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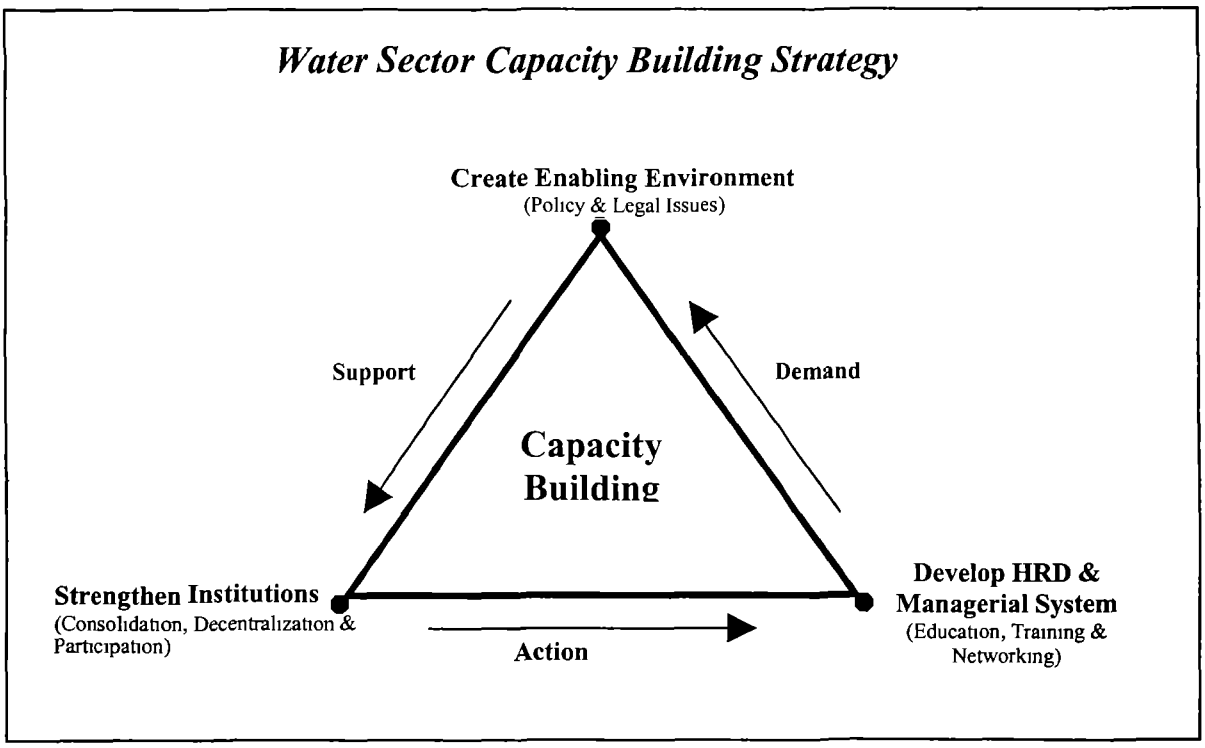
International Institute for Infrastructure,
Hydraulic and Environmental Engineering

Capacity Building for Water Sector in Gujarat, India

Individual Study Report

Submitted for

Master of Engineering Degree



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Preface

This individual study report is submitted in partial fulfillment of the requirement for postgraduate degree of Master of Engineering in Sanitary and Environmental Engineering, at the International Institute for Infrastructure, Hydraulic and Environmental Engineering, Delft, the Netherlands.This report is the outcome of a study carried out by the author on the topic as highlighted and presented in the form for its acceptance as a dissertation. The necessary inputs have been taken from the contemporary literature acknowledged under the list of references. The study is purely academic in nature, which was carried out under the able guidance of Mr. Teun Bastemeijer of IRC and Dr. Richard Franceys of IHE.

Acceptance of this report by IHE, signifies the approval for which it is submitted and neither IHE and IRC nor the parent department of author, the Gujarat water supply and sewerage Board, endorse or accept any statement made, opinion expressed or conclusions drawn in this report.

Jagdish.M.Barot

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Certificate

This is to certify that Mr. Jagdish M. Barot has carried out this study at IHE, Delft, The Netherlands, under our supervision during June and August, 1999.

Dr.Richard Franceys
Mentor

Mr. Teun Bastemeijer
Guide

Acknowledgements

I would like to express my deep sense of gratitude to my guide, Mr. Teun Bastemeijer, who has provided me meticulous guidance and insight for this study. Dr. Richard Franceys, my mentor, also provided me, necessary help and support, whenever required, for which, I am thankful to him.

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I take this opportunity to express my sincere thanks to Mr. J.P. Buiteman, Mr. Schakenraad and Ms.Vandana Sharma of IHE, for their kind help and support.

I fall short of words to place on record my indebtedness to my family especially my wife Neela, daughter Purvi and grandson Partha, for sustaining my estrangement from home for this study at The Netherlands, and providing inspiration, encouragement and support.

I also convey my thanks to my personal secretary Mr S.R. Krishnan, my friends Mr. Kiran Chavda, Mr. Vijayanand Katharani and my Indian colleagues at Meena hostel in Delft, Mr Jitendra Patel, Mr. Sudipta Chakraborty, Mr.Rakesh Gupta and S A Rehan, for their help and encouragement.

Jagdish M. Barot

Abbreviations and Acronyms Used

ACC- Administrative Committee on Co-ordination.

CAPNET- International NETwork for water sectors CAPacity building.

CB- Capacity Building.

D f I D- Department for International Development.

DWES – Drinking Water and Environmental Sanitation

EPA- Environment Protection Act.

ESA- External Support Agency.

FAO- Food and Agriculture Organization.

F.C.- Fully Covered (By supplying 40 LPCD water.)

GJTI-Gujarat Jalseva Training Institute.

GOG- Government Of Gujarat

GOI- Government Of India.

Govt.- Government.

GWP- Global Water Partnership.

Ha- Hectare

HRD- Human Resource Development.

ICWE-International Conference on Water and Environment.

ID- Institutional Development.

IGWR- Intersecreterial Group for Water Resources.

IHE-International Institute for Infrastructure, Hydraulics and Environmental Engineering.

INR-Indian Rupee (1US $ = 42 INR-1999)

IRC-International Reference Center for Water and Sanitation.

ITN- International Training Network.

LPCD-Liters Per Capita per Day

MNP- Minimum Needs Programme.

NABARD-NAtional BAnk for Rural Development.

NC- Not Covered under water supply programme.

NGO-Non Government Organization.

O&M- Operation and Maintenance.

PC- Partially Covered (By providing 10-lpcd water).

RC- Resource Centre.

RGNDWM- Rajiv Gandhi National Drinking Water Mission

SPCB- State Pollution Control Board.

SSP- Sardar Sarovar Project (Narmada dam project).

STREAM- Study of Resources and Management.

UN- United Nations.

UNDP- United Nations Development Programme.

UNICEF- United Nations Children's Funds.

VIKSAT-Vikram Sarabhai center for development interaction

WALMI-Water and Land Management Institute.

WB-The World Bank.

WSSCC-Water Supply and Sanitation Collaborative Council.

1. Background

Water is very essential for survival of human life and maintenance of health. It is also playing a very important role in food production, socio-economical development, and protection of environment. Management of water therefore is very vital aspect and calls for special skills and techniques. Though apparently water appears in abundance on the earth, the fresh water is limited (just enough), and causes concern in many parts of the world, due to erratic and uneven distribution. The exploding population, increased water demand for food production and the pollution of water have imposed new threats, in the management of water. All UN agencies, other international associations and the ESAs concerned with the water management have expressed serious anguish over the deteriorating water conditions and unanimously appealed, at various conventions, to exercise more care and take immediate remedial measures.

In the last two decades, an appreciable amount of awareness is generated on the subject and efforts are initiated accordingly. One of the important outcomes of these initiatives was the launching of international water supply and sanitation decade (1981-1990). Concerted efforts were made to provide safe water and adequate environmental sanitation coverage for all. However lessons learnt from the decade reveal, that targeted objectives are not achieved and the service levels are not improved to the satisfactory levels. Lot of deliberations have taken place subsequently at international and national levels on these issues, to ponder where we went wrong. Special mention could be made of "Global consultations at New Delhi (1990), UN symposium on capacity building at Delft (1991), Dublin conference on water and environment (1992), Rio conference on environment and development (1992), the international ministerial conference at Noordwijk (1994) and the second UNDP symposium on water sector capacity building at Delft (1996). All these conventions have unanimously concluded that the management of water resources need a rethinking and a policy change is required to introduce integration of fragmented efforts to achieve sustainability on along and continuous basis. The question now remains to be pondered is, how to make the water resources management more effective and efficient to achieve sustainability, targeted coverage and the satisfaction of user communities.

It has again been consensusly appreciated by all, that developing managerial capabilities is one of the important aspects to be looked into. (Please see box-4.1). Ultimately, the concept of capacity building has emerged as an important component in the water resources management. The ESAs lending technical and financial support to various countries, are now also insisting for adopting capacity building programme. It is a relatively new concept, which needs to be understood in proper perspective and applied appropriately to gain the benefits. Thus the detailed study of capacity building is the demand of the day and every country or a state is required to adopt it in the right earnest. What is it and how to do it is a subject of study.

