CHAPTER --- IX

Inference & Recommendation

9.1 Inference

The presented study on water resources and the existing management practice in three districts of South Gujarat – Valsad, Navsari and Dang through preceding chapters point to the following facts:

(A) Geographically the region comprises a blend of terrain conditions namely,

(i) Eastern hilly terrain;

(ii) Central alluvial plains and

(iii) Western coastal plains. These contrasting areas are characterized by their own geologically divers conditions having bearing over water resources potential, occurrence and distribution.

(B) The precipitation being only source replenishing the annual change in water resources is fairly high and has a potential to match the present demand and the future as well. However, its erratic pattern and adverse geomorphologic conditions especially in eastern hilly area (Dang); lack of efficient water management practices, major volume of the received rainfall input contributes to stream run-off.

(C) The water use that may be for domestic, irrigation and industrial needs owing to age-old and traditionally adopted practices as well as people’s mind set of grossly devaluing the importance of water resources it has been overused. This has created a situation of overexploitation, waste generation and quality deterioration.

(D) Globally water has been considered to be “The Common Property Resource”. In spite of this fact the exploitation and utilization of water resources are governed by individual country’s/state’s levels legislations. The lack of any efficient legislations for this and spirit of
implementation on the existing norms; water resources have been over-used causing stress to the authorities in matching with the sector demands. The study areas has not remained exceptional from this fact.

(E) Drinking and domestic needs of the inhabited people in the three districts show diverse situations. In the Dang district although quality of the groundwater is excellent. However, the district being hilly in spite of receiving more than 3000mm/yr rainfall witnesses acute shortage during summer season. This is due to steep slopes causing large run-off and sub-surface run-off of groundwater. Resultantly, there is an increase in lead and lift of collecting water causing much hardship to the people especially the women.

In the Valsad and Navsari districts which are represented by hilly and plain regions. The situation in hilly region remains same as that of Dang. However, alluvium plains are bestowed with ample resources both surface and groundwater but the quality tends to deteriorates as sea water intrusion. The large concentration of population, fertile agricultural land and heavy industrialization has remained important factors in polluting the water resources.

(F) The alluvium and coastal plain regions in the study area has well covered by canal irrigation. Generation of Cash Crops and traditional flood irrigation practice has led to the problem of water logging causing degradation inland, soil and water quality that has ultimately affected the socio-economic condition of the farmers’ community.

(G) Large scale industrialization with the predominance of chemical industries in the study area has apart from creating pollution in surface and groundwater resources; the over exploitation of groundwater to subset industrial and agricultural demands has led to lowering of water table as well as groundwater pollution due to sea water intrusion in the coastal aquifers.
(H) Awareness and knowledge about the importance of water resources, utilization, conservation, replenishment/harvesting fronts are barely restricted to a handful percentile of the people in the study area. Therefore, water is over-used without any significant implementation of the concepts of recycle and reuse.

(I) The existing management system of water resources, particularly in Urban, Semi-urban, industrial and agricultural sectors are governed by state or people authorities. Lack of regular maintenance, quality concerns inadequate and tariffs changed against the supplied quantity, subsides as tax holidays or community specific have further worsen the situation on the fronts of water resources management.

9.2. Recommendation

(1) Water is the most valuable resource. There are no serious efforts to gain water by practices like rainwater harvesting, watershed management and surface storage. Rainwater harvesting should be made mandatory. Sequential water use (reuse, recovery and recycling of waste waters) should be planned wherever possible so that the load on fresh water resources can be reduced. Water’s presence in agro-ecosystems should be treated on a holistic approach, and by employing scientific management tools, it should be judiciously used. For agriculture, an integrated water management practice consisting of three main components – rain water harvesting, water-saving micro-irrigation, and highly efficient crop production should be adopted. Conservation of water should be taken as a way of life and widely adopted.

(2) In the study area, it has been eluded that the amount of rainfall is fairly good but the geographical condition of some areas is the main cause of water scarcity. Due to steep gradient in Dang district water flows out as a runoff and therefore problem of water scarcity. The same problem also persist in the Dharampur and Kaprada talukas of Valsad district and Vansda taluka of Navsari district. Many check dams have been
constructed in Dang to store the rain water, more number of check dams to conserve the water which flows out as a runoff. Conserving the water through roof top water harvesting is the most suitable method in all the areas facing water scarcity.

