CHAPTER 1

INTRODUCTION

This chapter deals with an introduction to water sector, CTARA – Prayas study project objectives, methodology and summary of other chapters. The reference for this initial part is taken from Maharashtra government Jalswaraja Project website (www. mahawssd. gov. in).

1.1 Introduction to Water Sector :-

Water and sanitation have been recognized as the essential needs of human development and are also part of the Millennium Development Goals. Despite huge investments in the sector by governments and others, many still do not have access to these basic needs. The Government of Maharashtra (GOM) has so far invested considerable amount to address these needs and made substantial progress in enhancing the coverage and improving the quality of delivery. Despite these efforts, as of today there are many habitations that do not have access to desired quantity and quality of drinking water. A World bank funded project titled- **Jalswarajya** has also been launched in the year 2003, which is designed to strengthen the implementation of the reform approach all over the state.

The vision of the Government of Maharashtra is to: **"Empower** the rural communities in the state of Maharashtra, especially the poor and the vulnerable sections, to identify, plan and manage their water and sanitation resources and assets so as to facilitate better access to **'adequate/appropriate standards'** of service delivery in a **sustainable, equitable** and just manner".

Jalswarajya, the project is in support of the Government of Maharashtra's initiative to operationalise the statewide implementation of the Reform Agenda in Rural Water Supply and Sanitation Sector. The Project will support the GOM in building the capacity of institutions and communities throughout the state.

1.2 CTARA – Prayas study project objectives and methodology

Centre of technology alternatives for rural area (CTARA), Indian Institute of Technology, Bombay and PRAYAS, NGO based in Pune, Maharashtra state undertook a study project to review JAL SWARAJA .The objectives of this study program was to check the use of ground water for supplying water for domestic use from sustainability aspects and to verify the benefits proposed under Jalswaraja which are increase availability of safe drinking water, time saving in collecting water and to avail actual ground water scenario in Thane district .

The methodology adopted for this study project was to collect primary field data in villages / hamlets in which Jalswaraja is implemented in the month of May 2008.The reason to select May for data collection was to obtain the exact ground water situation and it was only possible in summer condition when the ground water has depleted to maximum possible level and when the service conditions are poor. This data was collected by invigilators who personally visited the villages in a batch of 2 / 3 and collected information at sources used by villagers and conducted household interviews in villages. Field data was collected in 31 Gram Panchayat of 12 Talukas, Thane district in which Jalswaraja is implemented as directed by Zilla Parishad, Thane .A total of 163 numbers of sources used by villagers were examined, which includes dug well measurement, hand pump, tank data measurement, Jalswaraja stand post and 105 household interviews were conducted to have information such as quantity of water consumed for drinking, cooking, bathing and washing and to have peoples reaction to Jalswaraja scheme. Also to study ground realities, we personally visited few Jalswaraja schemes to understand the technicalities and reasons behind the success / failure and to understand good practices for the scheme from sustainability point of view..

We then converted this primary data into secondary data by tabulating it source wise and taluka wise. To avail the ground water conditions in Thane district we approached Ground water survey and development agency, Thane to collect data pertaining to rainfall in the district taluka wise, ground water levels from 2004 onwards and increase / decrease in water table in comparison to last five years. We then tabulated observation well levels taluka wise for the month of May 2008 and last five years May month levels to observe increase / decrease in

ground water level in comparison to the average of last five years levels . We have also plotted observation well levels in the month of May particularly from year 2004 to 2008 taluka wise to observe the behaviour of ground water in each taluka and to assess the success / failure rate for each observation well.

Finally we brought out a sort of correlation with the secondary data of JSS and readings of observation well analysis and graphs plotted in the month of May along with the data of success rate for bore wells taluka wise.

1.3 Summary of other chapters

Chapter 2 mentions the status of water supply, objectives and sector status, its technical aspects, institutional and implementation arrangements, main features of JS, performance indicators and overall summary of JS. Chapter 3 is mainly about the study project which CTARA and Prayas under took and methodology in detail, Thane district review, GSDA and its data for ground water levels in Thane district and overall analysis of this data. Chapter 4 mentions our field observation related to design, implementation by personally visiting JSS and by conducting technical service provider and support organization interview. Chapter 5 is about conclusions and suggestions with future work, based on above chapters from sustainability, design, implementation and O&M aspects so as to aid in effective and efficient implementation of JSS along with fulfilling the proposed objective in a sustainable manner.

CHAPTER 2

JAL SWARAJA

This chapter deals with the status of water sector, its past and present situation, project objectives and sector status, technical aspects, institutional and implementation arrangements, sustainability and scaling-up strategies, key performance indicators, project benefits, main features of JS and overall summary. The reference for this chapter is taken from Jalswaraja project www. mahawssd. gov. in and www. worldbank.org

2.1 Status of water sector

Despite heavy investments, subsides and targeted interventions in the past pertaining to water sector, only about 20% of the rural families have access to safe drinking water.

The major reasons for this situation are:-

Non-involvement of communities in planning and management that resulted into lack of initiative for operation and maintenance of the scheme along with other reasons such as:-

- Reluctance in taking over of large scheme (multi villages) by local bodies.
- No focus on capacity building of communities to own and manage infrastructure.
- Less focus on source protection and augmentation.
- Focus on physical infrastructure building rather than delivering water in a sustainable manner.
- Hydro-geological and agro-ecological challenges on sustainability of water source.
- Delays in implementation of projects.
- Rising O&M expenses and poor recovery of water charges.
- Drying up of source and water quality problems are pushing habitations which were tackled during the earlier years into the list of problem habitations.
- Huge gap in the availability of financial resources for both new investments as well as maintenance and operation of existing facilities.

Based on the above lessons and the policy of Government of India (GOI) for the Sector Reforms Program (SRP), known as Swajaldhara, the GOM has taken a policy decision to implement key reforms in the sector, beginning in the year 2000. The major reform policies are related to: -

- Community ownership through appropriate participation and contribution at different stages,
- 100% Operations and Maintenance (O&M) responsibility to the community,
- Facilitation role to the State and the Zilla Parishads,
- Focus on water resource management for sustainability,
- Focus on collective community action for eliminating open defecation in a given habitation,
- Post-achievement incentives and rewards in place of subsidies.

2.2 Objectives and Sector Status:-

The development objectives of the proposed project are to:
(i) Increase rural households access to improved and sustainable drinking water supply and sanitation services; and
(ii) Institutionalize decentralization of Rural Water Supply and Sanitation (RWSS) service delivery to rural local governments and communities.

Maharashtra is located in the Western India and has a total population of about 96.7 million as per the 2001 census. Out of this 55.7 million (58%) population reside in rural areas and 41 million (42%) in urban areas. The State has 35 districts and 353 talukas. Two of the districts are urban. (Mumbai and Mumbai suburban) and the remaining 33 are rural. For administrative purpose the State is divided into six revenue divisions –Konkan, Pune, Nashik, Aurangabad, Nagpur and Amravati. The rural population resides in 40,785 villages and 45528 habitations.