Gujarat State in India is facing shortage of water and other organizational problems in the sector. Hence introduction of the concept of capacity building in a systematic manner, is perceived to be very useful tool in solving the sector problems. With this background in mind, the issue of capacity building is selected as a dissertation topic and studied.

2. Summary

In this study, the concept of capacity building has been discussed more elaborately and its usefulness as well as implementation in the management of water sector in Gujarat is explained. While doing so, initially, in chapter three, the aim, objectives and the scope of the study is defined. Obviously the sole aim and objective of this study is to understand the concept of CB and its linkages with management issues and recommend it for improvement of the performance of water sector in Gujarat, to achieve targeted goals and also to establish system sustainability. However due to time constraints, the scope of this study is limited to understand mechanisms of capacity building and establish its linkages with sector activities to operationalise it in Gujarat. In chapter four, an overview of the current global thinking going on, and the scenario prevailing at local level are discussed. It is observed that awareness prevailing at international level is appreciable and sincere efforts are initiated to persuade countries to adopt capacity building as a continuous process. While on the local front, the sector problems are numerous and no systematic approach to capacity building is practiced.

Chapter five discusses the concept of capacity building. The definitions given by various experts and the Delft symposium are quoted to clarify the true meaning of it. The purpose, linkages, elements, agents, process and outcome of capacity building are explained. It becomes clear from this, that capacity building is a multi-sectoral activity necessitating involvement of all stakeholders. Chapter six examines the prevailing water sector scenario in Gujarat through rapid assessment based on the literature study. It reveals the strengths and weaknesses of the sector. It is observed that the sector policies are lacking in integrated management, sustainability and capacity building concepts. Also the laws on ground water abstraction water pricing and environment protection need review and updating. The institutions in the sector need strengthening through decentralization and reinforcement. It has also been tried to identify the main problems of the sector, classifying them into policy and legal, institutional, technical and financial, so as to suggest remedial measures. The formulation of appropriate strategies to solve the sector problems and improve the performance is discussed in chapter seven. It consists of concentration mainly on policy review, organizational strengthening, HRD development, and community participation with emphasis on gender sensitization and networking for information, education, and communication. The last chapter, draws conclusions and recommendations based on the study carried out.

It is observed that the water sector in Gujarat is facing many problems especially of shortage of water and management. These problems could be solved though capacity building. Considering these issues, suitable recommendations are drawn. The main recommendations include, review of national policy to incorporate recent developments in the sector like, concept of integration of resources, sustainable management and capacity building. For building capacity, the strengthening of existing institutions through decentralized management, priority for HRD and training activities, twinning arrangements with peer institutions and expanding networking are suggested. Community participation and management are recommended with emphasis on involvement of women at all stages.

3. Aim, Objectives, and Scope of the Study

The aim, objectives and scope of the study are defined as under.

- **Aim :**
  The aim of this study will be to recommend capacity building process and methodologies, explaining its usefulness, for the water sector in Gujarat State, to improve the quality of decision making, sector efficiency, and management performance in the planning and implementation of projects and programmes.

- **Objectives :**
  The main objectives of this study are,

  - To explain the concept, guidelines and the tools for capacity building in water sector.
  - To review global thinking and local status, in the sector.
  - To carry out rapid water sector assessment to identify priority problems and action.
  - To formulate strategy for capacity building in Gujarat.
  - To draw conclusions and recommendations on building capacity for improving performance.
  - To help achieve financially and environmentally sustainable, more efficient and effective delivery of water services.

- **Scope of the study :**

  Time available for this study is only eight weeks. So keeping the time limit in mind, this study is limited to identify and discuss linkages between water resources management and capacity building. As water is a state subject in India, the study will be restricted to the state of Gujarat. Emphasis will be given to the issues related to irrigation, water supply and sanitation only. The hydropower sub sector is not included in it. Due to time constraint, rapid sector assessment will be carried out with the support of available literature.

4 An Overview of prevailing Scenario.

Fresh water has been recognized as a finite and vulnerable resource, essential to sustain life, development and the environment. It is considered a crucial element in the battle against poverty, the cornerstone of prosperity and a limiting factor to growth. Considering these vital aspects, The Mar del Plata conference (UN-1977) emphasized water supply and sanitation for all by 1990, and framed an action plan, for the purpose of improving their development and management. The action plan gave emphasis, on human resource development in terms of education, training, and research (Recommendation F) and institutional strengthening (Recommendation D), all of which are now considered as integral components of capacity building. This action plan gave rise to UN Decade of 1980,during which much effort was channeled into the extension and improvement of water supply services. The decade made major stride towards its objectives, however it fell short of its goal of services for all by 1990.Nevertheless, the important lessons learnt were the interdependence of all water uses and the indispensability of effective institutions. It was recognized that a key element in implementing the Mar del Plata action plan was the need for capacity building and strengthening water related institutes through out the world. (Okun et.al, -1991). As a follow up action to Decade experience, the ACC/IGWR committee of UN, agreed to address the shortcomings of Decade programme through the development of a strategy for Capacity building, including institutional development and HRD at all levels (Frank Hertvelt -1991). The problem of drinking water and sanitation was also highlighted by the Montreal international forum,"NGOs working together", (1990) calling for a new approach to managing water resources, emphasizing user participation and reliance on local community resources. (The World Bank-1993)

Global consultation on safe water and sanitation was held by UNDP in New Delhi in 1990, to review the Decade progress. It came out with The New Delhi Statement, which contained four guiding principles. Two of them were related to capacity building. International action programme on water and sustainable agricultural development of FAO (1990) also contained strengthening of institutions dealing with agriculture and water development

The concept of capacity building and its usefulness were discussed at length during a symposium on,"Strategy for water sector capacity building" at Delft (UNDP 1991). The author had the advantage to attend it as an IHE alumni. It recommended, incorporating capacity building into all water sector projects. Daniel Okun of North Carolina University (USA), one of the key speakers at the Delft symposium, advised to increase investments in the institutional strengthening and HRD for long term benefits. The concept of CB was endorsed by two subsequent conferences at Dublin and Rio de Janeiro. The Dublin Conference (ICWE - 1992), expressed serious concern about sustainable development and called for fundamental new approach, which included capacity building for water resources. The United Nations Conference on water and Development (Rio-1992) recognized the competition between economic growth and environment quality. Chapter18 of the Agenda 21,emphazises the need for improved management of water for sustainable development. The World Bank, considering water resources management as the most important area for its lending, insists for careful and economical environmental management adopting capacity building concept (The World Bank-1993). The International Ministerial conference on DWES (Noordwijk-1994) endorsed that for resolving the water crisis, the human resources are to be used more effectively, through capacity building. The Stockholm Water Symposium (1996) also focussed on safeguarding water resources and capacity building through institutional development, HRD and appropriate policy formulation (Biswas, A.K., 1996). Most of the ESAs have recognized the importance of capacity building and are advocating its implementation. The Netherlands Government, which is one of the leading ESA supporting sector activities in Gujarat, has, in its Policy priorities Report (Netherlands Govt., 1997), mentioned not to see water resources in isolation and support capacity building activities.

While studying the water resources management of Kenya - Africa, Dr J.J.Hukka (1998), has observed that the present institutional arrangements are not capable to cope with the future challenges in many developing countries. Therefore institutional changes are required. He has advocated linkages of water resources management, utility management and end users to offer holistic tool to improve the performance of the sector. The WSSCC, which met in Manila in 1997, also agreed on regionalisation,

placing better emphasis on information sharing and Capacity building. For addressing the capacity development needs, resource centers are considered to play a key role within the water sector. Hence to support the resource center development, Stream Project as recommended by ministerial conference on DWES (Noordwijk-1994), has been initiated by IRC, the Netherlands in 1998. (Bastemeijer, T. -1999). Under the stream project, sharing of information, consultation and training are provided on a regular basis through networking, which is considered an important tool for Capacity building (Maria, B. -1999). GWP, UNDP, and the Netherlands Government have recently created the international network (CAPNET) to support water sector capacity building activities. The workshop on " Towards an enhanced role of resource centers in capacity building at IRC (1999) emphasized the role of resource center in capacity development and discussed strategies for implementation. The author had the advantage of participating in the workshop deliberations as a participant from GJTI. It can be observed from the forgoing that good amount of awareness, anxiety and initiative are prevailing at global level to improve water sector performance using capacity building as a tool.

While looking at the local scenario in the country, situation prevailing is far from satisfactory. India has a large population (970 million in 1999) to be served, which calls for massive resources and efforts. Although it had made some good progress in water supply coverage during the Decade, much remains to be done for sanitation coverage and improvement of management performance. It faces some inherent problems of delivery services, quality maintenance and environmental protection. To overcome these problems, it has initiated some action by launching a national HRD programme (Govt. of India-1994). As regards, water resources utilization management, some policies are formulated but their implementation is not found satisfactory. Strong institutions are required to address the need (VB Patel et al-1992). The decentralization process is implemented through the 73rd and 74th constitutional amendments, which has substantially increased the responsibilities of district administrations and local bodies. Capacity building at local level therefore has emerged as a mammoth task for the sector (Kelvin Tayler et al-1996).

