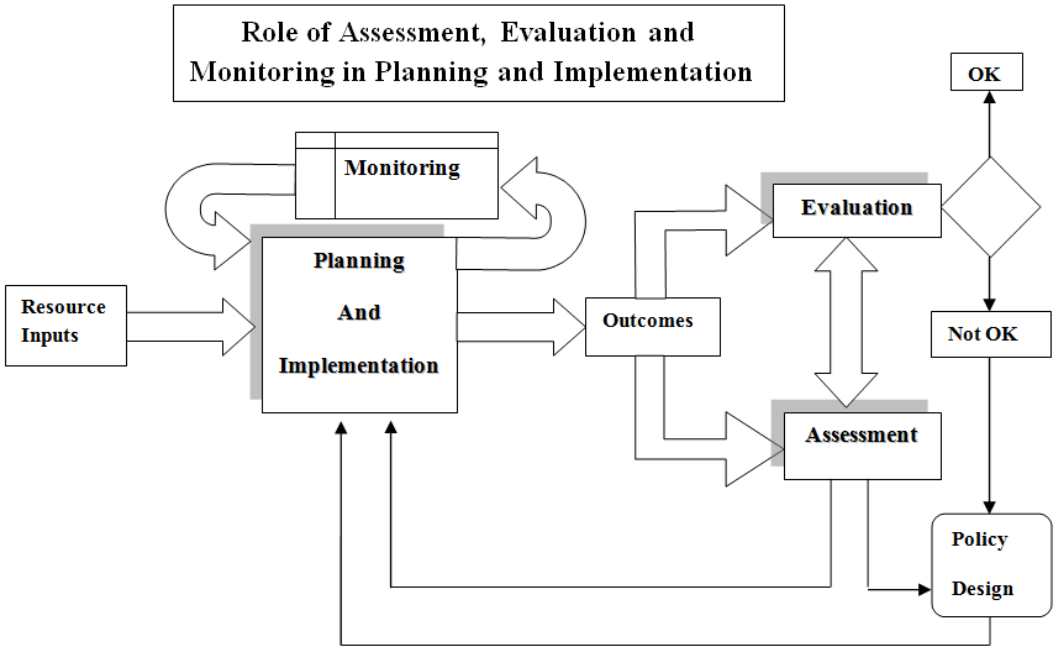


Figure 2-1: Role of Assessment and Evaluation

The fig 2-1 gives a simplistic pictorial representation of Policy design and its planning and implementation. Monitoring forms the integral process of Planning and Implementation and is more like a day-to-day business. In most of the cases it is in-house done by the implementing agencies, though some have raised concern over it and have suggested to be done by a third-party. It is so because accountability in the monitoring process is very weak. The fear of adverse remarks has prevented officials from reporting poor performances. Concealment of shortcomings and manipulation of data have been resorted to, to cover poor performances [Monitoring, PC, 2012]

Here, we would like to draw the attention on *Assessment and Evaluation.* A quick survey of relevant literature has revealed that the difference between assessment and evaluation studies in social sector programmes is loosely defined and in most places these two are used interchangeably. However, a key difference between the two is that in general *Assessment* typically focuses on assessing a situation or context within a defined geographic area, whereas the latter tend to focus on projects, programs, or systems [McNall et.al, 2007].The commonalities between them is due to the common techniques used in both type of studies. Many a times they combine to form *Appraisal.*

The literature survey has also revealed that there are a number of types or variants of these studies. These can be classified in to two broader categories:

(a) Based on objectives:- Impact Assessment, Risk assessment, Need Assessment etc.

(b) Based on time, infrastructure required:- Census, Survey, Participatory, Rapid etc.

The difference between Census/Survey and Participatory/Rapid is that the former one is quantitative where as the latter are more qualitative in nature.

The choice of type of study largely depends on factors like, objectives or goals, time, cost etc.

For example, if the objective is just to get some numbers or percentage quantitative methods are preferred. They use complex statistical social science research methods and structured questionnaire. These are thought to have higher degree of "validity". But they require large infrastructure and high cost. In contrast to this, The qualitative method investigates the why and how of decision making, not just what, where, when. Hence, It needs smaller but focused samples. Over the last two decades it has become popular in social science research. It requires less time, infrastructure and cost than to the quantitative counterpart.

Considering our objective that, the study it should be repeatable and administrable by persons/teams of reasonable competence and within an expense of roughly 2%of the net investments between two assessments, qualitative methods were found more suitable.

2.4.1 Rapid Assessment and Evaluation

Rapid Assessment and Evaluation can be seen as an approach for developing a preliminary. qualitative understanding of a situation. In literature more often it is defined as-

"intensive, team-based qualitative inquiry using triangulation, iterative data analysis and additional data collection to quickly develop a preliminary understanding of a situation from the insider's perspective" [Bebe, 2001]

Rapid appraisal methods have a number of variants. A quick survey of literature [Bebe, 2001;Kumar, 1995; McNall et.al, 2007] reveals some commonalities among them. These are listed below-

- **Methods**
  - *Mixed methods:*

Quantitative approaches typically include:

- ✓ Quantitative surveys
- ✓ Review of existing data sets

Qualitative approaches usually include:

- ✓ Key informant interviews
- ✓ Focus groups
- ✓ Naturalistic observations
- ✓ Record reviews
- ✓ Mapping of areas affected by problem

- **Process**

Rapid: Evaluation, assessment, or appraisal lasts from a few weeks to a few months

Participatory: Representatives of local populations and institutions are involved in the planning and implementation of the research

Team based: Members of the research team work collaboratively on all aspects of the research process, from planning and data collection to the interpretation of findings and presentation of results.

Iterative: Data are analyzed while they are being collected, and preliminary findings are used to guide decisions about additional data collection. This process continues until theoretical saturation is achieved

The framework for *Rapid Assessment and Evaluation* at taluka level was set up with above lying principles using mixed methods.

3 Introduction to RDWS: At District Level

The present and next chapter form the core setup of the framework for *Rapid Assessment and Evaluation Study.* As it was mentioned in the earlier section, prior familiarity with the study area and secondary data analysis is required. Hence a thorough understanding of RDWS at district level is must before executing the *Assessment and Evaluation Study* at taluka level. This is also because in practice district is the basic unit for planning and implementation of different programmes in the RDWS sector.

The district chosen for this purpose is Thane district in Maharashtra. It is a neighbouring district to Mumbai City, the economic capital of India. As per 2011 Census, it is the most populous district (over a crore people) in the country and has a high rate of urbanisation.

Why Thane?

At first it is a neighbouring district to Mumbai, the author's place of study. And many members of the Water Group, CTARA (Kiruba, Raj) have previously reported about the water crisis in the district. This situation is despite of a very high rainfall (3000-4000) and district having big reservoirs like Tansa, Vaitarana and Bhatsa (for supplying drinking water to Mumbai city).

3.1 Description of the District: Thane

Thane is situated on western strip of Maharashtra (Konkan region). In north the district is bordering with Gujarat state. The eastern part is bordered by Nasik, Pune and Ahmadnagar districts and southern side by Raigad and Mumbai districts. The district comprises of 15 revenue talukas and headquarter is Thane city. The total area is 9558 sq.kms. The district is covered in between two westerly flowing river basins i.e. Vaitarna and Ulhas. A brief description of Thane is given in the table.

Table 3-1: Demography of Thane

Location	18°42' N - 20°20' N 72°45' E - 73°48' E
Population	Rural-8,503,094 Urban- 2,551,037 Total-11,054,131
Number of Talukas	13
Number of GP/Vill/Habs	974/1769/6680
Number of SC/ST GP/Vill/Habs	728/1255/ 4689

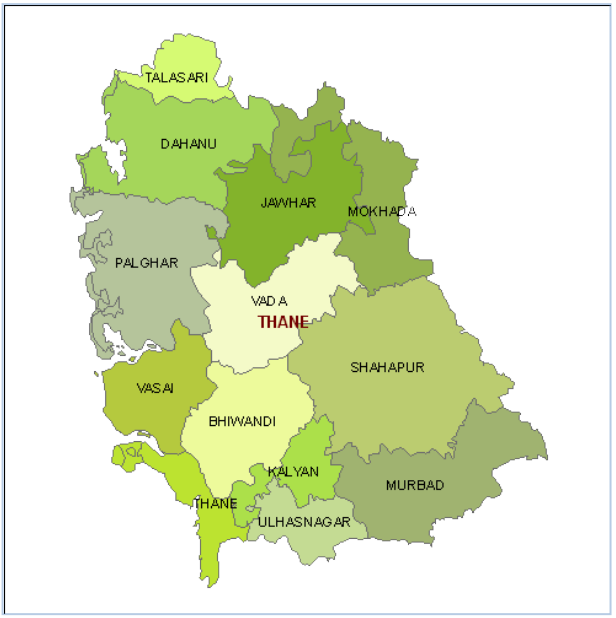


Figure 3-1: Map of Thane

3.1.1 PHYSIOGRAPHY:

Morphologically the district has been classified in to three groups [GSDA].

a. **Hilly and Foot hill region- Eastern part.**

b. **Moderately dissected and**

Sloping area- Central part.

c. **Coastal area- West part.**

3.1.2 HYDRO GEOLOGY:

Hydro geologically the basaltic terrain of Thane has aquifers in the form of jointed and fractured trap. The occurrence of ground water in deccan trap is governed by its degree of weathering, concentration of joints and fractures planes, porosity and permeability of geological units. The movement and storage of ground water are mainly controlled by physical and geological set up of the terrain. Only after weathering, cracks develop which allow ground water to be stored. However due to adverse morphological conditions, the availability of ground water is mainly restricted to plains and valley. Irrigation based on ground water is seen only in the parts of Dahanu, Talasari, Vasai, and Palghar talukas. This irrigation is mainly of horticultural crops. The coastal sandy aquifers are sufficiently good yielding, but even a marginal over exploitation causes intrusion of saline water [GSDA]

3.2 Rural Drinking Water Supply:

In Thane district, rural drinking water supply is taken care by three departments. Each department has definite roles and responsibilities. These three departments are-

i) Department of Rural Water Supply (ZP)

ii) Maharashtra Jeevan Pradhikaran (MJP)

iii) Groundwater Survey and Development Agency (GSDA)

3.2.1 Department of Rural Water Supply (ZP)

Rural Water Supply Department of Zilla Parishad, Thane (ZP, Thane) is the nodal agency for all RDWS related work. It is headed by Executive Engineer (E.E.), who is in-charge for the district and directly reports to Chief Executive Officer (CEO), ZP. The district is further divided in to seven sub-divisions, each division headed by an officer of a rank of Deputy Engineer. These sub-divisions are at taluka level, but as there are total 13 talukas, some of these sub-divisions have been allocated two or three talukas. The

Dy. Eng at each sub-division is assisted by Section/Junior Engineers and non-technical staff. It should be noted here that a few engineers from MJP are also deputed to the department as per the requirement.

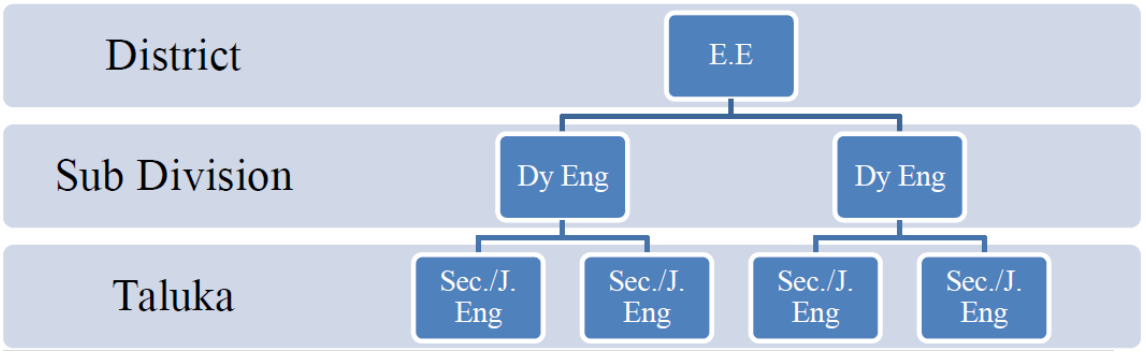


Figure 3-2: Hierarchy in RWS, ZP

The above figure shows the hierarchal arrangement of officers in RWS, ZP.

Table 3-2: Technical Strength of RWS, ZP (Thane)

Sr. No	**Head/Sub-division**	**Taluka**	**Number of Engineers (Executive Engineer + Deputy Engineer)**	**Number of Engineers (Sectional Engineers+ Junior Engineers)**		
				Sanctioned Posts	**Posts Occupied**	**Posts Vacant**
1	Head Office	N.A.	1+1*	6	5	1
2	Ambernath Sub-division	Ambernath	1	6	4	2
3	Kalyan Sub-division	Kalyan	1	6	5	1
4	Bhiwandi Sub-division	1.Bhiwandi 2.Vasai 3.Wada	1	6	6	0
5	Shahpur Sub-division	1. Shahpur 2.Murbad	0**	6	6	0
6	Palghar Sub-division	Palghar	1	6	5	1

7	Dahanu Sub-division	1. Dahanu 2.Talasari	1	6	5	1
8	Jawahar Sub-division	1. Jawahar 2. Mokhada 3.VikramGad	1	6	6	0
	Total	13	8	48	42	6

Source: RWS, Thane

* One Executive Engineer and one Deputy E. Engineer
** Deputy E. Engineer in Head office is in-charge for this sub-division

Table 3-2 gives the detail about technical strength of RWS, ZP (Thane). We can see that there are total 50 (1 E.E + 7 Dy. Eng + 42 Sec/J. Eng) in the department.

Educational background:

The qualification of Junior Engineers is DCE (Diploma in Civil Engineering) in general but newly recruited B.E. (civil) can be appointed as Sec/J.E. They get promoted with work experience. In general, E. Eng, Dy. Eng and Sec. Eng are B.E (civil) by qualification. It is worth mentioning here that a person with DCE qualification can reach up to Dy. Eng with work experience.

Roles and responsibilities of different engineers can be explained in brief as-

District Level: At district level E. Eng is responsible for overall functioning of all the programmes of the department. He gives technical sanction to the rural water supply schemes and ensures the progress is as per the AAP (Annual Action Plan). He is assisted by a Dy. E. Engineer. There also Sectional Engineers who are in-charge for different components of NRDWP.

Sub-divisional Level: At sub-divisional level, Deputy Engineer is responsible for the whole sub-division. He prepares the estimate and design document for the water supply schemes for the further approval by E. E. He takes part in preparation of AAP at the district level. He sends all the data required for updating IMIS to the district data operator.

Taluka Level: At taluka level, J. Eng is responsible for all the data collection. He does the survey required for the estimate preparation and also reports to the Dy. Eng about progress of the scheme.

We would like to mention here that through our discussion with different officials, we found that roles and responsibilities of different stake holders in a rural water supply scheme is ambiguous, especially in this post reform era period. Based on our discussions

with different officials we have tried to make a work flow diagram and to map the stakeholders involved. It can be seen in Fig.3-3.

We would like to mention here that a lack of accountability in terms of who is accountable for what can be seen in rural water supply schemes. Even in the NRDWP guidelines it is not very clear. For example, if contractor is not working properly who can be held accountable? The IEC component of NRDWP can be seen as core mandatory pre-requisite for running demand driven schemes. We have found that expenditure in Thane for IEC is very low. In lack of that operation and maintenance of the schemes after handover become one of the biggest issues and a major cause of failure.

