

DAMS AND DEVELOPMENT IN MAHARASHTRA WITH SPECIAL REFERENCE TO UJANI DAM IN SOLAPUR DISTRICT

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Abstract:-

Dams are important because they provide water for domestic, industry and irrigation purposes. Dams often also provide hydroelectric power production and river navigation. Domestic use includes everyday activities such as water for drinking, cooking, bathing, washing and lawn and garden watering. Ujani dam and their reservoirs provide recreate area for boating, bird watching and fishing. Ujani reservoir is the main source of fishing industry. There are 40,000 fisherman families depends on the Dam. Dam also protect the people by reducing or preventing floods. During the times excess water flow, dams store water in the reservoir, then they release water during the times of low flow. Dams provide water for society to drink and use protection from floods, hydro electric power, irrigation water to grow food a pleasant recreation area, and enhanced environment. Dams have been constructed during different periods depending on the needs of society at the time.

Introduction:-

At the time of Independence India was stranglehold of stagnating per capita national income, static agriculture production, poorly developed industries, inadequate infrastructure, mass poverty and extreme unemployment, etc. Among all these problems, food scarcity was worrisome to the whole nation. Indian agriculture was in deplorable condition. Immediately after Independence, a series of large dams were planned and built on the major rivers of India. The first Prime Minister, Jawaharlal Nehru called dams as “**Secular temples of modern India**”. It promised to solve the problems of floods, hunger and starvation by providing irrigation and enhancing food production and providing much electricity for industrial development and following this strategy, now India become one of largest dam building nations in the world.

Dams are considered as an agency of development for its contribution to flood management, hydropower production, irrigation, navigation, facilitate recreation and supplying water for urban and industrial needs. Which contribute greatly to the

growth of a nation. Dams have played a key role in development since the third millennium BC, when the first great civilization evolved on major rivers such as the Tigris-Euphrates, the Nile and the Indus. From these early times, dams were built for flood control, water supply, irrigation and navigation. However, construction and operation of dams received high priorities since Industrial Revolution to produce electricity.

In Maharashtra there are around 1821 notable large dams. Ujani is among this, a very important dam constructed on Baima River near Tembhurni in June 1980. It is located in Village Ujani in Madha Taluka of Solapur District. It is the third largest reservoir in Maharashtra after Koyna (2800 GL, on Koyna - Krishna) and Jayakwadi (2171 GL, on Godavari) with a reservoir capacity of 1517 Giga Litres (GL). So it is one of the biggest reservoirs in the region supplying water for drinking and irrigation in the Solapur district of Maharashtra. Ujani has got the importance not only because it falls between the draught prone areas of Maharashtra. The Solapur, East part of Pune district and some part of Ahmednagar district are complete arid regions. This dam becomes the lifeline of the inhabitants of these three districts.

Objective:-

In the present study an attempt has been made to examine the role of dam in economic development of the region.

Study Region :-

The Bhima River on which the Ujani Dam has been built rises from Bhimashankar hills in the Western Ghats, also known as the Sahyadri hill range. The river flows for a length of 725 km (450 mi) till it meets the Krishna River (one of the two major river systems in Maharashtra, the other being the Godavari River) near Raichur in Raichur district in Karnatka. Bhima River Basin has many tributaries of which the major ones are the Kundali River, Kumandala River, Ghodriver, Bhama River, Indrayani River, Mula River, Mutha River, Pavna River, Bori, Sina, Man, Bhogawati and Nira. The total drainage area of 48631 km (18777 sq mi) of Bhima River basin, an interstate river basin, covers both Maharashtra (75 %) and Karnatka (25 %) states. The river basin, which has a slope from west to east has extreme physiographic and agro – climate variations. The drainage basin has rich and fertile agricultural land, and several water resources.

