

RESERVOIR MANAGEMENT

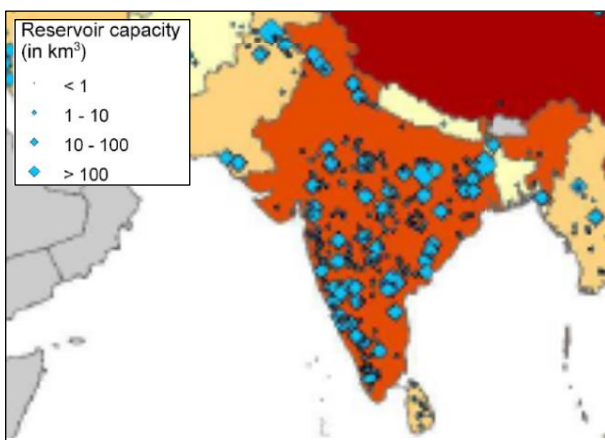


An Approach to Cost Efficient and Sustainable Use of Water Reservoirs.

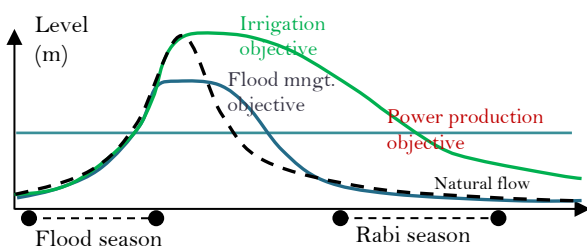
Managing water in rivers, canals etc. with dams, barrages and water reservoirs is widely used for single or multiple purposes such as irrigation, flood management, water shed erosion control, hydropower production, domestic and industrial water supply, mining, inland navigation, fishery, tourism etc.

Reservoir objectives

India ranks third globally with more than 5,000 large dams. In addition, there are thousands of smaller dams and run-of-river schemes.



Three main purposes dominate: Irrigation, hydro electric power (HEP), and flood control. The illustration below shows that the optimum reservoir level differs significantly depending on purpose. Thus, there is big scope for optimisation.



Summary

Clients

- Irrigation and Water Supply Departments
- Hydroelectric Companies
- Utilities
- Private industries
- Contractors

Challenge

- Water management optimisation
- Climate change implies design update
- Pollution
- Siltation and erosion
- Dam break risks

Solutions

- Monitoring of inflow, levels and outflow
- Forecast of floods, drought, pollution
- Dashboards and real-time control
- Rule curve (operation) optimisation
- Hydraulic design optimisation
- Environmental impact assessment
- Surveys and dam break analyses
- Dissemination of operation to multiple stakeholders

Value

- Data for taking the right decisions, can increase HEP power production, irrigation potential, flood storage volume capacity.
- Adverse impact of climate change, droughts, floods, and natural disasters can be mitigated in a timely manner and enhance sustainability.
- Generation of new sources of revenue by combining multiple purposes of reservoir operation.

Data Strategy

E&S helps in devising a cost-efficient data capture strategy adapted to the specific objectives such as design update, operation and maintenance, regulative compliance etc.

- **Type:** Water level, rainfall, discharge, concentration of suspended sediment, bed load, vegetation cover, vertical profiles of velocity, concentration, temperature etc.
- **Location:** Upper catchment, check dams, incoming rivers, reservoir, penstock, tail race, intakes, bypass channel, downstream river, stationary, mobile, temporary or permanent gauging stations
- **Timing:** Regularly scheduled (say 10 minutes for rainfall, hourly, daily, weekly, monthly) or Occasional (once, or triggered by events, e.g. flood event)
- **Mode:** Gauging stations, IoT instruments, survey boats, buoys, underwater drones, UAV drones, temporary installed stations, forecasts or monitored data from 3rd party (e.g. weather stations)
- **Accessibility:** Online real-time, or offline, remote sensing (satellites), mobile apps



Data Management and Analytics

E&S offers various solutions, either on client's own data servers or hosted solutions (cloud-servers)

Static Data – GIS database, data integration, and geo spatial analyses.

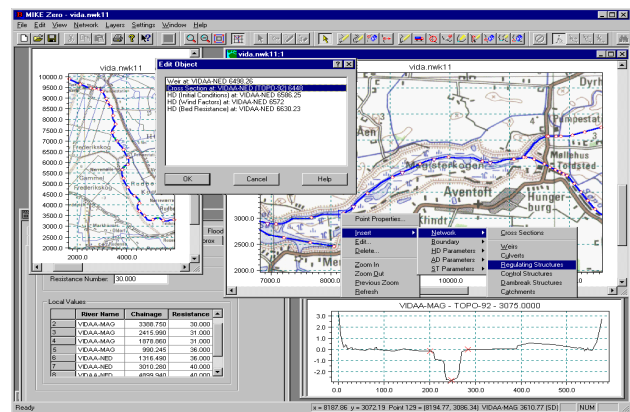
Realtime Data – Filtering, quality assurance, gap filling, alarms and triggers

Mobile Data – Use of apps in mobile phones as additional source of real-time data

Decision Making and Design

Using state-of-art tools available in the market, E&S provides

- **Modelling studies** with 1D, 2D or 3D mathematical models or AI artificial intelligence algorithms
- **Conversion of model results** to “software sensors” and dynamic setpoint generator
- **Configuration** of real-time monitoring dashboards – for central control rooms and/or mobile devices
- **Hydraulic design** studies for rule curve optimisation, sediment management, water release strategies, dam break mitigation plans, flood management options etc.



Business Model

- **Project** for surveys, remote sensing studies, GIS analyses, dam break analyses, flood mapping, rule curve optimisation etc.
- **System Setup** of monitoring network with sensors, data transmission, central command and control room, cloud server application, etc.
- **AMC** annual maintenance contract in operating and maintaining data monitoring, management, and control centre.