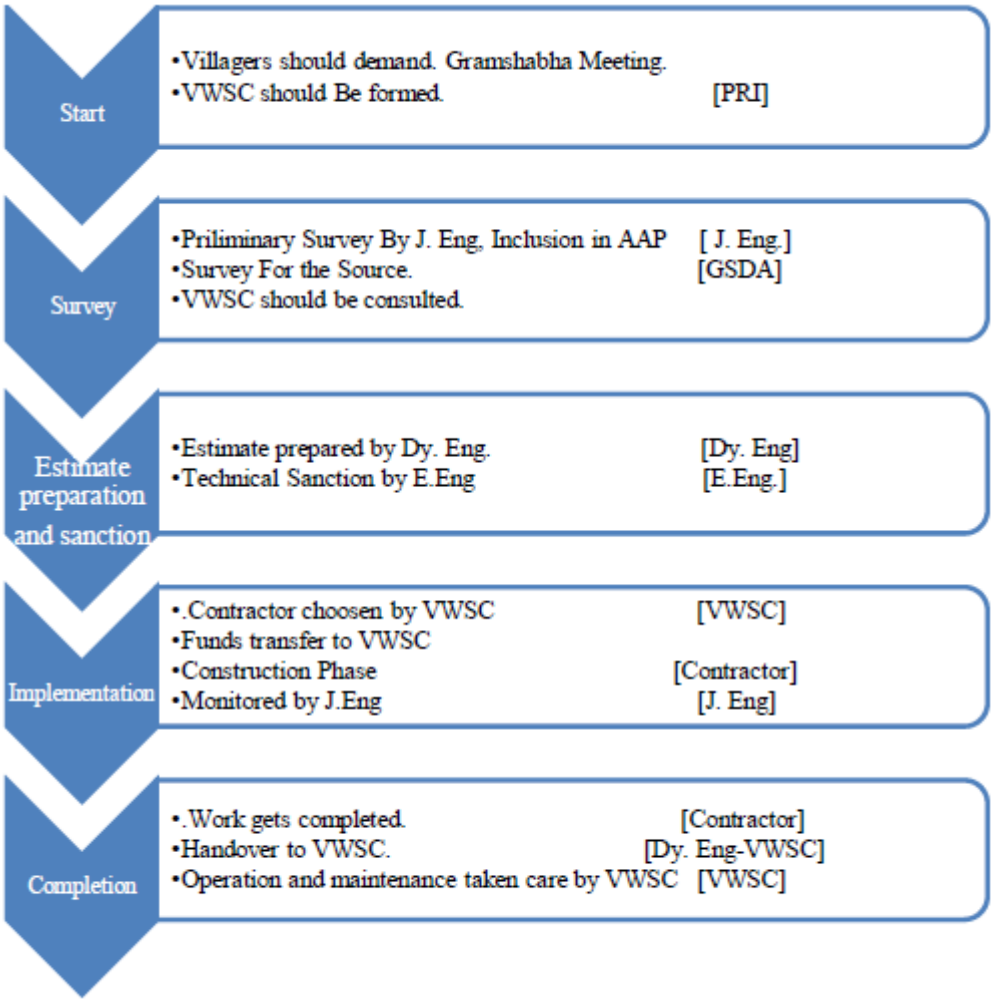


Figure 3-3: Work Flow Diagram for Rural Water Supply Scheme

3.2.2 Maharashtra Jeevan Pradhikaran:

Regional Rural Water Supply Schemes are mainly executed by MJP. These schemes are large schemes serving to number of habitations by a single scheme. Earlier ZP was authorised to execute schemes only up to estimated cost of 75 lakhs and schemes above 75 lakhs were executed by MJP. After 2010, this was changed to 5 crore. Now schemes costing more than 5 crore are executed by MJP. In Thane, MJP is also an implementing

agency along with RWS, ZP (Thane) under NRDWP. While preparation of AAP habitations are divided between ZP and MJP as per the applicability of schemes. Since MJP schemes are very big different than PWS schemes of ZP, their work flow is also different from ZP schemes. These are constructed by MJP and operation and maintenance also lies with MJP. The organisational structure (as explained earlier in chapter 2) of MJP is different from ZP. The technical strength of MJP is as-

Table 3-3: Technical Strength of MJP, (Thane)

District	Ex. Engineer	Dy. Engineer	Sectional Engineer
Thane	2	5	26

3.2.2.1 Groundwater Survey and Development Agency:

The main role of GSDA in rural water supply schemes is source (ground water) certification. When a source for particular scheme is selected, it has to be certified that it can deliver a minimum amount of water so that total lpcd requirement for the scheme can be met in a sustainable manner. For this purpose GSDA conducts yield test and ensures that source is fit for use or not. GSDA is also responsible for sustainability structures as per NRDWP guidelines.

3.3 History and present- RDWS

3.3.1 Key Data Sets

In order to understand the past and present of RDWS some key datasets are required. In this sections these datasets are elaborated.

As a part of data collection many visits were done to RWS (ZP), Thane. Many senior officials were interviewed. We got key data sets like year-wise Annual Action Plans and Scheme Data set along with some other details like, organisational structure, strength etc. These data sets were used for the analysis of the schemes.

Datasets Used-

i. Annual Action Plan (for three consecutive years, i.e. 2010-11, 11-12, 12-13)

ii. Scheme details: (A List of all the sanctioned schemes in the district, as on 13.06.2012)

iii. IMIS database: (An online system managed by DDWS, GoI)

1. Annual Action Plan:

The Annual Action Plan (AAP) is a document prepared by district implementing agency (RWS, ZP in Thane) for sanctioning of funds. As per guidelines of NRDWP, each state has to prepare a state annual action plan to be presented to the central government for fund approval before each financial year keeping in view normal allocation to the state. Hence, each district prepares an indicative action plan and sends it to state nodal agency where annual action plans of all the districts are compiled to form state annual action plan. At district level, demand should come from sub-divisional level and further from village level so that demand driven strategy can be applied.

There are a number of formats used for preparation of annual action plan, different formats dealing with different requirements like, funds required, details of schemes, financial and physical progress report, sustainability structures, IEC activities and many more. As per need, DDWS keeps on revising the structure and number of formats. As per now there are around 18 formats (exact number is not clear) and one master format which are updated every month.

All these formats are in the form of excel sheets. Snapshots of some of the formats are given-

Format-1

National Rural Drinking Water Programme									
FORMAT 1									(In Crores)
		Annual Action Plan 2012-13							
	NRDWP PHYSICAL Targeted Habitations-20 Point Programme Target	Quality affected (QA)/ Not Quality Affected (NQA)	Status as on 1/4/2011 as per IMIS (for all	Physical Target 2011-12	Physical achievement 2011-12 (upto Jan. end, 2012)	Total Anticipated Achievement from 1/4/2011	Physical Target 2012-13	Estimated Cost of Schemes /Activities 2012-13	Expected expenditure during 2012-13 (All Schemes)
	1	2	3	4	5	6	7	8	9
	1. Targeted habitations with								
	1.1 0% Population coverage / 0 lpcd	QA	0	0	0	0	0	0	0
		NQA	0	0	0	0	0	0	0
Augmentation	1.2 0-25% Population	QA	0	0	0	0	0	0	0
		NQA	3	5	3	3	24	6.942909	1.90402
	1.3 25-50% Population	QA	137	2	2	2	2	1.0494	0.263657
		NQA	483	62	73	73	98	40.16977	8.176321
	1.4 50-75% Population	QA	69	98	76	76	77	17.69111	3.468821
		NQA	575	363	328	328	274	389.3331	37.09107
	1.5 75-100 % population	QA	0	0	0	0	0	0	0
		NQA	8	0	0	0	0	3.903	0.847747
	1.6 100% population	QA	0	0	0	0	0	0	0
		NQA	5398	0	0	0	0	0	0
	Total Target under 20 point	QA	206	100	78	78	79	18.74051	3.732478
		NQA	6467	430	404	404	396	440.3488	48.01915

Figure 3-4: Format-1 of Annual Action Plan (AAP)

The format-1, as can be seen above gives coverage (Quality Affected, Not-Quality Affected) wise details of AAP. Column-3 gives details of habitation in terms of quality and coverage as on first day of financial year. It can be seen here that out of total 6673 habitations 206 are quality affected.Columns-4,5,6 tells about previous year target and achievement. Column-7 tells about targets of AAP 12-13 and it can be seen that total number of target habitations are 475 (79 QA, 396 NQA). Column-8 gives total estimated cost of all the schemes taken in all the habitations. It should be noted here that total number of habitations in AAP 12-13 are 949 but only 475 are targeted in year 12-13.

2. Master Format

Sr. No.	Taluka	Name of Gram Panchayat	Name of Village	Name of Habitation	20 Point Target (Yes / No)	NRDWP Category Coverage / Water Quality	Ongoing / New	Scheme Type (BWHP /BWPP/ DW / PWSS/ RPWSS/ Aug to PWSS/Def louridatio n Plant/)	Scheme Sanction Year (Financial Year)	Present Stage of Scheme (Planning/ I / II / III)	Implem enting Agenci es ZP / MJP	Sanction ed cost in Total Estimated Cost (Stage I + II + III)(Specific For RRWS/Co mbined
1	3	4	5	6	11	15	16	19	21	24	26	27
1	AMBARNATH	ADIVALI	ADIWALI	ADIWALI	NO	COVERAGE	TS	PWSS	--	PLANNING	ZP	2.263
2	AMBARNATH	AMBESHIV BK	AMBESHIV BK	AMBESHIV BK	YES	COVERAGE	ONGOING	PWSS	2008-09	II	ZP	0.624
3	AMBARNATH	AMBESHIV BK	AMBESHIV BK	KATKARIWADI	YES	COVERAGE	ONGOING	PWSS	2008-09	II	ZP	0.000
4	AMBARNATH	AMBESHIV BK	AMBESHIV BK	KHARIKPADA	YES	COVERAGE	ONGOING	PWSS	2008-09	II	ZP	0.000

Figure 3-5: Master Format of Annual Action Plan (AAP)

Source: AAP provided by RWS, ZP (Thane)

Note: This is a snapshot showing only a part of the sheet. It contains around 40 to 60 columns (different versions) giving very minute details of habitations, schemes, funds, progress etc.

The number of rows depends on number of habitations taken in that plan. This list contains all the habitations taken in hand, whether targeted for that year or not. Column - 2-5 give details of habitation and column-6 tells whether it is a target habitation or not. Column-15 shows the component of NRDWP and column-16 tells about scheme type. Column-21 tells sanctioning year of the scheme and 24 tells about present stage of the scheme. Column 26 and 27 tell about implementing agency and sanctioned cost respectively. There are many more columns which get updated throughout the year giving the details of expenditure and more.

2. Scheme Details: This is an excel datasheet which was provided to us by RWS (ZP, Thane). It contains all the information regarding water supply schemes sanctioned in the district for all the years (starting from 1950s to current year). It has 26 columns,

which give details like, Scheme Name; Scheme Category; Scheme Type/Source Type; Implementing Agency; Sanction Year; Estimated Cost; GOI/State/Community Share; Expenditure; Date Of Commencement/Completion etc with a habitation level detail.

Table 3-4: A snapshot of Scheme details database.

	1	2	3	4	5	6	7	8	9
Sr. No.	**Block Name**	**Panchayat Name**	**Village Name**	**Habitation Name**	**Habitation Id**	**Scheme Name**	**Scheme Category**	**Scheme Type**	**Source Type**
1	**AMBARNAH**	**ADIVALI**	**ADIWALI**	**ADIWALI**	**562589**	**ADIVALI PWSS**	**PWS**	**Piped Water Supply Scheme**	**River (Surface Water)**
2	**AMBARNATH**	**ADIVALI**	**ADIWALI**	**ADIWALI**	**562589**	**ADIWALI**	**PWS**	**Piped Water Supply Scheme**	**River (Surface Water)**
3	**AMBARNATH**	**AMBESHIV BK**	**AMBESHIV BK**	**AMBESHIV BK**	**562454**	**Ambeshiv Bk BW**	**Spot**	**Hand Pump**	**Ground Water**

Table continued....

10	11	12	13	14	15	16	17	18	19
Implementing Agency	Sanction Year	Estimated Cost (Rs.)	GOI Share (Rs.)	State Share (Rs.)	Community Contribution (Rs.)	Expenditure (Rs.)	Date Of Commencement	Date of Completion	Hab / School Covered
Zilla Parishad	2011-2012	10500000	9450000	0	1050000	10500000	20-05-2011	30-03-2012	1
Zilla Parishad	2012-2013	22625500	11313000	9050000	2262500	0	01-04-2013	31-03-2014	1
Zilla Parishad	2005-2006	30000	26000	4000	0	30000	01-03-2007	19-11-2008	1

In the above table first four columns give detail about location of scheme and next one shows habitation id. Column-6 shows the name of the scheme. Column-7 gives category as whether it is PWS or Spot (hand pump, dug well etc) or Sustainability structure. Column-8 tells about type of scheme, for example if it is spot, is it hand pump or dug well? Column-9 tells about type of source, ground or surface. Column-10 shows implementing agency, whether ZP or MJP? Column-11 shows the sanction year. Column 12-15 tell about estimated cost and respective shares. Column-16 shows expenditure incurred up to the date. Column-17-18 tell about date of commencement and completion.

3 IMIS Data Base:

DDWS has developed an excellent online IMIS (Integrated Management Information System). It is one of the thrust areas in NRDWP. Though the concept of IMIS was there

in Swajaldhara schemes also the level of details was not so much. All the information available on the IMIS can be categorised in three categories

(i) Habitation level all the basic data like- population; social profile; water sources etc,

(ii) Details about funds like- AAP wise allocation/ expenditure per state and

(iii) Details about schemes.

It has also developed a GIS (Geographic Information System). States are responsible for updating the data in the system. In Thane, there is a computer data operator at district centre who sends all the data to state for the updating.

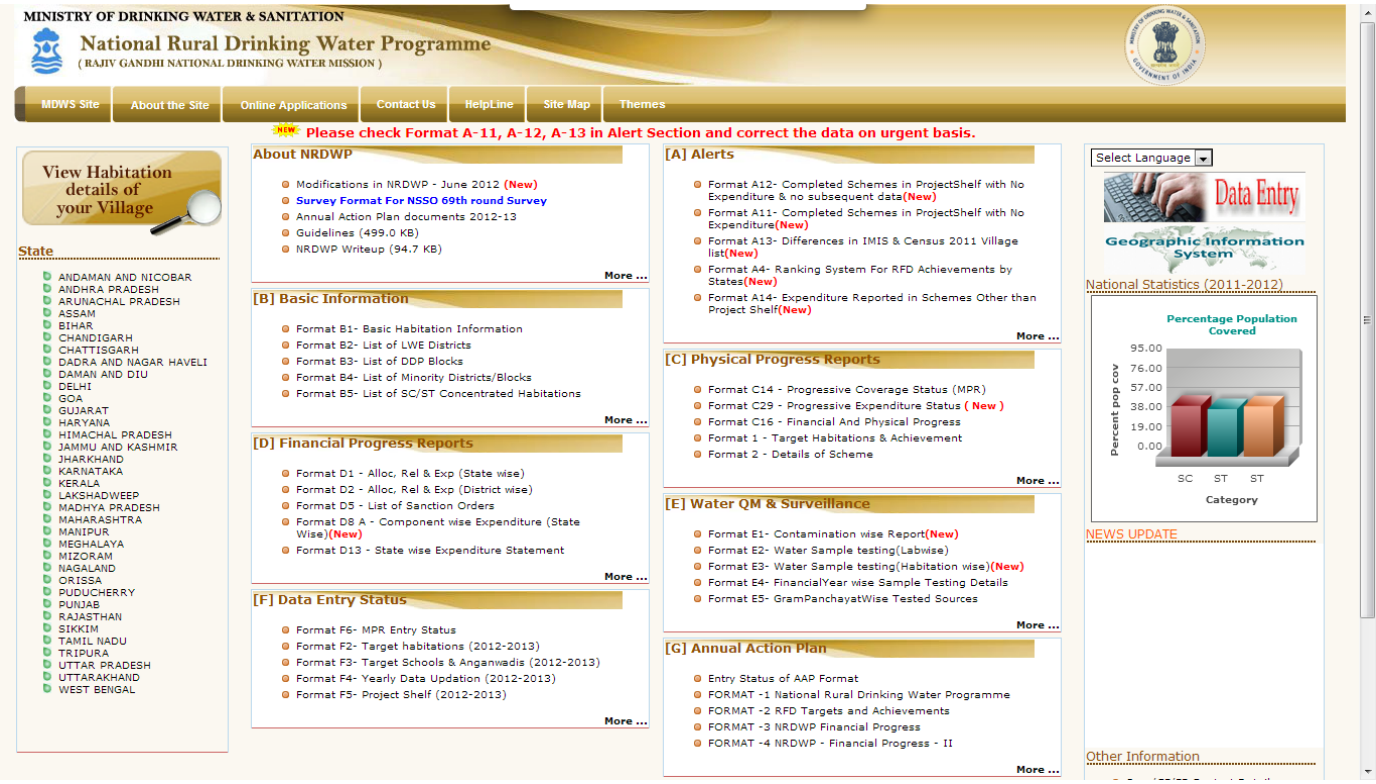


Figure 3-6: A Snapshot of IMIS, MDWS

Source: Website of DDWS, (GOI)

It has different categories of query generated forms. It follows a hierarchy system and one can go from national level to habitation level. As shown in the above figure, a number of reports related to physical and financial progress can be generated.

All the important guidelines and notices are available at the website.

Recently, an online Geographic Information System (GIS) has also been introduced. The GIS produces spatial maps up to district level based on the queries like, coverage, quality, habitations served by PWS etc.

3.3.2 Present Situation in Thane:

3.3.2.1 Coverage:

As per IMIS data, out of total 6680 habitations in Thane district, the coverage is as-

PC: 828 (12.40 %) ,FC: 5731 (85.79 %),QA : 121 (1.81 %).

Coverage can also be measured by different attributes like average LPCD, habitations with PWS etc. The figure given below shows the spatial distribution of villages with respect to these attributes. Figures 1, 2, 3 are from DDWS where as Figure 4 is a map prepared by GIS of Water Group, IITB. Figure-1 shows average LPCD of the village and we can see that most of the villages fall into 34-40 LPCD range. Figure-2 shows percentage of habitations in a village with PWS and it is clear that north western part of the district has fewer PWS than the rest. Figure-3 is coverage in normal terms where as Figure-4 is a mapping of tanker fed habitations in Thane. We can see here that even tanker fed habitations are shown as covered.

