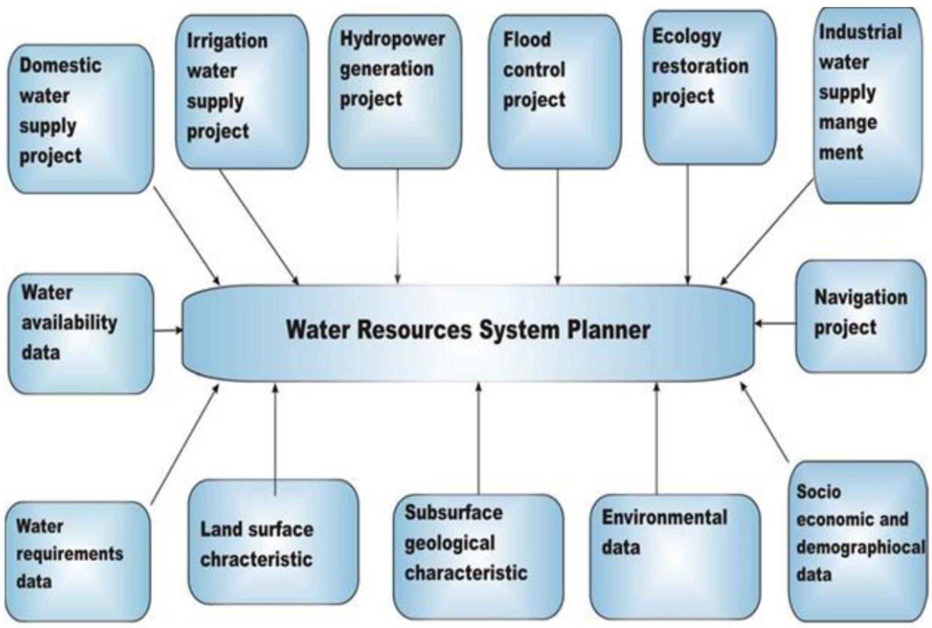
PLANNING AND ASSESSMENT DATA FOR PROJECT

A water resources systems planner is faced with the challenge of conceptualizing a project to meet the specific needs at a minimum cost. For a demand intensive project, the size of the project is limited by the availability of water. The planner then has to choose amongst the alternatives and determine the optimum scale of the project. If it is a multi-purpose project, an allocation of costs has to be made to those who benefit from the project. An important aspect of planning is that it has to prepare for a future date – its effects in terms of physical quantities and costs over a period of time spanning the useful life of project has to be evaluated. The return expected over the project period has to be calculated.

All this requires broader decisions, which affect the design details of the project. This chapter looks into the different aspects of preparing a project plan likely to face a water resources system planner, including the basic assessment of data that is primary to any project plan formulation.

Meeting the challenges

The major projects which water resources systems planner has to conceptualize are shown in Figure 1. Although the figure shows each project to be separate entity, quite a few real projects may actually serve more than one purpose. For example, the Hirakud or the Bhakra dams cater to flood control, irrigation and hydropower generation. On the other hand more than one project is necessary (and which actually forms a system of projects) to achieve a specific purpose.



Possible water resources projects requiring planning and necessary data requirement

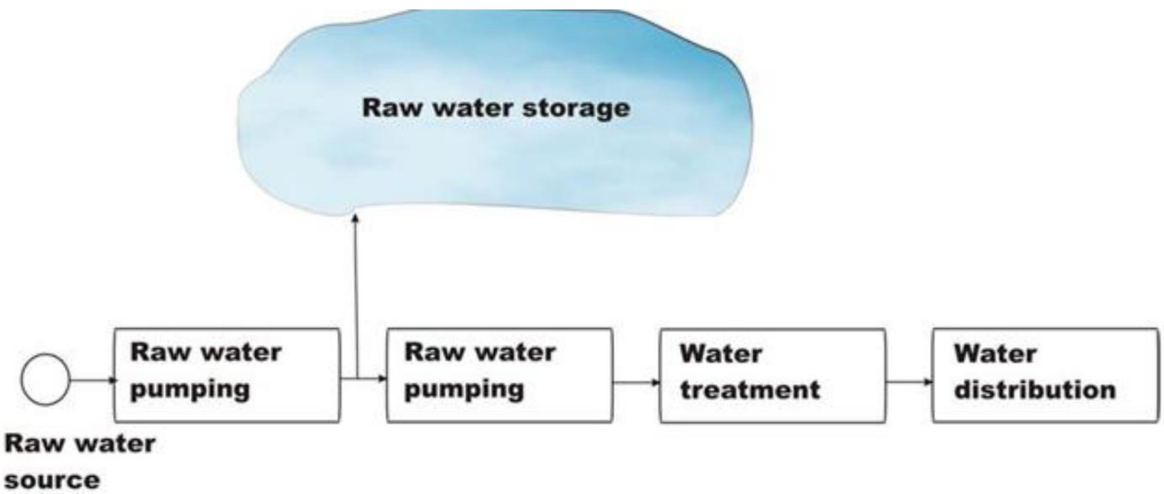
Project planning for domestic water supply