Water is considered a critical resource for the state of Gujarat and lack of water has often been perceived to be a constraint to the growth. The state therefore has accorded high priority to investments in water sector. An integrated water resources management is visualized essential, for sustainable system development (Govt. of Gujarat-1997). As a long-term measure to achieve the water sector goals, the state government has planned major projects. The management of such projects, call for strong institutions and capacity building (Govt. of Gujarat-1998). Thus the need for CB is realized by the authorities but its implementation is lacking which is evident from the report of Gujarat NGOs (Vision-21 for Gujarat –1999). An impetus is required.

(Box- 4.1) Consensus call for capacity building

1 Mar del Plata conference (UN –1977) emphasized institutional and human resources development to ensure long-term sustainability of water sector projects and programme.
2 ACC/IGWR agreed (UN-1989) to address the shortcomings of the Decade programme through the development of a strategy for capacity building including institutional development and HRD at all level
3 The Montreal International forum,"NGOs working together"-1990 highlighted the problems of water supply and sanitation It called for a new approach to managing water resources emphasizing on user partition, reliance on local community resources, and environmental and economic issues.
4 FAO 91990) concluded that institutions which deal with agricultural and water development need to be strengthened to meet effectively to promote sustainable development
5 The New Delhi Statement (UN-1990) recommended strong institutions for sustainable development and capacity building for community management
6 A WHO working group (1990)) on legal aspects of water supply and wastewater management emphasized the need for enhancement of the capacity of water agencies and user's associations to manage water systems and institutions to achieve sustainability
7 Delft Declaration (UNDP-1991) recommended special importance of capacity building in integrated water sector management-incorporating capacity building in all common programmes
8 Dublin Conference (ICWE-1992) specified that planning and management (including implementation) should take place at the lowest administrative level.
9 Brussels workshop (UNDP/WB-1992) observed that problems of water sector have their origins in and management shortcomings hence there is a l need for reforms that includes all stakeholders
10 Rio Conference (UNCED-1992) led to a general acceptance that water and environmental resources are finite and vulnerable in light of exploding population and economic growth, for which effective implementation and co-ordination mechanisms (Capacity Building) are required
11 The World Bank in its policy for water resources management (1993) places great importance on development of institutions and decentralized management to promote capacity building
12 The International Ministerial conference (Noordwijk-1994), recognized the effective use of human resource in solving the water crisis through capacity building.
13 The Stockholm Water Symposium (1994) focussed on safeguarding of water resources and capacity building, It recommended all countries to develop HRD, institutions and policy formulations
14 The World Water Symposium (Morocco-1997) called for working together addressing social, Institutional and educational issues to ensure sustainability
15The WSSCC meeting in Manila (1997) agreed on regionalization, placing greater emphasis on information sharing and Capacity building.

5. The capacity building concept

To understand the concept and usefulness of CB, various components of the process and its linkages with other sectors need to be understood. In this chapter an attempt is made in this direction.

5.1 Definition

The simplest meaning of capacity building is empowerment with knowledge, skills and training to do things better. As per Delft Declaration (1991), capacity building is defined as creation of an enabling environment with appropriate polices and legal framework. Policy issues to be addressed include a focus on sustainable development, pricing of water as an economic good and principle of cost recovery. It involves strengthening of institutions (both intra and inter-sectoral) and their managerial system through human resource development with a combination of planning, training and management. (Hartvelt, F, -1996). It is a novel approach, which takes comprehensive and holistic view of water sector. It emphasizes correct institutional arrangements, including financial implications, to achieve efficient and economic water management and water services delivery. . (Alaerts, G.J. et.al-1991). It calls for promotion of long-term, effective strategies involving communities and women in particular for approach up-to lowest level permeating in all activities of the sector. It provides vertical support and reinforces horizontal linkages between various sub-sectors and relies on learning by doing. It has been considered a process of directly reflecting the needs and overall conditions of a country, with short, medium and long-term goals to be evaluated periodically.

5.2Purpose.

Capacity building has emerged as an essential requirement for efficient management and planning of scarce water resources to assure fair and equitable allocation of water among all users and to protect the environment. It's main objective is to improve the quality of decision making, sector efficiency and managerial performance in the planning and implementation of water sector programmes and projects. It aims at developing and strengthening of the institutes that will become able to products and services that meet a

real demand. It will also empower the consumers to decide on matters regarding water use and take responsibility.

The specific purpose of capacity building is to improve the capabilities of sector assessment and financial arrangements through recognition of economic value of water. It also helps in responding to the international call for achieving financial, technical and environmental sustainability.

(Box 5.1)

Capacity building for responding to new challenges

Decentralization, community management and empowerment, integrated water resources management, private sector involvement, minimizing state intervention and integrating gender consciousness, all these new trends are influencing the political, economical and socio-cultural fabric of our societies The water supply and sanitation sector, so essential to life and health, was one of the first sectors, which had to respond to these new challenges After years of experiencing, it has been realized that responding to these challenges need necessary capacity within the sector (Sally, S R and Bastemeijer, T -1999)

Major constraint is CB and not technology or funds

Despite major commitments by countries, with the assistance of ESAs, water resources development, including water supply and sanitation for urban areas and water for irrigation, are not keeping up with demand Furthermore, many investments that have been made have not been utilized. The major constraint has not been the availability of water resources technology or funds but an absence of capacity to develop and utilize the resources (Okkun, D A , and Lauria, D T.-1991)

5.3 The Linkages

The sector is large and relies on the performance of its sub-sectors. Interdependency exists with other policies and sectors. Its linkages could be established at various levels, as under.

- Top layer-State or National level.
    - Here, broad comprehensive development plans and strategies are defined, which determine the general policy environment of the sector. It pertains to economic policies, industrial and agriculture development plans, public health, welfare and environment management plans.

- Second layer- Sector level

  At this level the general and integrated planning and management of water resources are carried out. The planning involves data collection and processing. It is carried out with the institutes of sub-sectors.

- Third layer –Inner level.

  It features of various sub-sectors, each having its own policies and implementation structure, e.g. watersupply and sanitation, irrigation, agriculture etc.

5.4 Elements of Capacity building

In the process of CB, certain specific elements are considered essential. They are creation of enabling environment through reforms in policies and legal framework, strengthening of institutions and development of HRD including support to educational institutions and professional organizations. To assess the national needs of the sector and establish flexible procedures to solve local problems at local level are also consider essential. For this the support of communities and their organizations is necessary. Vision and motivation are also the most important ingredients of capacity building.

5.5 Agents for capacity building.

The stakeholders in the sector activities are required to be made aware about the activities and needs to be involved in it. So it is essential to identify them. A broad classification of them is done as under.

- National, state and local government authorities and institutions.
- International organizations and ESAs.
- Non governmental organizations.
- Institutes concerned with education, HRD and training.
- Research and development institutes.
- Local communities and their organizations.
- Private sector professional associations.

5.6 Process of capacity building.

The capacity building is initiated by government, which is committed to improving water resources management by capacity building at all levels. It is carried out by water sector professionals, who constitute the nucleus. They programme then, providing assistance on demand. The process consists of two main aspects i.e. clear understanding of about water resources and structure/role of the sector. This could be achieved through water sector assessment, which is a first step in the water resources development. Capacity building processes should be aimed at three levels. (A.G.R. Alaerts et.al. -1991)

- Sector level – provision of an enabling environment for effective management.
- Institutional level - Use of collective strength of staff.
- Individual level - Skills improvement of individuals.

It is a long-term continuing process, which should be phased to accommodate requirements of governments and ESAs.Each individual phase should have a clearly defined measurable goal. A necessity prerequisite therefore is the setting of realistic goals based on the available resources.

5.7 The outputs

Capacity building programme is expected to produce a nucleus of committed and trained officers and specialists. At the same time, it will enhance the skills and resources of the consumers. It will also smoothen the availability of funds and management procedures. It will improve the co-ordination among various national agencies, sectors and the ESAs.

6. Water Sector Assessment in Gujarat

Water sector assessment is an important component in the capacity building process upon which future planning and development are dependent. It includes an account of water resources, needs for various sub sectors, service facilities available, policy climate, institutional resources, legal and regulatory tools, financial situation, ESA support etc. Such an assessment will give a clear picture of the strengths and weaknesses of the sector that will help decide the capacity building requirements. For the purpose of this study report, it is not possible to get detailed sector assessment carried out due to time constraint. However based on the literature review and author's own experience in the field, a rough assessment is attempted.