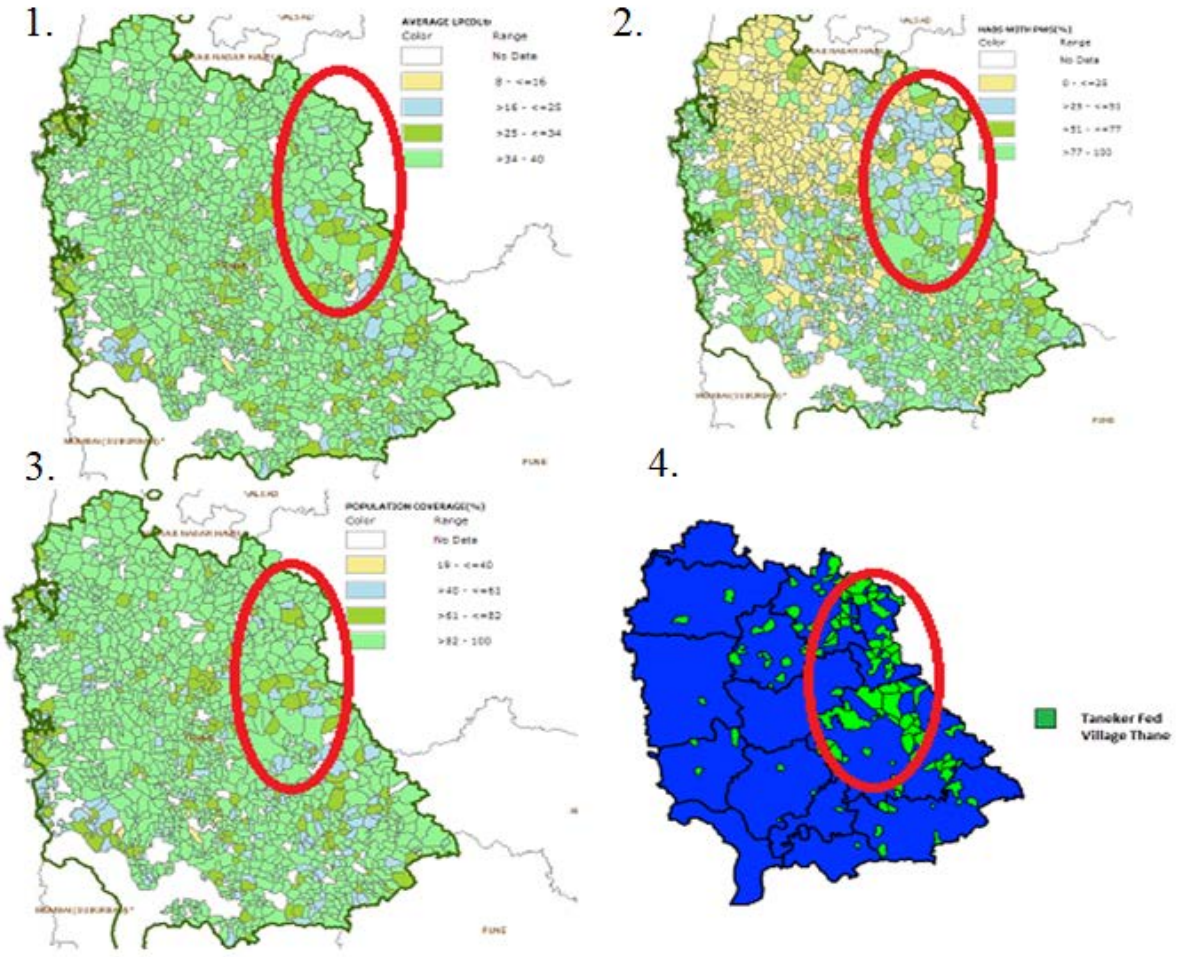


Figure 3-7: Different Maps of Thane showing coverage

3.3.2.2 Schemes Details:

The given figure shows total number of sanctioned schemes regarding rural water supply in Thane.

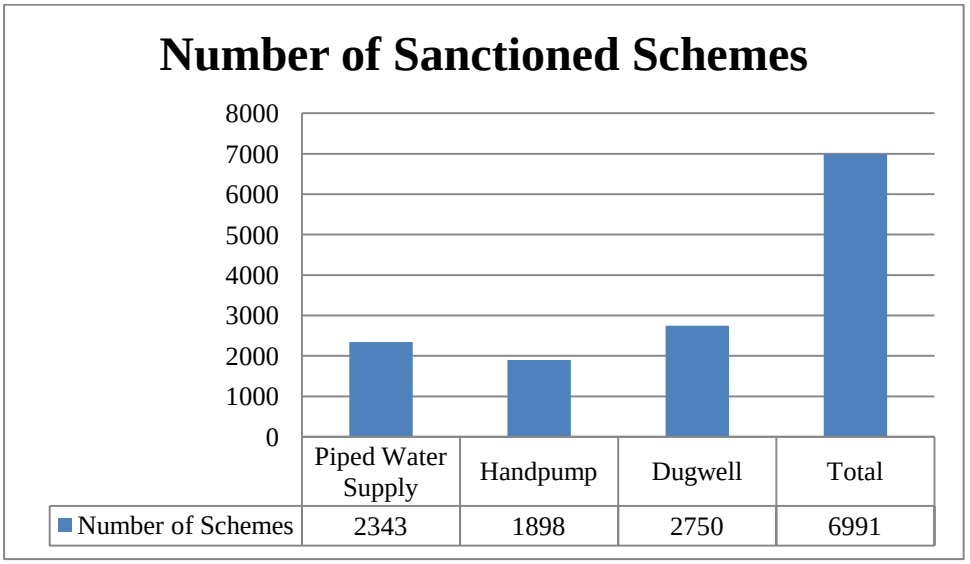


Figure 3-8: Bar Chart showing different types of sanctioned schemes

Source: Compiled from data provided by RWS, ZP (Thane)

A taluka wise list of number of schemes is given in the following table. It should be noted here that schemes details tells only about number of schemes sanctioned and completed or not completed. It does not tell whether that scheme is functioning or not. However, we got a list of non-functioning schemes from RWS, ZP (Thane) which puts the number as 99 non-functional schemes. At this point from our past experience in Konkan region we firmly believe that this could be very high. Furthermore it should be noted here that as per IMIS data there are no non-functional schemes in Thane (in fact, only 30 in Maharashtra). Details of these non-functioning schemes can be found in next section.

Table 3-5: Number of schemes per taluka with the year of sanctioning

Sr.No	Taluka	Habitations	Population	Total PWS	Sanctioned in 12-13	2011-12	2010-11	2009-10	2008-09	sanctioned in last 5 yrs
1	AMBARNATH	137	105020	117	10	9	8	2	15	44
2	BHIWANDI	572	388725	215	25	15	3	1	53	97
3	DAHANU	1044	334745	31	4	4	0	0	2	10
4	JAWHAR	358	116815	155	4	40	20		27	91
5	KALYAN	176	257503	151	11	13	5	5	14	48
6	MOKHADA	234	79006	138	10	85	4	0	10	109
7	MURBAD	478	199610	460	11	76	2	1	91	181
8	PALGHAR	992	456134	187	13	10	1	0	40	64
9	SHAHAPUR	661	292305	428	16	115	18	1	99	249
10	TALASARI	249	137042	10	1	1	0	0	1	3
11	VASAI	483	370523	48	1	1	0	0	8	10
12	VIKRAMGAD	540	118102	94	14	23	0	0	3	40
13	WADA	756	159905	309	30	23	0	0	14	67
	Total	6680	3015435	2343	150	415	61	10	377	1013

Source: Compiled from data provided by RWS, ZP (Thane)

3.4 Analysis and Discussion

3.4.1 Schemes Sanctioning Rate (Schemes per year)

A graph showing the total number of schemes sanctioned in last 10 years in Thane is given below. It can be seen here that in the first 3-4 years of the decade number of schemes sanctioned per year was very less. We can see a sudden rise in 2005-06 which is attributed to era after sector reforms. Swajaldhara was started in 2002-03 and RWS sector got a boost in investment.

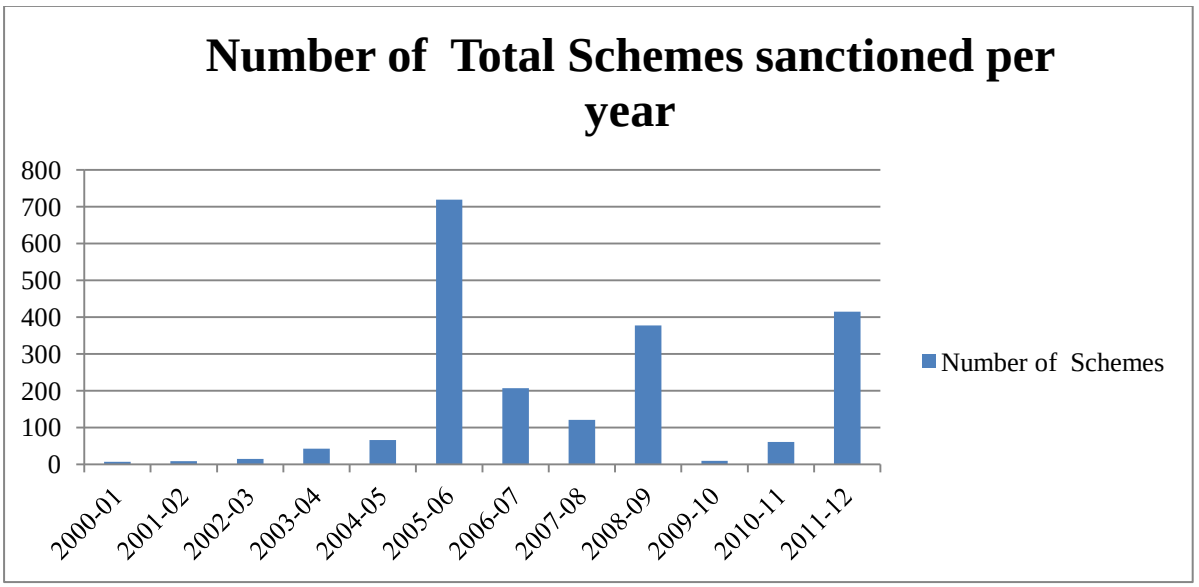


Figure 3-9: Bar Chart for total number of schemes sanctioned per year

3.4.2 Capital Cost of Schemes

In Table 3-6, we have grouped the schemes as per their sanctioned amount. It should be noted here that highest number of schemes are in group 0.15-1.00. It is so because these are mainly school schemes of average costing of .3 lakhs, actually these schemes do not cater to the main population and therefore should not add to the coverage. Further, the expenditure per scheme comes to be half of the estimated cost. Further, the average completion time for this group comes to be lowest i.e. only eleven months which is justifiable given to the small scale of schemes. But a question arises in case of schemes costing more than a crore whose completion (24 months) time is less than other schemes which are having less cost (5-100 lakhs).

Table 3-6: Schemes grouped as per sanctioned amount

Scheme Group(Sanctioned amount)	No of Schemes	Estimated Cost	Expenditure	Completion Time(in months)	Difference(Estimated-Expenditure)	Expenditure per Scheme	Estimated Cost per Scheme
0.15-01	500	278.92	114.35	11.39	164.57	0.23	0.56
01-05	154	467.20	366.02	26.72	101.18	2.38	3.03
05-10	64	471.50	353.31	40.33	118.19	5.52	7.37
10-15	67	859.22	639.57	39.33	219.65	9.55	12.82
15-20	59	1032.54	794.91	38.83	237.63	13.47	17.50
20-25	56	1271.67	850.58	42.03	421.09	15.19	22.71
25-50	135	4647.09	3345.42	38.67	1301.67	24.78	34.42
50-100	38	2428.94	1891.67	36.16	537.27	49.78	63.92
>100	17	5516.92	5401.43	23.92	115.49	317.73	324.52
Total	1090	16974.00	13757.26		3216.74		

Source: Compiled from data provided by RWS, ZP (Thane)

3.4.3 Completion time and expenditure of total Schemes

In this section we have analysed total number of schemes (PWS, dugwell, Handpump) sanctioned per year and the year of their completion for ten years (2001-10).

Table 3-7 gives details of number of schemes while Table 3-8 tells about the estimated cost of the schemes.

Table 3.5d: Total number of all sanctioned schemes and completion year

Table 3-7: Total number of all sanctioned schemes and completion year

		Completion Year										
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	Not Completed
Sanctioned Year	2001-02	96	13	0	1	0	1	3	1	0	0	6
	2002-03		156	15	3	2	3	11	4	0	7	6
	2003-04			103	34	5	2	13	6	12	52	1
	2004-05				214	33	5	21	17	46	48	14
	2005-06					159	277	883	183	300	67	90
	2006-07						81	41	70	192	68	55
	2007-08							61	50	204	69	73
	2008-09								80	185	354	268
	2009-10									12	13	6
	2010-11										60	33

Source: Compiled from data provided by RWS, ZP (Thane)

Table 3-8: Expenditure of all schemes sanctioned per year and completion year

		Completion Year									
Sanctioned Year	2001-02	133.46	23.39	0	1.2	0	0.29	5.14	3.02	0	0
	2002-03		124.8	23.2	10.2	189.5	7.68	43.7	15.93	0	37.98
	2003-04			116.91	55.48	49.81	18.95	38.72	21.74	54.68	249.5
	2004-05				558	61.98	17.77	101.05	108.36	351.74	286.31
	2005-06					158.42	205.22	522.13	671.59	2797.77	670.61
	2006-07						97.28	177.17	564.3	2567.91	773.93
	2007-08							99.59	304.37	941.39	690.93
	2008-09								417.19	1022.56	2160.83
	2009-10									27.86	15.15
	2010-11										32.42

Source: Compiled from data provided by RWS, ZP (Thane)

3.4.4 Completion time and expenditure of PWS Schemes

In this section we have analysed only PWS schemes (excluding z p school schemes) sanctioned per year and the year of their completion for ten years (2001-10).

Table 3-9: Total number of PWS sanctioned schemes and completion year

		Year of Completion (Number of PWS Schemes)											
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	Not Complete	Total Sanction
Year of Sanction	2001-02	0	3	2	0	1	0	0	0	0	0	1	7
	2002-03		0	0	0	0	0	0	0	0	0	0	0
	2003-04			1	1	2	0	1	2		4	1	12
	2004-05				0	2	0	3	1	1	4	4	15
	2005-06					0	0	3	15	10	13	15	56
	2006-07						0	6	18	33	63	72	192
	2007-08							1	11	12	15	36	75
	2008-09								0	34	55	160	249
	2009-10									1	13	83	97
	2010-11												

Source: Compiled from data provided by RWS, ZP (Thane)

Table 3-10: Expenditure of all PWS schemes sanctioned per year and completion year

		Year of Completion (Expenditure of PWS Schemes in lakhs)									
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Year of Sanction	2001-02	0	50.21	18.8	0	12.33	0	0	0	0	0
	2002-03		0	0	0	0	0	0	0	0	0
	2003-04			16.4	5	11.28	0	17.24	24.53	0	46.19
	2004-05				0	49.55	0	30.43	25.47	15.47	40.9
	2005-06					0	0	75.55	228.27	156.38	182.56
	2006-07						0	69.47	281.69	637.9	1135
	2007-08							8.91	155.89	294.12	363.1
	2008-09								0	480.4	876.69
	2009-10									11.51	235.48

Source: Compiled from data provided by RWS, ZP (Thane)

3.4.5 Analysis based on the Annual Action Plan (AAP):

We had accessed Annual Action Plan (AAP) for last three years of Thane. In this section we have tried to analyse these documents and derive some information.

Table 3-11: Habitation Coverage Status as per AAPs

Population wise Coverage of Habitation									
Details	Total Habs	100% Pop. Coverage	0 To 99% Pop. Coverage	0 % Pop. Coverage	0 To 25% Pop. Coverage	26 To 50% Pop. Coverage	51 To 75% Pop. Coverage	76 To 99% Pop. Coverage	Total Not Covered
All Habs (As on 1/04/09)	6537	4212	2325	2325	0	0	0	0	2325
All Habs (As on 1/04/10)	6673	5013	1660	0	1	838	821	0	1660
All Habs (As on 1/04/11)	6673	5376	1297	0	17	250	1022	8	1297
All Habs (As on 1/04/12) Tentative	6680	5731	949	0	24	195	720	10	949

Source: Compiled from four years AAPs, RWS (ZP), Thane

It is quite clear from the above table that with each year fully covered (100%) population is growing. At the start of each financial year number of habitations in each group i.e. (0-25%), (25-50%), (50-75%), (75-99%) is estimated and target is fixed in the annual action plan. A target reached means that habitation has become fully covered. Let a habitation is in partially covered group, it should become fully covered when the scheme gets completed or to be more specific only when the scheme gets completed. In other words, if habitation becomes fully covered there should be some cause and that can be only start of functioning of the scheme or at least completion. Based on this argument, we have analysed the two annual action plans. The results of which are-

Table 3-12: Coverage of habitations vs Completion of Schemes

	Total Habitations Taken in hand			Total Achieved Habitations(reported as FC)	Number of Scemes that were Sanctioned in those achieved habitation				Number of Schemes Actually Physically or financially completed			
	Total	Target	Non-Target		Total	PWSS	DugWell	BWHP	Total	PWSS	DugWell	BWHP
2010-11	1660	567	1093	508	421	205	215	1	89	33	56	0
2011-12	1297	530	767	482	252	150	101	1	23	4	19	0

In 2010-11, out of 1660 PC habitations 567 were target habitations, at the end of financial year department declared 508 as FC. Here it should be noted that total 421 schemes were sanctioned in those 508 FC habitations, where as only 89 got completed which means 332 schemes were incomplete still habitations managed to become fully covered.

4 Taluka Assessment and Evaluation: A Pilot Study

It has been established in the previous chapters that regular periodical assessment and evaluation is needed for the evolution of policy and its better outcomes. In this section we have tried to develop the conceptual framework for an assessment and evaluation study. This particular study envisages to work as a facilitating document for further assessment and evaluation studies.

It is quite clear that assessment unit should be small enough so that it can uncover localised issues. As argued earlier, a watershed or aquifer mapped unit would be ideal for various assessment studies in the rural water sector. But keeping in view the NRDWP programme structure and non-availability of aquifer maps/watershed maps in public domain, taluka as a unit was chosen for the study.

4.1 Objectives of Rapid Assessment and Evaluation Study:

The present objectives for rapid assessment and evaluation study are mainly derived from our past experience of working in the sector and familiarity with the area in the pilot study. A conscious effort has been made to keep the objectives of the study simple enough. The main objectives are-

1. To assess the impact of population size of habitations with respect to drinking water.

2. To assess prime source of drinking water during monsoon and non-monsoon seasons.

3. To assess the effect of source of water (Surface/ground) on drinking water security.

4. To assess the perception/awareness among people about supply driven/ demand driven paradigm change in the rural water supply change.

