

**DETAILED STUDY OF HYDRAULIC STRUCTURES OF THREE  
GORGES DAM SITUATED ON YANGZTE RIVER IN CHINA**

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**Abstract:** *The paper presents in detail study of one of the largest hydroelectric dam ever built in the human history. The three gorges is landmark achievement in the field of civil engineering. The motivation behind the construction of dam of this scale was to meet the energy demands of 60 million Chinese people. The main hydraulic structure consists of reservoir, dam, PowerStation, navigation facility.*

**Keywords:** *Three gorges dam; power station; hydraulic structure; foundation; navigation.*

**1. Introduction**

As powerful symbols of modernization, the big dam era started with the construction of the Hoover Dam on the Colorado River in the 1930s. The construction of dams on such a large scale helps not only in meeting the energy demands but also in reduction in CO<sub>2</sub> emissions. China also started construction of dams on large scale.

The Three Gorges Dam is located in China’s rural heartland on the third largest river, Yangtze. It has a height of 182 m and length is 2.4 km. 400 km reservoir is located on its upstream end.[1] It is one of the largest power station. Materials used for the construction of dam were steel and concrete. 28 million cubic meter of concrete and 463000 tons of steel which is enough to build 63 Eiffel tower was used. Total cost of construction is US \$22.5 Billion. [2]

The dam has reduced the severity of flooding by 90% thereby reducing loss of life and property. It produces 15% of china’s electricity. It is approx. equivalent to 50 million tons of coal or that of 18 nuclear power plants. It allows passage of 10000 ton ships. It decreases navigation cost by 35-37 % . It promotes the development of fishery, tourism and recreational activities

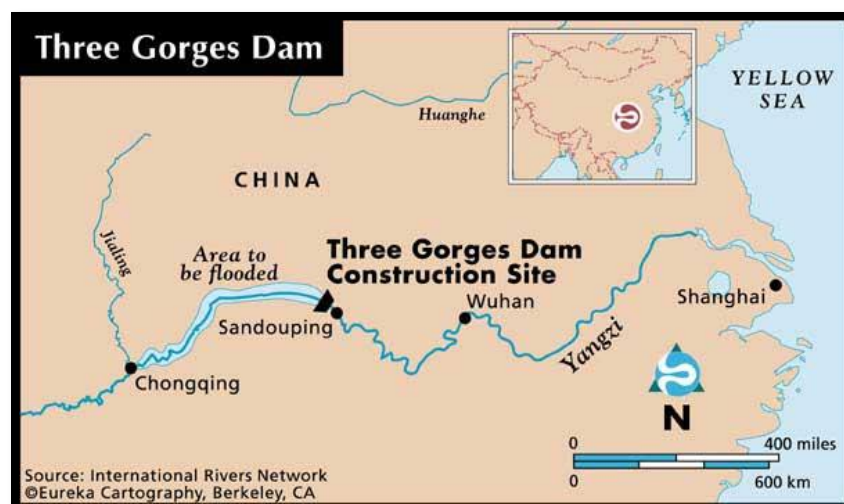


Fig 1: Location of 3 gorges dam

**2. Main Hydraulic Structures**

The main hydraulic structures in it are dam, power station, navigation facility.

**2.1. Dam:** It consists of three parts

- a) Spillway Dam
- b) Intake Dam
- c) Non overflow Dam



Fig 2: The Three Gorges Dam

**2.2. Power Stations:** The Power Station consists of:-

- i) Left Power House: It is 0.4 miles in length. It consists of 14 hydroelectric generators.
- ii) Right power house: It is 0.37 miles in length. It consists of 12 hydroelectric generators.
- iii) Underground Power House: It consists of 6 hydroelectric generators.

Cost of each generator is \$50 million. These 32 generators have the capacity of 700 MW each.

- iv) Plant power generators: These are 2 in number. Each has the capacity of 50MW.

Thus the total capacity is 22500MW. Expected annual electricity generation is 100TWH. Weight of each generator is 6000 tons. Type of turbine is Francis. [3].

