



Role of dams



Why do we need dams?

In ancient times, dams were built for the single purpose of water supply or irrigation. As civilizations developed, there was a greater need for water supply, irrigation, flood control, navigation, water quality, sediment control and energy. Therefore, dams are constructed for a specific purpose such as water supply, flood control, irrigation, navigation, sedimentation control, and hydropower. A dam is the cornerstone in the development and management of water resources development of a river basin. The multipurpose dam is a very important project for developing countries, because the population receives domestic and economic benefits from a single investment.

Demand for water is steadily increasing throughout the world. There is no life on earth without water, our most important resource apart from air and land. During the past three centuries, the amount of water withdrawn from freshwater resources has increased by a factor of 35, world population by a factor of 8. With the present world population of 5.6 billion still growing at a rate of about 90 million per year, and with their legitimate expectations of higher standards of living, global water demand is expected to rise by a further 2-3 percent annually in the decades ahead.

But freshwater resources are limited and unevenly distributed. In the high-consumption countries with rich resources and a highly developed technical infrastructure, the many ways of conserving, recycling and re-using water may more or less suffice to curb further growth in supply. In many other regions, however, water availability is critical to any further development above the present unsatisfactorily low level, and even to the mere survival of existing communities or to meet the continuously growing demand originating from the rapid increase of their population. In these regions man cannot forego the contribution to be made by dams and reservoirs to the harnessing of water resources.

Seasonal variations and climatic irregularities in flow impede the efficient use of river runoff, with flooding and drought causing problems of catastrophic proportions. For almost 5 000 years dams have served to ensure an adequate supply of water by storing water in times of surplus and releasing it in times of scarcity, thus also preventing or mitigating floods

With their present aggregate storage capacity of about 6 000 km³, dams clearly make a significant contribution to the efficient management of finite water resources that are unevenly distributed and subject to large seasonal fluctuations.

The purposes of dams:

Most of the dams are single-purpose dams, but there is now a growing number of multipurpose dams. Using the most recent publication of the World Register of Dams, irrigation is by far the most common purpose of dams. Among the single purpose dams, 48 % are for irrigation, 17% for hydropower (production of electricity), 13% for water supply , 10% for flood control, 5% for recreation and less than 1% for navigation and fish farming.



Irrigation:

Presently, irrigated land covers about 277 million hectares i.e. about 18% of world's arable land but is responsible for around 40% of crop output and employs nearly 30% of population spread over rural areas. With the large population growth expected for the next decades, irrigation must be expanded to increase the food capacity production. It is estimated that 80% of additional food production by the year 2025 will need to come from irrigated land. Even with the widespread measures to conserve water by improvements in irrigation technology, the construction of more reservoir projects will be required.

Hydropower:

Hydroelectric power plants generally range in size from several hundred kilowatts to several hundred megawatts, but a few enormous plants have capacities near 10,000 megawatts in order to supply electricity to millions of people. World hydroelectric power plants have a combined capacity of 675,000 megawatts that produces over 2.3 trillion kilowatt-hours of electricity each year; supplying 24 percent of the world's electricity.

In many countries, hydroelectric power provides nearly all of the electrical power. In 1998, the hydroelectric plants of Norway and the Democratic Republic of the Congo (formerly Zaire) provided 99 percent of each country's power; and hydroelectric plants in Brazil provided 91 percent of total used electricity.

Electricity generated from dams is by very far the largest renewable energy source in the world. More than 90% of the world's renewable electricity comes from dams. Hydropower also offers unique possibilities to manage the power network by its ability to quickly respond to peak demands. Pumping-storage plants, using power produced during the night, while the demand is low, is used to pump water up to the higher reservoir. That water is then used during the peak demand period to produce electricity. This system today constitute the only economic mass storage available for electricity.

Water supply for domestic and industrial use:



It has been stressed how essential water is for our civilization. It is important to remember that of the total rainfall falling on the earth, most falls on the sea and a large portion of that which falls on earth ends up as runoff. Only 2% of the total is infiltrated to replenish the groundwater. Properly planned, designed and constructed and maintained dams to store water contribute significantly toward fulfilling our water supply requirements. To accommodate the variations in the hydrologic cycle, dams and reservoirs are needed to store water and then provide more consistent supplies during shortages.

Inland navigation:

Natural river conditions, such as changes in the flow rate and river level, ice and changing river channels due to erosion and sedimentation, create major problems and obstacles for inland navigation. The advantages of inland navigation, however, when compared with highway and rail are the large load carrying capacity of each barge, the ability to handle cargo with large-dimensions and fuel savings. Enhanced inland navigation is a result of comprehensive basin planning and development utilizing dams, locks and reservoirs which are regulated to provide a vital role in realizing regional and national economic benefits. In addition to the economic benefits, a river that has been developed with dams and reservoirs for navigation may also provide additional benefits of flood control, reduced erosion, stabilized groundwater levels throughout the system and recreation.



Flood control:

Dams and reservoirs can be effectively used to regulate river levels and flooding downstream of the dam by temporarily storing the flood volume and releasing it later. The most effective method of flood control is accomplished by an integrated water management plan for regulating the storage and discharges of each of the main dams located in a river basin. Each dam is operated by a specific water control plan for routing floods through the basin without damage. This means lowering of the reservoir level to create more storage before the rainy season. This strategy eliminates flooding. The number of dams and their water control management plans are established by comprehensive planning for economic development and with public involvement. Flood control is a significant purpose for many of the existing dams and continues as a main purpose for some of the major dams of the world currently under construction.