The project for supplying drinking water to a township would usually consist of a network of pipelines to reach the demand area. The source of water could be underground or from a surface water body, usually a river. At times, it could be a judicious combination of the two. A water resources systems planner has to design the whole system from the source up to the distribution network. However, the scope of water resources engineering is generally be limited to the intake system design. The storage of water, its treatment and finally distribution to the consumers are looked after by the authorities of the township. Further details may be obtained in a course on Water and Waste Water Engineering.

Typical intake systems could possibly be one of the following, depending and the convenience of planning.

1. Construction of a water intake plant directly from the river
2. Construction of a dam across a river and drawing water from the reservoir behind.
3. Construction of a barrage across a river and drawing water from the pool behind
4. Construction of infiltration wells near a river to draw riverbed ground water
5. Construction of deep wells to draw water from lower strata of ground water

A simple line sketch is shown in Figure 2 to show the processes for intake, storage, treatment and distribution of a typical drinking water project.



A line diagram for intake, storage, treatment and distribution of a typical drinking water project

Data requirement for domestic water supply project

The following data is required for planning and designing a typical water supply system.

Demand of water

Rural water supply:

• 40 litres per capita per day or one hand pump 250 persons within walking distance of 1.6 km or elevation difference of 100m in hills

• 30 lpcd additional for cattle in desert development programmed areas

Urban water supply:

• 40 lpcd where only sources are available

• 70 lpcd where piped water supply is available but no sewerage system

• 125 lpcd where piped water supply and sewerage system are both available.

• 150 lpcd for main cities

• Additional water for other demands like commercial, institutional, firefighting, gardening, etc.

Since the water supply project would serve a future population, a realistic projection has to be made based on scientific projection methods like

• Arithmetic increase method.

• Geometric increase method.

• Incremental increase method.

Water supply projects, under normal circumstances, may be designed for a period of thirty years. This period may be modified in regard to certain components of the project, depending upon:

• The useful life of the component facility

• Ease in carrying out extensions, when required.

• Rate of interest.

Availability of water and other data

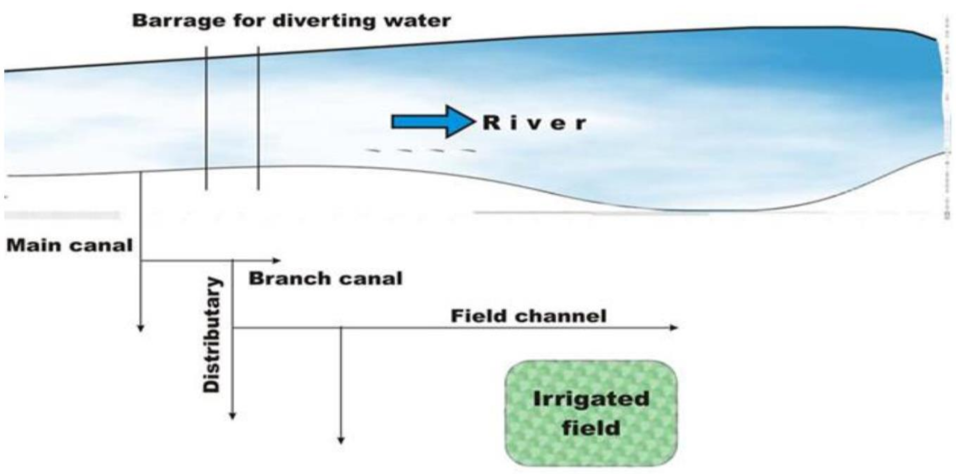
The availability of water has been discussed in a subsequent section of this lesson, which would be used to design the capacities of the intake by the water resources engineer, by comparing with the demand. The data for constructing the structures would usually be topography for locating the structure, geology for finding foundation characteristics and materials required for construction of the structure.

Project planning for irrigation water supply

The project may consist of supplying water to irrigate an area through a network of canals, by diverting some of the water from a river by constructing a barrage for water diversion and head regulator for water control. The water through canals mostly flows by gravity (except for pumped canal projects), the area under cultivation by the water of the canal is called the Command Area. This area is decided by the prevailing slope of the land. Although the main source of water for irrigating an area could be surface water, it could be supplemented with ground water. This combination of surface and ground water for irrigation is known as Conjunctive use.