The key characteristics of the State are summarized below:

Decadal % Growth rate of Population (1991-2001)	22.60%
Sex ratio	922
Population density	314 per sq.kms.
Literacy percentage	77.30%
Female literacy %	68%
Infant mortality rate	42 (2003)
Scheduled Tribe population	7.3 million (9.27%)

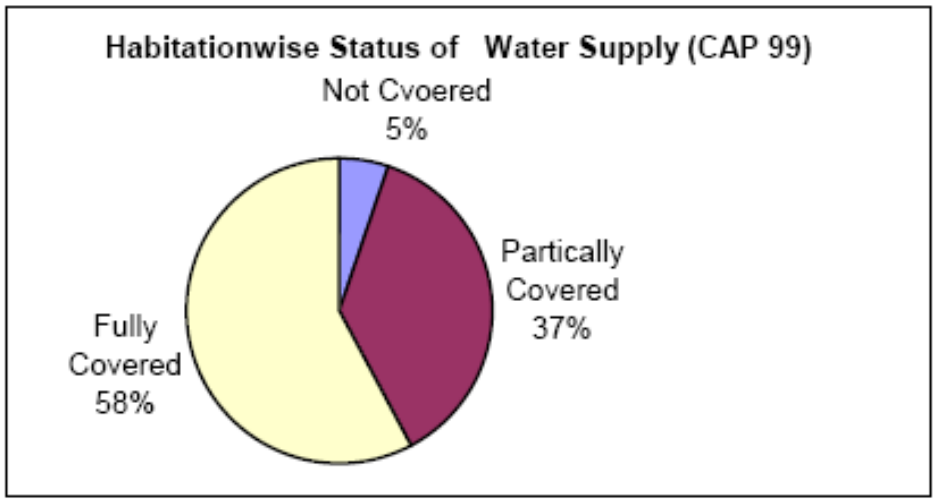
***(a) Physiography* :**

The state is divided into 3 physiographic regions. These are the Western Coastal Tract (the Konkan), the hill ranges of the Western Ghats, which run in a North-South direction parallel to the western coast and the Eastern area called the Deccan Plateau. Nearly 81.5% of the geographical area of the state is occupied by the geological formation of the Deccan plateau. Maharashtra faces a difficult water resources problem each year due to the geology, which provides very limited natural storage; the undulating steep topography, which encourages high runoff and spatially variable rainfall, with extremes of localized high monsoon precipitation and drought influencing rain shadow effects. All these factors dramatically impact on the sustainability of drinking water sources in summer and being natural cannot be influenced but only managed by careful assessment, planning and design.

(b) Water Resources:

Maharashtra receives an average rainfall of 1360 mm. to 650 mm, 85% of which will be mainly received from southwest monsoon during the period June to September. However, there is wide variation in the spatial distribution of rainfall across the state. The entire geographical area of Maharashtra is occupied by 5 major river basins namely Godavari, Krishna, Tapi, Narmada and west flowing rivers in Konkan coastal strip. About 75% area of Maharashtra is drained towards Eastern side, further joining with Bay of Bengal. The west flowing coastal rivers join the Arabian Sea. Ground water has been the primary source of water supply for domestic, agricultural and industrial uses in Maharashtra. It is the single largest and most readily available source of irrigation and more than 50% of the total area under irrigation depends on

ground water sources. Nearly 80% of rural water supplies are based on ground water. Ground water development as well as its judicious management is a major challenge faced by the State. The survey regarding status water supply of habitations has been indexed as per CAP 99 survey for GOI. As per the survey out of total 79267 habitations in the State 45768 (58%) are receiving 40 lpcd. These villages are termed as fully covered (FC), out of the remaining habitations 29237 (37%) are receiving below 40 lpcd water supply and are termed as partially covered (PC) and 4262 (5%) habitations are receiving below 10 lpcd and are termed as not covered (NC) villages. As per Habitation survey 2003, the total habitation have increased to 81271 and the distribution in each category is : FC : 36297 (45%) , PC : 42807 (52 %) and NC 2167 (3 %).



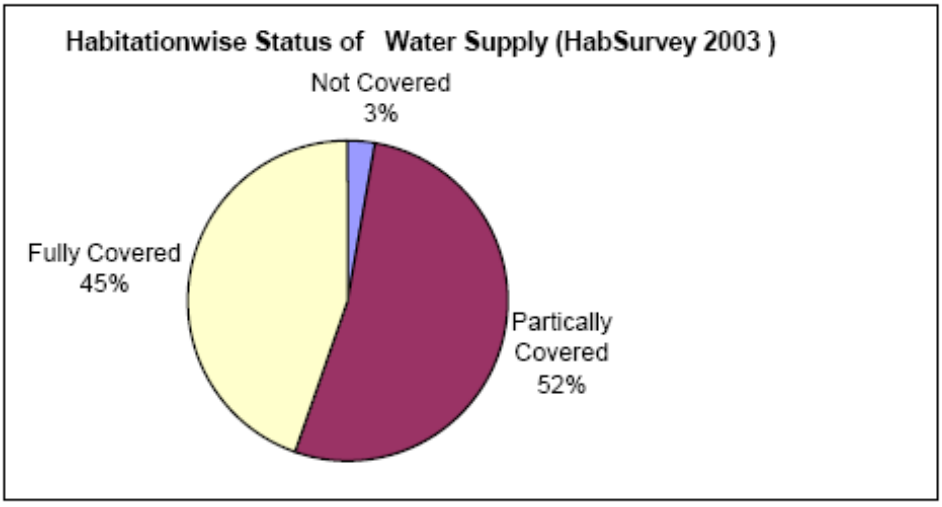


Fig 1. Habitation wise status of water supply for year 99 and 2003

The Government of India and Government of Maharashtra on 30th September 2003 had signed the project agreement for Maharashtra Rural Water Supply and Sanitation Project. The cost of the project is Rs. 1343.00 crores. Duration of the project is 2003-2009. The project will be covering 3258 GPs in 26 rural districts in Maharashtra including the 11 tribal districts. It is projected that 15 lakhs households of BPL and APL families will benefit from the project. The project processes are piloted in three districts (Satara, Osmanabad and Thane) in year 2003-04 and subsequently scaled in another 6 districts (Nasik, Nagpur, Chandrapur, Yavatmal, Buldana, and Sangli) in 2003. In 2004, phase II the project was scaled in 17 districts (Akola, Washim, Wardha, Gadchiroli, Gondia, Bhanadara, Nandurbar, Jalgaon, Jalna, Beed, Latur, Hingoli, Parbhani, Kolahpur, Solapur, Sindhudurg and Ratnagiri).

2.3 Technical aspects:

The project will support infrastructure building such as rural water supply schemes, ground water recharge measures including source strengthening, rain water harvesting measures, rehabilitation of existing schemes, community and environment, sanitation facilities such as group latrines, road side drains for disposal of sullage and storm water, compost/garbage pits for disposal of solid waste and conversion of unsafe sanitation technologies to safe sanitary latrines. Before construction of any new assets, the focus will be on rehabilitating the existing assets to the extent possible with conservation, reallocation and participatory demand management of water as the main strategies to reduce additional water demand and consequent need for additional infrastructure. Adequate focus will be given on sustainability of water resources by adopting various water recharge or conservation measures while planning the water supply schemes. The community will choose the desired technology and service as per their requirement. Most of the water supply schemes are expected to be single village schemes, with simple technologies, which the communities can handle themselves.

2.4 Institutional and implementation arrangements:

At the village level, the Gram Sabha (village general body) will be the decision making body and will approve Village Action Plans. VP constitutes the primary executing agency. VPs will

provide promotional and oversight role and Village Water and Sanitation Committees (VWSCs), or Pada Village Level Water and Sanitation Committees (PWSC) in case o f tribal settlements, will implement and manage the schemes. Together VPs and VWSCs would be responsible for:

(a) Planning, procurement, construction and O&M of rural water and sanitation schemes; and

(b) Conducting monitoring and evaluation studies, with technical support provided by district-level governments and Support Organizations (SOs). To ensure a wider base of leadership and ease of management, VWSC would delegate work to sub-committees for procurement, finance, supervision and social audit. In case of RWSS schemes involving more than one village, multi-village water and sanitation committees would be the executing agency. At the district level, the ZP through its restructured District Water Management and Sanitation Committee (DWMSC) will facilitate, appraise, monitor and supervise project implementation. Additional expertise will be brought in from SOs/ TSPs.

At the state level the Water Supply and Sanitation Department (WSSD) will be the counterpart agency, responsible for overall coordination, promotion, monitoring and oversight primarily as "guardian" to ensure that community participation, implementation and management of water and sanitation service spread smoothly and without undue interference from other government agencies and or unscrupulous contractors and non-governmental agencies

2.5 Sustainability and Scaling-up Strategies

The main focus of the project is on the sustainability of investments. An effort is made to create mechanisms to involve all sections of the communities in the selection of technical options which are affordable and environmentally and operationally sustainable. For this purpose, the source sustainability analysis would be made part of the participatory appraisal at the community level. The focus would be on developing low cost technical choices, with particular emphasis on recharge and conservation of ground and surface water rather than on construction of schemes. GOM would make a sustained effort to develop a large pool of service providers that would be accountable to and contracted by VPs and communities. To encourage the

partnership between service providers and communities, the project would promote:
(i) Developing a cadre of community level service providers - para professionals.
(ii) Building capacity of public service providers to deliver services in a demand driven manner.
(iii) Facilitating interaction between private sector service providers and communities to expose the former to various opportunities and develop partnerships.
(iv) Developing capacity of SOs that would move from village to village and provide catalytic inputs.
(v) Hiring capacity building organizations that would build capacity and mentor and coach district teams and SOs.

