

Water Resources Management

VENUGOPAL K

Chief Scientist, Centre for Water Research
Sathyabama University, Chennai, India

Abstract

The ceaseless rise in human population associated with increased urbanization, improvement in standard of living, industrialization, and intense agricultural activities place ever increasing demand for water. Water availability varies spatially and temporally. If the water available is in plenty, far exceeding the demand the flood situation is encountered which warrants strategies for control of water for minimizing the losses, both lives and property. On the other hand, if the water availability is too small, far less than the demand, then the area is drought affected which needs strategies for better utilization of the available water. If the available water on an average is less than the demand, then there is need for water conservation measures for improving the water availability and utilization strategies for making the best use of available water. In essence, the challenge to water resource engineers is to develop strategies for water utilization, conservation and control through scientific approach.

The allocation of available water resources among the beneficiaries namely countries/ states/ districts/ farmers and among purposes namely municipal, industrial, irrigation, power generation etc. both in space and time brings in conflicts at different levels. Resolving conflicts by providing compromising solution through scientific approach becomes yet another and important task of water resources engineers. The process of scientific allocation of water resources and methodologies for water conservation, control and utilization apart from being technical has economic and socio-political dimension. The scientists and engineers are responsible to provide the feasible alternatives and consequences of each of this alternative so as to enable the decision makers to choose the one which suits to their expectation and policy framework.

Key words: Water Policy, Water Bodies, Ground Water, Hydro Power, Pollution

I. NATIONAL WATER POLICY

In India, water resources being a state subject, the government of India has brought out National water policy, 1987 and subsequently National water policy 2002 for providing guidelines to the states for water resources development and management. The strategies for water resources development in different states are in large variance. This in essence means that some states are developing plans for utilizing their water resources, where as certain other states have utilized the available water resources almost fully. The country is facing flooding problem in one region and drought scenario in another region concurrently. Tamil Nadu state has also formulated Tamil Nadu State Water Policy, 1994 and is being currently revised.

II. CONSERVATION OF WATER BODIES

The reservoir storages created across the country are getting silted up and reducing in their capacity to store water. This is due to heavy inflow of silt brought by the rivers and the government of India started quantifying the loss of storage through construction of elevation capacity

water spread area curves using remote sensing and GIS technology.

Identifying the reservoirs wherein the loss of storage is high and developing strategies to reduce the sediment inflow becomes high priority area. Adequate steps needs to be taken to demarcate areas prone for soil erosion and adopt suitable strategies to reduce soil erosion. Tamil Nadu state has passed water bodies preservation act to protect the water bodies specially tanks that are spread all over the state. The record indicates that there are 39,202 tanks in Tamil Nadu. The tanks that are existing as on date needs to be assessed in order to effectively implement the act.

III. GROUNDWATER STORAGE

The groundwater storage are getting depleted due to abstraction and central groundwater board has carried out a study covering the whole country and identified blocks where there is over exploitation of groundwater, where the extraction is above 85% with declining groundwater levels as dark blocks, as per the Groundwater Estimation Committee, 1984 methodology. The Groundwater

Estimation Committee, 1997 has stipulated watershed as a unit instead of blocks for categorization as Black, Gray and White areas. In order to increase the recharge to groundwater aquifers, government of India has prepared a master plan for artificial recharge and roof top rainwater harvesting structures. A few states have taken up artificial recharge as an important task and the state of Tamil Nadu has taken the lead to have the roof top rainwater harvesting mandatory. Tamil Nadu is the first state to prepare a map indicating the favourable zones for artificial recharge covering the whole state.

In spite of all these efforts, there is continuous decline in the groundwater level. There needs to be a mechanism to identify critical areas and initiate actions to make the area sustainable. There is urgent need to map the groundwater aquifers and estimate its potential and monitor them continuously for timely abstraction.