The state of Gujarat is located in the Western part of the country having sub-humid to arid climate and tropical monsoon. The rainfall is often erratic and uneven resulting into recurring droughts and famines conditions. The last decade alone has experienced three droughts (B.J.Parmar.-1998).The current year is also facing problem of inadequate rains. The state has got only three perennial rivers, all in south Gujarat. The longest coastline in the country, 1600 Km. is posing a serious problem of salinity ingress. Seventy three percent of the state area is such where ground water of reliable quality and quantity is not available on sustainable basis. (Map of Gujarat at annex. III)

6.1 Water Resources of the state.

The water resources picture of the state is given in Table No.6. 1, as annexure. It indicates that the main source of water in the state is predominantly surface water. As per an estimate (Parmar, B.J.-1998), available surface water resources are 42,400 million cubic meters, out of which utilizable surface water potential is 31,500 million cubic meters. The utilizable ground water potential is 19,1705 million cubic meters. Water resources available for irrigation are limited. Nearly two third, of the population in the state depends on agriculture, which is essentially rain fed. . Against the ultimate irrigation potential of 6.9 million ha.,the irrigation potential created so far, is 3.6 million ha. out of which 2.9 million ha. is utilised.Thus it will be seen that, hardly 27% of the cultivable land is being provided with irrigation facilities. The present

water deficit for drinking and industrial use is 600 million cubic meters. The water demand for the year 2010 has been worked out as 51000 million cubic meters (2000 million cubic meters for domestic \ industrial purpose and 49000 million cubic meters for irrigation) (Tahal consultants -1997).

It will be visualized that available and developed water resources are far less than the actual requirement. The major river of the state, Narmada, which has got potential to provide 11,100 million cubic meters additional surface water, is trapped into inter-state dispute. The state will have to pool all out efforts to meet with the deficits obviously through better management and innovative techniques like water harvesting, recharging, reuse, conservation in irrigation through drip and sprinkler methods etc. This is possible only through strong managerial capabilities, demanding early capacity building process.

6.2 Status of water supply and sanitation sub sector.

Due to the complex geo-hydrological conditions, the state is facing numerous qualitative and quantitative problems. A large number of villages are facing acute water shortage. The planning for Ninth five year plan (1997-2002) reveals that out of 18569 revenue villages, as many as 14552 are classified as No source villages i.e. villages having no source of reliable quality or quantity. So far, 14379 villages are covered by providing safe water supply. Under the new policy, a habitation, having population of more than 100 persons is considered a unit that means it covers revenue villages as well as hamlets. As on 31st March 1999, out of total 30269 habitations, 25193 are covered under fully covered category providing 40 L.P.C.D. water (F.C.), 4539 villages are partially covered by providing minimum 10 LPCD water (P.C.) and 437 habitations are still remaining to be covered, i.e. they fall in not covered category (N.C.). Sanitation coverage is still more dismal, causing many problems of health and hygiene. Inspite of accelerated efforts of the Decade programme, the rural sanitation coverage is raised to only 10 percent. And the urban sewerage coverage ranges from 35% to 50%only. In the ninth five year plan it is planned to cover 2238 villages through 74 ongoing projects and 2021 villages from 54 new projects. These villages

will be from N.C. and P.C. categories. There are incidences of villages reappearing as problem villages, which are once already covered. Such things happen due to scarcity and ground water depletion as well as water quality deterioration likes salinity ingress and increase of fluoride in ground water.

6.3 Policy climate.

Water sector in India in general is a governmental monopoly. A comprehensive National Water policy (1987) has been prescribed by the union Govt. that provides guidelines to the State Governments. Water supply for drinking purpose has been accorded first priority followed by irrigation. The service approach is supply driven rather than demand driven. No thinking on privatization is given and the integrated water resources approach is also not fully developed. The cost recovery concept is also not fully developed. For the No-Source category villages, the state govt. provides 100% subsidy for capital expenditure and recovers very nominal amount towards O & M cost. (INR 75/- per year per person against the total expenditure of about INR 900/-) and the recovery is not more than 5%. For urban areas 35 to 70 percent grant for capital expenditure is provided for drinking water supply and sewerage projects. Subsidy upto 80% on capital expenditure is provided for low-cost sanitation projects in rural areas.Recognition of capacity building, HRD, Training and community participation are on a low profile and ESAs supports for financial help is available to a limited extend.

6.4 Existing legal framework.

India has a quasi-federal set up. Responsibilities in regards to water are largely with the states(provinces) but central (federal) responsibilities cover environment, economic development and water dispute etc. There are some direct and indirect controls over the use of surface and ground waters in the state of Gujarat. Regarding the use of water, the general guidelines are derived from National Water Policy (1987) which accords high priority of water for drinking purpose followed by irrigation. The NABARD Bank regulation provides control over use of ground water for agriculture in restricted areas. The Gujarat irrigation Act based on the Model Ground Water bill of

Government of India, controls deepening of tubewells below 45-m depth in restricted areas. Water Pollution Control Act (1974) and Environmental Protection (1986) are also in operation. Thus adequate legal provision appears to be available for the judicious use of water resources. However to control the overexploitation of ground water, the abstraction rules are not found adequate.

6.5 Current institutional set-up.

As per the constitutional provisions, the water and sanitation services form a part of the state Government. Hence the responsibilities for the above services rest with Gujarat State Government. The State Government has passed on some of the responsibilities to state level functional authorities or the local bodies.

Government of India reviews the state development plans and provides supplementary assistance through various ministries like;

- Ministry of Water Resources-for irrigation and flood control,

- Ministry of Rural Areas and Employment – for rural water supply and sanitation and

- Ministry of Urban Areas and Employment- for urban water supply and sewerage.

Special units within the Ministries like;

- Central Water Commission (CWC) in Ministry of Water Resources,

- Central Public Health and Environmental Engineering Organization(CPHEEO) in Ministry of Urban Areas and Employment and

- Rajiv Gandhi National Drinking Water Mission (RGNDWM) in the Ministry of Rural Areas and Employment are functional to accelerate the activities.

Gujarat also follows the same pattern and various activities are looked after by water resources and urban /rural development departments, within the respective ministries, the details of which are provided in the organizational set-up given at **Annexure-2**

The local bodies are managing the urban water supply for respective city or town with assistance of state Government as and when required. The water and environmental pollution control activities are undertaken by a separate statutory body viz. Gujarat Pollution Control Board under the Ministry of Environment and Forest.

The State has a set of hierarchical and organized local bodies like the Village Panchayats, Taluka Panchayat and District Panchayat (Panchayat means administration), Town Committees, Municipal Councils and Corporations.They work for the implementation of state initiated plans and programmes. A good number of NGOs are also active in the field doing various missionary activities, through Government and ESA support.

Institutes like WALMI and GJTI are working for improvement in the sector through training and awareness activities.

6.6 Financial provision.

(A) Irrigation and Flood control

The state has accorded highest priority in investment to the Sardar Sarovar Narmada dam project that is considered a lifeline for the state. An outlay of INR 64000 million is provided, which amounts to 22.86% of the total size of the Ninth year plan for it. In addition to above, with a view to completing other ongoing major/ minor irrigation and flood control projects, INR18565 million is provided. Thus an outlay of INR83815 million is provided in the Ninth five-year plan, which constitutes 29.5 % of the total outlay.

(B)Water supply and sanitation

Programme for Ninth five-year plan provides an outlay of INR29, 500 million for the water and sanitation sub-sector. It includes INR 21500 million for Sardar Sarovar canal based water supply project, INR5430 million for rural water supply and sanitation and INR 2070 million for other miscellaneous works.

Thus it will be seen that, inspite of financial constraints, the state government has made sizeable provision of fund in the planning budget recognizing the importance of the sector. (Govt. of Gujarat – 1997)

6.7 Environmental impacts and water quality.

Water is an integral part of the environment and hence it can not be looked at in isolation. On one side the state is making rapid industrial progress that results into many industrial pollution problems,on the other side, due to poor hygienic habits, domestic wastage contributes to heavy contamination of water sources.This results into frequent outbreak of water born diseases and unhealthy conditions. Lack of awareness, financial constraints and poor implementation of pollution control laws aggravate the situation warranting strong capacity building.

Salinity ingress due to long coastline, deterioration of water quality due to fast depleting ground water levels, and industrial pollution of water sources pose many water quality problems. A general overview of the distinctive water quality in the state is given at Annexure no ~~6.3~~ XV, which reveals that the state is facing problem of salinity, fluoride and nitrate contamination. Such problem sometime, renders the water supply source once created unfit for use, making the village to reappear in the no-source category disturbing the planned program. There appears to be a strong need for strict pollution control and quality monitoring which again needs capacity building.

6.8 Water sector problem identification

The problems encountered in the sector are of varied nature and complexities, which could be summarized, in different categories as under.

Institutional problems.

- Water institutes are all still largely desegregated. Different sub-sectors are working under different ministries and there exists no proper co-ordination among theme.
- No connection exists between various schemes, command areas and river basins.

- The institutes are dominated by government and their performance is very weak.
- There is lack of accountability, transparency and customer orientation.
- Low priority for HRD and training activities.
- Lack of community participation and commitments.

Legal problems.

- The implementation of the existing laws is not effective
- Ground water abstraction laws are not adequate and strong.

Technical problems.

- There is shortage of water, which aggravates during scarcity period
- There is over exploitation of ground water and recharge is poor.
- Seawater intrusion in coastal areas creates serious problem of salinity.
- Water demand is increasing heavily due to exploding population, urbanization and competitive use of water.
- Poor coverage of sanitation and sewerage facilities.