2.6 Key performance indicators

Key performance indicators to measure incremental achievements would be:
(a) Increase in the number (or %) of households having access to safe sources of water and improved sanitation services;
(b) Increase in the number (or %) of tribal households having access to safe sources of water and improved sanitation services;
(c) % decrease in incidences of water-related water-borne diseases;
(d) Improved perception of households on quality and access to safe water and clean sanitation services.
(e) Number of Village Panchayat (VPs) planning, implementing and managing sustainable RWSS services;
(f) Increase in proportion of state and district investment funds for water supply and sanitation transferred to VPs.

2.7 Project Benefits

The proposed project would be justified on the basis of direct benefits to about 7.5 million rural inhabitants, rising to about 10 million at the end of the project period (population is assumed to grow at 1.8 % per annum). The typical project benefits envisaged includes:

1. time savings in collecting water,
2. increased availability of safe water,
3. health benefits from access to cleaner water,
4. time savings from using household latrines,
5. improved sanitation knowledge,
6. better sanitation practices, environmental benefits and
7. strengthened community, panchayat and state institutions.

2.8 Main features of Jalswaraja:

1. Norms for supply – 40 LPCD.

2. Norms for selection of Village/ Habitation –
   a) No source within 1.6 Km in plain area and 100 m elevation in hilly area.
   a) Quality problems – Excess salinity, Iron, Fluoride, Arsenic or other toxic elements or biological contamination.

3. Priority –
   a) SC/ ST population to be given priority.
   b) Quality Problems.
   c) Up gradation from less than 40 LPCD to 40 LPCD.

4. Community Participation
   a) Public contribution of 10 % for no tribal and 5 % for tribal & 100% O&M.
   b) 50 % of the public contribution will be through shramdan.
   c) Exploring different alternative schemes.
   d) Community to be given all information about scheme through Gram Sabha.
   e) Ensure that Gram Sabha has followed the obligatory procedure before passing of resolution.
   f) Resolution in the specified format to be passed by VP/ZP.
   g) Information about the salient features of the scheme to be given to the beneficiaries after administrative approval.

h) VWSC to monitor the implementation of the scheme.

5. Involvement of Women

a) Women of different socio-economic strata & different habitations to be included in VWSC.

b) Certificate of Completion to be given by women's group/ Mahila Mandal.

2.9 Summary of project cycle:-

SUMMARY OF PROJECT CYCLE		
Phases	**Activities**	**Milestones**
Start Up / Dissemination of Information	▪ District officials' workshops ▪ Hire district Capacity Building Consortium, District Teams ▪ Sign MOU with ZP ▪ Train DAMT & DFT	▪ MoU with ZP signed ▪ District Teams appointed and trained
Pre-planning	▪ Multi- stakeholder workshops ▪ Accreditation, selection and training of SOs ▪ Enlist technical service providers and suppliers ▪ Conduct VP/block sensitization to seek expression of Interest ▪ VPs further disseminate project information through hamlet, group and women's meetings and Gram Sabha ▪ Self selection of VPs	▪ Adequate No of SOs empanelled ▪ Orientation Programs conducted in Districts ▪ VPs selected
Planning	▪ Sign MOU between VP and ZP ▪ GPs receive initial Capacity Building Fund ▪ Cross visits to learn about process ▪ First PRA ▪ Appointment of SOs/para professionals and training ▪ Topical PRAs to explore options ▪ Select VWSC and other Committees ▪ Train VWSC, VP and other Committees ▪ GS to select option ▪ Develop subproject proposal with SO assistance ▪ GS approves subproject proposal ▪ Submit proposal for DAMT appraisal ▪ DAMT clears the proposal ▪ 1st tranche released	▪ VWSCs, SACs and WDCs formed and trained ▪ Topical PRAs conducted ▪ VAPs approved by GS ▪ Capital contributions collected ▪ VAPs appraised and approved by DAMT ▪ First Tranch released
Implementation	▪ Sign contract with service suppliers ▪ Procure materials and labor ▪ Select village water person ▪ VP certifies completion of works and 2nd tranche released ▪ 3rd tranche released ▪ Completion of work	▪ Advance O&M of 6 months collected ▪ SAC conducts Works Completion Audit ▪ VP submits Works Completion Report ▪ WSS facility commissioned
Post-implementation	▪ Training of O&M team ▪ Sustainability audit ▪ Disseminate good practices and lessons learned	▪ Sustainability Audit conducted

Source: www.worldbank.org

CHAPTER NO. 3

CTARA – PRAYAS PROGRAM AND GSDA

This chapter is about the program which is jointly taken up by CTARA, IIT Bombay and PRAYAS, NGO to verify the sustainability of ground water for domestic use and to verify objectives and benefits proposed under JSS and to avail the ground realities associated with Jalswaraja in Thane district, its methodology, overall review of Thane district, GSDA, its functions and data availed from GSDA, Thane to bring out a sort of correlation with ground water data in each taluka of Thane district.

3.1 Program and Methodology:-

Centre of technology alternatives for rural area (CTARA), Indian institute of Technology, Bombay works for problems specific to rural India. One such study that CTARA , Bombay and PRAYAS- Resource and livelihood group , NGO a voluntary organization based in Pune, Maharashtra state took is to review the most appreciated and discussed project among stakeholders like never before known as JAL SWARAJA .

This World Bank funded project was launched in the year 2003, which is designed to strengthen the implementation of the reform approach all over the state. The development objectives of the proposed project are to:- increase rural households access to improved and sustainable drinking water supply and sanitation services; and institutionalize decentralization of Rural Water Supply and Sanitation (RWSS) service delivery to rural local governments and communities by an altogether different and innovative feature incorporated known as demand driven approach , decentralization of decision making authority , people participation in every aspect of project , transparency in working etc and many more which made common man feel good about this project JAL SWARAJA.

This work was done jointly by CTARA-Prayas by personally visiting each GP in which JS is implemented by a group of 2 / 3 invigilators. Detailed questionnaires (ref annex 1) were filled

up during field visits at the source used by villagers in that GP and secondly by conducting personal interviews in households to have people's reaction about JS and the quantity of water consumed by each household.

Field data was collected in 31 Gram Panchayat of 12 Talukas in Thane district jointly by CTARA and Prayas to review the Jal Swaraj project status in Thane district, Maharashtra state in May 2008 (1) .Gram Panchayat (2) selection criteria was in which JS is commissioned as suggested by Zilla parishad, Thane. Total 163 numbers of sources were examined for well data, hand pump, tank data sources and JS stand post (3) and a total of 105 household interviews (4) were conducted to have a correct scenario of ground conditions in the month of May 2008 and to have people's reaction on JSS and the quantity of water consumed by each household.

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(1) The reason behind selecting this period was to avail the correct situation when the service conditions are low because of depleting GW table and high evaporation loss which is only possible in summer conditions

(2) Sajai, Vaishakare, Nandgao Khutal in Murbad Taluka
Aaswe , Kapasi, Wangao in Dahanu Taluka ,
Manivali, Mamnoli, Chavre in Kalyan Taluka,
Vehelpada,Ambivili , KegvaBalapur,Dolhari in Vikramgad Taluka
Sapne , Pimplas in Wada Taluka,
Nyhale , Botoshi Pathardi , Sayde Jogalwadi , Gomghar vashind in Mokhada Taluka,
Khadkhad, Dabosha, Hateri, Jamsar and Kasatwadi in Javar Taluka,
Borivali Padgha , Khadki bu. in Bhiwandi Taluka,
Bohonoli in Ambarnath Taluka,
Zai borigaon in Talasari Taluka,
Bhadve in Palghar, Taluka

(3) The attributes for well data measurement, hand pump, tank measurements and JS stand post are listed in the annexure no. 1 (a).

