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The Three Gorges

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DECLARATION

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will cause for disciplinary action by the university and can also evoke penal action from the sources which have not been properly cited or from whom proper permission has not been taken when needed.

ABSTRACT

Construction and operation of the Three Gorges Dam (TGD) has significantly altered the downstream hydrological regime along the Yangtze River, which has in turn affected the environment, biodiversity and morphological configuration, and human development. The ecological and environmental systems of the middle and lower Yangtze River have been affected adversely, with the ecosystems of Poyang Lake and its deltas being among the most damaged. Besides posing a potential threat to the survival of migrant birds and aquatic species, operation of the TGD has also affected the human population, particularly with respect to water and food security. Though the above mentioned effects have been studied in previous papers, a comprehensive discussion has never been conducted. This paper provides the first ever summary of the impacts of the TGD on the downstream reaches of the Yangtze River. The costs and benefits identified provide a constructive eference that can be used in decision-making for sustainable development of water resources in other nations, especially those in the developing world.

I. INTRODUCTION

The Three Gorges Dam was a dream of many Chinese people, buttoday it has become a reality. The dam, 2309 m in length and 181 min height, is the largest ever built in China (Figure 1). The reservoirbehind the dam occupies the Three Gorges, one of the most spectacularsites of natural beauty in China, to form an elongated lake of morethan 600 km in length, with a water surface area of 1,084 km2. It hasa water storage capacity of 39.3 billion m3, equivalent to about 4% ofthe annual freshwater discharge of the Changjiang River. The dam hasa catchment area of one million km2 (i.e., 56% of the total catchment

area of the river system). The budget of the project, including constructionof the dam, the ship lock, power plant, and compensation for themigration of 1.2 million people from the reservoir area, reaches theastronomical figure of CNY 253.9 billion (USD 31.8 billion).

Because of its large scale, from the outset the project has been highlycontroversial, both within the country and worldwide. The benefitsof the project, without a doubt, are large, but uncertainties exist withregard to the long-term impact on the environment. The major concernis the extremely large change that will inevitably cause significant modifications to the environment of the catchment region, against abackground of global changes in climate, sea level, landforms, andecosystems. Thus, a synthesis of the available scientific information,together with an analysis of the future trends in catchment changes followingthe completion of the project, will enable us to understand the.

II. LITERATURE REVIEW

1 The Three Gorges Project Development and Environmental Issues Author By Nanjing University

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39.3 billion m3, equivalent to about 4% ofthe annual freshwater discharge of the Changjiang River.

2 Refrence paper Chinese Dam Project By Jim Yardely

The Three Gorges dam under construction on the Chang Jiang (Yangtze) will,if completed, be China's, and the world's, largest dam. Approximately twicethe size of Gezhouba, 40 kilometres downstream, this mega dam has becomehighly controversial worldwide

3 A Struggle For Power IN China By Dan hua

With the recent increased focus on renewable energy sources, hydroelectric dams are being constructed at a record pace. Worldwide, there are more than 45,000 large hydroelectric dams, plus countless smaller dams built for navigation, flood control, and other uses (Duflo and Pande, 2007). Currently, more than half of the world's rivers contain at least one dam; major rivers often contain multiple dams (Duflo and Pande, 2007).

4 Geo Disaster Governance under the IAD frame work By Chongqing

Disaster governance draws attention from academics and policymakers, especially indeveloping countries. This paper shows how daily geo-disaster governance at local level operatesin China and then reveals the causes of its pattern. To achieve the goals, we apply the InstitutionalAnalysis and Development (IAD) Framework as the lens into the case of Chongqing's Three GorgesReservoir Region.

5 The impact of dam coctruction on emerging human right By Sarah Arid

As the world population has exploded over the last century from 1.65 billion to over 6 billion people, demands on water andenergy have increased exponentially. To meet these increasedneeds, governments have dammed more than half of the world'srivers, constructing large dams for hydroelectric purposes, irrigation,flood control, water storage, and a variety of other uses. Only recently, however, have policy makers begun to systematically consider some of the devastating social and environmental consequences of such infrastructure giants.

III. THE YANGTZE RIVER

The Changjiang River can be divided into upper, middle, and lowerreaches. The upper reach (4,500 km long, one million km2 in catchmentarea) is above the city of Yichang, where the Three Gorges Dam wasbuilt. The middle reach extends from Yichang to Hukou (950 km long,0.68 million km2 in catchment area). The lower reach is from Hukouto the river mouth (930 km long, 0.12 million km2 in catchment area)(for locations, see Figure 2). In the upper reach, the river channels arecharacterized by V-shaped incised valleys. In the middle reach, overthe fluvial plains, the slope gradient of the riverbed is small (0.003% on average) and a meandering river channel system has been well developed.

Finally, in the lower reach, the bed slope is further reduced, and the river flow is influenced by the tidal action at the river mouth.