The principal component of an irrigation scheme is a diversion structure – a weir or a barrage – though the latter is preferred in a modern irrigation project. Since the height of such a structure is rather small compared to that of a dam, the volume of water stored behind a barrage (the barrage pool) is small compared to that stored behind a dam (the dam reservoir). The elevated water surface of the barrage pool causes the water to be diverted into the canal, the entry of which is regulated through a canal head works. If the river is perennial, and the minimum flow of the river is sufficient to cater to the flow through the canal, this arrangement is perfectly fine to irrigate a command area using a barrage and an irrigation canal system. However, if the river is non-perennial, or the minimum flow of the river is less than the canal water demand, then a dam may be constructed at a suitable upstream location of the river. This would be useful in storing larger volumes, especially the flood water, of water which may be released gradually during the low-flow months of the river.

A conceptual scheme of a diversion scheme for irrigation is shown in Figure 3.



Diversion scheme for irrigation

Data requirement for water supply to an irrigation project

The following data is required for planning and designing a typical irrigation system.

Demand of water for irrigation water supply

The demand of water for an irrigation scheme is to be calculated from the cropping schedule that is proposed in the Command Area. Different crops have different water requirements and their demand also varies with the growth of the plants. Further, Command Area may be able to cultivate more than one crop within since many of the crops have maturity duration of few months.

The field requirement decides the design discharge for the distributaries and so on up to the canal regulator. Of course, most canals are prone to losses with water seeping through the canal sides. Exceptions are the lined canals, though in this case, the loss of infiltrating water is very small. Thus the net demand at the head of the canal system, as a function of time, is calculated.

Availability of water and other data

This has discussed in a subsequent section of this lesson. The data for demand and availability of water would be used to design the reservoir upstream of the dam for storage. This water, when released in a regulated way, would be diverted by a barrage and passed through a canal head regulator and water distribution network consisting of canals and other structures such as regulators and falls. The data requirements for construction of the structures are usually: Topography, geology or riverbed soil characteristics, and materials.

National water policy

- A Policy can be considered as a "Statement of Intent" or "Commitment".

Types of Policies

- Distributive policies
- Regulatory policies
- Constituent policies
- Miscellaneous policies

Water Policy- policy that encompasses all efforts to define the rules, intent, and instruments with which governments manage human uses of water, control water pollution, and meet environmental water needs. It considers not only the legal and regulatory framework, but also the planning around water resource allocation and the implementation practices by water managers and other stakeholders in support of this framework.

NATIONAL WATER POLICY

1. PREAMBLE

1.1 A scarce natural resource, water is fundamental to life, livelihood, food security and sustainable development.

There are further limits on utilizable quantities of water owing to uneven distribution over time and space. In addition, there are challenges of frequent floodsand droughts in one or the other part of the country. With a population and rising needs of a fast developing nation as well as the given indications of the impact of climate change, availability of utilizable water will be under further strain in future
with the possibility of deepening water conflicts among different user groups. Low consciousness about the scarcity of water and its life sustaining and economic value results in its mismanagement, wastage, and inefficient use, as also pollution and reduction of flows below minimum ecological needs. In addition, there are inequities in distribution and lack of a unified perspective in planning, management and use of water resources. The objective of the National Water Policy is to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective.

1.2 The present scenario of water resources and their management in India has given rise to several concerns, important amongst them are;

(i) Large parts of India have already become water stressed. Rapid growth in demand for water due to population growth, urbanization and changing lifestyle pose serious challenges to water security.

(ii) Issues related to water governance have not been addressed adequately. Mismanagement of water resources has led to a critical situation in many parts of the country.

(iii) There is wide temporal and spatial variation in availability of water, which may increase substantially due to a combination of climate change, causing deepening of water crisis and incidences of water related disasters, i.e., floods, increased erosion and increased frequency of droughts, etc.

(iv) Climate change may also increase the sea levels. This may lead to salinity intrusion in ground water aquifers / surface waters and increased coastal inundation in coastal regions, adversely impacting habitations, agriculture and industry in such regions.

(v) Access to safe water for drinking and other domestic needs still continues to be a problem in many areas. Skewed availability of water between different regions and different people in the same region and also the intermittent and unreliable water supply system has the potential of causing social unrest.

(vi) Groundwater, though part of hydrological cycle and a community resource, is still perceived as an individual property and is exploited inequitably and without any consideration to its sustainability leading to its over-exploitation in several areas.

(vii) Water resources projects, though multi-disciplinary with multiple stakeholders, are being planned and implemented in a fragmented manner without giving due consideration to optimum utilization, environment sustainability and holistic benefit to the people.