Financial problems

- Constraints of funds for new projects and maintenance of schemes.
- . Cost recovery is poor.

6.9 E.S.A. Assistance:

India is a developing country with democratic set up. After Independence in 1947, the development of infrastructure had been taken up through five-year development plans. Ninth Five Year Plan is under implementation. It is mobilizing as much resources as possible to meet with the water sectoral demand. In this effort, the support of a number of

external funding agencies is being sought after, and is available. In the water sector activities, some UN Agencies and other bilateral as well as international funding agencies, are supporting the sector development through grants and soft loans. Notable among them are the World Bank, Netherlands Govt., DfID (UK), UNICEF and WHO.They extend support for the development and management of water resources, urban and rural water supply, sanitation improvement, research and training, promotion of health and hygiene and prevention and control of pollution

Box-6.4 Socio Economic Indicators of Gujarat

Serial no	Details	Value
1	Population	41.30 million(1991)
2	Annual growth rate	2 08 %
3	Average population density	211 persons/Km
4	Literacy rate	61 29%
5	Land utilization	9.61 million ha.
6	Net state Domestic Product rate	5.4%
7	Infant Mortality Rate	63
8	Per capita income	INR-10869
9	Area under Forest	10.01%

7. Strategy Formulation

While deciding the strategy formulation for any country or a state, two aspects are kept in mind. One is the definition of capacity building and another is the problem identification. The problem identification is already carried out in the previous chapter of water sector assessment. It becomes evident that in deciding the strategy of the water sector, its assessment is the first and foremost thing. It provides strengths and weaknesses of the sector, which is very useful in formulating the strategy. If we go by the definition of capacity building as provided by Delft Declaration, than the strategy needs focus on, enabling environment, water sector assessment, strengthening of institutions and development of human resources and managerial system. A.K.Biswas (1996) states that enabling environment is not only economical investments and participation of private sector, but also appropriate legislation, including an adequate set of rules and regulations that will state clearly the conditions for the use of water with equity for all stakeholders. Thus capacity building initiative first invites review of policy and legal framework. The strategy approach suggested by the Delft Declaration (1991) is given in Box –7.1, below.

(Box –7. 1)-Strategy approach recommended by Delft Symposium(1991)

- *Developing improved policy and legal frameworks, institutional development and a commitment to development of human resources and managerial systems for the sector,*
- *Managing water and environmental resources, including modifying demand by pricing, conservation, reclamation and reuse of wastewater, thereby reducing fresh water demands and pollution,*
- *Having the ESAs adopt capacity building as an essential element of their assistance efforts, including such initiatives as supporting community and water user associations, on farms and in the cities, so they can participate productively in investment made on their behalf; continued attention needs to be given to the pivotal role of women in water-related activities, and their proven capabilities to fulfill managerial tasks at all levels;*
- *Urging governments to coordinate ESA activities in their countries and encouraging the ESAs to coordinate their agendas;*
- *Involving, where appropriate, the private sector in managing or providing water-related services;*
- *Encouraging local and foreign universities, institutes, consulting organizations, professional associations and others to participate in capacity building as is most appropriate to their own capacities and ESAs are urged to facilitate this effort;*
- *Encouraging countries to conduct water sector assessments; these water assessments must include the need for capacity building in addition to traditional technical, social and economic aspects; and*
- *Creating awareness of the vital role and finiteness of water on the part of decision-makers and the public at large.*

(Source Daniel A. Okun and Donald T Lauria-1991)

7.1 Review of policy and legal framework.

As per the constitutional provisions in India, water is a state subject, however the policies are framed at national level. These policies provide guidelines to the state and resolve interstate water disputes. Otherwise also, according to D.A.Okun and D.T.Lauria, (1991), the capacity requirements are country specific and hence the initiative must come from within the country with full commitment of the government and the stakeholders. Essentially, the process of capacity building requires realistic and measurable goal setting based on the available resources. Gujarat follows the national water policy framed by Government of India in 1987. This policy needs to be reviewed now and concepts of integrated water resources planning and management to achieve sustainability and capacity building aspects needs to be emphasized. Responding to the call of Dublin Conference (1992), water needs to be considered an economic good and its productive and scarcity value is recognized. Women are the most affected lot of the society, their role and responsibility should be appreciated appropriately. Many states including Gujarat are facing water shortage due to inter state river disputes like Narmada.The water policy revision should consider intervention of union government outside the courts. In the legal framework, the central government should pressurize the state governments to tighten the ground water abstraction rules to control the mining. Inspite of the decade efforts, the sanitation coverage has remained very low. This needs to be given priority in the revised policy. Training and HRD activities including twinning process should get priority place in the policy. The Gujarat State government has to plan the judicious use of its water resources considering the recurring scarcity and complex geo-hydrological conditions. The state policy should clarify its goal of coverage of water supply and sanitation within stipulated timelimit. An initiative is taken to form water and sanitation committees (Watsan Committee), however, they need to be given required powers through legislation. The state policy should consider the issue of gradual privatization of the services and it should play a role of facilitator rather than a provider. To encourage water conservation and reuse of water in view of the scarcity of water, the cost recovery for delivery services should be enhanced and made more effective. The groundwater abstraction rules need to be tightened as many areas in the state like Mehsana (S. Mudrakartha, 1998) have reached alarming situation.

7.2Institutional Development

The institutions are considered to be the agents of capacity building and hence institutional development is an essential ingredient of the process. Here the intention of developing institutions does not mean to add new institutions but also to consolidate existing one. It has also to be kept in mind that, there should not be too many institutes with overlapping authorities. Institutional capacity could be strengthened by bringing together all sectors of society, government agencies, research centers, user associations and communities. Various functions are to be distributed among these institutions and co-ordination is to be maintained for sustainability. We have seen in the sector assessment study that Gujarat has a good number of institutions in the sector. It has a base of dedicated NGOs. The need therefore is to make best use of them through a process of

accelerated decentralization, the concept for which is already accepted in Panchayati raj system (transferring powers to local administration.) (Kelvin Tayler et.al -1998).

The institutional development could be organized according to a particular coherent model that is composed of instruments. D.A. Okun and D.T.Lauria (1991) observed that,"capacity building is a long term and country specific process and hence, the experience with comprehensive successful model is limited. All models have advantages and disadvantages, which depend on considerable extent to local circumstances. Institutions are essentially people hence major changes may be more difficult to be implemented than a series of small modifications. Some of the prominent models currently being experimented in various countries are illustrated in Box –7.2 below.

(Box-7.2)-Models for Capacity Building

(1) Decentralization

This process involves delegation of powers and responsibilities to lower administrative level up to Local bodies and communities It implies legal change development of procedure, staff formation and their training. This process is going on in Indonesia, India, Zimbabwe and Colombia

(2) Autonomy to Organizations

It is a process of increasing autonomy and accountability of the water organizations by loosening ties with government and turning them into utilities or corporations This process can increase cost recovery and involve private partners Legal and regulatory framework need to be changed and management culture introduced This model is being implemented in China, Egypt and Argentina

(3) Deregulating water prices.

Water must be managed as an economic good Subsidies may be reviewed and productive/scarcity values of water be internalized Cost recovery may be allowed by managing organizations. This will help extend service coverage, and develop sense of responsibility and ownership among consumers Such initiative are undertaken in Egypt, Brazil and Thailand

(4) Strengthening local capacity builders.

To create local capacity, focus on capacity builders like education and training establishments and NGOs is required This process will concentrate on staff development, curricular reforms and managerial assistance Interesting example is ITN initiative of UNDP presently active in Philippines, India, Ghana and Zimbabwe

(5)Education and Training.

This process focuses on local technical and multi-disciplinary problems Introduce more stimulating and interactive methodologies, involve practitioners in teaching programmes and shift from factual knowledge to developing skills and attitude This programme is initiated in Indonesia Iran, Thailand and Mexico.

(6) Changing organizational structure

The managerial system needs to be made more effective The work procedure is to be changed to make it meet requirements of more adequate organizations Such programme is undertaken by Sri Lanka and Egypt

(Source-Alaerts, G J. and Hartvelt F.J., 1995)

In the institutional development, Resource Centers have to play an important sector-supporting role as a capacity builder. Hence we must concentrate on strengthening resource center as a tool for CB. The STREAM project, initiated by IRC the Netherlands, at the instance of the ministerial conference (Noordwijk-1994), stresses the importance of resource center, in the capacity building process and aims at providing inputs in that direction, through sharing of information, mutual support, networking and training. The sector organizations in Gujarat should take advantage of these facilities, for strengthening their resource centers. Use of IRC facilities,could also be made, which is acting as a process facilitator and information provider.

