

Department of Civil Engineering
National Institute of Technology-Srinagar

MTech 3rd Semester (Water Resources Engineering)

Course Title:-Environmental Impact Assessment of Civil Engineering Projects(EIACEP)

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CHAPTER-1 PAGE-1

LECTURE-1 (L1)

Need for Water Resources Development projects

India sustains nearly 17 per cent of the world's population but has only four per cent of global water resources. About 50 per cent of annual precipitation is received in just about 15 days in a year, which is not being brought to productive use due to limited storage capacity of 36 per cent of utilizable resources (252 BCM out of 690 BCM). Leakage and inefficiencies in the water supply system waste nearly 30 per cent of usable water. The ground water level is declining at the rate of 10 cm per year. Over 70 per cent of surface water and ground water resources are contaminated. All this is leading towards a water scarce situation in many parts of the country. India has undertaken considerable investments for:-

Infrastructure development of large dams, storage structures, and canal networks to meet the country's water and agricultural needs, particularly in support of technology-based interventions to improve production of food grains, pulses, oilseeds, and vegetables. This is evident from the huge increase in budgetary allocation from the 11th Five-Year Plan compared to the 12th.

Five-Year Plan in irrigation including Watershed Development (from Rs 243,497 crore to Rs 504,371 crore) and Drinking Water and Sanitation sector (from Rs 120,774 crore to Rs 254,952 crore). This step has helped in achieving food and

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water security to a large extent, but in many areas of less plentiful surface water, the increasing use of water in agriculture and a growing population has led to higher and potentially unsustainable extraction of ground water for irrigation and domestic needs.

The estimated 'Water Gap' for India by the 2030 is an alarming 50 percent. The water supply and demand gap in India in various river basins is depicted as percentage of demand in the year 2030. India is now in a situation where some tough decisions regarding competing uses of water need to be taken.

The country is also facing the potential threat of climate change, which may have complex implications on the pattern of availability of water resources including changes in pattern and intensity of rainfall and glacial melt resulting in altered river flows, changes in ground water recharge, more intense floods, severe droughts in many parts of the country, salt water intrusion in coastal aquifers, and a number of water quality issues. Water being vital for equitable growth and development of a country, food security, livelihoods, and public health are at stake. Access to safe water has a direct bearing on productivity and health of human and animal populations. The public health implications of unsafe water are enormous and unacceptable.

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Types of water resources

While water covers approximately 71 percent of Earth's surface, only three percent is suitable for human consumption. People can not access most of this water, because it is frozen in polar ice caps or beneath the planet's surface. Available sources for water are derived largely from developments including the recycling and conservation of available water resources, and techniques, such as filtration, which make water potable.

(1)Oceans

Oceans cover most of the Earth, and contain about 97 percent of the water on the planet. This water has a high salt content and is unfit for human use. With the depletion of scarce freshwater sources, methods for removing salt from ocean water, including desalination or distillation, have not been cost-effective. Although untreated sea water is not suitable for human consumption, oceans remain a valuable resource, because they provide food, recreation, oil and a transportation route for trade.

(2)Rivers and Streams

Rivers and streams cover the globe and run through every nation, providing drinking water and recreational areas for swimming, boating and fishing. Rainfall and melting snow continually replenish these waterways. However, weather patterns impact water depth. Severe droughts dry rivers up, while too much rainfall can cause flooding when the water overflows a river's banks. Because rivers and streams cross national boundaries, water rights remain a topic of political debate and conflict.

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(3)Lakes

Lakes are natural or man-made depressions on the surface of land that hold water. Natural lakes occur due to geological processes, such as weathering and erosion. Man-made lakes, also called reservoirs, occur when people dam up rivers and streams or divert the flow of these waterways in order to contain a large amount of water in one area. Lakes provide an energy source for generating electricity, offer recreational areas for swimming and fishing and provide a source of drinking water for many communities. Rainfall replenishes lake water; however, this water is vulnerable to pollution.

(4)Groundwater

Water seeps into the ground from surface run-off and precipitation. As the water enters the ground, part of it clings to plant roots and particles of soil and becomes trapped, creating a water table. Aquifers beneath the water table collect the seeping water, which is called groundwater. According to the United States Geological Survey, or USGS, approximately 50 percent of Americans use ground water for drinking and other household uses. People collect this water by drilling or digging wells that pump the water from below the water table to the surface.

LECTURE-2 (L2)

Some major Multipurpose projects in India

There are several important Water Projects in India that were built as multi-purpose projects, with the aim of not only providing water to the towns and cities but also to generate Hydel-power. With the advent of the 20th century, a new era of developing water projects for generating Hydro-electricity in India began on a modest scale.

After Independence there has been a sharp burst in developing hydro-electricity in various parts of the country. From this time, India has been engrossed in projected economic activities to attain self-sufficiency and improve the quality of living of its citizens. Amongst the various actions that followed for this intention, dealing with water resources has been one of the primary aims and therefore, developing water projects in a larger scale gained importance.