(4) The attributes for household interviews were drinking, cooking, bathing, and washing water consumption, time taken to avail water and Jalswaraja status.

Note: - The selections of household for interviews do not have any correlation with that of source measurements data due to field constraints.

We converted this primary data collected into secondary data (ref annex 1 a). Further this data is divided source wise and taluka wise. Secondly to avail the ground water conditions in Thane district, we personally approached Ground water survey and development agency, Thane to collect data pertaining to ground water levels from 2004 onwards. This data obtained (ref annex 2 to 9) is to have an insight of ground water conditions taluka wise in Thane district. Further to obtain ground water level fluctuation in the month of May from 2004 to 2008, we plotted the readings of observation wells from 2004 to 2008 (Ref. annex 10) and compared with our secondary data, so as to have a sort of correlation with ground water based schemes success results and the results of success rate % for observation wells of GSDA and bore wells in Thane district.

Note:-1. Wells which are close to rivers, jack wells and those in the vicinity of streams are categorized under surface water based schemes.
2. Wells which are not surface water based and are not influenced by surface water are categorized under ground water based schemes which includes dug wells, bore well with hand pump and bore wells with pumps.

3.2 District review:-

Thane District forms a part of North Konkan region which lies between the Sahyadri hills in the East and the Arabian Sea in the West. Area of the district = 9558 sq. kms. Population = 524900, villages = 1697, watersheds = 34 with an average area of 280 sq. kms. It has coastal line of about 113 kms. It lies between 18°42' and 20°20' North latitudes and 72°45' to 73°48' East longitudes in eastern part of the state. Its East-West spread is maximum at the South which is about 100 kms. The North-south length is approximately 140 kms. District head quarter Thane is about 25 kms from the international airport and 35 Kms from the main down town of Mumbai City.

Boundary: -

The district has triangular shape. Pune and Ahemednagar districts lie on the East. Dadra and Nagar Haveli lie on the North, Arabian Sea forms the North West boundary; while Mumbai and Sub-Urban Mumbai Lie on the South.

Fig 2. Thane district map.

Topography:-
The district is divided into three parts on the basis of its topography.

- The central portion having Sahyadri ranges and their slope is mainly forest area.
- The central region covering mostly paddy fields and
- Western part along the West coast, where horticulture, cultivation of high quality fodder and vegetables are agricultural practices.

Hills:-

The Sahyadri ranges, having unbroken boundary run North South in the Eastern region of the district. There are also spurs running laterally to the main ranges. The heights of the mountains are maximum on the East and diminish gradually westwards. The mountain ranges also spread unevenly in the Central region of the district. Yeor hills or Mama Bhanja hills is a hill station in Thane district. This naturally beautiful and pollution free area attracts lot of people.

Rivers:-

The two main rivers, which join the sea on the West coast, are Vaitarna and Ulhas. The Vaitarn river rises in the hills near Trambak in the Nashik district and flowing Southwards takes a Westwards turn entering Thane district at Vihigaon in Shahapur taluka/ tahsil. It is further passes across northen boundry of Shahapur tahsil to enter Wada tahsil near Nishet village and then taking East-West course through the middle of Wada tahsil. It enters Palghar tahsil near village Vasuri and runs in North-West direction upto Manor, where-from it turns South-West and Southwards upto village Navghar forming Vaitarns creek at the south of Palghar tahsil. The important tributaries of Vaitarna are:-

- Pinjal, which rises in the mountains in the South of Mokhada tahsil, joins it at Aleman village in Wada tahsil.
- Daherja, which rises in the mountain in Jawhar tahsil, joins it at village Durvas in Palghar tahsil.
- Surya, which rises in the mountains in Mokhada tahsil and taking south West and southwards course joins it near Sakri village in Palghar tahsil.
- Tansa, which rises in the mountains in Shahapur tahsil and joins it near Chirman village in Vasai tahsil. The first three tributaries viz-Pinjal, Daherja and surya join the Vaitarna

from the right and Tansa joins it from the left. The Ulhas river rises in the Bhoir pass and flows North-West through Karjat tahsil of Raigad district from creek at Vasai. Its important tributaries in Thane district are

a) Bharvi which rises in the mountains in Murbad tahsil and joins it at Apti village in Ulhasnagar tahsil and

b) Bhatsa which rises in the mountains in Shahapur tahsil and joins it at Vadavali in Kalyan tahsil. Kalu is an important tributary of Bhatsa river. It is rised in the mountains in Shahapur tahsil and joins Bhatsa river near Sangoda in Kalyan tahsil. Both these tributaries viz. Barvi and Bhatsa join it from the right. The Vaitarna is navigable for 25 kms. inside the coast and Ulhas is navigable for 40 kms from Kalyan.

Soils: - –

The soils of thane district can be conveniently divides into three categories.
1) Block Soil containing sand.

2) Red soil in the Eastern region mostly on the slopes and

3) Brownish-black soil in the patches of the valleys mostly lying between the coastal plains and the hilly slopes of Sahayadri.

The first type of soil, which is found in Dahanu, Palghar, Vasai and Thane tahsil, is fertile and useful for horticulture, Paddy cultivation and vegetables. Whereas, the second type which is found in Mokhada, Talasari and some parts of other tahsils on the Eastern slopes is useful for growing millets like Nagli and Vari. The third type of soil found in Bhiwandi, Kalyan and Shahapur tahsils is useful, particularly for Paddy cultivation.

Climate: - -

The climate of the district is distinctly different on the coastal plains and on the eastern slopes. Being fully tropical, the coastal strip including Thane, Vasai, Palghar and Dahanu tahsils is very humid and warm. On the other hand, the climate on the eastern slopes and in the plains at the foot of the slopes is comparatively less humid. However, variation in temperature in the

eastern region is more than that on the coastal strip. The maximum temperature lies between 28.0 to 35.2 centigrade and the minimum temperature lies between 16.3 to 26.5 centigrade.

Rainfall: - - -

The district gets assured rainfall of 2000 to 4000 mm. from the South-West monsoons during the months June to September. Generally highest rainfall is recorded in the month of July. It is considerably more inland than on the coast. It is also less towards the North than towards the South.

Geographical Area:

The total geographical area of the district is 9558 sq. kms. which is 3.11% of the total Maharashtra area. The district has 15 tahsils out of which Shahapur tahsil is the largest area of 1555 sq. kms and Talasari tahsil is the smallest area of 268 sq. kms.

3.3 GSDA and its functions:-

Ground water survey and development agency is engaged since last 33 years 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 and protecting the existing groundwater resources through technical assistance under Groundwater Act.

Functions:-

1. Develop and disseminate technologies, monitor and implement national and state policies for the scientific and sustainable development and management of groundwater resources.

2. Conduct village wise systematic hydro geological investigation under various institutionally financed and housing schemes.

3. To collect, evaluate, interpret, process and disseminate data on water level and water quality.

4. To carry out periodic ground water assessment in order to regulate the ground water use and guide ground water developmental activities on scientific lines.

5. To ensure sustainability of ground water resources, on a long-term basis.

6. To act as a custodian, for the implementation of ground water legislation, within the state.

3.4 VARIATION IN RAINFALL TALUKAWISE IN THANE DISTRICT (Table 1):-

Sr. No.	District	Talk	Avg. Rain - fall from June to Sept. in mm.	June 08 to Sept 08 rain fall in mm	Increase or decrease in rainfall compared to avg.	% increase or decrease in rainfall
1	2	3	4	5	6	7
1	Thane	Thane	2446	2710	264	10.79
2		Vasai	1991	3701	1710	85.89
3		Palghar	1780	2832	1052	59.1
4		Dahanu	1834	2332	498	27.15
5		Talasari	2171	2564	393	18.1
6		Jawhar	2637	2961	324	12.29
7		Vikramgad	2637	2937	300	11.38
8		Mokhada	2455	2757	302	12.3
9		Wada	2512	2918	403	16.02
10		Bhiwandi	2559	2982	423	16.53
11		Shahapur	2663	2600	-63	-2.37
12		Murbad	2736	2628	-98	-3.58
13		Kalyan	2555	2848	293	11.47
14		Ulhasnagar	2465	2796	331	13.43
15		Ambernath	2465	1437	-1028	-41.7
		Total	2393.33	2733.53	+353.33	**+14.76**

Source – GSDA, Thane

From the above rainfall measurement sheet it is clear that there is an increase in rainfall of approximate 15 % in 2008 as compared to that of last five years readings.