7.3 Human Resources development.

Capacity building depends upon adequate institutions, but institutions depend on human resources. In an institution, people are more important than any other infrastructure. Therefore, sound institutions along with high quality human resource are the best assurance of capacity to achieve water sector objectives. HRD is more than just a responsibility for improving the competence of staff. It involves employment practices, career structure, and professional and financial incentives. Essential elements of HRD are education and training at all levels. HRD and training have received low profile in the state. Although the state has established institutes like WALMI and GJTI, they are not having autonomy to function effectively and efficiently. Moreover they lack qualified and dedicated core faculty i.e. internal training staff.Training at all levels for technical and non technical staff will be very helpful in developing HRD.Twinning arrangements with international agencies should be established to exchange the views and get exposure to outer world. The state has good number of engineering colleges to produce graduates and post graduates, where the course curricula need orientation for the sector activities. Fresh graduates coming out from the colleges who start their carrier in the sector have very little knowledge about the sector activities. Induction training courses therefore become essential for them.

7.4 Community organizations.

Community organizations have to play an important role in water sector management. Their support at local level can provide great help in achieving sustainability of the systems. Local knowledge of the community could be harnessed through their involvement in the project. They can also provide support in the operation and maintenance of the schemes. Their involvement in the programme will create sense of responsibility and ownership. This will also increase their willingness to pay. The state should therefore increase its attention towards more involvement of the community organizations. The role of women in the sector activities assumes greater importance in view of the fact that it is they that are concerned and affected most by the adversities. Traditionally in Indian context where water supply is intermittent and house connections are not provided on a regular basis, the women are called the custodian and managers of water supply. They also play an important role in agricultural irrigation by sharing labour with men in the field. Hence capacity building at local level can not succeed without the full support of women. For involving them in the programme, they need to be made aware and encouraged through various programmes. At local level the village communities and women can be involved in the O&M programmes and made to share the responsibilities.

What the UN Secretary –General says about participation of community organizations (UN-1991)

There is a promising trend, in some countries, towards the more positive involvement of communities in the conservation and management of their natural resources and the environment This mobilization of the people, particularly women, with appropriate information support, and education and training, may offer one of the greatest opportunities for the sustainable management of those resources, and compaign to stimulate such action could give a strong impetus to the implementation of a national strategy

(Source- D A Okun and D T.Lauria –1991)

7.5 Networking.

Sharing of information, experiences, products and skills can greatly contribute to capacity building. Networking is an important mechanism to facilitate this sharing process. It acts as a catalyst in providing technical support (consultation), promoting research and stimulating information exchange. It strengthens regional, national and international linkages, and also plays an important role in decision making. These tools could also be used for effective communication and awareness purpose The strategy formulation therefore involve development and use of such facilities in more effective way. Gujarat does not have good facilities available for research, database, communication mechanism and networking. The strategy formulation should therefore consider these aspects and make best use of the existing networking facilities available world over. The Internet and the World Wide Web are the new communication tools. Their use in the exchange of lessons learned and success stories in water management must be fully harnessed. It should be used to in creating good communication, interaction, horizontal co-operation and awareness among all sectors of the society and levels.

(Box- 7.3)-Quotable quotes.

To quote from the Delft Declaration (1991):
"If we are to satisfy the acute needs of hundreds of millions of people to-day, and those of billions tomorrow, we must take a quantum leap by doing things differently and start doing them now."

To quote from the Noordwijk ministerial conference (1994):
"Many countries face a water crisis, and that to satisfy atleast the basic needs for water and sanitation, the crisis can and must be resolved. This means that we need to use our resources- people, water, and finances, more efficiently and effectively. To achieve this, change is needed, business as usual is not enough."

8. Conclusions and Recommendations

Based on this study, the following conclusions and recommendations are drawn, which can be considered at appropriate level for incorporation into the action plan for implementation.

- Fresh Water is a scarce resource for Gujarat, creating shortages at many places and times. The development programmes of the state and the life of people are adversely affected. The water resources development therefore, needs rethinking on policy priority. Some efforts are initiated, but they are halfhearted and need to be accelerated and made more effective.
- Capacity building has been recognized worldover, as an important input for efficient and effective planning and management of water resources on sustainable basis. The state needs to make commitment and accord priority to building sector capacity for its water resources as a long-term continuous programme
- The capacity building process requires water sector assessment as a first step. The water resources assessment therefore needs to be carried out as per the guidelines provided in the proceedings of Delft Symposium. (1991). Such an assessment will reveal the strengths and weaknesses of the sector and provide an idea about policy review and planning requirements.
- In view of fast depleting ground water sources, the ground water regulations need to be made more stringent encouraging recharging and reuse of wastewater. Issues like creation of a state level central water authority to co-ordinate the sector activities and concept of basin management needs urgent consideration.
- The fast growing population demands more food, necessitating more water for agricultural irrigation. The state is already facing deficit of irrigation facilities, which are not going to improve remarkably in the near future as Narmada dam is trapped in court dispute due to inter-state conflict. The state should therefore encourage, adopting by the farmers, innovative irrigation methods like dripping and sprinkling irrigation, which have proved successful in Israel and Jordan. Though, the state has provided subsidies for this programme, it has not gained momentum, presumably due to lack of awareness and enthusiasm, which need to be created.
- Adequate legislative provision appears to be available for environmental protection, however the pollution impacts on the water resources, are severe, warranting urgent need for strengthening the department and making the enforcement more stringent, to address the environmental issues properly.The concept of "polluter pays" through imposition of charges will help in encouraging water conservation and reduction of pollution
- The supply driven approach adopted by the government for water supply coverage needs reconsideration for changing to a demand driven approach making the cost recovery more effective. Though it appears difficult in the present climate, through

political and public awareness and understanding a beginning has to be made. Also the government should gradually change its role from a provider to a facilitator.

- The sanitation coverage in the state is in a very dismal condition,(only 10% so far) resulting into spread of water borne diseases and unhygienic conditions. Priority has to be accorded to the sanitation programme both in rural and urban areas.
- The sewerage coverage has also to be increased through increased resources. The awareness campaign will help boost up the programme.
- The water quality monitoring system is also not adequate and regular resulting into poor quality of water and subsequent consequences. The monitoring network of the water quality should be enlarged and made effective. Support of NGOs and science/engineering colleges could be sought in this aspect
- Need for establishing research facilities to address to local problem solving and a sound databank are experienced badly.
- The process of decentralization has been initiated through the constitutional amendments, but the process needs to be accelerated to empower the local level institutions to make their own decisions, considering local circumstances.
- Operation and maintenance of the systems created is not satisfactory, which defeats the purpose of programme. More attention is required be given to this issue. Help of communities can be taken for this aspect.
- Gujarat has a good base of NGOs, working in the sector. These organizations need to be given more support and encouragement. The role and responsibilities between them should be defined clearly.
- Women has a special role to play in the sector activities, which should be recognized and they should be involved in the sector activities especially in decision making process.
- The role of private sector for service improvement, with provision of accountability is required to be considered and initiated.
- The capacity building process includes creation of a good cadre of senior managers and decision-makers that are competent and well trained and committed. This needs a sound training and manpower development programme for technical and nontechnical staff at all levels. The state has got some training institutions but they lack autonomy and core faculty, which needs to be provided on priority basis. Some more regional / district level training centers are also required to be created.
- The universities have to play an important role of training the next generation of water professionals properly. They should be mobilized and provided necessary support to meet with the demands The education curriclla could be modified to give orientation towards sector activities.
- More emphasis needs to be given to attitude change of professionals and behavior change of people. The people should be educated to recognize the value of water and conserve it and pay for it. They should also demand better services and quality.

Recommendations

Following recommendations are made to develop the capacity building programme within water sector of Gujarat State to improve performance and achieve targeted goals of water and environmental sanitation on sustainable basis.

- Review the national water policy to incorporate the recent trends regarding, integrated water resources management, capacity building concept and economic value of water for sustainable sector management.

- Introduce river basin development and watershed management approaches for better utilization of the resources.
- Provide for resolution of interstate water conflicts like Narmada River, outside the courts, to avoid delays in harnessing the benefits.
- Establish centralized State water authority for budgeting and equitable allocation of water resources.
- Prevent over exploitation of ground water through reviewing and tightening ground water abstraction regulations and better control mechanism.
- Accelerate the water harvesting and recharging programmes to increase the water storage and use. Popularize the innovative irrigation techniques like drip and sprinkler irrigation to save water.
- Review the environmental protection acts to plug loopholes and make them more stringent for effective control. Also reorganize and strengthen the present law-implementing department. Adopting the "polluter pays" principle will help to exercise better control the industrial pollution and encourage wastewater reuse and recycling.
- Review the present supply driven approach to introduce gradually the demand driven approach, by changing the role of the government from that of a provider to a facilitator.
- Various management options including the introduction of privatization, in the project implementation and delivery service systems for better performance should be considered.
- Decentralize the administration to strengthen local level organizations for managing local level issues.Involve community organizations and NGOs in managing local affairs, especially operation and maintenance of irrigation, water supply and sanitation schemes.Adept gender sensitive approaches and increases women participation in the sector activities
- Strengthen the sector organizations through human resource development at all levels. Give priority to HRD and training activities and allowing them functional autonomy for better performance. Twinning facilities with peer organizations for exchange of ideas and experiences are recommended.
- Enhance research and development activities and database through making best use of network facilities available to increase knowledge, information and communication. Also share ideas and experiences by taking benefit of STREAM project for strengthening resource centers.