4.2 Description of Study Area (Taluka)

As explained earlier each taluka of a district should go through assessment process on a continuous basis. A sample taluka was needed to start with for a pilot study. The taluka chosen for the present study is ***Shahpur*** taluka in ***Thane*** district. There are a number of facts about *Shahapur* which made it a good example for the study. Some of them are-

1) It has highest number PWS schemes in the district. Also, since it has two big reservoirs, a good dependence on surface as well ground water was expected.

2) It has around 30% urban to rural population, not as high as *Talasari* or as low as *Mokhada*.

3) It has also a good mix of Tribal-to- General (33%) population.

Thus, in many ways it is a good representative of the district.

Shahapur, is the largest Taluka in Thane District, having an total geographical area of 159,527 hectares. Its geographical extent is in between 73.17^0 and 73.70^0 E and 19.30^0 and 19.73^0 N. It is situated in Western Ghats surrounded by eastern slopes of the *Sahyadris* making it hilly region having hard rock formations of Deccan basalt in nature.

Figure 4-1: Map of Shahapur

4.2.1 Administrative and Demographic profile of Taluka

4.2.1.1 Administrative:

Shahapur, is categorized as taluka for administrative puposes, which is a sub-unit of district administration. It is also an *Panchayat Samiti*, under three tier of *panchayati raj system* of elected bodies of local governance. It has 110 GPs (gram panchayats) comprising of 222 villages. These 222 villages are again divided in to 661 habitations as per NRDWP classification.

4.2.1.2 Demographic profile of Taluka:

The table below represents the demographic profile of *Shahapur.*

Table 4-4-1: Demographic Profile of Shahapur

Particulars		Value
Total Population	Total	2,31,741
	Male	1,18,879
	Female	1,12,862
Social Category	SC	7,077
	ST	81,781
	GEN	1,42,883

4.2.2 Climate and Geo-hydrology

It has a tropical monsoon climate that borders on a tropical wet and dry climate. Overall climate is equable with high rainfall days and very few days of extreme temperatures. Thane temperature varies from 22°C to 36°C. In winter temperature is between 12°C to 20°C while summer temperature ranges from 36°C to 41°C. Out of total rainfall, 80% rainfall is experienced during June to October. Average annual rainfall is 2000–2500 mm and humidity is 61-86%, making it a humid-per humid zone. The driest days are in winter while the wettest days are experienced in July.

Table 4-2: Climate data for Shahapur

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	30.6 (87.1)	31.3 (88.3)	32.7 (90.9)	33.1 (91.6)	33.3 (91.9)	31.9 (89.4)	29.8 (85.6)	29.3 (84.7)	30.1 (86.2)	32.9 (91.2)	33.4 (92.1)	32.0 (89.6)	31.7 (89.1)
Average low °C (°F)	16.4 (61.5)	17.3 (63.1)	20.6 (69.1)	23.7 (74.7)	26.1 (79)	25.8 (78.4)	24.8 (76.6)	24.5 (76.1)	24.0 (75.2)	23.1 (73.6)	20.5 (68.9)	18.2 (64.8)	22.1 (71.8)
Precipitation mm (inches)	3.1 (0.122)	1.0 (0.039)	1.5 (0.059)	2.3 (0.091)	25.1 (0.988)	541.3 (21.311)	922.0 (36.299)	539.7 (21.248)	326.9 (12.87)	93.2 (3.669)	19.1 (0.752)	2.3 (0.091)	2,477.5 (97.539)

Shahapur is drained by two major rivers, *Vaitarna* and *Bhatsa.* Vaitarna, the largest of Konkan rivers rises in the Tryambak hills in Nashik district and flows across Shahapur and other talukas in Thane district before entering to Arabian sea. The Bhatsa becomes tributary to Ulhas river. There are two major dams, Tansa and Bhatsa which provide water to Mumbai City.

The major type of rock formation in the area is *hard rock.* Out of the total area of 159,527 hectares, 84,101hectares (53% of total) falls under *hilly region.* The remaining area of 75,426 hectares is worthy of ground water recharge. The average bottom of the unconfined aquifer in soft rock areas and depth of weathered zone or maximum depth of fractures under unconfined zone is around 9mtrs. The total estimated recharge is about 10,163 ham out of which during monsoon seasons is 7463 ham and during non-monsoon seasons is 2700 ham. The present stage of ground water development in the taluka is 3.92% and has been categorized as a safe zone for further development.

4.2.3 Status of Rural Water Supply:

Rural Water Supply department of ZP, Thane is the implementing agency for rural water supply programmes in the taluka. The taluka falls under *Shahapur* sub-division of the RWSD, Thane which comprises one more taluka *Murbad.*

As per IMIS, *MDWS,* the status of coverage for last four years are shown in the Table 5-2 below.

Table 4-3: Status of Coverage during last four years

As per dated	Total Habitations	No. Of Habitations with 0 Population Coverage	No. of Habitations With Population Coverage > 0 and < 25%	No. of Habitations With Population Coverage >= 25 and < 50%	No. of Habitations With Population Coverage >= 50 and < 75%	No. of Habitations With Population Coverage >=75 and < 100%	Total No. Of Habitations With Population Coverage < 100%	No. Of Habitations with 100% Population Coverage
01-04-2009	**625**	**295**	**0**	**0**	**0**	**0**	**295**	**330**
01-04-2010	**657**	**0**	**1**	**144**	**123**	**0**	**268**	**389**
01-04-2011	**657**	0	**1**	**76**	**105**	**0**	**182**	**475**
01-04-2012	**661**	0	**3**	**85**	**50**	**0**	**138**	**523**

As per the Scheme database the number of sanctioned Piped Water Schemes in the taluka per year can be seen the table below.

Table 4-4: Number of Schemes in Shahapur

Taluka	Habitations	Population	Total PWS	Sanctioned in 12-13	2011-12	2010-11	2009-10	2008-09	Sanctioned in last 5 yrs
SHAHAPUR	661	292305	428	16	115	18	1	99	249

4.3 Sampling

Since we had decided to use mixed methods of qualitative and quantitative approaches, we did a purposeful sampling. While designing sampling methodology for the present assessment survey, it was kept in mind that it should be easily understandable, repeatable by other agencies in different situations and modifiable as per new developments of the sector. Hence we have refrained from using advance complex survey techniques. But at same time it was required to be scientific enough and should certainly bring up core emerging issues and implemental gaps of the policy.

4.3.1 Sampling Methodology:

A sampling or survey methodology is the process of studies the sampling of individual units from a population and the associated survey data collection techniques, such as questionnaire construction. A *stratified multi-stage design*, which is used by NSSO for its different surveys [NSSO, 2009] was used as guiding principle with (some modifications) for the development of survey methodology. A reason for this particular choice was because NSSO has recently (July-Dec, 2012) conducted a survey which includes “Drinking Water, Sanitation, Hygiene, Housing Conditions.” The report of survey findings is still awaited.

A *stratified multi-stage design* involves a number of steps to be followed for the sampling. At first, first stage units (FSU) are identified which may be census villages in the rural sector and Urban Frame Survey (UFS) blocks in the urban sector. It may be

followed by some intermediate stage units (ISU) if required and the ultimate stage units (USU) are households in both the sectors. Here we used a purposeful stratified multi stage design.

4.3.1.1 Sampling Frame:

A *sampling frame* is the source material or device from which a sample is drawn. It is a list of all those within a population who can be sampled, and may include individuals, households or institutions [wikipedia]. As in the present case *FSUs* are habitations, a directory of all habitations with their important characteristics like, total population, dominant category, covered/partially covered etc. was needed. A "Habitation Information" file was accessed from RDWS, Thane.

4.3.2 First Level of Sampling: Stratification

Stratification is the process of dividing members of the population into homogeneous subgroups before sampling. [wikipedia]

It is one of the preferred ways in statistical surveys, when subpopulations within an overall population vary. It becomes advantageous to sample each subpopulation (stratum) independently. In our present study one of the objectives was to understand the effect of population size on the prevailing issues of the sector. Hence, stratification was thought a good option to be used.

For stratification purpose the *Habitation Information directory* was sorted in ascending order of number of individuals per habitation and five groups were formed as per population size of habitation. The output of stratification process can be seen in the table below.

Table 4-5: Stratified Habitation Information, Shahapur.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Pop Group (Number of individuals per habitation)	**Total Number of individuals in that group**	**% of Total**	SC	ST	**GEN**	**SC-ST Fraction (SC+ST/Total)**	**Total number of habitations**	**% of Total**	**PC**	**PC/ Total**
<500	88572	38.17	1879	50443	36250	0.66	482	77.24	90	0.19
500-1000	72678	31.32	2284	20691	49703	0.33	101	16.19	25	0.25
1000-1500	27929	12.04	601	5912	21416	0.24	23	3.69	9	0.39
1500-2000	13548	5.84	319	1260	11969	0.12	8	1.28	2	0.25
>2000	29335	12.64	1993	3292	24050	0.18	10	1.60	2	0.20
Total	**232062**	**100.00**	**7076**	**81598**	**143388**	**0.31**	**624***	**100**	**128**	**0.21**

*** The total number of habitations does not match with number of habitations in Shahapur as there were number of habitations having less than 10 persons in the list, which were insignificant and were removed as noise.**

The first column shows the minimum and maximum population size of habitations that fall in that stratum. For example, the first group contains all the habitations whose population is less than 500 souls, similarly in the second group all the habitations whose population is more than 500 but less than 1000 souls. The last group contains habitations having population size of more than 2000 souls/hab. The second column shows combined population of all the habitations in that group and the third column shows its percentage to the total population.

Column 8, shows number of habitations that fall in that group and the next column shows its percentage to the total number of habitations in the *Shahapur*.

The last column tells about PC/FC ratio for that stratum. A careful observation tells that for population group 1000-1500, this ratio is almost double of the value for the whole taluka. This was contrary to our experiences as we have seen smaller habitations to be more problematic. In order to understand this abnormality we decided to target this stratum specifically. A single habitation from this group was chosen based random sampling and pilot study was carried out. The experiences gained from that were incorporated for the second level of sampling.

4.3.3 Second level Sampling: Purposeful Sampling

It is important here to mention that, this survey was executed in an academic environment which put constraints on resources. A large number of survey trips and huge man power engagement was not possible. But, at the same time we wanted to collect as much primary data as possible and uncover the issues of sector. This guided the further second level sampling procedure. Few assumptions were made which is mentioned here-

Firstly, Habitations whose population size is more than 1500 souls, are generally found to be urban in nature i.e. comparatively economically sound and somehow manage drinking water needs. Hence, those were excluded from the sample.

Secondly, for the sampling of smaller habitations it was kept in mind that they are in close distance from each other, so as they form a cluster. In each trip a cluster was decided to be targeted. Even then, it should be clearly noted here sanity of sample should not be questioned. All attempts were made to keep the sample to be good representative of the modified sample frame (excluding extra larger habitations). For a purposeful second level of sampling, it was made sure that some kind of relationship exists for the sampled habitations with last three years of AAPs for the taluka. Habitations were categorised as per their inclusion in last three AAPs. Four habitations from each extreme i.e. from those who were not included in last three AAPs and four from those who were included in all the last three AAPs were selected. In total, eight habitations were chosen.

Table 4-6: List of Habitations and their position in Annual Action Plan

Panchayat Name	Village Name	Habitation Name	Status of Coverage as On 01/04/2012	Present Population as on 01/04/2012	AAP 2010-11	AAP 2011-12	AAP 2012-13
DOLKHANB	DOLKHAMB	DOLKHANB	FC	1486	0	0	0
ATGAON	ATGAON	AGREEPADA	FC	1385	0	0	0
BHAVSE	TANASA	TANSA	FC	1344	0	0	0
BIRWADI	BIRWADI	PALHERI	FC	1250	0	0	0
SURLAMBE	SARALAMBE	SURLAMBE	FC	1238	0	0	0
DAHAGAON	DAHAGAON	DAHAGAON	FC	1151	0	0	0
SHERE	SHERE	SHERE	FC	1087	0	0	0
SATHGAON	SATGAON	SATHGAON	FC	1031	0	0	0
AJNUP	AJNUP	AJNUP	FC	1004	0	0	0
VEHLOLI (AN)	VEHLOLI	VEHLOLI (AN)	FC	1483	1	0	0
BHATSAI	BHATSAI	BHATSAI	PC	1467	0	0	1
NANDVAL	NANDVAL	MOREPADA	PC	1298	0	0	1
LAHE	LAHE	LAHE	PC	1135	0	0	1
ATGAON	ATGAON	ATGAON	FC	1210	0	1	0
KHARIWALI (S0)	KHARIVALI (SO)	KHARIWALI (SO)	FC	1269	1	1	0
CHIKHALGAON	CHIKHALGAON	CHIKHALGAON	FC	1219	1	1	0
AWARE	AWARE	AWARE	FC	1061	1	1	0
GEGAON	NANDVAL	NANDVAL	PC	1280	0	1	1
GEGAON	GEGAON	GEGAON	PC	1009	0	1	1
MALEGAON	NARAYANGAON	NARANGAON	PC	1359	1	1	1
KOTHALE	KOTHALE	KOTHALE	PC	1067	1	1	1
AWARE	KAMBARE	KAMBARE	PC	1048	1	1	1
VELUK	VELUK	VELUK	PC	1048	1	1	1

After that for each habitation, 2-3 habitations were chosen randomly from lower strata in the Gram Panchayat of those bigger habitations. The outcome was a sample set of 30 odd habitations which can be found in the annexure I-A. The table below outlines few important characteristics of the sample set.

Table 4-7: Comparison of original to the Sample

Sr No	Particulars	Original (Excluding extra large habitations)	Sample Set
1	Total Number Of Habitations	601	30 (5% of total)
2	Total Population	1,89,179	15,674 (8% of total)
3	PC/ Total habitations	0.20	0.33
4	(SC+ST)/Total population	0.43	0.46

4.4 Data collection

Primary data i.e. the direct information about the target obtained by the researcher is the most important part of this kind of assessment process. As mentioned earlier, it was decided to use a mix of quantitative and qualitative methods for data collection which resemble Rapid Assessment Process.

4.4.1 Process of Rapid Assessment and Evaluation

Rapid assessment and Evaluation requires team based and iterative process to be followed. It increases the validity of research.

Team based: The study was a team based research. Members of the research team worked collaboratively on all aspects of the research process.

Iterative: Data were analyzed while they were being collected, and preliminary findings were used to guide decisions about additional data collection.

4.4.2 Data Collection Tools Used

This section describes some data collection tools used in the study.

4.4.2.1 Google Maps:

Google maps were used to get information about the habitations. Three zoom level maps were used. First zoom level helped us to locate the habitation. Second zoom level helped to enquire the spatial extent of the habitation, its geographic conditions, distance from neighbouring habitations and also to see if any kind of segregation is present among human settlements due to caste or other factors. The third zoom level helped to discover sources of water like wells, rivers, ponds etc.

4.4.2.2 IMIS database, MDWS (GoI)

Integrated Maintenance Information System (IMIS) of MDWS, GoI was used to get different habitation level and scheme level information.

4.4.2.3 Structured and Semi-Structured Questionnaire

One Structured and two Semi-structured questionnaires were prepared. The structured questionnaire was to get scheme level information, while two semi-structured questionnaire were used to get information at habitation level and household level.

4.4.2.4 Key Informant

In each habitation a key informant was selected during the process. The Key informant was one of *Sarpanch, Gramsevak, Scheme operator* or any other knowledgeable person as thought to be fit for this role.

4.4.2.5 Focussed Group Discussion

In each trip a focussed group discussion was held especially with women. It helped to understand the drinking water security in the habitation.

4.4.2.6 Household Interview

Randomly selected household interviews were done. The information collected was triangulated with others.

4.4.2.7 Transect Walk

Transect Walk up to the place of drinking water sources were done. The sources were physically inspected.

4.4.3 Assessment and Evaluation Protocol

A protocol was developed to follow the above mentioned tools for data collection which can be seen in the following table-

Table 4-8: Assessment Protocol Table

Steps	Description	Document	Remarks
Step 1	Prepare Village Level Questionnaire	Q1	
Step 2	Prepare Individual household Questionnaire	Q2	
Step 3	Prepare Scheme Level Questionnaire	Q3	
Step 4	Collect Map of target habitat, village at 3 zoom levels	M1	www.Googlemaps.com
Step 5	Collect basic data from Census	D1	CENSUS Report
Step 6	Village inclusion details from Annual Action Plan	D2	Indiawater.gov.in
Step 7	Collect habitation details from NRDWP	D3	Indiawater.gov.in
Step 8	Collect Scheme details from NRDWP	D4	Indiawater.gov.in
Step 9	Village visit- Interaction with Sarpanch / Patil/ Key informant.	Fill Q1 and record observations	
Step 10	Hold Focussed Group Discussion	Record observations	
Step 11	Household level interaction	Fill Q2 and record observations	
Step 12	Transect Walk- Confirm scheme details and prepare short report	Fill Q3. Cross check Data obtained	

#Documents M1 and from D1 to D2 are supposed to be filled by use of secondary data. Q2 and Q3 are structured questionnaires but were mostly executed in semi-structured manner.

4.5 Data Analysis and Results

All the primary data collected were aggregated and compiled to facilitate the analysis process. The different assessment objectives were kept in mind while the compilation of data so that analysis produces fruitful results.