Isohyets curve for rainfall as shown in annexure 2.

Rainfall variation in percentage (increase / decrease) map as shown in annexure 3.

3.5 GROUND WATER LEVEL CHART OF OBSERVATION WELLS IN THANE DISTRICT (for the month of September) (Table 2)**:-**

Sr. No.	District	Taluka	No. of O.B.	Avg. Sept. 08 Gr. water level (m)	Last 5 yrs. decrease / increase in GW for O.B.		Gr. water level decrease / increase	
1	2	3	4	5	6	7	(-)8	(+)9
1	Thane	Thane	6	0.88	0	6		0.27
2		Vasai	7	0.71	2	5		0.1
3		Palghar	15	1.22	6	9		0.08
4		Dahanu	5	2.56	1	4		0.3
5		Talasari	7	2.61	5	2		0.02
6		Jawhar	2	0.83	1	1		0.02
7		Vikramgad	2	0.85	0	2		0.05
8		Mokhada	6	1.08	3	3	0.02	0
9		Wada	10	1.05	3	7		0.09
10		Bhiwandi	8	0.79	1	7		0.1
11		Shahapur	7	0.53	6	1	0.03	0
12		Murbad	7	1.3	2	5		0.06
13		Kalyan	3	0.63	1	2		0.22
14		Ulhasnagar	0	0	0	0		0
15		Ambernath	7	0.85	5	2		0.2
		Total	92		36	56		

Source – GSDA, Thane

Map showing location of O.B. well in Thane district in Annexure 4.

Observation wells are those wells which are dug up by GSDA in each watershed to have levels of ground water in each watershed. Approximately 2 / 3 wells are dug up in each watershed, so as to avail the correct ground water level (readings) in each watershed, and then this O.B.wells are divided taluka wise. GSDA ensures that these O.B. wells are protected from drawing excess water by nearby hamlet and the location of O.B. wells is not influenced by any surface water.

Total no of O.B. wells are 92 , out of which 36 O.B. wells has shown fall in G.W. level, whereas 56 O.B. wells has resulted in increase in G.W. for the month of September 08 as compared to the average of last 5 years September month readings.

Map showing increase / decrease in ground level in September 08 in comparison to last 5 yrs September month is shown in annexure 5.

3.6 GROUND WATER LEVEL CHART OF OBSERVATION WELLS IN THANE DISTRICT (for the month of May) (Table 3)**:-**

Sr. No.	District	Taluka	No. of O.B.	Avg. May 08 Gr. water level (m)	. Decrease/increase in GW of O.B. as compared to last 5 yrs. readings		Gr.water level decrease / increase	
1	2	3	4	5	6	7	(-)8	(+)9
1	Thane	Thane	6	2.46	5	1	0.19	0
2		Vasai	7	5.11	6	1	0	0
3		Palghar	15	6.51	13	2	O.22	0
4		Dahanu	5	6.93	1	4	0	0
5		Talasary	7	7.41	5	2	0.32	0
6		Jawhar	2	7.07	1	1	1.09	0
7		Vikramgad	2	4.9	0	2	0	0.13
8		Mokhada	6	5.6	4	2	0.11	0
9		Wada	10	6.03	3	7	0.82	0
10		Bhiwandi	8	5.32	7	1	0.51	0
11		Shahapur	7	4.55	2	5	0	0.03
12		Murbad	7	6.41	4	3	0	0.14
13		Kalyan	3	3.5	2	1	0	0.01
14		Ulhasnagar	0	0	0	0	0	0
15		Ambernath	7	4.95	6	1	0.48	0
		Total	92		59	33		

Tabulated from 92 O.B.reading hand book GSDA, Thane.

Total number of O.B. wells are 92 , out of which 59 O.B. wells has shown fall in G.W. level , whereas 33 O.B. wells has resulted in increase in G.W. level for the month of May 08 when compared with that of last five years average May month level readings.

3.7 AVERAGE GROUND WATER LEVEL IN THANE DISTRICT IN 2008 (Table 4)**:-**

Sr. No.	District	Taluka	No. of O.B. wells	Avg. Gr. water level increase / decrease before and after monsoon (m) in 2008.
1	2	3	4	5
1	Thane	Thane	6	0.04
2		Vasai	7	(-) 0.06
3		Palghar	15	(-) 0.14
4		Dahanu	5	0.15
5		Talasari	7	(-) 0.15
6		Jawhar	2	(-) 0.53
7		Vikramgad	2	0.09
8		Mokhada	6	(-) 0.16
9		Wada	10	(-) 0.36
10		Bhiwandi	8	(-) 0.2
11		Shahapur	7	0
12		Murbad	7	0.1
13		Kalyan	3	(-) 0.11
14		Ulhasnagar	0	0
15		Ambernath	7	(-) 0.14
		Total	92	

Tabulated from 92 O.B.reading hand book, GSDA, Thane.

Above table indicates increase / decrease in the average GW level in year 2008 as compared to that of last five years average G.W.level readings. In 9 out of 15 talukas, G.W. level found to

be dropping in comparison to last 5 years readings. G.W. level in Shahapur taluka found to be almost constant in year 2008.

3.8 BOREWELL SUCCESS RATE TALUKAWISE IN THANE DISTRICT:-

(Table 5)

Sr. no.	Taluka	Success rate of Borewells
1	Jawhar, Mokhada	20 - 30 %
2	Wada, Shahapur,Bhiwandi, Murbad, Ambernath, Vikramgad, Kalyan, Ulhasnagar	50 - 70 %
3	Talasari, Dahanu Palghar,Vasai, Thane	70 - 100 %

Source – GSDA, Thane

From above chart it is clear that the success rate is more to the West of Thane district as compared to that of East. The success rate further reduces as we move to North West of Thane district where the average altitude is more.

Map showing altitude of Thane district in Annexure 6.

Map showing geology of Thane district in Annexure 7.

Map showing bar chart of bore wells number, successful bore well and hand pump number taluka wise in Thane district in Annexure 8.

3.9 GROUNG WATER MEASUREMENT (RECHARGE, EXTRACTION AND BALANCE) (Table 6)**:-**

Sr. No.	District	Taluka	Effective recharge in Ha. M.	Extraction in Ha.M .	Ground water storage Ha.M.	New wells which can be dug
1	2	3	4	5	4	5
1	Thane	Thane	1107.05	165.12	941.93	628
2		Vasai	2016.35	1021.05	995.3	663
3		Palghar	11746.39	1823.27	9923.12	6615
4		Dahanu	2542.66	1360.26	1182.4	788
5		Talasari	819.26	305.39	513.87	342
6		Jawhar	1142.6	113.16	1029.44	686
7		Vikramgad	2437.48	301.16	2136.32	1424
8		Mokhada	570.44	92.81	477.63	318
90		Wada	2314.13	241.4	2072.73	1382
10		Bhiwandi	2864.14	986.53	1877.61	1252
11		Shahapur	5669.84	382.68	5287.16	3525
12		Murbad	1583.27	256.91	1326.36	884
13		Kalyan	22.17	14.54	7.63	5
14		Ulhasnagar	317.95	95.27	222.68	148
15		Ambernath	717.4	205.3	512.1	341
		TOTAL	35871.13	7364.85	28506.28	19004

Source – GSDA, Thane

Effective recharge is calculated by GSDA watershed wise considering annual rainfall in the watershed, geological condition, physiology, land cover, infiltration rate, net runoff from watershed, evaporation, percolation , canal seepage if any, additional recharge from water conservation measures etc. Extraction is calculated considering before and after monsoon water levels in the O.B. wells in the watershed, domestic / irrigation wells reading in the watershed

and specific yield from each aquifer by aquifers performance test (APT). Finally this data is divided taluka wise by splitting up watershed area in each taluka so as to obtain above results. This analysis is done once in five years by GSDA.