References

1 Alaerts, G.J., Blair, T.L., and Hartvelt, F.J. (1991) "A Strategy for water sector capacity building", IHE, Delft, The Netherlands

2 Alaerts, G.J., and Hartvelt, F.J., (1995) "Capacity building for the water sector", proceedings of a workshop on "A strategy for water sector capacity building in Palestine" pp. 25-46.

3 Bastemeijer, t., (1999) "Capacity building and the role of Resource centres in the water and sanitation sector", workshop paper , IRC Delft, the Netherlands.

4 Biswas, A.K., (1978) United Nations water conference: summary and main documents. Pergamon press, Oxford.

5 Biswas, A.K., Hartvelt, F.J., and Quiroj, C.T., (1996) (Eds) International Journal Of Water Resources Development, vol-12, no-4, Carfax publishing co. UK.

6 Govt. of Gujarat,(1997), Ninth five year plan (1997-2002) for water supply and sanitation sector. Gandhinagar, Gujarat, India.

7 Govt. of Gujarat, (1998) Gujarat Infrastructure Development Agenda (Vision-2010), General Administration Department, Gandhinagar, Gujarat, India.

8 Govt. of India,(1994), National HRD Programme for Rural Water Supply and Sanitation sector-A project profile, Ministry of Rural Development, New Delhi,India.

9 Hartvelt, F., (1996), Capacity building programme for sustainable water sector development, Water Resources Development Journal. Vol-12, no-4, pp407-411, Carfax Publishing Co. UK.

10 Hukka, J.J. (1998) "Institutions, Organizations, and viable water services: A capacity development model for drinking water provision and production, Tempere University, Finland.

11 IHE (1995), A strategy for water sectors capacity building in Palestine. Proceedings of symposium. Delft, the Netherlands.

12 IHE (1999), International Network for water sector capacity building (CAPNET), concept paper, Delft, the Netherlands.

13 IRC (1995), Water and Sanitation for All- A world priority, 3. No more business as usual. Govt. of Netherlands, The Hague, the Netherlands.

14 Kelvin, T., Ineke, v. H., Archana, p. (1996) Human Resource Development in the water supply and sanitation sector in India, Final report, Department for International Development (UK), New Delhi, India.

15 Maria, L.B. (1999) Networking to serve Resource centres. A discussion paper workshop on Resource centre development. IRC, Delft, the Netherlands

16 Mandy, M., Ellen, S., and Iree, D., (1997)" Gender and organizational change-Bridging the gap between policy and practice. Royal Tropical Institute, Amsterdam, the Netherlands.

17 Netherlands Govt. (1997) "Water for the future": Integrated Water Resources Management, Policy priorities for Netherlands Development Assistance.The Hague, the Netherlands.

18 Okun, D.A., and Lauria, D.T., (1991) "Capacity building for water resources management", An international initiative for the 1990s. UNDP New York, USA.

19 Patel, V. B. ,(1992) (Editor) "Proceedings of seminar on," Irrigation water management ,"Water management forum, Ahmedabad, India.

20 Parmar, B.J., (19998) "Irrigation growth and perspective in Gujarat", Govt. of Gujarat, Gandhinagar, Gujarat, India.

21 Sally, S.R., and Bastemeijer, T. (1999) Resource centre development- Processes and Experiences. Challenges to Resource Centres in their role as capacity builders. (STREAM project) paper for workshop on Resource centre development. IRC, the Netherlands.

22 Srinivas, M. (1999) "Status and policy framework of ground water in India," VIKSAT, Nehru Foundation for development, Ahmedabad, India.

23 Tahal Consulting Engineers, Israel, (1997) "Water Resources Planning for the State of Gujarat. Final Report. Govt. of Gujarat, Gandhinagar, India.

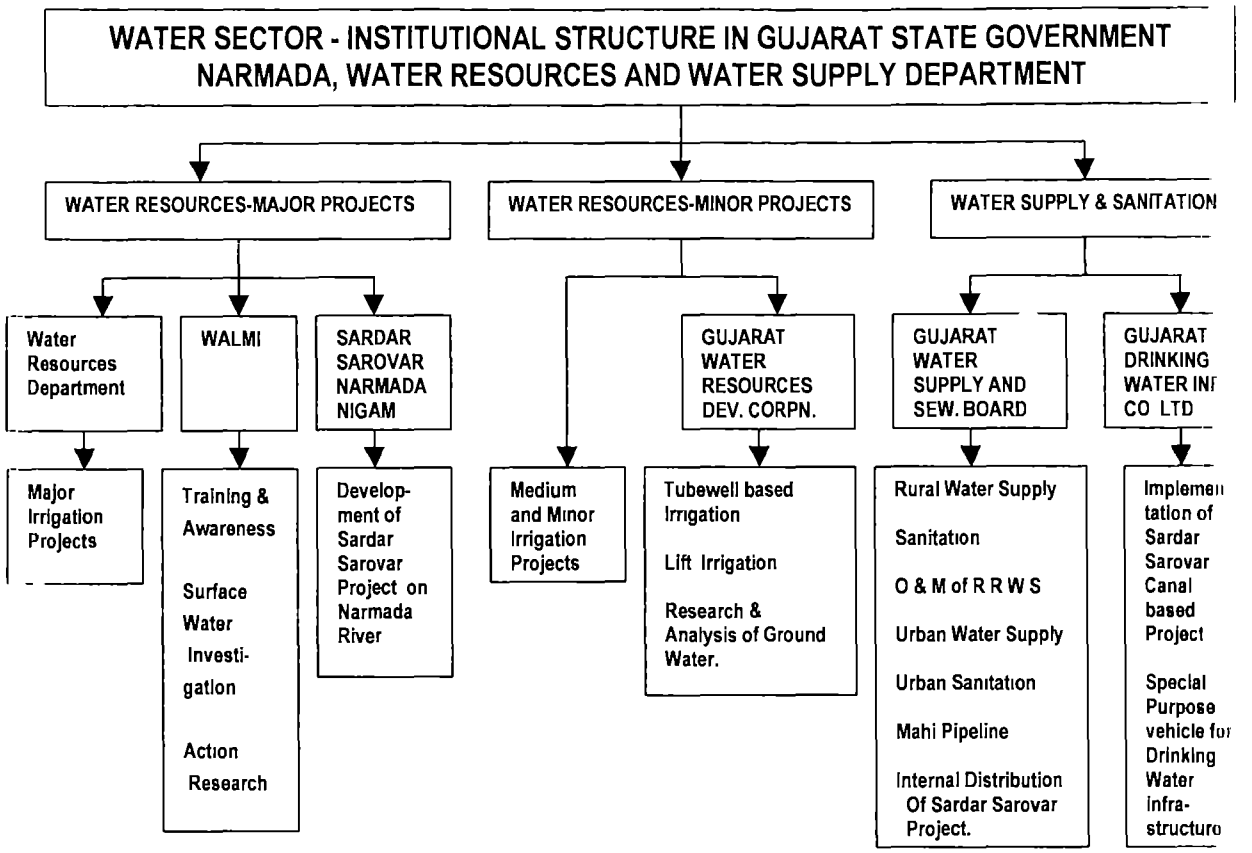
24 Vision 21:Gujarat, (19990, Minutes of the meeting of Ahmedabad NGOs. National Institute of Design, Ahmedabad, India.