(viii) Inter-regional, inter-State, intra-State, as also inter-sectoral disputes in sharing of water, strain relationships and hamper the optimal utilization of water through scientific planning on basin/sub-basin basis.

(ix) Grossly inadequate maintenance of existing irrigation infrastructure has resulted in wastage and under-utilization of available resources. There is a widening gap between irrigation potential created and utilized.

(x) Natural water bodies and drainage channels are being encroached upon, and diverted for other purposes. Groundwater recharge zones are often blocked.

(xi) Growing pollution of water sources, especially through industrial effluents, is affecting the availability of safe water besides causing environmental and health hazards. In many parts of the country, large stretches of rivers are both heavily polluted and devoid of flows to support aquatic ecology, cultural needs and aesthetics.

(xii) Access to water for sanitation and hygiene is an even more serious problem. Inadequate sanitation and lack of sewage treatment are polluting the water sources.

(xiii) Low consciousness about the overall scarcity and economic value of water results in its wastage and inefficient use.
(xiv) The lack of adequate trained personnel for scientific planning, utilizing modern techniques and analytical capabilities incorporating information technology constrains good water management.
(xv) A holistic and inter-disciplinary approach at water related problems is missing.
(xvi) The public agencies in charge of taking water related decisions tend to take these on their own without consultation with stakeholders, often resulting in poor and unreliable service characterized by inequities of various kinds.
(xvii) Characteristics of catchment areas of streams, rivers and recharge zones of aquifers are changing as a consequence of land use and land cover changes, affecting water resource availability and quality.

1.3 Public policies on water resources need to be governed by certain basic principles, so that there is some commonality in approaches in dealing with planning, development and management of water resources. These basic principles are:

(i) Planning, development and management of water resources need to be governed by common integrated perspective considering local, regional, State and national context, having an environmentally sound basis, keeping in view the human, social and economic needs.
(ii) Principle of equity and social justice must inform use and allocation of water.
(iii) Good governance through transparent informed decision making is crucial to the objectives of equity, social justice and sustainability. Meaningful intensive participation, transparency and accountability should guide decision making and regulation of water resources.

(iv) Water needs to be managed as a common pool community resource held, by the state, under public trust doctrine to achieve food security, support livelihood, and ensure equitable and sustainable development for all.
(v) Water is essential for sustenance of eco-system, and therefore, minimum ecological needs should be given due consideration.

(vi) Safe Water for drinking and sanitation should be considered as pre-emptive needs, followed by high priority allocation for other basic domestic needs (including needs of animals), achieving food security, supporting sustenance agriculture and minimum eco-system needs. Available water, after meeting the above needs, should be allocated in a manner to promote its conservation and efficient use.

(vii) All the elements of the water cycle, i.e., evapo-transpiration, precipitation, runoff, river, lakes, soil moisture, and ground water, sea, etc., are interdependent and the basic hydrological unit is the river basin, which should be considered as the basic hydrological unit for planning.

(viii) Given the limits on enhancing the availability of utilizable water resources and increased variability in supplies due to climate change, meeting the future needs will depend more on demand management, and hence, this needs to be given priority, especially through (a) evolving an agricultural system which economizes on water use and maximizes value from water, and (b) bringing in maximum efficiency in use of water and avoiding wastages.

(ix) Water quality and quantity are interlinked and need to be managed in an integrated manner, consistent with broader environmental management approaches inter-alia including the use of economic incentives and penalties to reduce pollution and wastage.

(x) The impact of climate change on water resources availability must be factored into water management related decisions. Water using activities need to be regulated keeping in mind the local geo climatic and hydrological situation.

WATER FRAMEWORK LAW

1 There is a need to evolve a National Framework Law as an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the Centre, the States and the local governing bodies. This should lead the way for essential legislation on water governance in every State of the Union and devolution of necessary authority to the lower tiers of government to deal with the local water situation.

2 Such a framework law must recognize water not only as a scarce resource but also as a sustainer of life and ecology. Therefore, water, particularly, groundwater, needs to be managed as a community resource held, by the state, under public trust doctrine to achieve food security, livelihood, and equitable and sustainable development for all. Existing Acts may have to be modified accordingly.

3 There is a need for comprehensive legislation for optimum development of inter-State rivers and river valleys to facilitate inter-State coordination ensuring scientific planning of land and water resources taking basin/sub-basin as unit with unified perspectives of water in all its forms (including precipitation, soil moisture, ground and surface water) and ensuring holistic and balanced development of both the catchment and the command areas. Such legislation needs, inter alia, to deal with and enable establishment of basin authorities, comprising party States, with appropriate powers to plan, manage and regulate utilization of water resource in the basins.

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