Map showing taluka wise recharge, extraction, balance and number of new wells which can be dug in Thane district in Annexure 9.

From above chart it is observed that the extraction is only 20.5 % of recharge, but still effective tapping of 79.5 % of water is not possible due to geology and physiographic conditions.
Note- A well is considered to have an effective yield of 1.5 ha.m. per year .

3.10 Overall analysis of the data:-

1. Gram panchayat selected for overall analysis = 31 nos.(including JS and non JS GPs), out of them 68 % were tribal as per primary data.
2. Gram panchayats data of 14 nos. is actually available for analysis in which Jalswaraja project is implemented. Nine from source measurement and 5 from house hold interviews.
   Note: - the reason behind availability of only 14 GP among 31 for analysis of JS is because the invigilator have not collected information from all the village/ padas of GP in which JS was actually implemented .
3. Total sources in villages in which Jalswaraja implemented found to be 46 nos.

Total sources					
46					
Surface water based			**Ground water based**		
13			33		
water availability					
No water	Insufficient	Sufficient	No water	Insufficient	Sufficient
0	1	12	8	5	20
Success rate			Success rate		
92.31%			60.61%		

4. Eight sources out of 33 were dry under JSS which are ground water based, no source was found to be dry for surface water based JSS.
5. Five out of 33 ground water based sources and only 1 out of 13 surface water based source under JSS ,water availability found to be insufficient (presumably less than the requirement of even a household of 5/6 persons)
6. Twelve out of total 13 surface water schemes have sufficient water availability. Twenty sources out of total 33 have sufficient water availability in case of ground water based schemes , which means that the success rate of JSS works out to be 92.31 % in case of surface water schemes and 60.61 % in case of ground water schemes for JS.
7. In 38 sources the hamlet/village was found to be tribal out of 46 sources in which JS is implemented. It means 82.62 % tribal hamlets are served by JSS as per secondary data. (Thus it is found that priority is given to tribal community for availing water for domestic use as per objectives of JSS)

<table>
<tr><td colspan="8">Total sources</td></tr>
<tr><td colspan="8">46</td></tr>
<tr><td colspan="4">Tribal</td><td colspan="4">Non-Tribal</td></tr>
<tr><td colspan="4">38</td><td colspan="4">8</td></tr>
<tr><td colspan="2">surface water based</td><td colspan="2">ground water based</td><td colspan="2">surface water based</td><td colspan="2">ground water based</td></tr>
<tr><td colspan="2">8</td><td colspan="2">30</td><td colspan="2">5</td><td colspan="2">3</td></tr>
<tr><td colspan="8">water availability</td></tr>
<tr><td>sufficient</td><td>insufficient</td><td>sufficient</td><td>insufficient</td><td>sufficient</td><td>insufficient</td><td>sufficient</td><td>insufficient</td></tr>
<tr><td>8</td><td>0</td><td>18</td><td>12</td><td>4</td><td>1</td><td>2</td><td>1</td></tr>
<tr><td colspan="8">success rate in % for GW/SW</td></tr>
<tr><td colspan="2">100</td><td colspan="2">60</td><td colspan="2">80</td><td colspan="2">66.67</td></tr>
<tr><td colspan="8">overall success rate</td></tr>
<tr><td colspan="4">68.42%</td><td colspan="4">75.00%</td></tr>
</table>

8. From above chart it is clear that overall success rate is more in non tribal villages as compared to that of tribal villages. Also when it comes to avail GW as a source it further drops down to 60 %.

9. Water consumption from source measurement analysis and considering all gram panchayat padas / villages works out to be 28 lpcd.(considering JS and non JS sources from primary data)
10. Water consumption from source measurement analysis and considering gram panchayat padas / villages were Jalswaraja scheme is not implemented works out to be 25.5 lpcd.
11. Water consumption from source measurement analysis and considering gram panchayat padas / villages were Jalswaraja schemes is implemented works out to be 30 lpcd.
12. Water consumption from household interviews analysis (from primary data) and considering all gram panchayat padas / villages works out to be 41 lpcd. (considering JS and non JS sources from primary data)
13. Water consumption from house hold interviews analysis and considering gram panchayat padas / villages were Jalswaraja schemes are not implemented works out to be 40 lpcd.
14. Water consumption from household interviews analysis and considering gram panchayat padas / villages were Jalswaraja schemes is implemented works out to be 44 lpcd.

Water availability in villages having J.S.S, no J.S.S is as tabulated below.

Parameters	Lpcd of all villages	Lpcd (Jalswaraja not implemented)	Lpcd (Jalswaraja implemented)
Source measurement data	28 lpcd.	25.5 lpcd.	30 lpcd.
Household interviews data	41 lpcd.	40 lpcd.	44 lpcd
Average	34.5 lpcd	32.75 lpcd	37 lpcd

15. Time taken per household to fetch water for domestic use is as tabulated below.

Parameters	Time taken per day considering all Gram panchayat	Time taken per day in GP (JS not implemented)	Time taken per day in GP (JS implemented)
Households	156.8 min.	161.58 min.	145.06 min.
Per person in a village	25.93 min.	25.96 min.	25.84 min.

Saving in time per household (as per primary data) works out to be merely 16.52 min per day, which means approximately 17 min per household of drudgery in collecting water is saved after implementation of JSS.

16. Water consumption found to be decreasing per capita or per household as the distance of the source for availing water for domestic use increases from village/ hamlet.

Analysis of the data Taluka wise:-

Sr. no.	Taluka	GW based in JSS			Surface water based in JSS			% success for O.B. wells	% success for bore wells
1	Mokhada	6			0			67	25
		dry	insufficient	sufficient	dry	insuff.	sufficient		
		3	0	3	0	0	0		
2	Javahar	16			2			50	25
		3	2	11	0	0	2		
3	Dahanu	1			7			60	85
		0	0	1	0	1	6		
4	Vikramgad	2			0			100	60
		0	2	0	0	0	0		
5	Wada	1			2			38	60
		0	0	1	0	0	2		
6	Murbad	2			2			75	60
		1	0	1	0	0	2		
7	Talasari	3			0			71	85
		0	1	2	0	0	0		
8	Ambernath	1			0			100	60
		0	0	1	0	0	0		
9	Kalyan	1			0			100	60
		0	0	1	0	0	0		

1. In Mokhada Taluka the success rate for water availability throughout the year for dug well under JSS is not satisfactory. Three wells go dry before May out of 6 ground water based wells under Jalswaraja, (Ref. tabulated well data details in annexure 1 (a) and the analysis above). Observations wells results in Mokhada reflects almost similar trend, 2 out of 6 have gone dry from 2006 onwards (Ref. graph plotted for O.B. wells in annex. 10 for Mokhada taluka) also the curve of O.B. wells from 2004 onwards up to 2008 have an upward inclination , which reflects that the ground water situation in this taluka is declining. Results for Observations wells and bore wells in this Taluka are with **67 %** and **25 %** success rate respectively.

2. In Javahar Taluka inspite of having very similar conditions as that of Mokhada Taluka the success rate of water availability throughout the year for dug well is satisfactory. Three out of 16 wells which are ground water based go dry in the month of May / before May, two ground water sources under Jalsawaraja water availability found to be insufficient in month of May or before May. Results for Observations wells and bore wells in Javahar Taluka are with **50 %** and **25 %** success rate respectively. Graphs plotted for O.B. wells from 2004 have an upward inclination which reflects the ground water situation in this taluka is declining at a faster rate (Ref. Annexure 10 of Javahar Taluka).Two out of 2 surface water based wells in Javahar taluka have good water availability. Success rate in Javahar for surface water schemes under JS seems to be good.