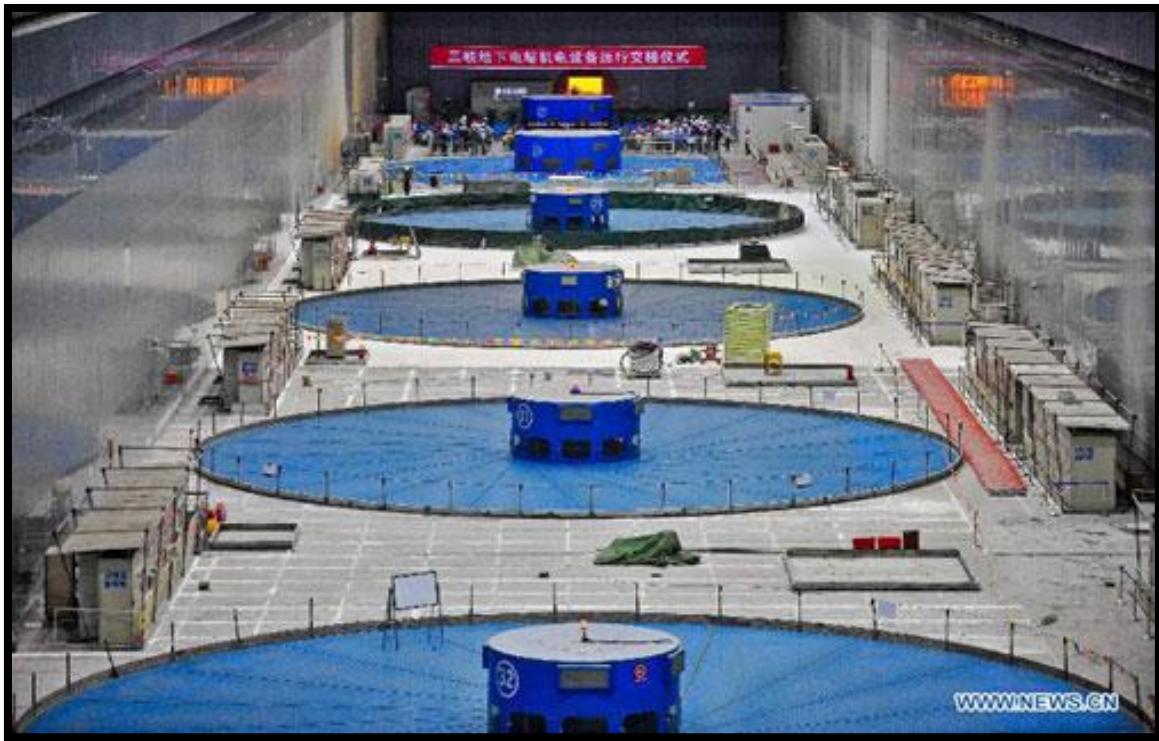


Fig 3: Generators of Three Gorges Dam

**2.3. Navigation Facility:** It consists of shiplock and shiplift.

i) SHIPLOCK: Designed as double way, five step flight lock carved from granite on rivers left bank and lined with concrete. It is capable of lifting 10000 tons of barge fleet 285 ft. making it largest such system in the world.

ii) SHIPLIFT: It is designed as one stage vertical hoisting type. It is capable of carrying one 3000 ton passenger or cargo boat each time. [4]

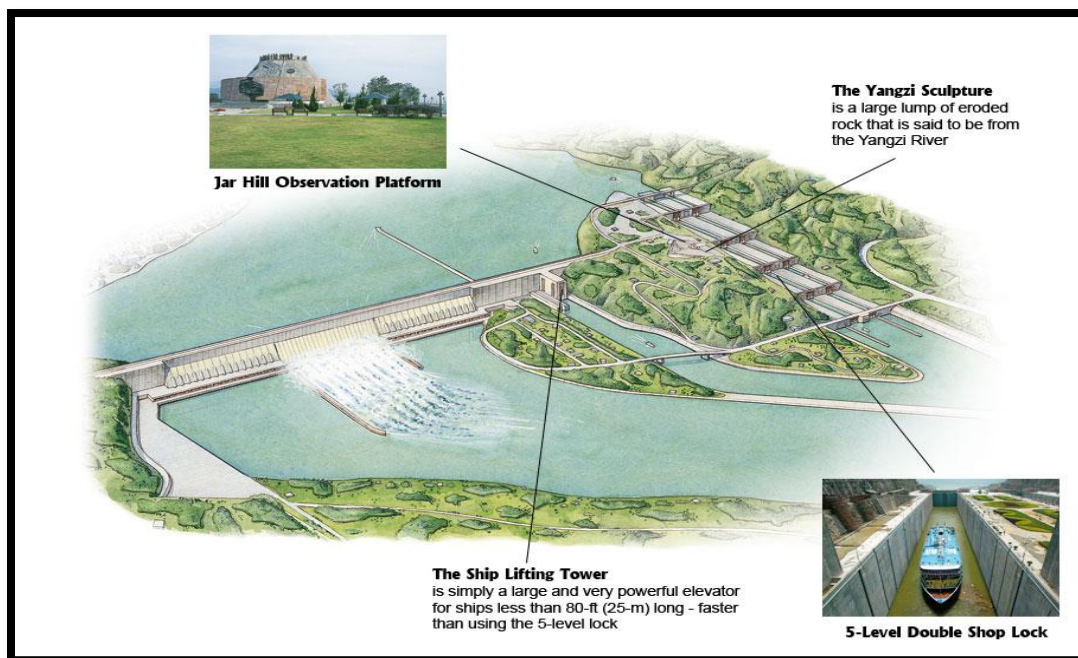


Fig 4: Location of Shiplock and Shiplift

### **3. Reservoir**

The total length of the Reservoir is 400 miles and width is 0.7 miles. Its surface area is 1084 sq. km. The water catchment area is 1 million sq.km. Total runoff is 451 billion cubic meter. Annual sediment discharge is 526 million tons. [2]



**Fig 5: Reservoir on the upstream side of the dam**

### **4. Conclusion**

The TGP has been most controversial project in China. It has helped in controlling floods, generating electricity, and navigation improvement. But at the same time it has also given rise to various environmental and social issues. About 1.2 million people had to be relocated. Huge farmland was lost. During the construction of TGP flooding of various historical and cultural sites occurred. [5]. At the same time, many innovative technologies developed in the Three Gorges Project have been widely applied to follow-up water resource and hydropower projects around the world. These technologies play an immense role in promoting global water conservancy and the technological progress of the hydropower industry [6].

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