4.5.1 Primary Source of Drinking Water:

The primary source of drinking water was ascertained for each habitation after a rigorous application of all the data collection tools. The final result is shown in the

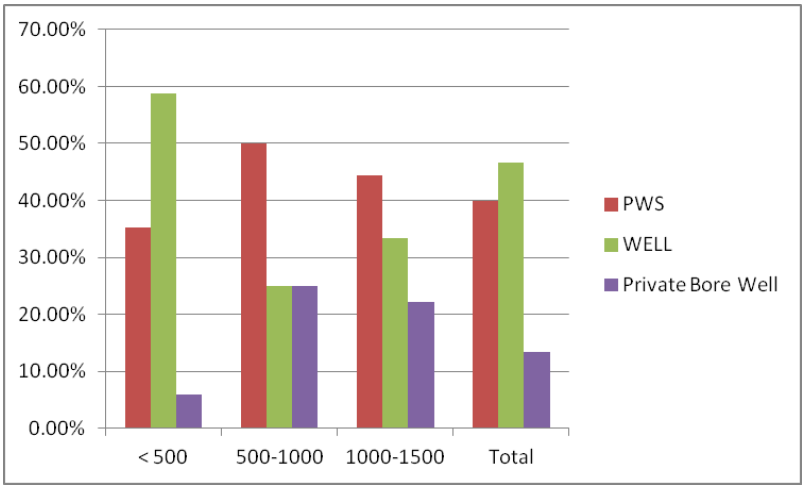
4.5.1.1 During Normal Days of year

Table 4-9: Primary Source of drinking water during normal days of year

Sr No	Population Group	Total No of habitations	PWS	WELL	Private Bore Well
1	< 500	17	6	10	1
2	500-1000	4	2	1	1
3	1000-1500	9	4	3	2
4	Total	30	12	14	4

In Table 4-9, the primary source of drinking water as per the population group is shown. A percentage wise distribution is shown in the adjoining figure.

We can see that during normal days of year 40% of habitations are depending on PWS schemes where as more than 45% are using well as the primary source.

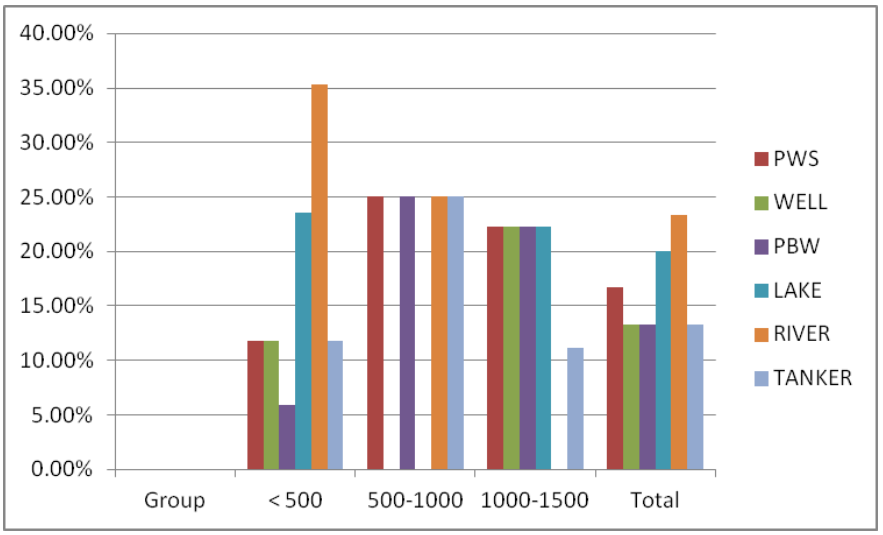


4.5.1.2 During Dry Days of year (March-May)

Table 4-10: Primary Source of drinking water during dry days of year

Sr No	Population Group	Total No of habitations	PWS	WELL	PBW	LAKE	RIVER	TANKER
1	< 500	17	2	2	1	4	6	2
2	500-1000	4	1	0	1	0	1	1
3	1000-1500	9	2	2	2	2	0	1
4	Total	30	5	4	4	6	8	4

Table 4-10 shows primary source of water during dry days of year. These are usually from March to May. We see here that a number of different sources have to be used during the dry days. As it is clear from the adjoin figure that the dependency of PWS as well as Well has decreased.

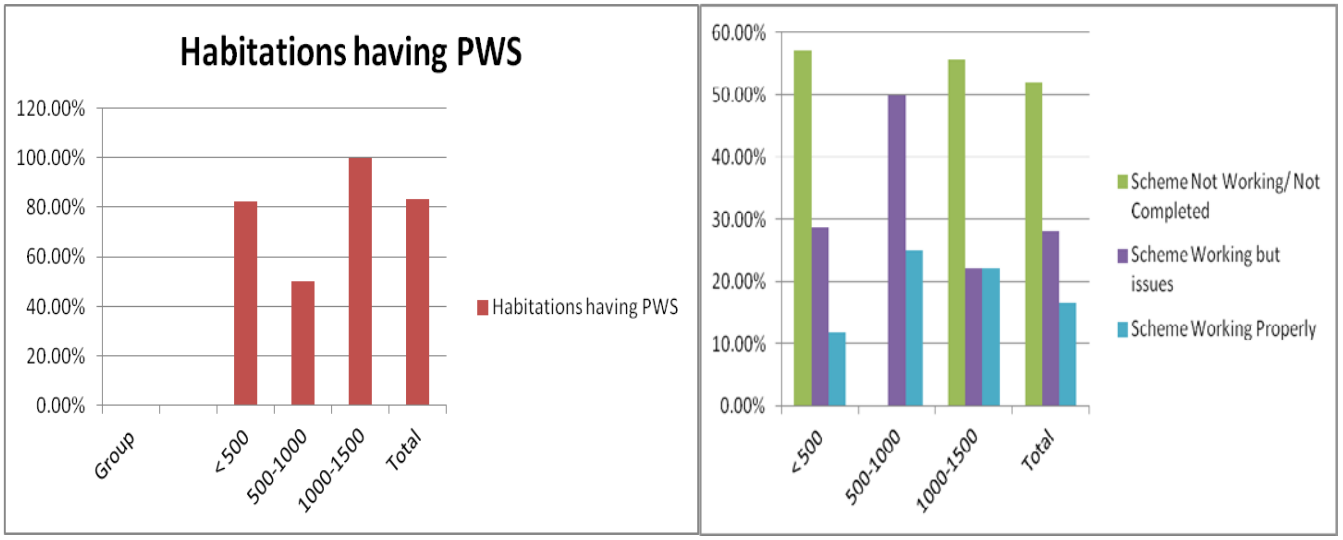


4.5.2 Status of Piped Water Schemes in the Habitations

Table 4-1: Population Group wise status of PWS Schemes

Sr No	Population Group	Total No of habitations	Habitations having PWS	Scheme Not Working/ Not Completed	Scheme Working but issues	Scheme Working Properly
1	< 500	17	14	8	4	2
2	500-1000	4	2	0	1	1
3	1000-1500	9	9	5	2	2
4	Total	30	25	13	7	5

Table 4-11 shows group wise status of PWS in the habitations.



It is clear from the above figures that almost 80% habitations have piped water schemes. In the bigger habitation it is 100%.

But in more than 50% of total habitations the piped water schemes are either not working or not completed. In only 17% habitations, schemes were working properly.

4.5.3 Sources of Piped Water Schemes in the Habitations

Table 4-2: Status of working PWS Schemes and their sources

Sr No	Population Group	Total No of habitations	Habitations having working PWS	Scheme Working but issues		Scheme Working Properly	
				GW	SW	GW	SW
1	< 500	17	6	2	2	0	2
2	500-1000	4	2	1	0	1	0
3	1000-1500	9	4	1	1	0	2
4	Total	30	12	4	3	1	4

The table shows that 4 out of 5 schemes that were working properly were based on surface water.

4.5.4 Habitations depending on River, Lake, Tanker or PBW during dry days and reported fully covered

Sr No	Population Group	Total Number Of Habitations			Habitations depending on River, Lake, Tanker or PBW during dry days		
		PC	FC	Total	PC	FC	Total
1	< 500	6	11	17	6	7	13
2	500-1000	1	3	4	1	2	3
3	1000-1500	3	6	9	2	3	5
4	Total	10	20	30	9	12	21

The table shows habitations depending on sources like Lake, River, Tanker etc during dry days. It is quite revealing that out of 20 habitations that are reported fully covered almost 60% have to depend on these sources which are often far from the habitation.

More discussion:

- During the assessment we also found that the awareness among people about demand driven approach is not there. In only few instances VWSC were found.
- Nowhere the idea of public contribution was there among the people.
- There is also confusion about water tariff among the people. They usually think local tax levied by GP to be water tariff for scheme.

5 Experience from neighbouring state: Gujarat

The development in rural water supply sector in Gujarat has been applauded on various platforms. The working group of planning commission on rural water and sanitation has also cited example of WASMO, Gujarat in its report of the 12th Plan. [12thPlan, 2012]

As a part of this *Assessment and Evaluation* project, it was decided to understand the structure and working of WASMO and its impact on rural water supply in Gujarat.

The present chapter details our study of WASMO and subsequent findings and learning.

5.1 Gujarat state and its Rural Water Supply:

Gujarat state is located in the western part of India. The geographic characteristics of Gujarat are highly diverse ranging from thick forests and hilly regions in south part to arid desert in the north area. These diverse geological, hydrological, climatic and soil conditions had implications on the status of surface and groundwater resources in the State. The distribution pattern of rainfall in the State ranges from over 2000 mm (in the Dangs in South Gujarat) to about 200 mm (in Kutch). There is also regional variation of surface water through the rivers like Narmada, Mahi, Tapi, Ambica and Poorna. Typical geological formations across the state make water storage in the aquifers and percolation for ground water recharge difficult. Gujarat has long coastline and two huge gulfs – the Gulf of Cambay and the Gulf of Kutch which are inundated with saline sea water for a long period and deteriorates the ground water quality in adjoining areas.

Figure 5-1: Map of Gujarat

It has 5.96 % of nation's geographic area with 5% population and only 2.63% of share of water resources. Most part of Gujarat comes under scarcity prone area due to the variation in distribution of rainfall. [WASMO Report]

In a large area of the State over drafting of ground water mainly for agriculture and subsequent depletion of aquifers has had a great impact on the fresh water availability during the recent past.

There are number of officially declared

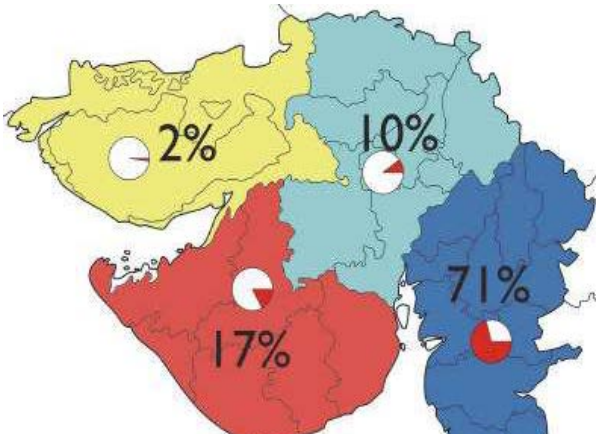


Figure 5-2: Variation in Availability of Fresh Water

Source: WASMO Report

droughts in Gujarat since last 75 years. There are water quality issues in number of habitations such as fluoride, nitrate content and salinity. 74% of drinking water supply of Gujarat State is dependent on ground water sources. Over the period, the ground water use has increased for irrigation purpose affecting the exploitation of ground water source. The State Government had to play a crucial role to manage water sources for sufficient access of drinking water to the rural area ([Hirway 2005], [WASMO report]).

Institutional Structure of Rural Water Supply

To manage rural water supply Gujarat State has established Department of Water Supply headed under Narmada and Water Resources, Water Supply and Kalpsar Department. There are three departments formed under Water Supply Department namely, Gujarat Water Supply and Sewerage Board (GWSSB), Water And Sanitation Management Organization (WASMO) and Gujarat Water Infrastructure Limited (GWIL). Each of these departments has to play different role in relation of rural drinking water supply. GWSSB and WASMO are both prime responsible departments for rural drinking water supply in the State. GWSSB plays important role in managing the water resources and making water available at village level whereas WASMO plays the role of facilitator and to supply the water within the village.

Gujarat Water Supply and Sewerage Board (GWSSB)

The State Government established the Gujarat Water Supply and Sewerage Board (GWSSB) in 1979. The board was formed for rapid development and proper regulation of water supply and sewerage services in the State. GWSSB was sole responsible to prepare, execute, promote, maintain and finance the rural drinking water supply.

Organization Structure

The board is governed under the authority of Cabinet Minister and Principal Secretary of Water Supply Department. The organization structure of GWSSB is shown in Fig.5-3. Chairman is the head of the board under which Member Secretary is placed. There are different sections and departments working in the board such as mechanical, material, technology and planning, finance, administration headed by the respective Chief Engineers. For execution and control purpose all 26 districts of the State are

divided in four zones, which are governed by the respective Zonal Chief Engineers.

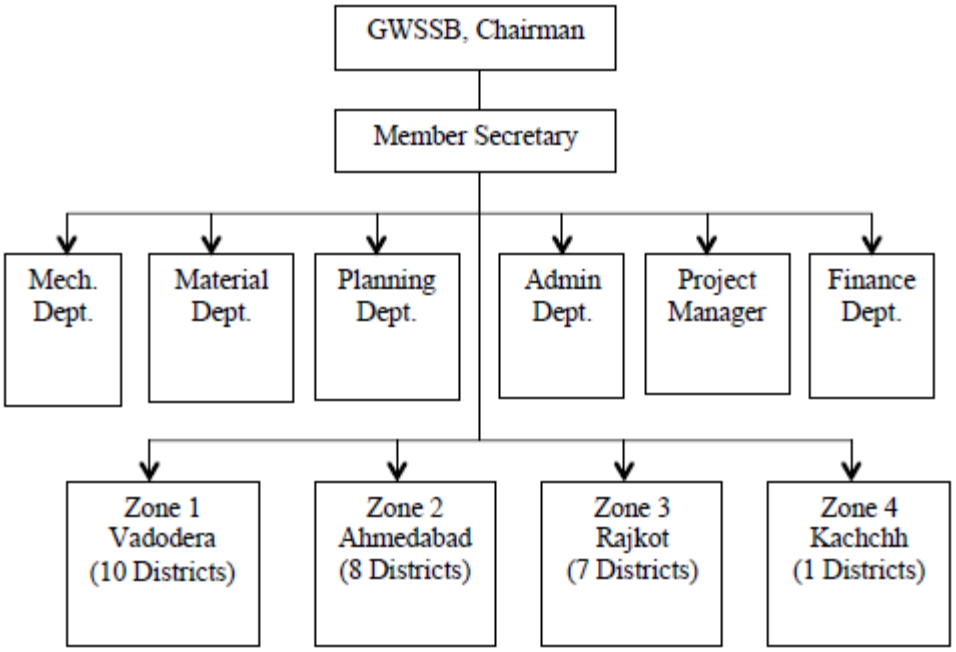


Figure 5-3: Organisational Structure of GWSSB, Gujarat

Source: Website of GWSSB.From the time of establishment of the board it has developed the rural water supply coverage using single village schemes, stand post and hand pumps in different parts of the State. Over the period of time severe depletion of water source was observed in Saurashtra, Kachchh, north Gujarat and some parts of central Gujarat. As a result there were no local drinking water sources available in these regions. Further, the small multi-village and single village water supply schemes face the shortage of potable water, particularly in summer season [Hirway Indira;Goswami Subhrangsu 2008]. To tackle with these problems the State Government is implementing different projects under GWSSB such as, Sagar Khedu Development Programme, Tribal Area and Scheduled Caste Sub Plan, Single village Mini Schemes etc. One of the ambitious plan was of transferring the surface water of Narmada Canal to the affected and arid region and to fulfil the rural drinking water demands of Gujarat. Drinking Water Supply Master Plan Based on Sardar Sarovar Narmada Canals was prepared in year 1996 and the implementation was started in year 1999. Later on the programme was named as Sujalam Sufalam Scheme. Under this project, it was planned to supply 3571 MLD of Narmada water to 8215 villages & 135 towns of 15 districts, by laying 2700 Kms. Bulk Water Transmission pipelines in the project area. The Grid network is shown in the fig 5-4.