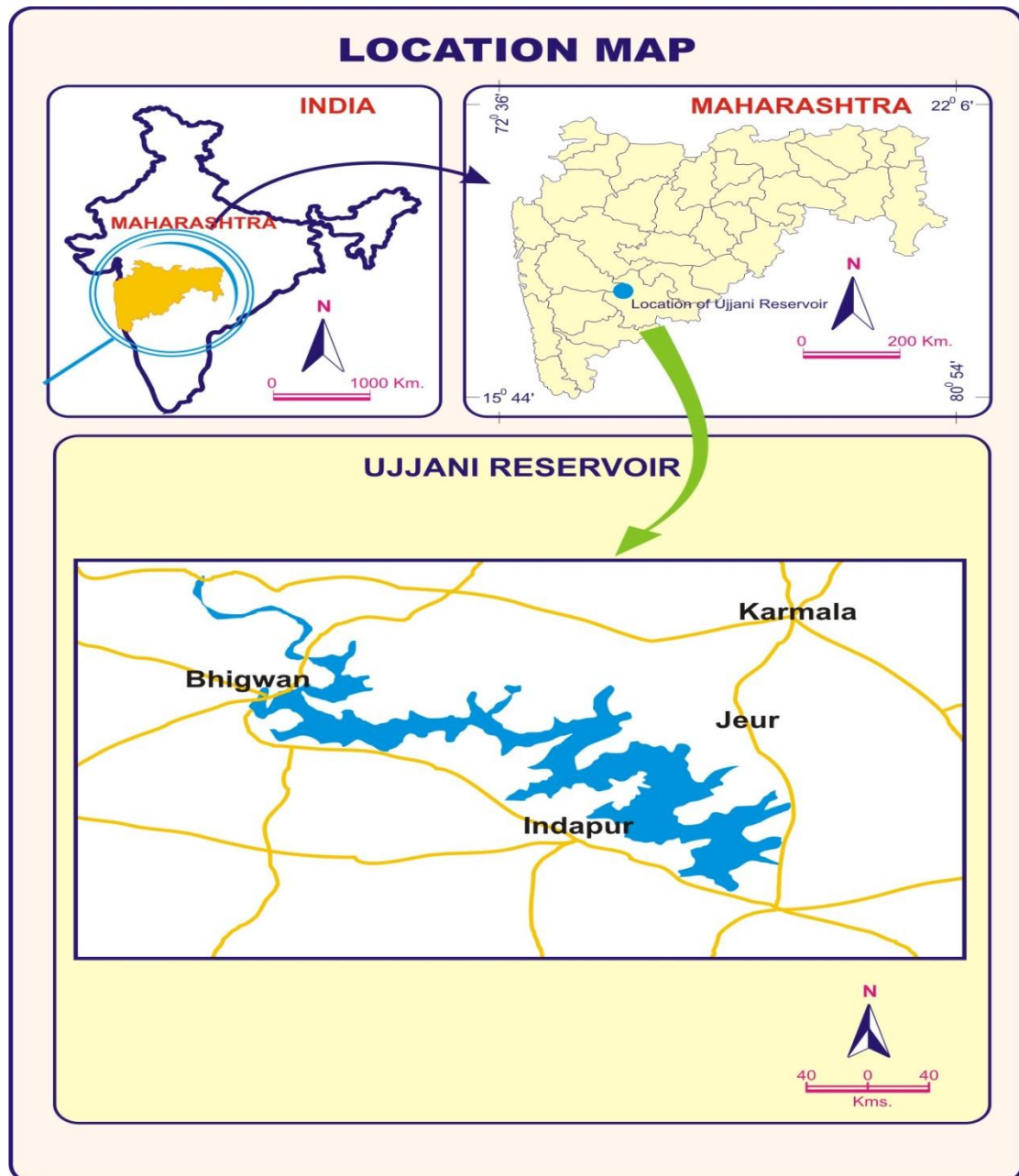


Fig.No.1

Data Base :-

For the analysis of the existing conditions of Ujjani Dam related data and information is collected from various sources. All the relevant published and unpublished records are consulted. However the present work is based mainly on primary data collected through intensive field work. The primary data are supplemented by secondary data. The data published by Governmental and non governmental agencies, research organizations, research journals formed the secondary sources of data. The secondary data were collected from water quality reports of Maharashtra Pollution Control Board.

Result and Discussion:-

The state of Maharashtra tops the list of the highest number of large dams in India as per the data of National Register of large Dam (NRLD) of 2017. It had 2354 during the year 2017 in which 285 dams were under construction. In terms of percentage Maharashtra has 41.29% of India's Large Dam as compared to 35.66% in the previous edition. Although the state has the maximum number of dams in India, but it has only utilized 18 percent of the land for the purpose of irrigation. Madhya Pradesh comes next with 906 dams. The state has 8 dams which are under construction. The dams in Madhya Pradesh are constructed over several rivers with the motive of providing water for irrigation facilities to the agriculture fields. These dams are the major source of drinking water and the generation of hydro – electric power. Some of the dams have become tourist destinations in the state.