3. In Dahanu Taluka the water availability is good enough because the source for the wells on which Jalswaraja scheme executed is surface water based. Six out of 7 surface water based wells under JSS have shown sufficient water availability. Success rate in this Taluka for surface water based schemes is good. Most of the wells are used for piped water schemes as the yield for the wells is sufficient. But the actual ground water scenario is not satisfactory (Ref. Annexure 10 of Dahanu Taluka). Results for Observations wells and bore wells in Dahanu Taluka are with **60 %** and **85 %** success rate respectively. Graphs plotted for O.B. wells from 2004 to 2008 have an upward inclination which reflects the ground water situation in this taluka is declining (Ref Annexure 10 of Dahanu Taluka).

4. In Vikramgad Taluka 2 wells out of 2 which are ground water based, water availability is found to be insufficient. Observations wells results in Vikramgad Taluka reflects almost similar trend, 2 out of 2 has a upward inclination (Ref. Annexure 10 of Vikramgad Taluka) which reflects the ground water situation in this taluka is declining but at a steady rate. . Results for Observations wells and bore wells in this Taluka are with **100 %** and **60 %** success rate respectively.

5. In Wada taluka 2 out of 2 well dug up under JS are surface water based and have sufficient water availability. Success rate of water availability throughout the year for this Taluka considering surface water based scheme is **100 %**. But the actual ground water scenario is not

satisfactory as indicated in the graph (Ref. Annexure 10 of Wada Taluka). Four out of 8 O.B. wells have started going dry from 2006 onwards. Also the graphs plotted of O.B. wells from 2004 have a steep upward inclination which reflects the ground water situation in this taluka is declining at a faster rate. Results for Observations wells and bore wells in Wada Taluka are with **38 % and 60 %** success rate respectively.

6. Similarly for Murbad Taluka, 2 out of 2 well which are surface water based have good water availability. Water availability considering surface water throughout the year for this Taluka is with **100 %** success rate. One out of 2 ground water based wells go dry. This indicates that ground water scenario is not satisfactory also indicated in graph plotted for O.B. wells (Ref. Annexure 10 of Murbad Taluka). Results for Observations wells and bore wells in this Taluka are with **75 % and 60 %** success rate respectively.

7. In Talasari taluka were 2 out of 3 ground water based scheme water availability found to be good. Success rate of water availability throughout the year through bore wells for these hamlets is satisfactory .Also reflected from the graph plotted for O.B. wells (Ref. Annexure 10 for Talasari taluka) the situation is satisfactory, the ground water depletion is at a very steady rate (less than 0.5 meters from 2004 onwards up to 2008) as compared to other talukas mentioned above. Results for bore wells in this Taluka are with **85 %** success rate as per GSDA data mentioned above.

8. For Ambernath and Kalyan taluka, one out of 1 well is ground water based and have sufficient water availability .But the actual ground water scenario is not satisfactory as indicated in the graph (Ref. Annexure 10 of Ambernath and Kalyan taluka) plotted for O.B. wells from 2004 onwards, graphs have an upward inclination which reflects that the ground water situation in this taluka is declining but at a steady rate. Results for Observations wells and bore wells in this Talukas are with **100 %** and **60 %** success rate respectively.

CHAPTER 4

FIELD OBSERVATIONS

This chapter deals with field observations which we obtained by personally visiting JS schemes, checking JSS documents and conducting interviews with TSP and SO.

4.1 Field observations:-

Design related: -

1. Forecasting measures which are adopted based on past censes/ records are less accurate. Actual population in most of the cases is more than what is reflected while preparing estimates.

2. Estimates prepared for availing water supply schemes by TSP (Technical Service Provider) are as per MJP / PWD current schedule of rates which is followed for 12 months from the date of issue. Current schedule of rates do not consider the price fluctuation/ hike for that complete year.

3. Locations of well, bore well, elevated service reservoir (ESR) and piping arrangements is influenced by political pressure, elites, influential villagers, interest groups etc. Hence the best solution for availing the source and water supply arrangement is not explored.

4. Ground water Survey and development agency (GSDA) or Geologist from this department are deputed under Zilla Parishad to assess the availability of ground water, preferred location for well/ bore well and its dimensions. Many times it is observed that location suggested by Geologist are not tapped due to reasons stated in Sr. no. 3 above ,hence a source which has been given least preference by Geologist among others source is selected by the villagers, also the dimensions worked out according to the population structure are not fulfilled.

Implementation related -

1. Jalswarajya guidelines indicate 10% of people contribution in case of non tribal village and 5% in case of tribal village. This contribution is essential to bring out a sense of belonging and ownership towards there own water supply scheme, so as to maintain the facilities properly. It was found that people are not so proactive to pay the small initial amount from their pockets as they still believe that making water supply provision is a part of government institution and they should do it for us.

2. Due to above contractors make the initial contribution on their behalf due to their vested interest .This procedure brings the feeling among the people that the scheme is implemented by contractors / TSP for gaining profit. Illusions make people less belonging towards their scheme. Water is still considered to be a social right and to be provided by government.

3. 40 lpcd ceiling on water under Jalswarajya scheme is unaware by majoring of people and still tend to practice wasteful methods of using water. They think government schemes sustain for a limited time period hence make fullest use of the water made available now.

4. Capacity building and IEC in a given time cannot completely make any PRI capable enough to handle all techno-managerial issues hence there is a lack in technical capability, effective monitoring and overall management (estimate procedure, procurement, construction, accounts and audit).

5. Material procured and used for water supply schemes are not of the best quality and standards, also workmanship during construction is not satisfactory.

6. Faculty water distribution practices in case of piped water schemes results in considerable pressure drop for the habitants located at farthest distance from the source, hence the feeling of dissatisfaction among them increases and they are reluctant to contribute for O&M.

7. The idea of bearing 100% cost towards O&M by villagers is not borne by many villages.

8. People tend to avail / extract more water during initial stage of implementation (more than 40 lpcd norm) due to lesser number of connections on the scheme (in case of piped water supply). As the number of connections increase, the water availability reduces thereby creating water restrictions in the later stages which ultimately results in poor service delivery of the total scheme.

9. As there is no control of any governmental organization on the extraction of water and VWSC and gram sabha makes decision for their water supply scheme the restriction on water utilization (40 lpcd) is often overlooked.

10. Purification of water is often neglected and therefore quality of water supplied is many time not portable.

11. Source strengthening is no where observed in Jalswaraja schemes, hence questioning sustainability issues.

12. Energy conservation measures were neglected considering present energy crises.

13. One thing that was found appreciating was the formation of women's SHG in villages. This SHG idea was disseminated in a good manner thereby empowering rural women's.

4.2 TSP and SO Interviews:-

SO role in JSS:-

Advocacy

- Generating felt demand for sanitation facilities through
  - Creation of awareness for eliminating open defecation to minimize risk of

contamination of drinking water sources and food.

- Health education.

- Attitudinal change including superstition/de-addiction/family planning.
- Eradication of disparities (economic & social).
- Ownership building and
- Women's participation

Training

- Planning & implementation of the project.
- Water management.
- Financial management (Budgeting & Accounting).
- Monitoring and Evaluation of the project.
- Ensuring sustainability of the project and
- Vocational guidance and training to members of SHGs for sustainable livelihood.

Capacity Building

- Build capacity of local communities particularly women and motivate them to participate fully in the implementation of the project.
- Women's empowerment through savings and credit programs through Self Help Groups and their involvement in decision-making processes.
- People's participation in decision making and community self governance.

Technical support

- Encouraging cost effective and appropriate technologies in sanitation.
- Monitoring & Evaluation.
- Helping villagers in identifying water sources and selecting appropriate scheme for water supply.

Role of TSPs in JSS:-

Technical service providers play a very crucial and important role in Jalswarajya project right from the stage of preparation the estimate to get it approved from Zilla Parishad, fixing up the agency to execute the work, implementation and overall management of the project, checking the quality of work and supervision till the final stage of completion of the work.