(3) Harvested rainwater if recharged into the ground than the problem of depletion of underground water can be minimized greatly. This method can be very beneficial to the coastal areas of Valsad and Navsari districts, where the people are facing water scarcity due to lack of any water harvesting methods as the water flows away into the sea. The technology to effectively utilize rain and river water through advanced groundwater recharging technique is the best possible method which will channelize the rain water as well as flood water as a groundwater reserve and can exercise control over the problem of sea water intrusion.

(4) The urban areas in all the three districts of study area and also rural sectors where people are supplied with water through bore wells should also effectively adopt the method of artificial recharge of groundwater through roof top water harvesting. Artificial recharge to groundwater system if properly implemented then it is the most suitable method for all of the three districts falling in the study area.

(5) There is need for rainfall & runoff harvesting therefore, more check dams should be constructed with the help of local authorities and government. In case of implementing the groundwater recharging method or any other method in which water will flow through surface and then get collected, provision for filtration technique should be made to provide potable water to the people.

(6) Other recommendations are as follows:

- The community taps which are provided by the municipality should be stopped and instead taps should be provided in each house at low rate. Through this step the wastage of water by open taps in public places will be resolved on a great extent. Meters should be fixed for the usage
of water same as those are fixed for electricity usage which will further stop the people from wasting of water in their own houses too.

- Water pricing should be made at par with the incurred resource cost with the inbuilt provision for penalty to the people for wasting of water. This will further stop the wastage of water.
- There should be appropriate legislation and frame work of guidelines for exploitation of water resources from the existing surface and groundwater structures, permission for digging of new dug/bore wells.
- Essential scientific and technical knowledge should be provided by the local bodies of the government for recharging the wells and bore wells through roof top water harvesting and should be made mandatory for existing households and upcoming new building structures.
- Strict rules should be made for the proper maintenance of environment before permitting the new construction of any of the new societies, malls and so on adopting the concept of “Green Environment.”
- Water management system like revival of ponds and dug wells should be encouraged.
- Small ponds like (khet talavdi) should be constructed near the houses on available open places in rural as well as urban areas. This would minimize the stress on groundwater resources.
- People should be made aware about every aspect of global water scarce scenario through water education and awareness program and encouraged to adopt water harvesting methods.
- Water related topics should be included the syllabus of the students from primary to post graduation level of studies.
- Responsible water behavior should be promoted through communication and street plays, awards and public felicitation.
- Cognitive approaches should be adopted for creation of awareness on health hazards.
- National and international course programs in water management should be included by the government at university level.
- Farmers should be informally educated on the various aspects of groundwater management and important water conservation techniques like drip irrigation.
- Participation of the civil society has to be made as a key element in designing, planning and implementing remedial strategies.
- Scientific research has to be emphasized to reduce uncertainty with due consideration to local conditions.
- Silting is the major problem faced wherever the check dams are constructed therefore desilting and maintenance be carried out on regular basis.
- The management approach should be based on “People Centered Decentralized system,” particularly in rural sector.
- The Urban and industrial sector where water management invariably involves large capital in creating infrastructure for water resource accumulation, distribution and maintenance.
- Therefore, like other development programs water resource development and management should be managed through Private-Public Partnership. This would facilitate in bringing efficiency the system and removed the existing ill-effects.
- The below depicted scheming diagram (Fig. 9.1) display an ideal framework of water resources management, encompassing ethics and responsibilities of the various stake holders.

![Plan for action diagram](image-url)

**Fig.9.1 Plan for action.**
9.3 Concluding Remark

The researcher’s endeavored through this study has been given an insight on the broad aspects of water resources in the districts of Valsad, Navsari and Dang. Topic is more scientific as well as technically, induced and intensive field oriented. There have been numerous limitations for the candidate to derive in-depth and refined conclusions on the said topic. However, his efforts designed questionnaires and available secondary data, researcher could able to come out with a broad scenario on existing status of water resources; awareness of the different water users in the study area about water conservation and harvesting techniques; and prevailing state of water resource management.

Researcher is quite confident that through this study he could able to create a base for other researchers who are aspiring to study similar aspects may be for other regions or the present.

The study area has still potential to study and work out following in-depth aspects:

1. Quantitative assessment of available water resources and the sector demand on annual basis. (Water Balance Study).

2. Mechanism for management of water resources especially in urban and industrial sectors.

3. Water pricing issues and solutions.

4. Resource conservation through use, reuse and recycle.