The state of Gujrat occupies the third position with 632 dams out of which 13 were under construction. Dams in Gujrat were primarily constructed to control floods. Later on, they started to function as suppliers of drinking water and reservoirs in the state. Chhattisgarh comes on the fourth position in the list of states with maximum number of dams in India. The state has a total of 258 dams with 10 incomplete dams. Chhattisgarh state has a limited irrigation system with dams, barrage, reservoir and canals. But the state also flaunts some beautiful dam in Chhattisgarh that are pleasurable to the eyes.

Karnatka comes fifth position with 231 dams out of which only one is under construction. These dams are used for retention of water, water supply prevention of floods, water diversion etc. These dams even distribute water to other places. They help in generation electricity from water.

Ujani Dam, also known as Bhima Dam or Bhima Irrigation Project, on the Bhima River, a tributary of the Kkrishna River, is an earthful cum Masonry gravity dam located near Ujani village of Madha Taluka is Solapur district of the state of Maharashtra in India.

The Bhima River, which originates in Bhimashankar of the Western Ghats, and forms the Bhima Valley with its tributary rivers and streams, has twenty – two dams built on it of which the Ujani Dam is terminal dam on the river and is the largest in the valley that intercepts a catchment area of 14858 km (5737 sq mi) (which includes a free catchment of 9766 km (3771 sq mi). The construction of the

dam project including the canal system on both banks was started in 1969 at an initial estimated cost of Rs.400 million and when completed in June 1980 the cost incurred was of the order of Rs.3295.85 Million.

Table no. 1 Ujani Dam

Official Name	Ujani Dam / Bhima Dam
Location	Ujani (Madha), Solapur
Co – ordinates	18 ⁰ 04' 26" N Latitude 75 ⁰ 07' 12" E Longitude
Construction began	1969
Opening date	June 1980
Construction Cost	Rs.3295.85 Million (1983 - 84)
Owner	Government of Maharashtra, India
Operator (s)	Water Resources Department, Govt. of Maharashtra

The reservoir created by the 56.4 m (185 ft) high earth cum concrete gravity dam on the Bhima River has a gross storage capacity of 3.320 km (0.797 cu mi). The annual utilization is 2.410 km (0.578 cu mi). The project provides multipurpose benefits of irrigation, hydroelectric power, drinking and industrial water supply and fisheries development. The irrigation supplies benefit 500 km (190 sq mi) of agricultural land, particularly in the Solapur district. Water supplied from the reservoir to irrigate agricultural areas primarily aims to reduce incidence of famines and scarcity during drought conditions. The reservoir operation also lessens threat due floods to cities such as Pandharpur (an important religious pilgrimage centre for the Hindus). As a result of irrigation facilities, some of the important crops grown under irrigated conditions are sugarcane, wheat, millet and cotton.

Reservoir

The reservoir created by the dam has a water spread area of 357 km (138 sq mi) at the High Flood Level (HFL) and 336.5 km (129.9 sq mi) at Full Reservoir Level causing submergence of land and houses in 82 villages. The reservoir stretches upstream of the dam to a length of around 50 km, and the maximum width of the reservoir is 8 km (5.0 mi). The rim of the reservoir periphery measures 670 km (420 mi).

Table no.2 Reservoir Capacity

Total Capacity	3,140,000,000 m ³ (2,550,000 acre ft)
Active capacity	1,440,000,000 m ³ (1,170,000 acre ft)
Inactive capacity	1,802,000,000 m ³ (1,461,000 acre ft)
Catchment area	14850 km ² (5,730 sq mi)
Surface area	337 km ² (130 sq mi)

As a result of reservoir submergence, realignment of railway line (of the Daund Solapur section) to a length of 33.251 km (20.661 mi), realignment of National Highway No.9 between Pune and Solapur sector over a length of 23.4 km (14.5 mi), and the State Highway between Tembhurni and Karmala to the extent of 15.35 km (9.54 mi) was involved.

Two years after commissioning of the project, the reservoir water quality was tested to establish its suitability for various uses. The physical and chemical analysis indicated that the pH values, free carbon dioxide, total hardness, alkalinity, nitrates, chlorides, sulphates, calcium and magnesium were within prescribed limits. Heavy metals, copper and lead were not present. However, during the rainy season, the iron content though high, was found to be within permissible limits. Potassium and ammonia were within prescribed safe limits of acceptance for use of stored water for drinking, industrial use and for fish propagation. However, since its creation in 1980, it is now recorded that substantial quantity of the untreated sewage is discharged into the streams which flow into the Ujani Reservoir, particularly in the river stretch close to the Pune city.