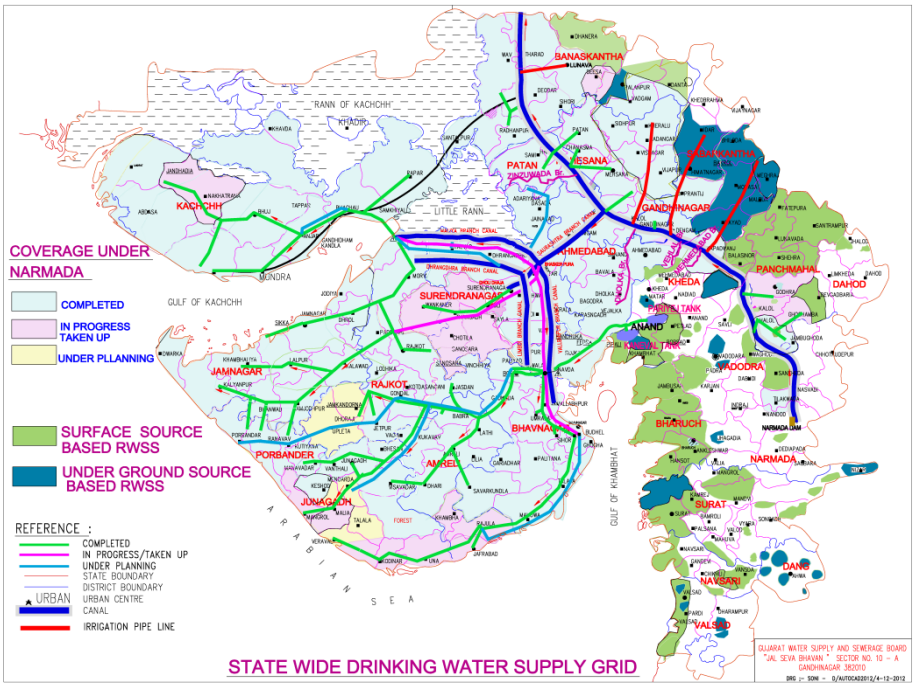


Figure 5-4: Water Supply Grid Network

There are three organizations responsible for implementation of the

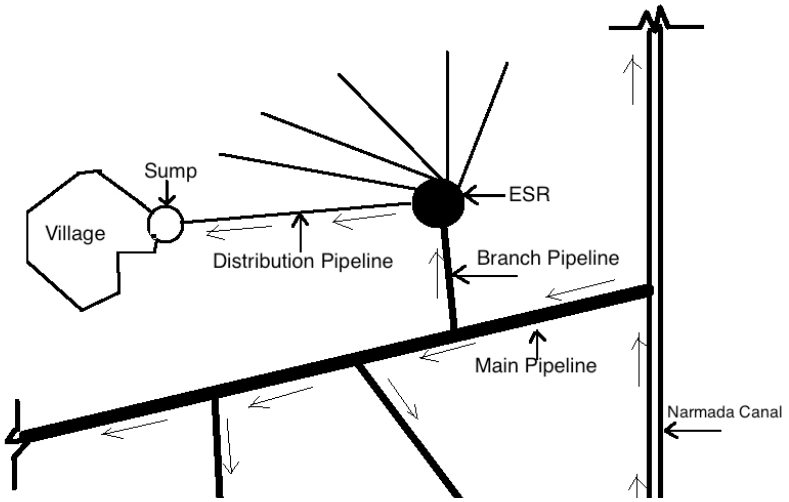


Figure 5-5: A Typical Layout of distribution system

programme namely, GWSSB for implementing the distribution network, GWIL for bulk transmission of water from the Narmada to the villages and towns through various pipelines, and WASMO for distribution of water within village and for promoting Village Water and Sanitation Committees (Pani Samitis) for local management of the water supply. GWSSB is responsible for supply of water in a sump (underground water tank) in each village. WASMO has to facilitate the household drinking water connections within the village using the water provided by GWSSD in a sump. [Hirway Indira, Goswami Subhrangsu 2008].

5.2 Water And Sanitation Management Organisation (WASMO)

The genesis of WASMO lies in, Royal Netherlands Embassy (RNE) funded a Ghogha Regional Rural Water Supply Project for 82 villages of Bhavnagar district that was designed as a community managed project [Governance Knowledge Centre, 2011]. Under this project a new organization of the State Government was established to promote, support and monitor the community participation and community based management in water and sanitation projects. After severe earthquake in 2001, the Royal Netherlands Embassy again provided the funds for Gujarat Earthquake Rehabilitation & Reconstruction Project (GERR). Rural drinking water supply schemes were executed as part of the project in earthquake-affected area. The organization established in Ghoga project for the purpose of community participation continued to operate in this project, which was named as WASMO. As a SPV, It was registered under Company Act in 2002.

5.2.1 Organization Structure

Under the head office of WASMO (located in Gandhinagar), namely, Project Management Unit, Water Quality Unit, Information, Education & Communication (IEC) Unit, Finance & Accounts Unit, Board & Funding Unit, Management Support Unit and Management Information System (MIS) Unit. Similarly, there are two district level units in each district of the state, District Water and Sanitation Unit (DWSU) and Coordination, Monitoring and Support Unit (CMSU). The Member Secretary heads DWSU, generally an Executive Engineer of GWSSB is appointed for this post. Under each DWSU there are different number of block units depending upon number of Taluka in the district. e.g., Ahmedabad District have two Block Offices (BO) comprises of four and six Taluka simultaneously. Each BO has at least one Technical Person (TP) and three Social Mobilizers (SM) in each district depending upon the population of Taluka. E.g., in Ahmedabad District there are total four technical and ten number social mobilizers in two BOs (WASMO Report, 2011). The detailed organization chart of WASMO is shown in Fig.5-7

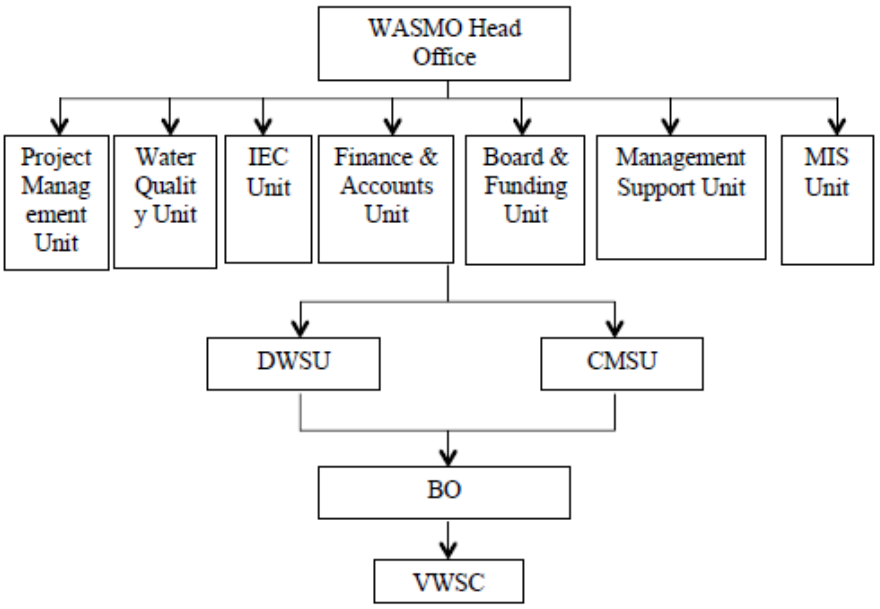


Figure 5-6: Organisational Structure of WASMO

5.2.2 Responsibilities of WASMO

The organization was a vehicle to introduce demand driven mechanism in rural water supply in the State. Since its inception till 2011, in more than 16,740 Villages the VWSCs have been formed in the State. WASMO has commissioned piped water supply schemes with household connections in more than 6,500 villages in a demand driven mode and another 4,547 schemes are under construction [Gupta Rajiv, 2011].

Generally, the demand of village is forwarded to DWSU under the authority of Sarpanch of the village. Then DWSU and BO organize a GramSabha in village for formation of Pani Samiti, which is necessary for implementation of the scheme. As per the rules 10 to 13 people are selected as members of the Pani Samiti from village depending upon its population. There should be 50 % of representation of women in the Samiti. The typical activities and responsibilities of TP and SM for implementation of the scheme are discussed in next chapter.

5.3 Case Studies

In order to fulfil the objectives of the study, it was decided to build some case studies. Case Study is one of the important methods in social science research. It heavily depends on qualitative inputs. Researchers have used the case study research method for many years across a variety of disciplines. Social scientists, in particular, have made wide use of this qualitative research method to examine contemporary real-life situations and provide the basis for the application of ideas and extension of methods. Researcher Robert K. Yin defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context. An explanatory case study is used to explore causation in order to find underlying principles. A case study design should be considered when: the focus of the study is to answer "how" and "why" questions [Yin, 2003]

Though the Case Study is established method of research in social sciences, there exists some misunderstandings like; one cannot generalize from a single case; the case study contains a bias toward verification; It is often difficult to summarize specific case studies and more. Bent has analysed and corrected one by one all these misunderstandings. [Bent, 2006]

5.3.1 Sampling: Selection of sites

Some parameters were required for the selection of the villages were so as to get a clear picture of rural water supply in the state and to understand the working of WASMO. Rural water supply in Gujarat has distinct characteristics with respect of source of water and delivery mechanism. Earlier, most of the schemes were working on open wells or tube wells, i.e., on ground water source. Later on, since 1999 the Government of Gujarat has simultaneously initiated Drinking Water Supply Master Plan based on Sardar Sarovar Narmada Canal. Under this project bulk surface water transmission pipelines are laid in the 15 districts of Gujarat. The transmission network can be seen in the figure(refer to the figure). It was an important parameter for the selection of the villages that some of the schemes must represent both ground water source as well as connection with the bulk surface water transmission pipeline. Secondly, the aspect of water availability was also looked at for the selection of the cases since Gujarat State is considered as one of water scarce regions in India. A map representing the water availability can be in the figure(refer). Moreover, in demand driven/community managed scenario success of drinking water schemes heavily depend on financial ability of people. In order to take account of this fact, a region with better economic condition was selected. To summarize the above, selection of the villages for case study was based on-

a. Connectivity and non-connectivity with bulk water transmission grid.

b. Different water sources (ground water and surface water)/ Water scarcity region.

c. Economic status of the region.

These parameters helped to collect diverse information of cases and to understand the mechanism of WASMO under various conditions. Based on this understanding three districts of Gujarat namely, Ahmedabad, Surendranagar and Dang were selected as study area. The distinct feature of each of these districts is discussed here.

Ahmedabad District is located at the central eastern part of Gujarat. It falls under the industrial belt that determines the economic activities of the area. It is well connected with the bulk surface water grid and also there are schemes, which are based on ground water source.

Surendranagar District is situated on central western part of Gujarat. As per our parameter this district is considered as the drought prone region and availability of water is prime concern of the region. The bulk surface water grid is not fully covered in Surendranagar District as it is under construction phase.

Dang District is located at the extreme south of Gujarat, which is having 100 % of tribal population. It is completely mountainous region covered with 75 % of forestland. The geographic features of this district are similar to Thane District of Maharashtra. Dang is not connected with bulk surface water grid hence rural water supply is largely based on ground water source.

Table 5-1: List of Sample Villages

List of Sample Villages for Case Study Analysis					
Name of District	Name of Village	Source of Water	Population Distribution		
			SC	ST	GN
Ahmedabad	Junapadar	Ground & Surface Water	109	0	1586
	Melaj	Ground & Surface Water	679	0	721

Surendranagar	Adalsar	Ground & Surface Water	314	0	1030
	Jamvali	Ground Water	0	0	873
Dang	Khirmani	Ground Water	0	530	0
	Kunda	Ground Water	0	330	0

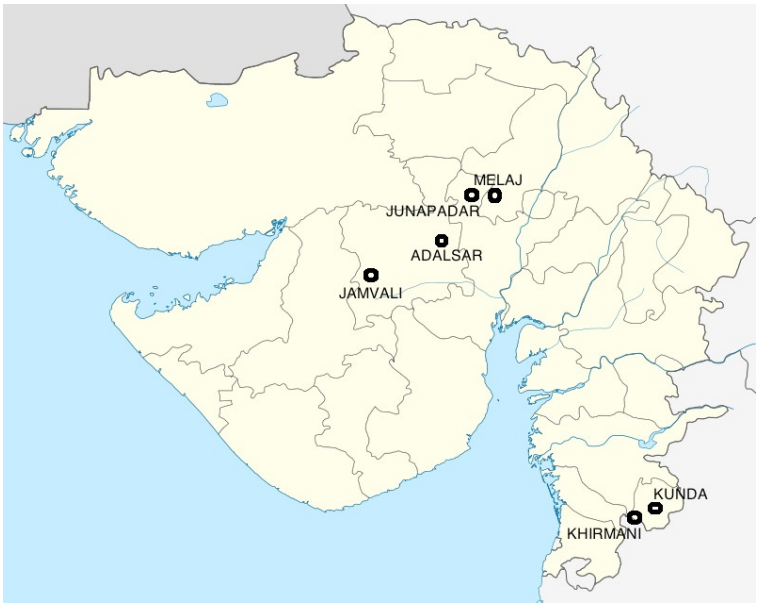


Figure 5-7 Map showing study sites

5.4 Data Collection

After sampling the villages for case study next important step was to collect the data. Various datasets were required for the analysis and understanding several implementation processes of drinking water schemes. For dataset collection each of the village is considered as vehicle of information through which the detailed understanding will be formed. A detailed schedule was prepared for the field visits at villages and district offices of WASMO. The focus of the field visits was to collect different aspects of information related to the drinking water schemes such as demography of the village, history of drinking water in the village, detail process of scheme of WASMO and various official documents and formats. This is further divided as primary and secondary datasets based on the source of data. Stakeholder interviews were the source for primary

data where as government datasets and scheme documents was the source for secondary data. It was decided to conduct the semi-structured interviews of government officials and people of the village to assemble the primary data about the scheme (Annexure II). The secondary data was physically collected from District offices of WASMO at Ahmedabad, Surendranagar and Dang respectively.

Case Study Reports and Analysis

The most critical part of the study is to carry out the analysis of the collected information from the fields. In this study the datasets were in two forms, one is government documents of the schemes and second is audio recordings & field notes of field interviews of the stakeholders. First operation conducted was to compile the field notes and recordings and formation of case narratives. Then all the documents of each of the village were closely observed to understand the processes and various features of each of the schemes. Based on this structured material case based understanding was developed and different inferences were obtained related to the objectives of the study.

Analysis and important observations are detailed in the next section. A detailed study report of all the cases studies can be found in the annexure.

5.5 Important Observations and Learning

In this section we have mentioned the important observations and learning.

5.5.1 Summary of Important parameters

In course of different site visits, we have found some important parameters that were common to almost all the schemes. A summary of these parameters can be seen in the table below.

Table 5-2: Summary of Important parameters

Name of the village / Parameters	Junapadar	Melaj	Adalsar	Jamvali	Khirmani
VWSC Resolution	Passed	Passed	Passed	Passed	Passed
PRA Activity	Conducted	Conducted	Conducted	Conducted	Conducted
Technical Survey	Conducted	Conducted	Conducted	Conducted	Conducted
Rough Map	Prepared	Prepared	Prepared	Prepared	Prepared
Technical Design & Estimation	Prepared	Prepared	Prepared	Prepared	Prepared
MoU	Signed	Signed	Signed	Signed	Signed

Capital Contribution Register	Not Maintained	Not Maintained	Maintained	Maintained	Maintained
Bank Account slips	Produced	Produced	Produced	Produced	Produced
Hydro Geologist Report	Not Required	Not Required	Not Required	Not Prepared	Prepared
Material Testing Report	Not Tested	Not Tested	Tested	Tested	Not Tested
Field Visit Reports	Maintained	Maintained	Maintained	Not Maintained	Not Maintained

These parameters were validated through documentary evidences and our interaction to various stakeholders.

5.5.2 Role of WASMO in Scheme Design and Implementation

Teamwork between WASMO Officials and VWSC: In the case study it is observed that technical person and social mobilizer of WASMO work as a team that benefits the villagers as well the scheme. e.g., in the PRA activity technical person involved with social mobilize benefits to understand livelihood patterns of the village, which can be used to estimate total water demand of the village.

Technical tools used for design: The technical survey, which was carried out in all the cases give knowledge of the internal physical structure of the village and elevations of key locations. WASMO officials use various surveying tools like dumpy level, measuring staff, tape etc. for the execution of the survey. Technical person prepares a rough drawing on the site mentioning elevations, angles and road positions on it. This is further used for the final design of distribution network of pipelines using BRANCH software or by manual calculations (Annexure III). E.g., in Adalsar village they have used both manual as well software calculations and finally selected the design, which gives the best results.

Assistance for technical activities: Though the organization is established as a facilitating agency they provide all the technical support required at various levels of the scheme, as they possesses the capacity to conduct the technical activities. Similarly, the detail estimation of all the components of the scheme such as pipeline network, ESR,

pumping equipment etc. is made by WASMO based on which Pani Samiti executes the scheme in the village (Annexure IV).

Assistance for quality assurance: While implementation of the scheme WASMO officials provide the assistance from other agencies for testing of pipe material and water quality testing. (Annexure V). The pipes are tested from Central Institute of Plastic Engineering & Technology while Nirmala Water Testing Laboratory performs water quality testing. At the time of execution of the scheme they worked as supervisor, which helps to ensure good quality of work.

Assistance for O&M: After completion of the scheme villagers faces the problems of related to O&M of different components of the scheme such as pipe repairs, valve replacement, O&M contribution etc. In these situations villagers do contact to the WASMO officials. They provide the guidance to the village as per their capacity or connect the village with appropriate agency to correct the problems.

5.5.3 Vital Procedures of WASMO

Planning in participatory mode: The WASMO officials maintain continuous communication with Sarpanch and VWSC members of the village. They physically visit the villages under their authority once in two weeks. They have regular telephonic conversations with Pani Samiti members of Sarpanch of the Gram Panchayat while execution of the scheme. This helps the official to mobilize the people of the village capital and O&M contribution. Similarly its add to the planning, timely completion of the scheme.

Accountability through Institutional set-ups: WASMO has emphasized in formation of VWSC in all the villages before sanction of the scheme. They work in collaboration with VWSC members at different levels of the scheme. This defines the liable role of both institutions in case of execution of the scheme in the village. A village level institution helps to increase the accountability of the programme. In case of WASMO the authorized members such as Sarpanch, Pani Samiti members and Thalathi of the village, sign the imprint VWSC resolution and MoU. This is formal document, which describes the official responsibility of VWSC and WASMO officials regarding the implementation of the scheme.

Transparency while execution of scheme: In the case study of six villages it is found that WASMO has allocated all the funds of the scheme through the bank account of Pani Samiti. For the transaction of funds the signature of Sarpanch and Pani Samiti member is compulsory. This has maintained the transparency in the economic activities of the scheme. Similarly, VWSC gave the villagers a Gram Panchayat receipt against payment of 10% capital contribution and monthly O&M charges to avoid unaccounted fund raising from the villagers. The monthly salary of operator of the scheme is done through the cheque drawn from Pani Samiti account by VWSC of the village.