Located in a mid-latitude region with a monsoon climate (annual precipitation exceeding 1,000 mm on average), the freshwater dischargeis large.6 According to statistical analysis of the gauge recordat the Datong Hydrological Station, which is located 624 km to thewest of the Changjiang River mouth, the long-term average water dischargeof the river is approximately 900 billion m3 yr−1. Maximum discharge eoccurs in summer and is minimal in winter. Soil erosion is mildbecause of the dense vegetation cover in the watershed, but the sediment discharge still reached 500-million t yr−1 before the 1980s because of the large catchment area.

FLOOD RECORD OF THE YANGTZE RIVER

For over 2000 years disastrous floods have affected the middle and lowerreaches of the valley. Every decade they have caused serious loss of life and livelihoods. But flooding is becoming more frequent and population growth has resulted in higher flood damage costs. In 1995 these were put at £2.9 billion.

1931 -145,000 killed. Very high level at Hankou.
1935-High level at Hankou, the result of a local rain event affecting the Hanjiang
1954-Worst flood of 20th century. 1 in 100 year flood.
300,000 killed. 18.9 million suffered from flood damage.
Highest flood on record at Hankou. Occurred after the completion of the Jingjiang flood diversion project
1998-Worst since 1954. Hankou experienced 75 days above danger warning level; run off 50% above average in July, 70% above average in August 4,000 killed; millions displaced. Dams weakened increasing flood hazard. Many lessons learnt from flood event

IV. FLOOD CONTROL

As flooding in the upper catchment is a major cause, opponents of thedam advise the

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construction of a number of smaller reservoirs in theupper reaches of the tributaries and main river but supporters pointout that those already in place have not been effective so a major damis needed.

• Furthermore, tributaries below Yichang also have heavy sedimentloads which lead to flooding downstream, and there are plans for a dam also due for completion in 2009, on the Qingjiang. The 1998 floods reinforced the need to reduce soil erosion andlogging ban was subsequently introduced although a sustainableapproach to forest management had already been adopted in Sichuan.
• In 2000 pilot projects were introduced to convert slopes in excess of20° to forest, compensation being given to farmers involved

V. SCALE OF THREE GORGES DAM

The Three Gorges Dam is 2335 metres long and 181 metres highIt took over 40000 workers more than 17 years to buildThe project used 27.2 million cubic metres of concrete(mainly for the dam wall).463,000 tonnes of steel (enough to build 63 Eiffel towers)was used, and 102.6 million cubic metres of earth was moved The estimated cost of the project is 22.5 billion USD The dams body was finished in 2006 and it became fully operational on 4th of July ,2012. The dam consists of ship lock facility and ship lift which is due to complete in 2015. Spillway Capacity 116000meter cube per second Total capacity of dam 39.3 kilometer cube

VI. POWER GENERATION

In China, the construction of large hydraulic power stations essentiallybegan in the 1980s, and so far the Three Gorges Power Plant is the biggest(Table 1). With a total capacity of 18,200 mw, the electricity that canbe generated will be approximately 85 billion kwh every year,23 after the power plant is in full operation in 2009. The power plant started togenerate power in late 2003. By the end of 2005, some 9.4 billion kwhof electricity had been produced. In 2005, the power generated by allthe power plants in mainland China was around 2,470 billion kwh24;hence, the electricity provided by the Three Gorges Dam will accountfor about 3.4% of the total figure. This is a significant contribution,especially for the Changjiang River basin. It is the largest hydro electricity producing dam in the world It generates 22,250 MW of electricity. It has 34 generators.(32 main , 2 small). The generators are coupled with huge turbines. Cost of each turbine is 50 million USD. Produces electricity to 60 million Chinese

VII. CONSRUCTION OF DAM

The project started in 1993 and will be completed in 17 years, by 2009.22 The construction, according to the plan, consists of three phases: Phase I, 1993–1997, for river closure; Phase II, 1998–2003, for water storage at the preliminary stage; and Phase III, 2004–2009, completion of the whole project. So far, construction has been conducted according to plan. The channel at the dam site was closed in 1997, and the first power generator unit started to supply electricity in 2005. Around 70% of the investment has been used .Construction Construction of main body includes Rock and earth excavation of 102.83 million cubic metre Concrete placement of 27.2 million cubic metre Rock and earth refill of 31.98 million cubic metre. Metal frame installation of 256,500 tonnes Installation of 32 turbine generator units each of 700 MW capacity each.

SHIP LOCK FACILITY

The ship lock is five step and double way type. The locks are 280 metres long 35 metres wide and 5 metres deep The transit time is 4 hours.The max vessel size is 10,000 tonnes 40,000 tonnes of metal structures were used to construct the ship lock.