The reservoir created by the Ujani dam is also one of the largest backwaters in India, Since its creation in 1980, the reservoir backwaters attract, every year, a large number of migratory birds (from North India and other countries); about 100 – 150 species of flamingos and cormorants are reported. The migratory bird species in the Ujani reservoir have been studied by the Science and Technology Park (STP), a Pune – based institution. Some of the key species which are found around backwaters are: greater flamingos, pheasant – tailed jacana, painted stork, moorhen, river terns, aquatic insects, pied kingfisher and stilts.

Dams and Development:-

Growing population and rising levels of economic activities increase human demand for water and related services. The spree of development activities has brought significant use of water and its demand has been steadily increasing throughout the world. Although the amount of water resources is enough for the entire world, their distribution in time and space shows uneven pattern. Taking these in to account, emphasis is given to supplying water in sufficient quantity and quality at the right time and place, reallocating water according to certain priorities among sectors, by using surface water and groundwater resources. One of the basic requirements for socio-economic development throughout the world is the availability of adequate quantities of water. Dams provides regular water from reservoir, Dams are the symbols of development and their multi-purpose utility- generation of electricity, irrigation, flood control and navigation which contribute greatly to the growth of a nation. The Ujani Dam and its large reservoir provide multi – purpose benefits of irrigation, hydroelectric power generation, drinking and industrial water supply and fisheries.

i) Irrigation:-

Agriculture plays a greater role in the economic and social development and is seen as a vehicle for development, poverty alleviation, rural development and solution for food insecurity. Irrigation from the storage created by Ujani dam in the reservoir are provided via two irrigation canal systems originating from the dam – The left Bank Main Canal (LBMC) and The Right Bank Main canal (RBMC) – the LBMC is 126 km (78 mi) long, designed to carry a discharge of 109 m³/s (3800 cu ft/s) and provides irrigation to command of 688.4km (265.8 sq.mi) while the RBMC which is 112 km (70 mi) long designed to carry 42.5 m/s (1500 cu.ft/s) provides irrigation benefits to an area of 44100 m³/s (1560000cu ft/s) through its network of canal system.

Bhima to Sina interlink (Jod Kalava) with 21 km long tunnel from Ujani reservoir is constructed to supply water for vast lands in catchment area of Sina tributary. The storage created by the Ujani Dam has resulted in the irrigation of 500 km² (190 sq mi), particularly in Solapur district, resulting in doubling the yield of sorghum (jowar) and tripling the yield of groundnut. Farmers management organizations set up in the command area of the project are an important component of equitable distribution of irrigation under the rotational irrigation water management

practice followed in the command. The irrigation component of the Ujani Dam project was co – financed by IFAD and the World Bank with specific objective to enhance the social and economic conditions of the Scheduled castes and Scheduled tribe people in the command.

i) Hydropower Production:-

Energy is the prime mover of a country's economic growth. Availability of energy with required quality of supply is not only key to sustainable development, but commercial energy also has a parallel impact and influence on the quality of service in the fields of education, health and, in fact, even food security. Hydropower is a renewable, economic, non-polluting and environmentally benign source of energy. A pumped storage type powerhouse has been built at the toe of the Ujani dam with an installed capacity of 12 MW (one unit of vertical Francis reversible pump turbine) on the left bank of the dam, 65 m (213 ft) downstream from the axis of the dam. It operates under 20 percent load factor under a range of maximum head of 36.77 m (120.6 ft) and minimum head of 25.6 (84 ft). The hydropower component involved construction of a 13.42 (44.0 ft) high weir, 915 m (3002 ft) below the Ujani Dam to control the lower pond for operation during the pumping mode. A penstock pipe of 3.2 m (10 ft) diameter (12 mm (0.47in) and 70 m (230 ft) length embedded in the dam diverts the flow of 44 m³/s (1600 cu ft/s) from a gate controlled trash racks (15 panels) covered intake into the powerhouse. The lower pond in the pumped storage scheme of operation was built initially itself, soon after commissioning of the dam.