Proper documentation: The precise documentation was done of all reports of each scheme in all District offices by WASMO. These reports can help to resolve any conflicts at the time of execution by revisiting the documents. E.g., field visit reports of technical person and social mobilizer can help to track back the processes of execution of the scheme. Official documents such as PRA report, Technical design and estimates, MoU, bank account transactions benefits for the evaluation and monitoring of the scheme in particular and programmes in general.

Decisions for better planning: The WASMO officials have emphasized on better selection of source, which would be sustainable to run the scheme. E.g, in Jamvali and Adalsar village the source of water is selected based the quantity of water and the sustainable characteristics of the source. They have taken important decision in Dang to lift the ground water from 2 to 3 Kms distances and store it above the village so that it can be distributed in the village through gravity force. The schemes can afford to use electricity power to lift the water for such long distances as the State Government has fully subsidizes the electricity for rural drinking water programmes. As per the policy guidelines of WASMO there is no upper limit or per capita cap of total expenditure of the scheme. This helps in covering villages having small population.

6 Conclusion and Recommendations

The literature reveals the huge spending of Central as well as State government in rural water supply sector. This has been supplemented by different external agencies like; World Bank, Kfw etc. This has resulted in increased number of programmes and policy changes.

It can be concluded from the study taken that just the change of policy from supply driven to demand driven would not suffice the present drinking water security challenge in rural areas.

While making policies at national level, much thinking should be given for possible hurdles in the implementation at regional level. For example, situations where ground water is not available Multi-Village Schemes become only viable option but a number of villages coming together as required by the policy becomes a hurdle.

Moreover, many guidelines are only in papers and those should be materialised at ground level. Clearly defined protocols for monitoring and reporting should be developed and strictly followed in implementation. Ideally, reporting of assets created should be done by a third party.

In the case of Thane district we saw that large part of schemes which are reported as PWS are actually ZP school schemes, which do not cater to the main population. Hence it should not be credited for the coverage of population.

Moreover we also saw that just introduction of a scheme in a habitation makes it fully covered. Merely introduction of scheme does not ensure drinking water security to its people unless and until it is properly functioning. This fact should be taken care of while declaring a habitation fully covered.

More stress should be given to proper monitoring and evaluation and strict guidelines should be made available for the concerned authorities.

The assessment and evaluation study showed the huge error- reporting. The functioning schemes as reported in the website were not functioning on the ground in the study area. The same was the case with coverage reporting. The coverage should take into account of temporal differences as in places like thane and also other parts of state or country drinking water security becomes challenge in summer months.

The example of Gujarat has proved that that better implementation and conjunctive

use of different sources can be a very good idea. The second learning was that as opposed to current system the BRC should work closely with the implementing agencies.

Assuming the importance of assessment and evaluation studies more such experiments should be tried in academic environment. At the same time it should thrive to work closely with local administrations.

One such attempt has already being done by CTARA, IITB. The centre has submitted a proposal for template bases assessment and evaluation study to WSSD, GoM.

We believe, Assessment and Evaluation studies evolved in local conditions would uncover the various issues of the sector and bring the Policy-implementation gap narrower with time.

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Annexure:

I: List of Sampled Habitations in Shahapur

GP	VILL	HAB	AAP-2012	AAP-2011	AAP-2010	Status of Coverage as On 01/04/2012	Present Population as on 01/04/2012	SC	ST	GEN
BHAVSE	TANASA	TANSA	0	0	0	Covered	1344	47	1127	170
SURLAMB	SARALAM	SURLAMBE	0	0	0	Covered	1238	37	0	1201
CHIKHALG	CHIKHALG	CHIKHALGAON	0	1	1	Covered	1219	7	125	1087
DAHAGAC	DAHAGAC	DAHAGAON	0	0	0	Covered	1151	0	882	269
KOTHALE	KOTHALE	KOTHALE	1	1	1	Partially Covered	1067	0	1067	0
AWARE	AWARE	AWARE	0	1	1	Covered	1061	36	9	1016
AWARE	KAMBARE	KAMBARE	1	1	1	Partially Covered	1048	42	41	965
VELUK	VELUK	VELUK	1	1	1	Partially Covered	1048	46	539	463
SATHGAO	SATGAON	SATHGAON	0	0	0	Covered	1031	0	112	919
SATHGAO	SHILOTTA	SHILOTTAR	0	0	0	Covered	812	100	168	544
VELUK	SUSARWA	SUSERWADI	0	0	0	Covered	793	11	748	34
AWARE	PUNADHE	PUNDHE	1	0	0	Partially Covered	688	34	0	654
SATHGAO	SATGAON	SATHGAONPADA	0	0	0	Covered	337	73	63	201
SURLAMB	SARALAM	SAVARSHET	0	0	0	Covered	275	0	0	275
BHAVSE	TANASA	TANSAPADA	0	0	0	Covered	210	0	210	0
SURLAMB	SARALAM	KHAIRPADA	0	0	0	Covered	208	0	0	208
DAHAGAC	DAHAGAC	POWARPADA	0	0	0	Covered	205	15	70	120
BHAVSE	BHAVSE	CHINCHECHAPADA	0	0	0	Covered	195	0	195	0
DAHAGAC	KATBAO	KATBAV	1	1	1	Partially Covered	189	0	168	21
AWARE	PUNADHE	KATICHAPADA	0	0	0	Covered	184	0	184	0
VELUK	PATOL	PATOLPADA	1	1	1	Partially Covered	180	0	180	0
VELUK	PATOL	TELAMPADA	1	1	0	Partially Covered	160	0	160	0
CHIKHALG	CHIKHALG	GUNDYACHAPADA	0	1	1	Covered	150	0	0	150
SURLAMB	SARALAM	SAKARPADA	0	0	0	Covered	115	0	96	19
CHIKHALG	CHIKHALG	KATKRIPADA	0	1	1	Covered	100	0	100	0
VELUK	VELUK	KATKARIWADI	1	1	1	Partially Covered	100	0	100	0
BHAVSE	BHAVSE	AKHARYACHAPADA	0	0	0	Covered	95	0	95	0
DAHAGAC	DAHAGAC	CHAFYACHAPADA	1	1	1	Partially Covered	95	0	95	0
VELUK	VELUK	DHENGANMAL	1	1	0	Partially Covered	91	0	91	0
AWARE	AWARE	JAMBHULPADA	0	0	0	Covered	85	0	85	0

Note: In AAP Column, 0- Not Included, 1- Included

II

Q-1 VILLAGE LEVEL QUESTIONNAIRE (Used as a Guide)

General:

1. Total number of house holds in the village ?
2. Total population of the village ?
3. Total number of habitations and their names ?
4. Population and cast at habitation level ?

Water:

1. Total number of schools and water facility status in them ?
2. Habitations benefited by the scheme ?
3. Partially covered or Fully covered habitations ?
4. Name, type and source of scheme ?
5. Age of scheme ?
6. Number of working months ?
7. Functioning of Scheme during summer ?
8. Promised schemes and their extent of completion ?
9. Presence of water committee and role of panchayat in water issues ?
10. Presence of large water body like river, lake near by village ?
11. Source of water for non beneficiaries ?
12. Distance of the source from habitation ?

Q-2 INDIVIDUAL HOUSEHOLD QUESTIONNAIRE (Used as a guide)

1. Name of the head of family and contact ?
2. Number of people in home ?
3. Amount of water required per day for family ?
4. Source of water for drinking, cooking ?

Sr No		Name	Contact No
	Surveyor		
	Date of Survey		
	Checked		

5. Source of water for washing clothes, vessels and bathing ?
6. Source of water for live stocks if any ?
7. Benefited by scheme or not ?

Beneficiaries:

8. Type of scheme or mode of delivery ?
9. Hours of working hours of the scheme ?
10. Water tariff for family per month ?
11. Number of months the scheme works ?
12. Source of water during summer ?
13. Satisfaction with water quality – colour, taste & odour ?

Non- Beneficiaries:

14. Source of water for Non-beneficiaries ?
15. Distance of source location ?
16. Mode of transport ?
17. Man hours spent in collecting water ?
18. Satisfaction with water quality – colour, taste & odour ?

Q3

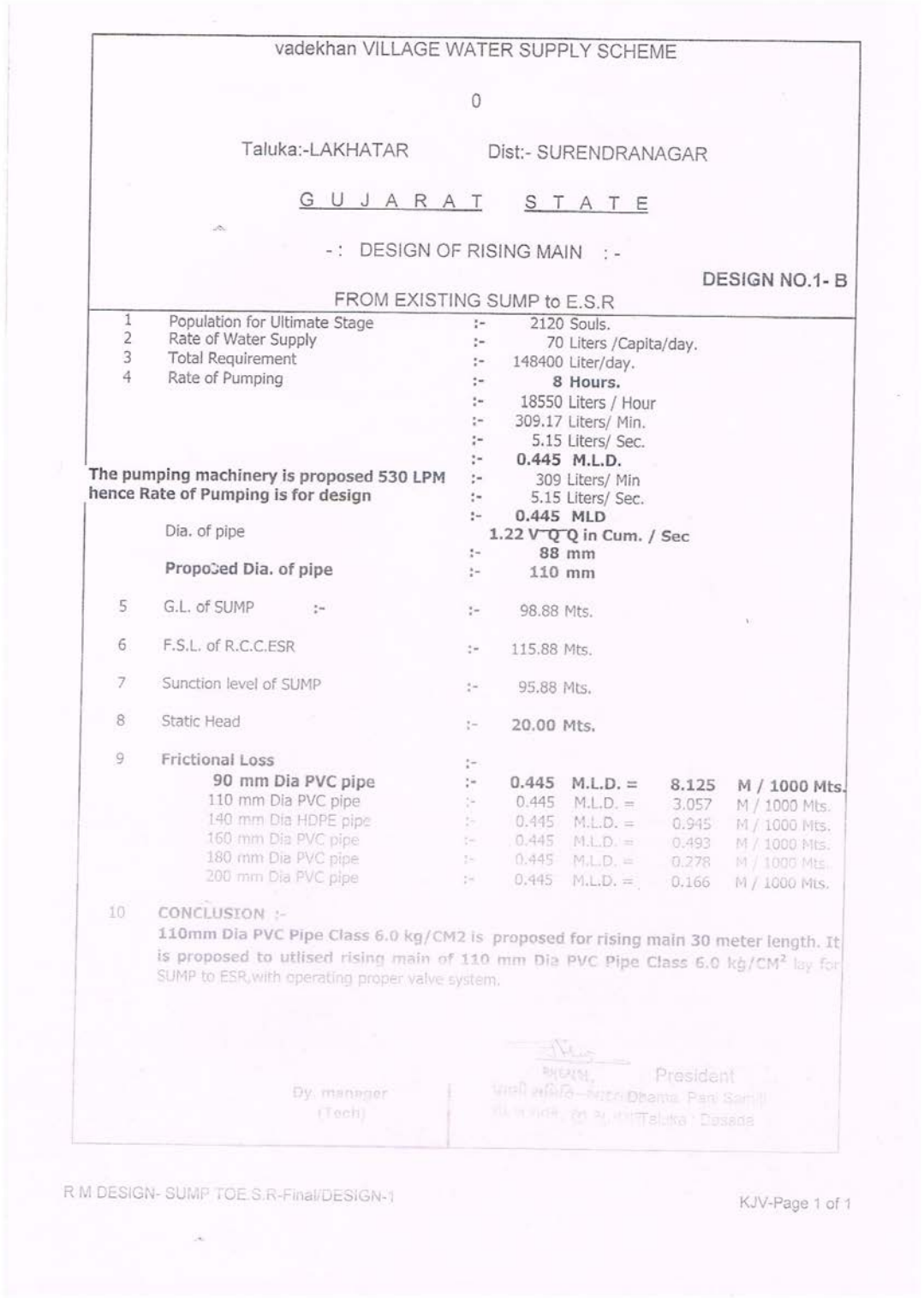
	Details of PWS(Note:1. Get some details from official documents also. 2. If not Individual scheme, analyse with considering other habitations also.)		
	Functional (Y/N/S/U)		
	If Yes		
	Name		
	Estimated Cost		
	Year		
	Source		
	Storage Capacity		
	Pumping Machinery		
	Delivery Structure(no of standpost)		
	Number of dependents		
	Owned/Operated by.(Name,payment)		
	Hours and time of operation		
	Amount of monthly Electricity bill		

	Amount of Pani-patti/HH		
	Remarks if any		
	If No(Is it present in database, Get details, inspect the asset)		
	Name		
	Estimated Cost		
	Source		
	Year		
	Non-functional Since		
	Storage Capacity, Status of asset		
	Pumping Machinery, status		
	Delivery Structure (no of standpost, status)		
	Reason of failure		
	If Under Construction, note status of asset.		
	Name		
	Construction(On/Stopped)		
	Estimated Cost		
	Year		
	Source		
	Storage Capacity		
	Pumping Machinery		
	Delivery Structure(Pipe, no of standpost)		
	Number of dependents		
	Remarks		

	Details of Wells						
No	Name	Diameter	Depth	Present Water level	Dries in Month	Usage	No of dependent
1							
2							
3							
4							
5							

	Details of Rivers/lakes						
No	Name	Distance	Seasonal/ perennial	Present Water level	Dries in Month	Usage	No of dependent
1							
2							
3							
4							
5							

III



vadekhan VILLAGE WATER SUPPLY SCHEME

0

Taluka:-LAKHATAR Dist:- SURENDRANAGAR

G U J A R A T S T A T E

-: DESIGN OF RISING MAIN :-

DESIGN NO.1- B

FROM EXISTING SUMP to E.S.R

1	Population for Ultimate Stage	:-	2120 Souls.			
2	Rate of Water Supply	:-	70 Liters /Capita/day.			
3	Total Requirement	:-	148400 Liter/day.			
4	Rate of Pumping	:-	**8 Hours.**			
		:-	18550 Liters / Hour			
		:-	309.17 Liters/ Min.			
		:-	5.15 Liters/ Sec.			
		:-	**0.445 M.L.D.**			
The pumping machinery is proposed 530 LPM		:-	309 Liters/ Min			
hence Rate of Pumping is for design		:-	5.15 Liters/ Sec.			
		:-	**0.445 MLD**			
	Dia. of pipe		**1.22 V Q Q in Cum. / Sec**			
		:-	**88 mm**			
	Proposed Dia. of pipe	:-	**110 mm**			
5	G.L. of SUMP :-	:-	98.88 Mts.			
6	F.S.L. of R.C.C.ESR	:-	115.88 Mts.			
7	Sunction level of SUMP	:-	95.88 Mts.			
8	Static Head	:-	**20.00 Mts.**			
9	**Frictional Loss**	:-				
	90 mm Dia PVC pipe	:-	**0.445**	**M.L.D. =**	**8.125**	**M / 1000 Mts.**
	110 mm Dia PVC pipe	:-	0.445	M.L.D. =	3.057	M / 1000 Mts.
	140 mm Dia HDPE pipe	:-	0.445	M.L.D. =	0.945	M / 1000 Mts.
	160 mm Dia PVC pipe	:-	0.445	M.L.D. =	0.493	M / 1000 Mts.
	180 mm Dia PVC pipe	:-	0.445	M.L.D. =	0.278	M / 1000 Mts.
	200 mm Dia PVC pipe	:-	0.445	M.L.D. =	0.166	M / 1000 Mts.

10 **CONCLUSION :-**

110mm Dia PVC Pipe Class 6.0 kg/CM2 is proposed for rising main 30 meter length. It is proposed to utlised rising main of 110 mm Dia PVC Pipe Class 6.0 kg/CM² lay for SUMP to ESR,with operating proper valve system.

