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A Review on Three Gorges Dam

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ABSTRACT

The Three Gorges Dam (Sanxia Daba), on the upper reaches of the Yangtze River (Central China), is almost finished after many years of planning and discussion. This mega-dam, which will house the largest hydropower plant in the world, is anticipated to help with flood control in the middle and lower parts of the Yangtze River, solve the area's energy shortage, and increase the river's navigability. However, its construction would also entail several serious negative effects on the environment, including the loss and fragmentation of numerous habitats and other effects on wildlife, the destruction of numerous archaeological and cultural sites, and the forcible eviction of over 1 million people.

Keywords: Three Gorges dam, Yangtze River, Central China, and forcible eviction.

I. INTRODUCTION

The Three Gorges Dam (TGD) and its accompanying infrastructure make up the largest integrated water project ever constructed. Because to its significant environmental, economic, and social effects, it has also been one of the most contentious. Sun Yat-sen presented the idea of constructing a massive dam on the Yangtze River in the Three Gorges region more than 80 years ago. Chairman Mao Tse Tung promised to hasten the construction of a huge dam in the 1950s after there was severe flooding along the river, but nothing noteworthy happened for several more decades.

The 600-kilometer-long reservoir that the Three Gorges Dam constructed has a total storage capacity of close to 40 billion cubic metres and is nearly 200 metres high, with a volume of 40 million cubic metres. The dam's water storage capacity will reach its peak sometime in 2008. On October 18, 2006, once the reservoir's water level had been raised to 156 metres, the 14 generators on the dam's north side had attained their maximum output (9,800 MWe). By the end of 2007, seven generators had been installed on the dam's south side, raising its total power capacity

to 14,800 MWe, surpassing that of Brazil's Itaipu Dam (14,000 MWe) (Government of China 2006). The project is anticipated to have a cumulative installed hydroelectric capacity surpassing 22,000 MWe when it is finished, which is anticipated to happen after 2010. Due to an expansion that was started in 2002, this power capacity is greater than what was initially anticipated. Over 62 billion kW/hr of power was produced by the turbines in 2007, which is almost two-thirds of the project's anticipated maximum output. Other benefits of the project claimed by project designers include 140 The World's Water 2008–2009 flood protection on the historically dangerous Yangtze River and improvements to river navigation for thousands of kilometres.

II. COMPOSITION AND DIMENSIONS

The 2,335 m (7,661 ft) long concrete and steel dam has a top elevation of 185 m (607 ft) above sea level. The project needed 463,000 tonnes of steel (enough to construct 63 Eiffel Towers), 102.6 million m3 (134.2 million cu yd) of earth, and 27.2 million m3 (35.6 million cu yd) of concrete, mostly for the dam wall. The height of the concrete dam wall above the rock base is 181 metres (594 feet).

The dam reservoir is typically around 660 km (410 mi) long and 1.12 km (3,675 ft) wide when the water level is at its maximum of 175 m (574 ft) above sea level, 110 m (361 ft) higher than the river level downstream. Its overall surface area is 1,045 km2, and its volume is 39.3 km3 (31,900,000 acre-feet) of water (403 sq mi). When completion, the reservoir flooded 632 km2 (244 sq mi) of land, as opposed to the Itaipu Dam's 1,350 km2 (520 sq mi) of water.

Fig-1: Model of TGD

III. MAJOR ENVIROMENTAL IMPACTS

Emissions:

The National Development and Reform Commission estimate that in 2006, 366 grammes of coal would yield 1 kWh of energy. The amount of energy produced from 2003 to 2007 was equivalent to 84 million tonnes of ordinary coal.

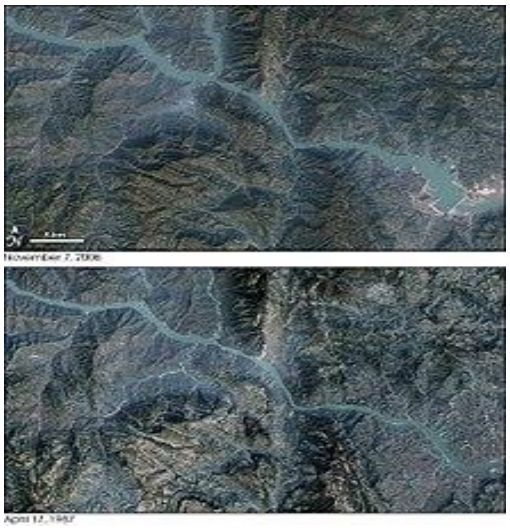

Fig-2: Satellite view of Three Gorges reservoir

Erosion and sedimentation:

The dam has been specifically linked to two risks. One is that there is disagreement on sedimentation projections, and the other is that the dam is situated on a seismic fault. At present rates, the area's 80% of the land is eroding, adding around 40 million tonnes of sediment to the Yangtze per year. There will be less sediment downstream as a result of the sediment

settling there rather than going downstream due to the slower flow above the dam.