Table no.3 Power Station

Operator (s)	Govt. of Maharashtra
Type	Pumped Storage
Turbines	Reversible pump Turbine
Installed Capacity	12 MW
Annual generation	105 Gwh initial 21 Gwh Later

The power plant is reported to be providing benefits since then. However, the power generation estimated initially at 105 GWh was expected to reduce to 21 GWh, as water was utilized for irrigation through the RBC and LBC

canal systems. During the drought year 2015, the inflows into the reservoir were very meager due to failure of rains in the catchment area. However nearly 36 tmc ft dead storage water available in the reservoir could not be used for the dire needs. With minor external modifications to the exiting reversible hydro turbine unit, all the dead storage water can be put to use during the drought years by using the hydro power plant for pumping water into the nearby left canal. Water would be released downstream into the tail pond over the spillway (if needed by siphon pipes). The pen stock of the hydro power unit is extended (less than 100 m long) to connect to the nearby left canal. The hydro power unit is operated in pumping mode to pump water from the tail pond to the left canal when the reservoir level is below the canal's minimum draw down level (MDDL). The pen stock extension piping is detached when water pumping to the canal is not required to restore its normal power generation when the reservoir level is above the left canal's MDDL.

ii) Fish Production:-

The high density of phytoplankton (of many species) in the Ujani Reservoir is conducive to proliferation of fish species. Production of fish resources from the reservoir has been estimated at 22000 tonnes per year, and 19 percent of the catch consists species of major carps. Fish yield is reported to be 2450 kg/km² of the water spread area of the reservoir. There are 40000 fishermen families are depend on Ujani reservoir. Ujani reservoir is the main source of fisheries in Solapur, Ahmednagar and Pune District.

iii) Bird watching:-

With the water reservoir of Ujani Dam, Bhigwan is a small town developed on the Pune – Solapur Highway around 105 km from Pune which is on the backwaters of Ujani dam. Bhigwan is famous for bird watching especially flamingos and wild life photography. It is also known as mini Bharatpur. Many kinds of Ducks, Herons, Egrets, Raptors and Waders along with flocks of hundreds of flamingos can be seen. Variety of birds at Bhigwan gives of sighting of almost all the prime bird species there and also creates great photographic opportunities for wildlife photographers. At times, 1000 - 1200 flamingos are seen. The low rains and low water level has now reduced the number of flamingos over some years. It is a favorite spot for migratory birds, with more than 230 species found here. One can see flamingos, painted storks, bar – headed geese, demoiselle cranes etc.

These birds can be seen in the winter season between December and March. The bird generally migrates via marine routes and adult females depart from the breeding grounds.

v) Flood Control – Flood plain areas are ecologically important and had competitive advantage for human settlement in the past. But flood hazard is a threat to life and property, health, livelihoods and other valued resources presented by a body of water, which might rise and flow over land that is not normally submerged. Flood disasters are about the third most harmful form of geophysical disaster in terms of loss of life.

vi) Navigation and Recreation – It is generally known that carriage of water is cheaper than any other form of transport. Water transport is more favorable than the other mode of transport. In backwater of the Ujjani reservoir water transport is practiced at some place like Chikhalthan to Padasthal, Kugaon to Kalashi, Washimbe to Gangawalan, Candgaon to Parewadi etc.

Problems :-

While many have benefited from the services dams provide, but their construction has led to many significant social and human impacts, particularly in terms of displacement. Thus affected people face a broad range of impoverishment risks that includes landlessness, joblessness, homelessness, marginalization, food insecurity, increased morbidity. The water flow regulations by dams provide benefits for many segments of society and worldwide, many millions of people have benefited from their construction. But on the other hand, conversely, many people have suffered and much environmental damage occurs as a consequence of dam construction.

Conclusion:-

Dams are important because they provide water for domestic, industry and irrigation purposes. Dams often also provide hydroelectric power production and river navigation. Domestic use includes everyday activities such as water for drinking, cooking, bathing, washing and lawn and garden watering. Ujjani dam and their reservoirs provide recreate area for boating, bird watching and fishing. Ujjani reservoir is the main source of fishing industry. There are 40,000 fisherman families depends on the Dam. Dam also protect the people by reducing or preventing floods. During the times excess water flow, dams store water in the reservoir, then they release water during the times of low flow. Dams provide water for society to drink and use protection from floods, hydro electric power, irrigation water to grow food a

pleasant recreation area, and enhanced environment. Dams have been constructed during different periods depending on the needs of society at the time.

Dam and the reservoirs they form have provided considerable benefit to society from early times providing water for drinking, growing food and power when it would not otherwise be available. They also provide and enhanced environment and recreation for many.

One of the basic requirements for socio – economic development throughout the world is the availability of adequate quantities of water with the appropriate quality and an adequate supply of the energy. Among the all sources of water, dams contribute significantly toward fulfilling our water supply and energy requirement. If it properly planned and carried out regular maintenance.

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