Dy. manager (Tech)

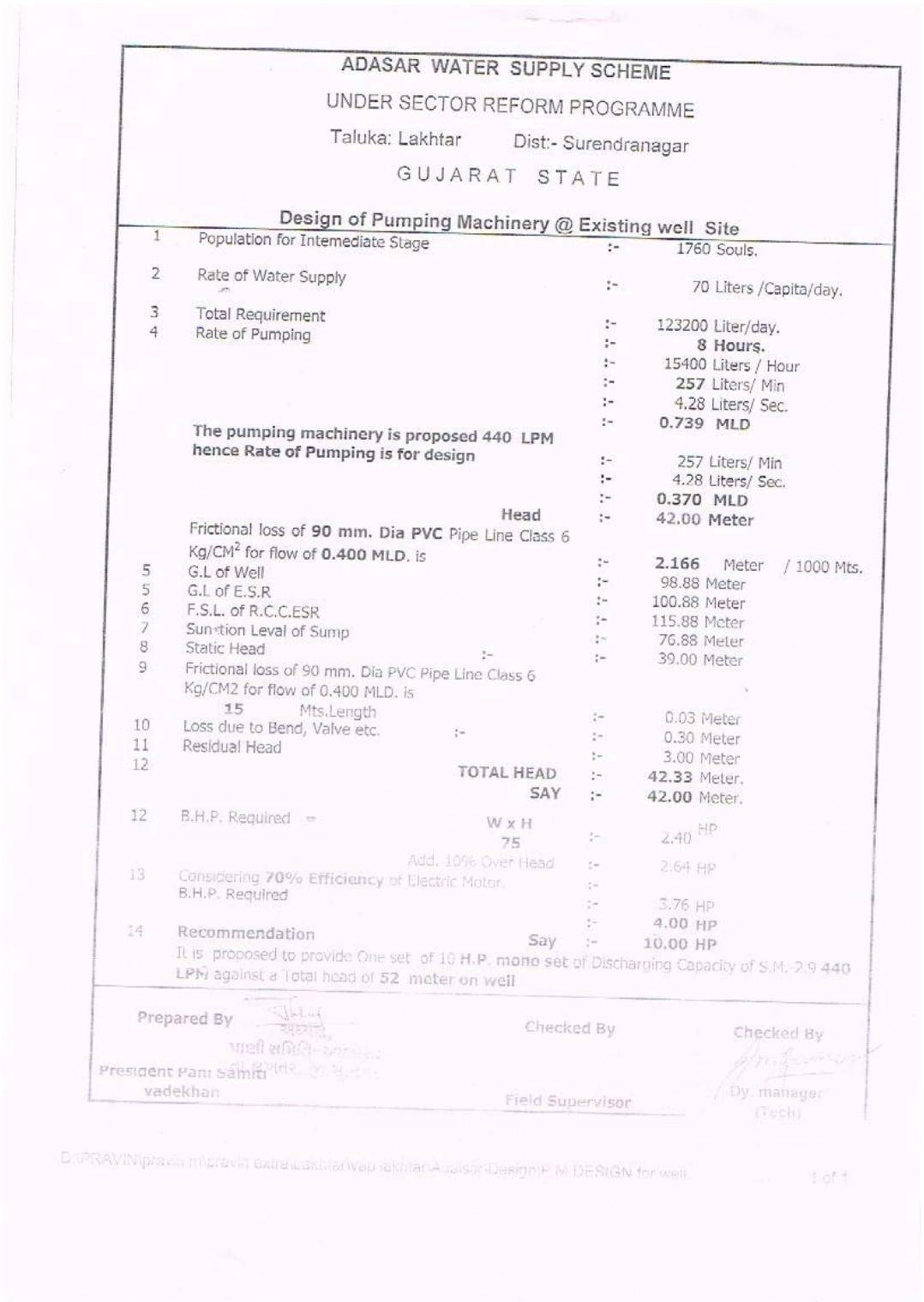
President

Taluka : Dasada

R M DESIGN- SUMP TOE S.R-Final/DESIGN-1

KJV-Page 1 of 1

Design of Rising Main in Adalsar Scheme



ADASAR WATER SUPPLY SCHEME

UNDER SECTOR REFORM PROGRAMME

Taluka: Lakhtar Dist:- Surendranagar

GUJARAT STATE

Design of Pumping Machinery @ Existing well Site

1	Population for Intemediate Stage	:-	1760 Souls.
2	Rate of Water Supply	:-	70 Liters /Capita/day.
3	Total Requirement	:-	123200 Liter/day.
4	Rate of Pumping	:-	**8 Hours.**
		:-	15400 Liters / Hour
		:-	**257** Liters/ Min
		:-	4.28 Liters/ Sec.
		:-	**0.739 MLD**
	The pumping machinery is proposed 440 LPM hence Rate of Pumping is for design	:-	257 Liters/ Min
		:-	4.28 Liters/ Sec.
		:-	**0.370 MLD**
	Head	:-	**42.00 Meter**
	Frictional loss of **90 mm. Dia PVC** Pipe Line Class 6 Kg/CM^2 for flow of **0.400 MLD.** is	:-	**2.166** Meter / 1000 Mts.
5	G.L of Well	:-	98.88 Meter
5	G.L of E.S.R	:-	100.88 Meter
6	F.S.L. of R.C.C.ESR	:-	115.88 Meter
7	Sunction Leval of Sump	:-	76.88 Meter
8	Static Head :-	:-	39.00 Meter
9	Frictional loss of 90 mm. Dia PVC Pipe Line Class 6 Kg/CM2 for flow of 0.400 MLD. is **15** Mts.Length	:-	0.03 Meter
10	Loss due to Bend, Valve etc. :-	:-	0.30 Meter
11	Residual Head	:-	3.00 Meter
12	**TOTAL HEAD**	:-	**42.33** Meter.
	SAY	:-	**42.00** Meter.
12	B.H.P. Required = $\frac{W \times H}{75}$	:-	2.40 HP
	Add. 10% Over Head	:-	2.64 HP
13	Considering **70% Efficiency** of Electric Motor. B.H.P. Required	:-	3.76 HP
		:-	**4.00 HP**
14	**Recommendation** **Say**	:-	**10.00 HP**

It is proposed to provide One set of 10 **H.P. mono set** of Discharging Capacity of S.M. 2.9 **440 LPM** against a Total head of **52 meter on well**

Prepared By

President Pani Samiti vadekhan

Checked By

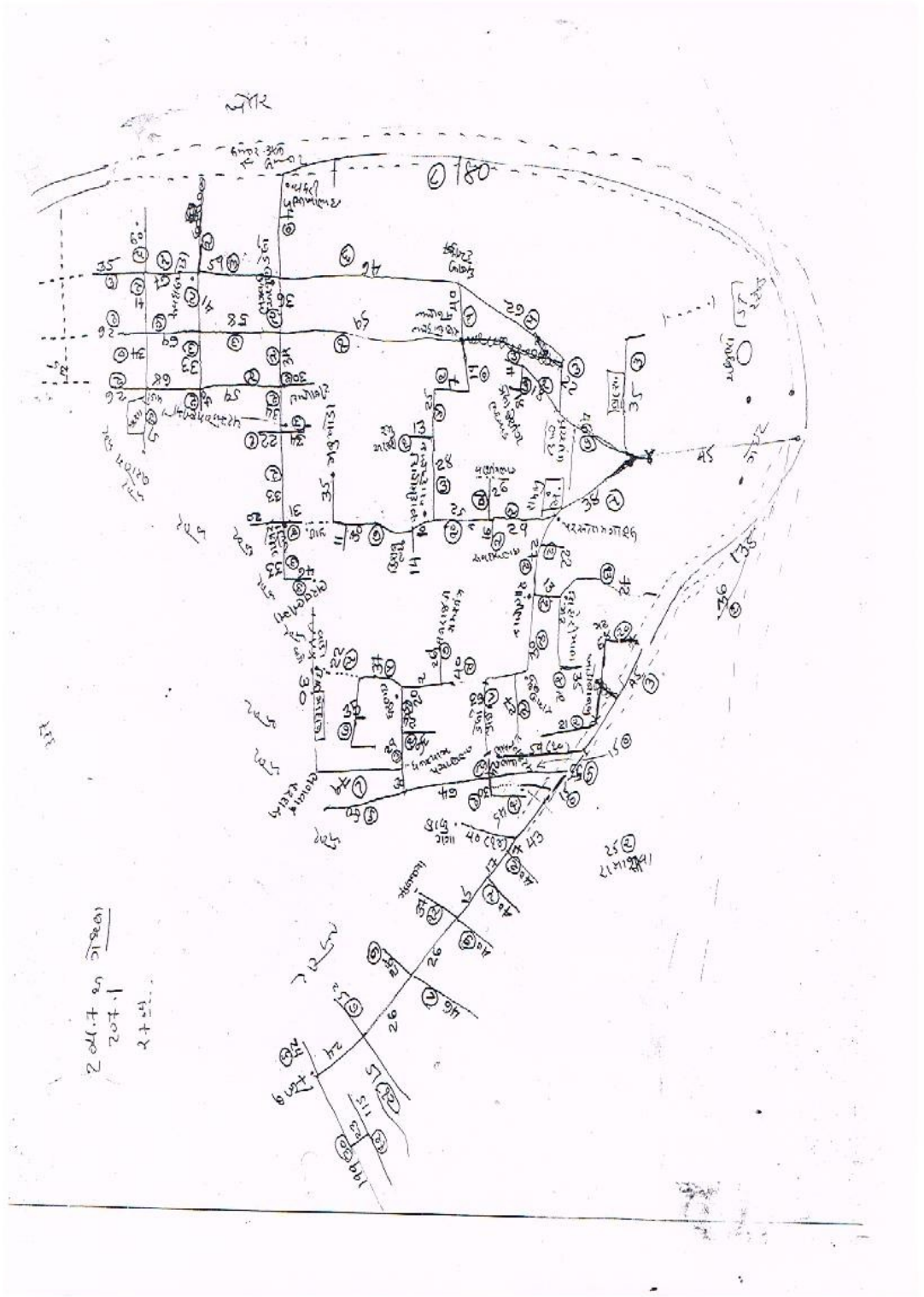
Field Supervisor

Checked By

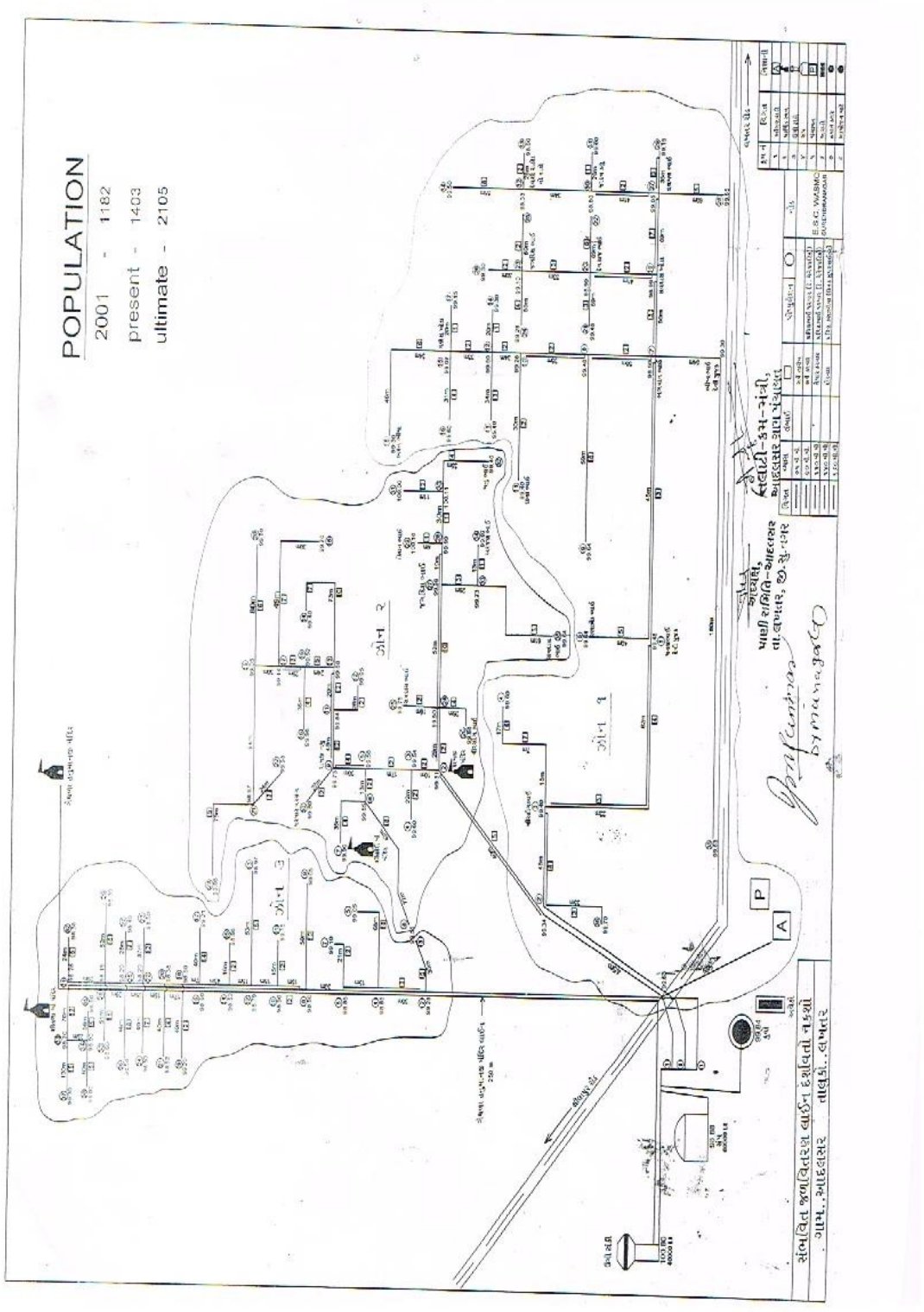
Dy. manager (Tech)

D:\PRAVIN\pravin infra\pravin extra\Lakhtar\wap lakhtar\Adalsar\Design\P M DESIGN for well... 1 of 1

Design of Pumping Machinery of Adalsar Scheme

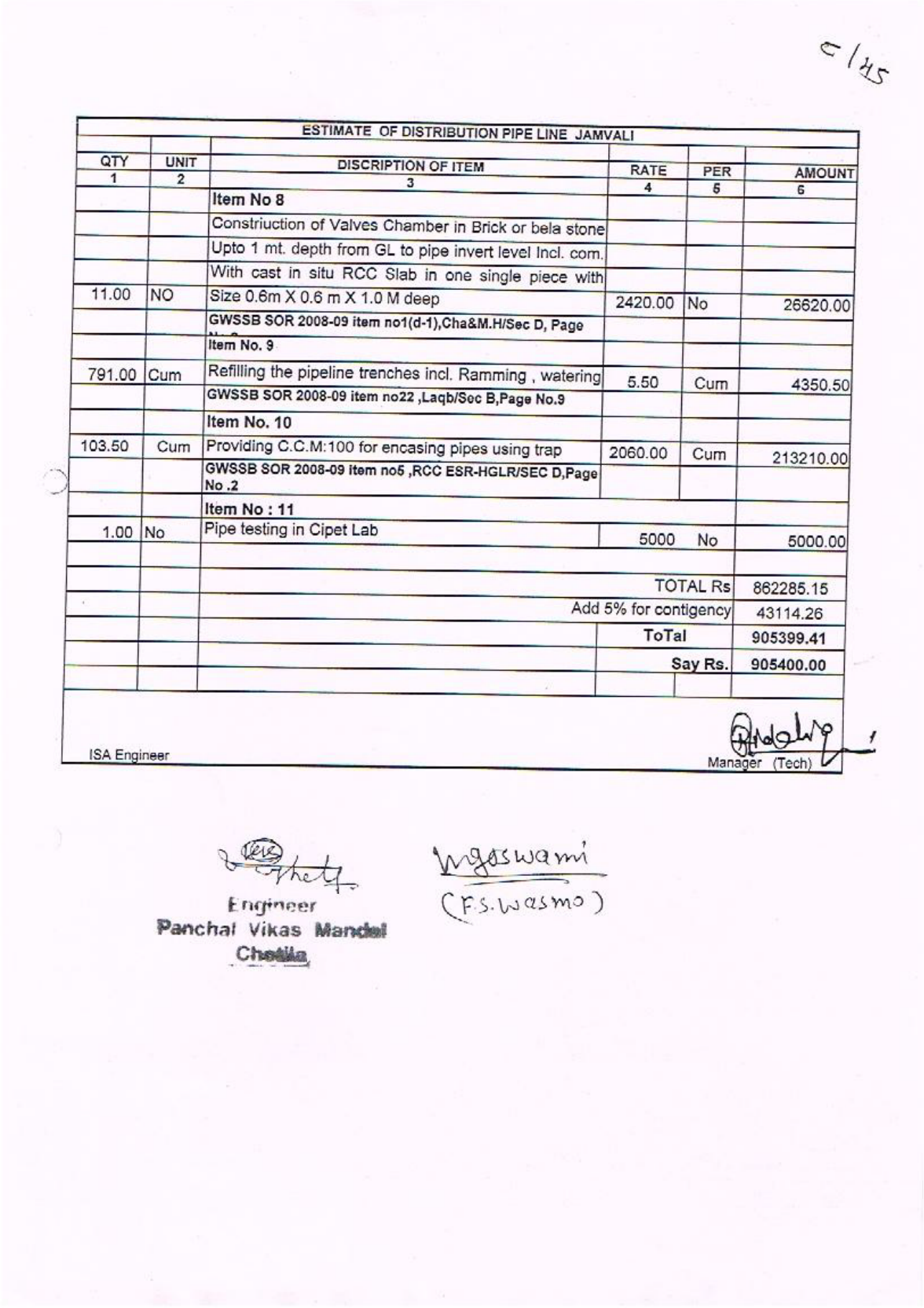


Rough drawing of layout of the village based on technical survey in Adalsar



Final Drawing of Adalsar Scheme

Estimate of Scheme



ESTIMATE OF DISTRIBUTION PIPE LINE JAMVALI					
QTY	UNIT	DISCRIPTION OF ITEM	RATE	PER	AMOUNT
1	2	3	4	5	6
		Item No 8			
		Constriuction of Valves Chamber in Brick or bela stone			
		Upto 1 mt. depth from GL to pipe invert level Incl. com.			
		With cast in situ RCC Slab in one single piece with			
11.00	NO	Size 0.6m X 0.6 m X 1.0 M deep	2420.00	No	26620.00
		GWSSB SOR 2008-09 item no1(d-1),Cha&M.H/Sec D, Page			
		Item No. 9			
791.00	Cum	Refillling the pipeline trenches incl. Ramming , watering	5.50	Cum	4350.50
		GWSSB SOR 2008-09 item no22 ,Laqb/Sec B,Page No.9			
		Item No. 10			
103.50	Cum	Providing C.C.M:100 for encasing pipes using trap	2060.00	Cum	213210.00
		GWSSB SOR 2008-09 item no5 ,RCC ESR-HGLR/SEC D,Page No .2			
		Item No : 11			
1.00	No	Pipe testing in Cipet Lab	5000	No	5000.00
				TOTAL Rs	862285.15
				Add 5% for contigency	43114.26
				ToTal	**905399.41**
				Say Rs.	**905400.00**

ISA Engineer

Manager (Tech)

Engineer
Panchal Vikas Mandal
Chotila

(F.S.Wasmo)