SHIP LIFT FACILIT

Ship lift is a kind of elevator for vessels . Designed to lift ships upto 3000 tonnes. Will lift ships vertically upto 113 metres high. Lift basin is 120 metres long, 18 metres wide and 3.5 metres deep Transit time 30-40 minutes Due to be completed in 2015.

RELOCATION AND RESETTLEMENT

Re-location: will involve at least 1.2m
Some settlements will be completely submerged e.g. Fengdu some displaced people will have to be re-settled in physically different and distant regions within the valley re-location involves movement to higher altitudes with steeper slopes, poorer soils and climate - consequently poorer quality of life.
new settlements will impact on residents of hill villages; will
occupy large areas of land and loss of former land use

Loss of farmland:

Most fertile cropland and areas of citrus groves will be submerged will result in urban migration for many, some of whom will lack necessary skills and mind set to cope with new jobs The TGP reservoir inundated 632 km sq. of land and 24,500 hectares of farmland 1.24 million people were relocated to higher grounds. So far 13

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cities, 140 towns and 1600 villages have been submerged under the worlds largest reservoir. The total cost spent on relocating people was 6.5 billion dollars. u The relocation process was the largest for a river water project.

BENEFITS OF THE DAM

Flood control in middle and lower reaches is the key benefit:

* will afford protection from 1 in a 100 year flood
* will save lives and livelihoods in the densely populated Jingjiang and Dongting Lake plains, the area most prone to devastating floods

Economic

Flood control below Yichang losses will only be incurred in the event of a greater than 1 in 100 flood event

Hydropower 18,200MW capacity; sale will fund project cost will provide about 10% of China's current needs well placed to transmit to Beijing and to east and SE coastal provinces

will create jobs and promote economic growth in valley and other regions

Water:

• water supply for towns in the valley will facilitate transfer of water to water short Northern Plain via Danjiangkou Reservoir to Beijing (middle route)

ENVIRONMENTAL BENEFITS

By providing hydroelectricity at such a high scale, the TGP has saved 31 million tonnes of coal and prevented.. 100 million tonnes of green house gas per year 1 million tonnes 370,000 tonnes of nitric oxide. of sulphur dioxide per year 10,000 tonnes of carbon monoxide

NAVIGATION BENEFITS

The installation of ship locks and ship lift has increased river shipping from 10 million tonnes to 100 million tonnes annually. Transportation rates are cut by 30-37 %. u The water traffic on the Yangtze has increased by 6 times. Improved navigation on the upstream side important in area where communication byland restricted: will enable 5,000 t vessels to reach Chongqing at all times of year,10,000 t. vessels for 6 months It will become a major port of China will boost growth of Pudong and valley upstream to Chongqing other major growth points will be Wuhan-Yichang and Chongqing

DRAWBACKS OF THE TGP

Silt factor land slides u erosion and sedimentation loss of wildlife relocation of over a million people. loss of important archeological sites 530 million tonnes of sediment into the reservoir every year The 600 km long reservoir flooded 1400 archaeological sites Due to high water levels on upstream side, major landslides have occurred in the recent past 80% of the land area is experiencing erosion. u Shanghai sits on a sedimentary plain. Loss of endangered species due to the change in water level and water quality. (ex-Chinese river dolphin)

Increased pollution from sewage and industrial effluent in reservoir area as flow will be reduced. Chongqing particularly concerned - toxic pollution from chemicals from drowned factories will also reduce water quality. **Siltation** of reservoir

Increased scour below the dam; larger bank protection works may beneeded in middle reaches.

Earthquake threat large dams can cause earthquakes

Ecosystems some habitats may well be affected e.g. River Dolpin

CONCLUSION

Three Gorges Dam Project working as the most productive dam in surge control so far started to convey advantages to Chinese individuals in for the most part four viewpoints which is Flood Control, Power Generation, Navigation and Tourism. The undertaking can effectively control the water from upper stream and decrease the surge and sand filling Dongting Lake amid the surge season. It likewise can working as force era since it is situated amidst China, the hydropower station supplies energy to the center,eastern and southern China, inside 400 to 1000 km monetary transmission separation of the heap. Moreover, the Three Gorges Dam which is situated in the center compass of Yangtze River will to a great extent enhance the water condition from Yichang City to Chongqing City. To wrap things up, after the dam venture finished, guest charmed to see a marvel in the Yangtze River where a quiet lake sits among the precarious crevasses and this will advance tourism. In any case, China was being accounted for that they conceded the Three Gorges Dam has made a scope of real issues that can hurt our surroundings andhuman. Those effects that brought on by Three Gorges Dam are movement issue. Chineseauthorities assess that the store will halfway or totally immerse 2 urban communities, 11 districts, 140 towns, 326 townships, and 1351 towns. Moreover, making of Three Gorges Dam likewise brings awful effects on the earth and nature of the supply zone and the Yangtze River. The production of the dam and related repository has brought about a few issues identified with atmosphere decayed, plants and natural life vanished.

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