Landslides:

Major landslides frequently occur in the reservoir as a result of erosion brought on by rising water levels. In two instances in May 2009, between 20,000 and 50,000 cubic metres (26,000 and 65,000 cu yd) of material fell into the flooded Wuxia Gorge of the Wu River. There were 97 large landslides in the first four months of 2010 have been occurred.

Waste management:

The dam improved upstream wastewater treatment in the areas surrounding Chongqing and its suburbs. As of April 2007, more than 50 new plants could treat 1.84 million tonnes per day, or 65% of the total demand, according to the Ministry of Environmental Protection. A total of 32 landfills were added, with a daily capacity of 7,664.5 tonnes of solid waste. The river receives an annual outflow of more than one billion tonnes of wastewater, which was more likely to be swept away before the reservoir was built.

Forest cover:

10% of the Three Gorges region was forested in 1997, compared to 20% in the 1950s. According to research conducted by the Food and Agricultural Organization of the United Nations, by 2008, the Asia-Pacific area would have gained roughly 6,000 km2 (2,300 sq. mi) of forest. This represents a major improvement above the annual net loss of forest in the 1990s of 13,000 km2 (5,000 sq. mi). China's extensive reforestation programme is partly to blame for this.

Wildlife:

Prior to the National People's Congress's approval of the project in 1992, worries about the dam's possible effects on wildlife existed. For years, this area has been renowned for its abundant wildlife. 6,388 plant species from 238 families and 1,508 genera are found there. 57 percent of these plant species are in danger of extinction. Also, these endangered species are employed as components in conventional Chinese remedies. Near the Three Gorges Dam, the amount of forested land has already decreased from 20% in 1950 to less than 10% as of 2002, adversely harming all plant species in the area.

IV. CONSTRUCTION

Locks:

With the installation of ship locks, river shipping is expected to expand from 10 million to 100 million tonnes yearly, resulting in a 30–37% reduction in transportation costs. Shipping will be safer as a result, as navigating the gorges is notoriously hazardous.

The dam is located close to two ship lock series. Each of them has five steps and takes about four hours to travel. The largest vessel allowed is 10,000 tonnes. [113] The locks are 918 114 16.4 feet long, 35 m wide, and 5 m deep. [114] [115] That is half as deep but 30 m (98 ft) longer than those on the St. Lawrence Seaway. The Three Gorges site's maximum annual freight capacity was 18.0 million tonnes before the dam was built. 198 million tonnes of freight flowed through the locks from 2004 to 2007. The river's freight capacity increased six times, while shipping costs were cut by 25%.

Fig-3: ship locks for river traffic to bypass the TGD

Since these locks are staircase locks, the upper and lower gates are both served by inner lock gate pairs. The flight's gates are of the delicate hinged variety, and if one of them is broken, the entire flight can become momentarily unusable.

Ship lift:

Together with the canal locks, there is a ship lift, which functions as an elevator for boats. The ship lift has a lifting capacity of 3,000 tonnes for ships. The ship lift's basin is 120 m by 18 m by 3.5 m (394 ft by 59 ft by 11 ft) and travels a vertical distance of 113 m (371 ft). As opposed to the three to four hours needed to walk through the locks, the ship lift requires only 30 to 40 minutes to complete its journey. The fact that the water level might change drastically is one difficulty. Even with sea levels varying by 12 metres (39 feet) on the lower side and 30 metres (98 feet) on the higher side, the ship lift must function.

Fig-4: ship lift, a kind of elevator

Portage railways:

Short portage railways that completely avoid the dam region are also in the works. There will be two short rail lines built, one on each bank of the river. The Taipingxi port facility on the northern side of the Yangtze, immediately upstream from the dam, will be connected by the 88-kilometer (55-mile) northern portage railway to the Baiyang Tianjiahe port complex in Baiyang Town, below Yichang. The 59-mile (95-kilometer) southern portage railway will connect Zhicheng with Maoping (upstream of the dam) through Yichang South Railway Station (on the Jiaozuo–Liuzhou Railway).

V. CONCLUSION

China's Three Gorges Dam is getting close to being finished. This project is the largest water supply development in human history, combined with a plethora of other smaller initiatives. The Three Gorges Dam will have huge costs and benefits, much like any large-scale construction project that significantly affects or alters a watershed. The production of electricity without the release of greenhouse gases, advancements in navigation, and potential reductions in flood risk are some of the most significant advantages. Massive displacement of millions of Chinese to make way for the dam and reservoir, further ecological degradation of the Yangtze River ecosystem and fisheries, a decrease in sedimentation reaching the East China Sea, and a rising risk of new landslides and reservoir-induced seismicity are some of the costs that are most significant.

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