25 The World Bank, (1993) Policy paper on Water Resources Management, The World Bank. Washington D.C., USA.

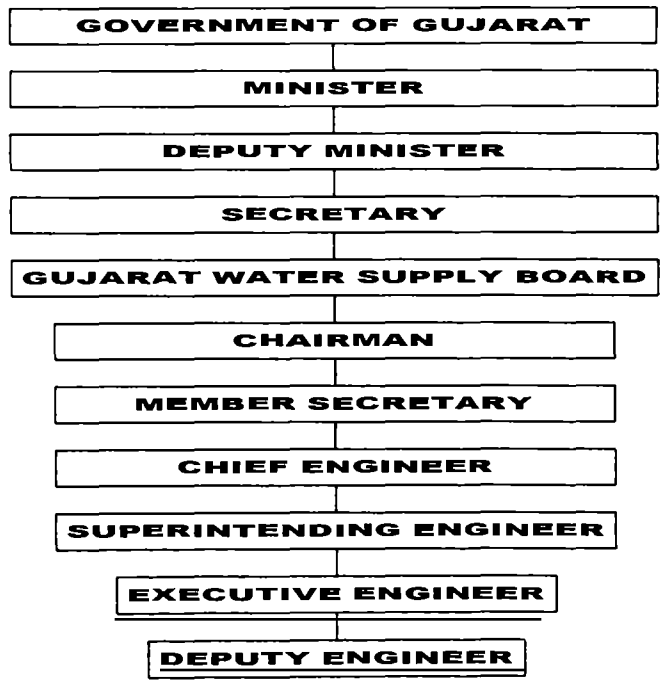
Annexure- I

Table-6.1 Water Resources of Gujarat State

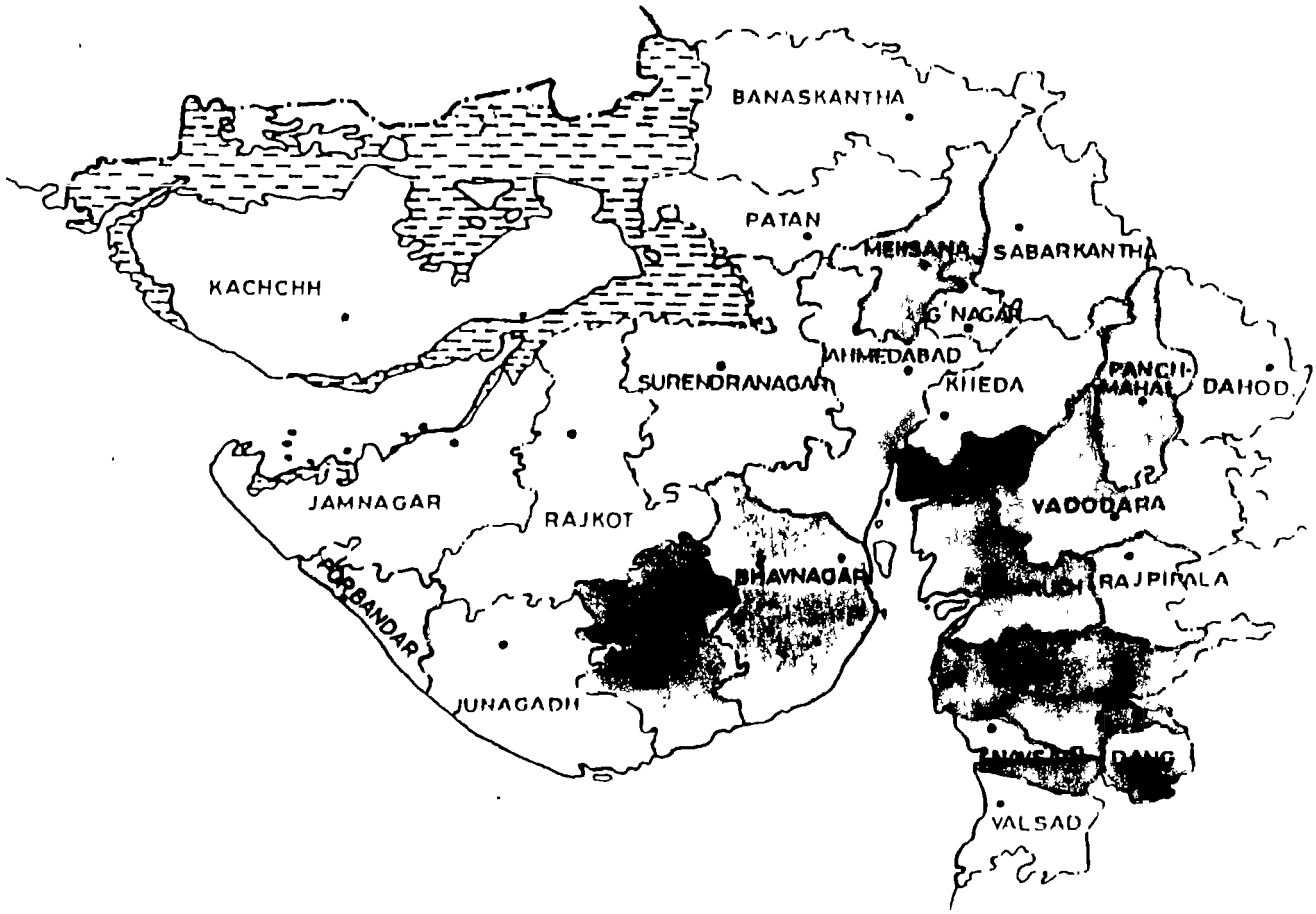
1	Total Land Area	196000 Km^2
2	Rainfall – Average	800 mm
	Range	400 to 2000 mm
3	Climate	Tropical- sub humid to arid
		Temperature 10 ^{0} C to 46 ^{0} C
4	Available surface water	42,400 million m^3
5	Utilizable surface water	31,500 million m^3
6	Available ground water	19,170 million m^3
7	Utilizable ground water	12,280 million m^3
8	Resources developed up to 1998	28,000 million m^3
9	Total irrigable land	12 million ha (65% of the state)
10	Ultimate irrigation potential	6.9 million ha (52% of the land)
11	Irrigation potential created (1996)	16.6 million ha.
	Utilized potential	2.9 million ha.
12	Domestic & industrial need (Present)	1.5 billion m^3
	Present deficit	0.6 billion m^3



STRUCTURE OF WATER SUPPLY DEPARTMENT



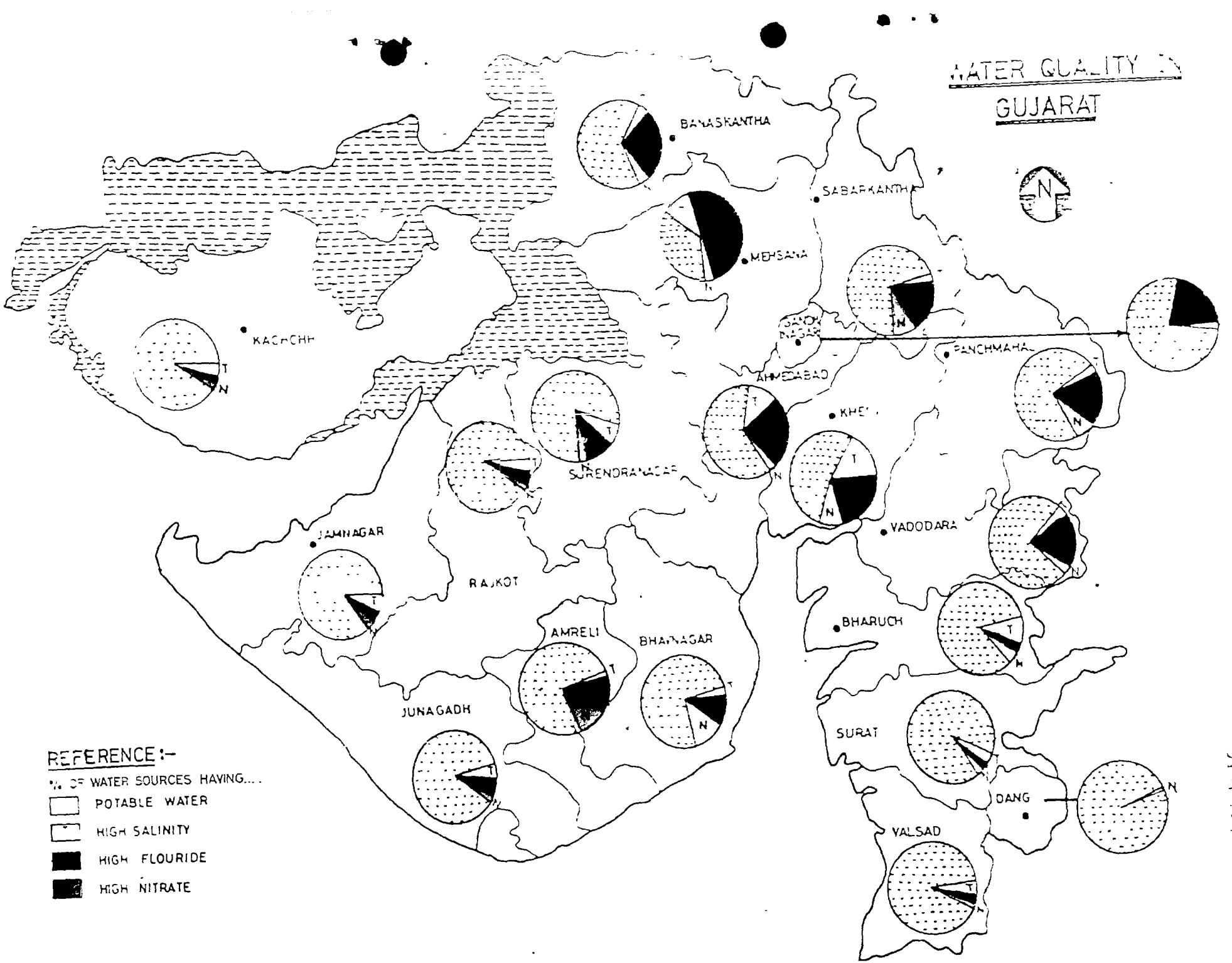
ADMINISTRATIVE MAP OF GUJARAT



LEGEND

—·—·— District boundary

• District H.Q.


WATER QUALITY
GUJARAT
BANASKANTHA
SABARKANTHA
MEHSANA
KACHCHH
PANCHMAHAL
AHMEDABAD
SURENDRANAGAR
JAMNAGAR
RAJKOT
VADODARA
BHARUCH
AMRELI
BHAVNAGAR
JUNAGADH
SURAT
DANG
VALSAD
REFERENCE :-
% OF WATER SOURCES HAVING....
POTABLE WATER
HIGH SALINITY
HIGH FLOURIDE
HIGH NITRATE