TSPs and SOs are appointed by village gram panchayat to have a technical expertise to guide the village for successful implementation of the project and for capacity building of the village. It was observed that TSP/ SO depart in middle stage / later stage of the project period, due to various reasons hence they are not held responsible for the project execution for that village. Villagers do not have technical exposure to civil, mechanical, electrical works and they even lack making all necessary compliance required by ZP under JSS. Finally they are left with no option but the search for a new TSP / SO which ultimately results in considerable delay in completion of the project.

CHAPTER 5

CONCLUSIONS AND FUTURE WORK

This chapter mentions conclusions which are drawn from Jalswaraja data available through field survey, our analysis of secondary data, GSDA data analysis and its correlation with secondary data, interaction with Geologist at ZP and GSDA and personal visits to JSS sites.

Sustainability issues:-

1. From sustainability point of view JSS with surface water shows good results when compared to that of ground water based schemes, hence maximum effort should be made to tap surface perennial source, so as to prevent summer stress due to depleting ground water table.

2. Source strengthening concept village wise is not borne by any of JSS, because of the reason that if considered in the scheme, the villagers have to contribute for the same thereby putting additional burden on them and secondly the structure proposed will not last even if constructed due to excess precipitation and high runoff in most of the places in Thane district, hence a holistic approach for source strengthening is necessary from sustainable point of view.

3. People tend to avail / extract more water during initial stage of implementation (more than 40 lpcd norm) due to lesser number of connections on the scheme (in case of piped water supply). As the numbers of connections increase the water availability reduces thereby creating water restrictions which ultimately results in poor service delivery in the later stages. Hence right from the initial period of commissioning of JSS the water supply should be restricted / regulated to have uniform water supply services throughout the period proposed for the scheme.

4. As there is not control of any governmental organization on the extraction of ground water and VWSC and gram sabha makes decision for their water supply scheme the restriction on water utilization is often overlooked. If it is ground water based scheme it should be borne in the mind of people that more the extraction more will be the water scarcity in the summer

season. Thus SO can take a crucial role to explain them the ground water stress and influence people for restricted /proper use of water and prevent wasteful practices.

5. Tribal habitations due to lesser capacity to contribute towards the initial 5 % of capital cost and avoiding future burden of 100 % O & M, generally adopt low cost schemes which are mostly ground water based schemes .But considering less success rate (60 % only, from the analysis of secondary data) of the ground water schemes the tribal community will face a big problem when it comes to sustainability issue for availing water throughout the year. The basic objective of giving priority to tribal community under JSS will not be fulfilled in a sustainable manner if 80 % of the schemes adopted by tribals are ground water based and the success rate is merely 60 %.

6. Ground water scenario in Thane district due to its geology and physiology is not satisfactory as per results obtained from field data and GSDA records. In the month of May 2008, 64 % of the total O.B. wells reflects drop in ground water levels when compared to last 5 years record for the month of May.

7. The ground water level graphs for O.B. wells plotted for the month of May 2004 to 2008(Ref. Annexure 10), majority of them follow a decreasing trend which denotes GW dropping down steadily.
Note: - depletion of GW table more than 1 or 1.5 meters a year is considered to be alarming rate by GSDA, Thane.

8. Locations of well, bore well, elevated service reservoir (ESR) piping arrangement etc. is influenced by political pressure, elites, influential villagers and interest groups. Hence the best alternative for availing the source and water supply arrangement is not been explored. Hence it puts big question on sustainability issues, but this influence can be restricted by intervention of SO / TSP making people aware of the consequences and results of selecting faulty site/ location.

9. Ground water Survey and development agency (GSDA) or Geologist from this department are deputed under Zilla Parishad to assess the availability of ground water, location for well/ bore well and its dimensions in JS project. Many times it is observed that dug well dimensions are not as suggested by Geologist resulting in insufficient / less water. As it is the most critical part of the project thereby questioning sustainability of the system, hence we strongly fell the need of intervention of Geologist immediately after the well / bore well is completed. If required a certificate of work completion as per dimensions and location proposed by Geologist should be made mandatory.

Design related issues:-

1. Forecasting measures which are adopted based on past records are often less accurate. Actual population is most of the times more than what is reflected, hence an adequate safe margin is required to be incorporated while forecasting analysis and preparing the estimate. Water quantity requirements, pump capacity, well dimensions, ESR capacity, piping system and distribution system should cater for the same.

2. Estimate prepared for availing water supply scheme by TSP (Technical Service Provider) are as per MJP / PWD current schedule of rates which are most of the times very less in comparison to the prevailing market rate also this rates adopted do not consider the price hike / fluctuations in market rate for complete one year. Hence executing the work on this estimate makes the quality of work poor or the actual specification of the work in most cases is below the standard requirements. Hence it is necessary to have a market survey done for some critical / major items before finalizing the estimate, so as to have the quality and specification as per requirement in the scheme.

Implementation and O&M related issues:-

1. After implementation of JSS in Thane district water consumption increase and time saving obtained are 5 lpcd and 21 min. per household respectively.

2. Jalswarajya guidelines indicated 10% of people contribution in case of tribal village and 5% in case of non-tribal. This contribution was essential to bring out a sense of belonging, affection towards their water supply scheme, so as to maintain the facilities properly. It was found that people are not so proactive to pay the initial small amount. Due to this reasons contractors make the initial contribution on their behalf due to their vested interest .This procedure brings the feeling among the people that the scheme is implemented by contractors / TSP for gaining profit. Illusion makes people less belonging and sense of ownership towards their scheme. But this notion can be restricted by intervention of SO, making people aware of the consequences and result of initiating contractors for initial payment as it may result in less belonging and ownership towards their scheme and even result in low quality work or work not as per specification.

3. 40 lpcd ceiling on water under Jalswarajya scheme is unaware by majority of people and still tend to practice wasteful methods of using water. They think government schemes sustain for a limited time period hence make fullest use of the water made available. This illusion should be made transparent by SO / NGOs that JSS if implemented once means no funding by Government for next **15 years** pertaining drinking water solution in their village.

4.Capacity building and IEC in a given time cannot completely make any PRI capable enough to handle all techno-managerial issues hence there is a lack in technical capabilities, effective monitoring and overall management (estimate procedure, procurement, construction and audit). Hence a third party agency / TSPs should be skilled enough to handle this type of work because the norms clearly mention no funding for next 15 years if JSS implemented. A faulty design, estimation, execution and commissioning can result in the whole system to perform unsatisfactorily and put the whole village under severe water stress year after

year. Hence it should be made mandatory to certify the correctness of all technical aspects so as to hold them responsible and accountable for it.

5. Many times the TSP / SO depart during middle/ later stage due to various reasons hence they are not held responsible for the complete project execution for the village. Villagers do not have required technical exposure to handle civil, mechanical, electrical works nor they have required skills for making all necessary compliance required by ZP under JSS .They are left with no option but to search for a new TSP/ SO. Hence there is definite need to fix up the responsibility of TSP/ SO and make adequate provision to prevent them from departing till successful implementation of the project. One way could be to keep some security deposit withheld (of TSP/ SO) with GP till successful completion of the project and handing it over to the GP.

Future work:-

This report is the study work of Jalswaraja scheme implemented and the ground water scenario in Thane district. The basis objective of this study project was to check the sustainability of ground water for domestic use and verify the objectives and benefits proposed under JSS. The results of this report are worked out after JSS is implemented in villages / hamlets and compared with the villages in which JSS is not implemented considering the same scenario prevails in the village before implementation of JSS.

To get an actual insight of the project benefits proposed under Jalswaraja it would be justifiable to collect data of village / hamlet before and after implementation of JSS and then to analyze and check the objectives and benefits proposed .For this the questionnaire designed should be filled up once before and after implementation of JSS .

Secondly the GSDA data availed by us should be correlated with the rainfall data and GW levels in O.B. wells taluka wise on yearly basis from 2004 onward. Also number of actual rainy days data should be collected taluka wise from Indian Metrological Department and correlated with GW readings data taluka wise so as to obtain a greater insight of ground water levels and its correlation with rainfall.