IV. EFFICIENCY OF WATER USE

Irrigation sector alone consumes around 83% of the water resources that is developed. The irrigation systems operate with efficiencies of the order of 30%--40%. There is urgent need to take initiatives to improve the efficiency of irrigation system. An improvement of about 5 % will mean that the entire municipal demand of the country can be met from the savings alone. This is to highlight the importance and the need to take up this in war footing.

V. HYDROPOWER DEVELOPMENT

There is vast potential for development of hydropower. With the advancement in transmission technology and power system engineering the development of hydropower potential which is using renewable resource is under active consideration of Government of India. This also can provide support to meet peak power requirements with ease.

VI. GROUNDWATER POLLUTION

The problem of pollution by dumping municipal wastes and industrial effluents is on the rise in spite of the fact that they are being monitored. The aquifers damaged are increasing in its aerial extent. The dumping solid wastes need to be more scientific starting from identification of locations to monitoring the effect continuously. The study of movement of pollutants through groundwater is more challenging as it requires quantitative modeling of groundwater first which itself is a challenge. There is urgent need to develop and adopt strategies to keep the groundwater quality deterioration under check by continuous monitoring. The other aspect of groundwater pollution is salt water intrusion in the coastal aquifers which again requires detailed investigation for effective control of ingress of sea water.

VII. INTERSTATE WATER DISPUTES

Interstate water disputes are on the rise and the earlier cases referred to the tribunals constituted were taking more than a decade to give the award. This essentially brought to stand still the water resources development process itself. The government of India has taken note and is in the process of improving the system of addressing the conflict resolution. There is urgent need to bring out guidelines for sharing waters by the party states and to settle the disputes much faster as otherwise there will be undue delay in the development process.

VIII. INTERLINKING OF RIVERS

The government of India has initiated the process of interlinking of rivers as per the recommendations of National water development agency and trying hard to convene the states concerned in a fully consultative manner to make them a partner in the interlinking of river project. It is natural that a state with abundant water resources looks for its utilization in the future and is reluctant to share the resource as it becomes a commitment. On the other hand, the state in need of water are pressurizing for interlinking. As such it is the government of India's commitment to take up this venture for the development of the country.

IX. PRESENT CHALLENGES

The challenges in water resources development and management are many. A few of them are specified below.

1. The water resource database is available with the states as well as with Government of India. The database needs to be made transparent and should be shared freely. Unless this is done the country may not be able to assure that the development process is the best and there is likelihood of vested interest impinging on the development strategies.
2. The methodology adopted for estimating the water availability for planning and operation of water resource systems needs refinement.
3. There is need for adopting scientific approach for deciding the release from storage or decide the extent of storage in a reservoir or to divert water for utilization. The question is

❖ Where?	Store/ release/ divert
❖ When?	Store/ release/ divert, and
❖ How much?	Store/ release/ divert

This is a challenge if only one thinks of getting the best from the present system. This requires development of models to be followed by economic

analysis and social acceptability.

4. Basin planning approach, public participation are being talked about and initiated. There is a long way to go. It has to be pursued strongly otherwise they may not see the light of the day in the near future.
5. Use of advanced technology namely remote sensing and GIS can be effectively used for irrigation system operation, flood damage assessment and drought prone area identification and so on. There is basic need for a base map being made available which can trigger lot of developmental activities for future.
6. There are number of educational institutions in the country offering post graduate and research degrees in the field of water resources and as it stands the co-ordination between the departments and the educational institutions both at the Government of India level as well as at the state Government level is

insignificant. This interaction will enable free flow of data to the institutions which possess the knowledge of latest trends in the discipline. This enables the scientific community to analyze and understand the possible alternatives and the consequences of each of the alternatives, which will be helpful to the department and decision makers for taking better decisions.

X. CONCLUSION

The above description indicates that we have to go a long way in handling the discipline of water resources engineering and we look forward to have the consortium of experts from connected disciplines to join hands with the organizations responsible for water resources development to develop strategies to be placed before the decision makers for enabling them to make informed decisions.