To control the twin problems of flood and famine and also to generate Hydro-electricity in a larger scale developing and maintaining water projects in India became a prime concern. Although the main aim for developing the water projects in India was indeed to generate Hydro electric power; however, providing power to the cottage industries, medium and major industries also became an imperative part of the objective of the water projects in India.

In the year 1902, India witnessed the first Hydel-power house on the **River Kaveri** in Sivasamudram, Karnataka. However, it was just the beginning and almost immediately Tata Hydroelectric Scheme in the Western Ghats of Maharashtra, to furnish power to Mumbai, was established. **Pykara** was marked as the first water power station in Tamil Nadu.

Water Projects in India followed even in the Northern part of the country and **Mandi Power House** was the first one, developed in the Himalayan region. The next one in the pipeline was the **Upper Ganga Canal Hydroelectric Grid System**.

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The water projects of India are also the part of the several multi purpose projects. One of the illustrious water projects in India is the **Rihand Project**. This is the largest man made lake in India, on the fringes of Madhya Pradesh and Uttar Pradesh. Its capacity is 300 mw each year.

The **Koyna Project** in Maharashtra is another important water project in India and is constructed on an east flowing tributary of the River Krishna. A dam on the Koyna River has been built only to ferry waters through a tunnel to the western slopes of the Ghats. Its capacity is 880 mw and it provides power to the Mumbai-Pune industrial region.

The **Sharavathy Project**, another important water project in India is located in the Jog Falls in Karnataka. Its total capacity is 891 mw. It serves the Bengaluru industrial region and also furnishes the states of Goa and Tamil Nadu.

The **Saharigiri Project** in Kerala, **The Balimela Project** in Orissa and the **Salal Project** for Hydro-electricity in Jammu and Kashmir are other important water projects in India.

In addition to these power projects, India has also built a gigantic Hydel power project in Bhutan at **Chukha**, which was financed by India. The excess energy is brought by India for its use in the north-eastern parts of the country, including West Bengal. The National Hydroelectric Power Corporation Ltd, (NHPC) was established in 1975. It has added 2133 mw raw Hydel power since then. These encompass- Chamera Stage I, Uri, Salal Stage I, Baira-Siul, Loktok, Tanakpur.

With the evolution and development of technology, and with the growing demand for water and energy, along with the growing Indian population, more such Water Projects in India are being planned by the government.

LECTURE--3 (L3)

Importance of Water and its Resources in India

India being an agricultural country, water has served as the most important resource for agriculture. Next to China, India has second largest acreage of irrigated land in the world. In a monsoon country with a characteristic dry season and variability of rainfall, man's ingenuity has long been exercised to reduce his dependence on nature.

The story of water is the story of Indian civilization, indeed, all civilizations. Fifty centuries ago the Mohenjo-Daro civilization of Indus Valley enjoyed the benefits of well-designed water supply and even public swimming pools and baths.

Modern civilization has increased the importance of water as a resource. Economic progress of India is not only tied with agricultural development, but also with industrial development for which she requires hydel power, water for industry, and for domestic use in the ever-growing urban settlement.

Different types of fishes and other animals live in the sea-water. Another wealth of the sea is minerals. Among them sodium chloride or edible salt, Ilmenite, Monazite, Manganese Nodule, and Magnesium are the most important. Sea is also a very important source of gas, petroleum and renewable energy resources. Given below are the various uses of water

* **Water in Agriculture**

Water plays the most important role in agriculture. Agriculture is impossible without irrigation throughout the crop season. Irrigation ensures proper plant growth.

* **Water for Municipal use**

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Lifestyle of the inhabitants and their economic conditions affect the water use within the home in different parts of the country. Municipal; demand includes water for domestic purposes, commercial uses, street washing, lawn and garden irrigation, fire protection.

* **Water in the domestic sector** is generally used for drinking, washing toilets, lawn sprinkling, and food preparation etc.

* **Balancing the ecosystem**

Water is not only important for human beings but also plays an important role to balance the entire ecosystem by various ways:

* By its presence in the **atmosphere** it absorbs the Sun's heat.

The rain water scours the hills and carries the sediments into rivers, valleys etc.

Percolating water into rock crusts takes part in the formation of mineral deposits.

In Polar Regions, water in the form of the caps influences climatic and geographical changes.

* **Water for industries**

Water is used in huge quantities in the industries like steel industry, chemicals, fertilizers, textiles, cement, electricity, petrochemicals and paper. Mining, food etc. these industries require water for following or the other reasons:

Cooling.

Generation of power.

Cleaning purposes.

Fire protection.

Air conditioning.

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* **Water for power**

* Thermal power plants also requires large volume of water for the purpose of cooling and disposal of fly ash. Water is used in thermal power generation.

* **Water for Navigation**

Water ways are important medium of transportation. Transport by water ways is cheaper as compared to by road and railway. The main waterways exist in the Ganga in the eastern region and Brahmaputra in the north-eastern region, which account for more than 60 per cent of the traffic.

* **Water for fish, wildlife and recreation**

Fish, wildlife and recreation facilities play an important role in nation's life and adequate water supplies for their continued development and important. Swimming, boating, fishing is the important outdoor recreational activities which are impossible without water.

